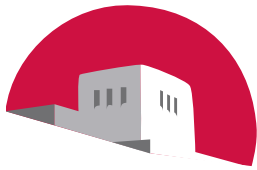


THE UNIVERSITY OF NEW MEXICO
DEPARTMENT OF COMPUTER SCIENCE

Academic Program Review
Self-Study



THE UNIVERSITY *of*
NEW MEXICO

www.cs.unm.edu

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Computer Science Department Academic Program Review

Chapter 1: General Characteristics of the Computer Science Department

This document presents the 2009 self-study for the Department of Computer Science at UNM. The self-study was prepared as part of the Department's Academic Program Review (APR). The Department emphasizes high-quality high-expectation teaching, and 100% of the tenure-stream faculty are research active. The Department is ABET accredited, undergoing intensive scrutiny of its undergraduate program every six years.

The department has changed dramatically in the past four years, with the retirement or resignation of six professors, five of whom were senior faculty who retired after long careers in the department. The department has hired six new faculty to replace these vacancies, emphasizing new trends in computer science, enhancing the diversity of its faculty significantly, and enhancing its connections to other programs at UNM.

Enrollments in CS at UNM follow those of the rest of the country, with historically large swings both up and down. CS enrollments, both graduate and undergraduate, fell dramatically after the "dot com bust" in 2002, remained low for several years, and are now trending up again. We anticipate continued growth over the next several years, in particular resulting from a renewed national emphasis on STEM (Science, Technology, Engineering and Mathematics) fields.

The self-study shows a department that is on the rise in terms of research prominence, is excellent in several research specialties; offers rigorous degree programs, values teaching, has a diverse faculty and student body, and is generally well-run. Notable issues raised by the self-study include: lack of funding for one tenure-track position; lack of staffing for recruiting, outreach, and development activities; the need for increasing institutional support to enhance extramural funding; the inadequate condition of its physical facilities; and planning for the next Department Chairman.

1.1 Brief History of the Department

The Computer Science Department, originally known as Computing and Information Sciences Department (CIS), began in the late 1970s. Before joining the School of Engineering, being renamed the Computer Science department, and receiving Ph.D. granting powers from the state of New Mexico in 1979, CIS was a loose confederation of Professors from the Mathematics and Computer Engineering faculties that taught software related courses. At the end of 1978, for example, CIS consisted of six tenure-track faculty and one lecturer.

The formal introduction of the CIS Department into the School of Engineering in 1979 initiated the modern Computer Science Department. In 2010 the CS Department has grown to 17 tenure-track faculty, one unfunded tenure-track position, plus two full-time lecturers (one funded from soft money). Details about the current faculty's research and teaching, along with public and other outreach activities appear in Chapter 6, Faculty Matters.

1.2 The Computer Science Department's Objectives:

The Computer Science Department has the following objectives:

- Excellence in teaching and research
 - B.S. graduates prepared for top-tier graduate programs and employment as software professionals.
 - M.S./Ph.D. graduates receive offers from top-tier employers
 - Rank among the top 40 departments nationally
 - Maintain ABET accreditation
- Emphasis on interdisciplinary research and teaching
 - Links with other departments and colleges
 - Strong collaborations with external research laboratories
- Broadening participation of underrepresented groups
- Industrial partners and sponsors

1.3 The Computer Science Department Goals and the UNM Strategic Plan

UNM's Strategic Framework includes the mission, vision, and core values of the University. These are included in Appendix A.

1.4 Overview of Faculty, Staff, Student, and Community Participants

The Computer Science Department, as of September 2009, consists of 17 tenure-track faculty and two full time lecturers (one funded on soft money). The Department has one additional tenure-track line but does not have funds available to fill the line. One of the 17 resigned in Dec. 2009, and the Department is currently searching for a replacement. The research areas, public service, and related endeavors of these faculty are listed in Chapter 6. The CVs may be found in Appendix D. The Department has seven full-time staff members supporting both academic and computing facilities. Several twenty-hour per week work-study students supplement the staff.

The Computer Science Department plays an active role in both technological and educational activities in Albuquerque and the State of New Mexico. Our community collaborators include The Santa Fe Institute, Los Alamos and Sandia National Laboratories, and many private and public companies. The department interacts regularly with the Albuquerque Public Schools as well as with the community and four-year colleges of New Mexico, including a State-wide articulation effort to smooth student transitions from 2-year to 4-year programs. Further details of these collaborations are found in Chapter 6 where individual faculty research and outreach efforts are listed.

The Computer Science Department is well-known nationally and internationally. Current research funding (Chapter 6) is predominantly from the National Science Foundation, and annual research expenditures in the Department are approximately \$3 million per year. Faculty publications appear in international venues, faculty books are distributed and translated into multiple languages, and department faculty are regularly invited to lecture in other countries. Computer Science graduate students come to UNM from around the world.

Departmental Leadership and Governance

The Computer Science Department is one of five departments in the UNM School of Engineering, with the CS Department Chair sitting on the Dean's Advisory Council. The leadership and governance of the department is lightweight, with a single half-time Department Chair, a supporting Associate Chair, and a few sitting committees: the Awards Committee, the Undergraduate Curriculum Committee, and the Promotion and Tenure Committee. Other routine department jobs are assigned annually to one or two faculty (e.g., Colloquium, Graduate Admissions, Graduate Examinations), and most strategic decisions are made by consensus and vote in weekly or bi-weekly faculty meetings, with ad hoc committees appointed from time to time. For example, one ad hoc committee redesigned the M.S. curriculum two years ago, and another such committee is currently working on a 4+1 year B.S./M.S. program.

The Department Chair is responsible for all personnel decisions, including salaries, faculty assessment, and teaching and committee assignments. The Associate Chair coordinates the graduate and undergraduate programs and sits on the committees responsible for curriculum organization and review. The faculty discuss and approve most curricular and academic decisions, for example, voting on which students pass the department Comprehensive Exams.

1.5 Academic Programs Overview

The Computer Science Department offers B.S., M.S., and Ph.D. programs. The Undergraduate program is accredited by ABET, the national computer science accrediting agency. Until recently, the Department was the only accredited program of computing education in the State of New Mexico. The details of the ABET accreditation, along with student performance measures, are presented in Chapter 2. In addition to the 4-year B.S. degree, the Department participates in a 3+2 program whereby students receive a B.S. in Computer Science and a MBA by enrolling in special combined program. This program was quite popular a decade ago but is currently underused. The Department has close ties with the new Interdisciplinary Film and Digital Media (IFDM) program at UNM. Department faculty helped conceive the program, designed the curriculum, and teach some of its courses. The Department recently adopted a new IFDM minor for CS majors in the IFDM program.

The graduate program in Computer Science is respected both nationally and internationally, receiving applications from a broad range of local, national, and international students. The graduate program offers both M.S. and Ph.D. degrees. Most CS graduate courses can count towards either degree. The decision on which degree is eventually awarded to a student is governed by that individual student's intentions and the particular Program of Studies (POS) that the student negotiates with his/her advisor. The POS (see Appendix B) is directed at explicitly fulfilling the requirements of the university catalog for the M.S. or Ph.D. degree. Further details on the Graduate program appear in Chapter 3.

1.6 Major Research and Creative Endeavors

The major research and creative efforts of the department are measured in the research, funding, and outreach efforts of its faculty and students. These are catalogued in Chapter 6, with faculty CVs in Appendix D. The Department is well-known for its wide range of interdisciplinary research, which spans biology, biomedicine, physics, cognitive science, and high-performance computing. In recent years, it has developed significant momentum in more core areas, including computer science theory, theoretical approaches to programming languages, graphics, and security.

1.7 Public Service and Other Major Initiatives

See Chapter 6 where public service and other initiatives are linked to faculty.

1.8 Program Accreditation Review and Subsequent Changes

The Undergraduate and Graduate programs are continually changing to meet the education and research requirements of the State of New Mexico and the Nation. The field of computing continues to evolve at an amazing, exciting, and challenging rate, and the Department strives to maintain a balance between updating the program to reflect important changes and avoiding fads.

Our assessment mechanisms, both for our graduate and undergraduate programs, support an evolving curriculum where new courses are regularly introduced to meet the changing needs and requirements of our educational system. At the same time, the accreditation structures support the preservation of the foundations of sound computing in mathematics, computer architecture, data structures, and appropriate programming language skills. Thus, within the bounds of our Undergraduate ABET accreditation and our graduate program design, the curriculum continues to preserve basic skills and evolve to meet changing educational and research needs. Details about the curriculum and its evaluation appear in Chapters 2 and 3.

Chapter 2: Undergraduate Degree Programs, Curricula, and Student Performance Measures

The Department is ABET accredited, receiving its most recent 6-year accreditation in 2006. The accreditation report was very favorable, with a few concerns, which are discussed here: (1) need for UG exposure to working in multidisciplinary teams; (2) assessment plans; (3) oral communication skills are not sufficiently emphasized; (4) lack of space devoted to laboratories and lack of institutional funding to support laboratory facilities. The Department addressed concern (1) by revamping CS 365 Introduction to Scientific Modeling and encouraging students from other departments to enroll for the course. Concern (2) is being addressed by the Department maintaining its assessment program, although ABET has recently changed its requirements for assessment, and the Department will be modifying its assessment procedures to track these changes. Concern (3) is being addressed informally, as more faculty require more class discussion and presentations. Several classes now use class participation scores as part of the final grade calculation. Concern (4) remains a concern and is not being addressed currently. This is discussed in the self-study sections devoted to Physical Space and Staffing. (ABET report is included as Appendix C)

2.1 Objectives of Undergraduate Degree Program

Program educational objectives were established in September 2002 with input from the Department's constituents, which included the faculty, undergraduate students, and alumni. These objectives were first published in the University of New Mexico Catalog and later posted on the Computer Science Department's web page. The objectives are as follows:

1. Have sufficient analytical skills and knowledge to make appropriate system and language choices for computer based problem solving.
2. Possess algorithm development skills for effective problem solving and programming.
3. Understand the software development process.
4. Besides the core computing skills, have significant background in application areas such as databases, graphics and artificial intelligence.
5. Communicate effectively in both oral and written modes.
6. Understand and respect the professional standards of ethics expected of a computer scientist as well as appreciate the social impact of computing.
7. Appreciate the intellectual environment offered by the University of New Mexico and adopt the goal of life-long learning in an ever-evolving world.

The core of the University of New Mexico's mission statement is concerned with providing students with the skills and knowledge they need to contribute to the state and national economies and to lead satisfying lives. All of the objectives of the Computer Science Department derive from its commitment to provide its graduates with an education of the highest quality, which will allow them to pursue careers as computer scientists and software engineers, or to pursue advanced degrees. In doing so, its alumni will contribute to the state and national economies, gain economic self-sufficiency, and develop their intellectual faculties, all of which contribute to a satisfying life. The goal of leading a satisfying life is further reinforced by the department's explicit objective of fostering an appreciation of life long learning, a "habit of mind" which we believe is a key component of personal development.

Outcomes of Undergraduate Degree Program

The Department of Computer Science established the following program educational outcomes:

- A. An ability to apply knowledge of mathematics, science and computing
- B. An ability to design and conduct experiments and to analyze and interpret data
- C. An ability to design a system, component or process to meet desired needs
- D. An ability to function on multidisciplinary teams
- E. An ability to identify, formulate and solve computer related problems
- F. An understanding of professional and ethical responsibility
- G. An ability to communicate effectively both orally and in writing
- H. An understanding of the field of computing in a global and societal context
- I. A recognition of the need for and an ability to engage in life long learning
- J. Knowledge of contemporary issues in computing
- K. An ability to use the techniques, skills and modern computing tools necessary for computer science practice

All required and elective courses in the computer science curriculum support subsets of the program educational outcomes A-K. Earlier, the objectives and outcomes were being assessed informally and in an integrated manner through homework, quizzes, midterms, exams, and other coursework including projects and term papers as well as course evaluations. We would solicit informal reports from employers during meetings with the faculty and the Department Chair. In addition, students would express their concerns and views at the exit interviews as well as to faculty advisors and Program Advisement Coordinator at advisement. These informal and ad hoc processes have been effective and led to many significant improvements over the years, strengthening the program. The

new formal and systematic assessment processes have been in place for several years now and have led to further improvements.

Outcomes A-K are now explicitly assessed by faculty each semester. Faculty are free to choose their own instruments for assessing program outcomes and are free to set their own performance standards. Instruments for assessing program outcomes can be homework assignments, individual homework problems, quizzes, individual quiz questions, midterm and final exams, questions from exams, programming projects, oral presentations, and term papers. The faculty are explicitly instructed that not all class work is necessarily suitable for unambiguously assessing program outcomes. In particular, faculty are instructed that instruments for program outcomes assessment must fall into one of two categories:

1. *Targeted assessment instrument*: a graded element of class work where the credit received by the student is directly correlated with the student's performance on a task embodying a single program educational outcome.
2. *Integrated assessment instrument*: a graded element of class work where the credit received by the student is directly correlated with the student's performance on a task embodying multiple program educational outcomes that are inextricably linked so that no credit is received unless all are adequately demonstrated.

The purpose of classifying assessment instruments into these two types and in instructing faculty to restrict themselves to these interpretations was to ensure that outcomes are assessed in a uniform way which is unambiguous with respect to credit assignment, that is, leaving no doubt as to whether or not a particular outcome has actually been assessed.

In order to determine whether or not an outcome assessment is positive or negative, the faculty member formulating the instrument specifies two numbers. The first number is termed the *goal* and the second number is termed the *standard*. Both are percentages. The *goal* is the percentage of students whose performance ideally will exceed the *standard* on the assessment instrument. After applying the instrument, the faculty member reports a third number, the *measured*, also a percentage, which corresponds to the actual percentage of students whose performance equaled or exceeded the standard. If *measured* equals or exceeds *goal* then the assessment is considered positive. This process is facilitated by the use of a web-based application. See Figure 1.

ABET COURSE ASSESSMENTS

CS 241L: Data Organization (Spring 2009)

Legend: **A** = Math, Science, and Computing; **B** = Experiment; **C** = Design; **D** = Teamwork; **E** = Problem solving; **F** = Ethics; **G** = Communication; **H** = Computers and Society; **I** = Life long learning; **J** = Current Issues in Computing; **K** = Techniques and Tools

	Assessment	Goal	Standard	Measured	A	B	C	D	E	F	G	H	I	J	K
CS 241L castellanos	Lab 1	85	85	83	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 2	85	85	82	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 3	85	85	85	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 4	85	85	92	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 5	85	85	88	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 6	80	85	50	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 7	85	85	73	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 8	85	85	95	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lab 9	85	85	72	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 1. Sample web-based assessment form

The ultimate goal of outcomes assessment is the assessment of the program objectives, which support the mission statement of the School of Engineering and the University of New Mexico. Accordingly, raw data from the faculty, in the form of *outcomes assessment tables*, one for each course, are compiled into summary statistics at the end of each semester, and these summary statistics are provided to the Undergraduate Curriculum Committee in order to assess program objectives. For this purpose, the following *grounding scheme*, which explicitly reflects the dependence of the program outcomes (A-K) on program objectives (1-7), is employed:

1. Have sufficient analytical skills and knowledge to make appropriate system and language choices for computer based problem solving (outcomes A, B, C, E, K specifically assessed in required courses)
2. Possess algorithm development skills for effective problem solving and programming (outcomes A, B, C, E, K specifically assessed in CS 361 and CS 362)
3. Understand the software development process (A, B, C, E, K specifically assessed in CS 251 and CS 351)
4. Besides the core computing skills, have significant background in application areas such as databases, graphics and artificial intelligence (outcomes A, B, C, E, K specifically assessed in technical electives)
5. Communicate effectively in both oral and written modes (outcome G specifically assessed in required courses)

6. Understand and respect the professional standards of ethics expected of a computer scientist as well as appreciate the social impact of computing (outcomes F, H, J specifically assessed in required courses)
7. Appreciate the intellectual environment offered by the University of New Mexico and adopt the goal of life-long learning in an ever-evolving world (outcome I specifically assessed in required courses).

The summary results for the program objectives assessment for Spring 2005-Fall 2009 are shown below:

OUTCOMES ASSESSMENT REPORT *GENERATED FOR ACCREDITATION YEAR 2006 (SUMMER 2005, FALL 2005, & SPRING 2006)*

Outcomes Legend: **A** = Math, Science, and Computing; **B** = Experiment; **C** = Design; **D** = Teamwork; **E** = Problem solving; **F** = Ethics; **G** = Communication; **H** = Computers and Society; **I** = Life long learning; **J** = Current Issues in Computing; **K** = Techniques and Tools

Category	A	B	C	D	E	F	G	H	I	J	K
Required Courses	0.62	0.64	0.73	1.00	0.61	0.79	0.79	0.75	0.76	0.79	0.63
CS251 and CS351 (software)	0.62	0.55	0.71	1.00	0.61	-	0.77	-	0.79	-	0.63
CS361 and CS362 (Algorithms)	0.73	1.00	1.00	-	0.73	-	1.00	-	-	-	0.60
Technical Electives	0.56	0.75	1.00	-	0.71	-	1.00	1.00	1.00	1.00	0.71

PROGRAM OBJECTIVES ASSESSMENT

Table 1: Have sufficient analytical skills and knowledge to make appropriate system and language choices for computer based problem solving.

Category	A	B	C	E	K
Required courses	0.62	0.64	0.73	0.61	0.63

Table 2: Possess algorithm development skills for effective problem solving and programming.

Category	A	B	C	E	K
CS361 and CS362 (Algorithms)	0.73	1.00	1.00	0.73	0.60

Table 3: Understand the software development process.

Category	A	B	C	E	K
CS251 and CS351 (Software)	0.62	0.55	0.71	0.61	0.63

Table 4: Besides the core computing skills, have significant background in application areas such as databases, graphics and artificial intelligence.

Category	A	B	C	E	K
Technical Electives	0.56	0.75	1.00	0.71	0.71

Table 5: Communicate effectively in both oral and written modes.

Category	G
Required courses:	0.79

Table 6: Understand and respect the professional standards of ethics expected of a computer scientist as well as appreciate the social impact of computing.

Category	F	H	J
Required courses:	0.79	0.75	0.79

Table 7: Appreciate the intellectual environment offered by the University of New Mexico and adopt the goal of life-long learning in an ever-evolving world.

Category	I
Required courses:	0.79

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OUTCOMES ASSESSMENT REPORT

**GENERATED FOR ACCREDITATION YEAR 2007
(SUMMER 2006, FALL 2006, & SPRING 2007)**

Outcomes Legend: **A** = Math, Science, and Computing; **B** = Experiment; **C** = Design; **D** = Teamwork; **E** = Problem solving; **F** = Ethics; **G** = Communication; **H** = Computers and Society; **I** = Life long learning; **J** = Current Issues in Computing; **K** = Techniques and Tools

Category	A	B	C	D	E	F	G	H	I	J	K
Required Courses	0.87	0.80	0.80	1.00	0.86	0.83	0.75	0.83	0.85	0.86	0.87
CS251 and CS351 (software)	0.97	0.88	1.00	1.00	0.97	-	0.62	-	0.88	-	1.00
CS361 and CS362 (Algorithms)	0.76	1.00	0.78	-	0.76	-	1.00	-	-	1.00	0.76
Technical Electives	0.86	0.75	0.75	-	0.80	-	1.00	1.00	1.00	1.00	0.86

PROGRAM OBJECTIVES ASSESSMENT

Table 1: Have sufficient analytical skills and knowledge to make appropriate system and language choices for computer based problem solving.

Category	A	B	C	E	K
Required courses	0.87	0.80	0.80	0.86	0.87

Table 2: Possess algorithm development skills for effective problem solving and programming.

Category	A	B	C	E	K
CS361 and CS362 (Algorithms)	0.76	1.00	0.78	0.76	0.76

Table 3: Understand the software development process.

Category	A	B	C	E	K
CS251 and CS351 (Software)	0.97	0.88	1.00	0.97	1.00

Table 4: Besides the core computing skills, have significant background in application areas such as databases, graphics and artificial intelligence.

Category	A	B	C	E	K
Technical Electives	0.86	0.75	0.75	0.80	0.86

Table 5: Communicate effectively in both oral and written modes.

Category	G
Required courses:	0.75

Table 6: Understand and respect the professional standards of ethics expected of a computer scientist as well as appreciate the social impact of computing.

Category	F	H	J
Required courses:	0.83	0.83	0.86

Table 7: Appreciate the intellectual environment offered by the University of New Mexico and adopt the goal of life-long learning in an ever-evolving world.

Category	I
Required courses:	0.86

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OUTCOMES ASSESSMENT REPORT

*GENERATED FOR ACCREDITATION YEAR 2008
(SUMMER 2007, FALL 2007, & SPRING 2008)*

Outcomes Legend: **A** = Math, Science, and Computing; **B** = Experiment; **C** = Design; **D** = Teamwork; **E** = Problem solving; **F** = Ethics; **G** = Communication; **H** = Computers and Society; **I** = Life long learning; **J** = Current Issues in Computing; **K** = Techniques and Tools

Category	A	B	C	D	E	F	G	H	I	J	K
Required Courses	0.83	0.52	0.88	0.88	0.85	0.67	0.85	0.57	0.74	0.92	0.83
CS251 and CS351 (software)	0.79	0.25	0.80	1.00	0.82	-	0.92	-	0.82	-	0.79
CS361 and CS362 (Algorithms)	0.88	1.00	1.00	1.00	0.88	-	1.00	-	-	-	0.88
Technical Electives	0.60	0.67	1.00	-	0.60	-	-	-	-	-	0.60

PROGRAM OBJECTIVES ASSESSMENT

Table 1: Have sufficient analytical skills and knowledge to make appropriate system and language choices for computer based problem solving.

Category	A	B	C	E	K
Required courses	0.83	0.52	0.88	0.85	0.83

Table 2: Possess algorithm development skills for effective problem solving and programming.

Category	A	B	C	E	K
CS361 and CS362 (Algorithms)	0.88	1.00	1.00	0.88	0.88

Table 3: Understand the software development process.

Category	A	B	C	E	K
CS251 and CS351 (Software)	0.79	0.25	0.80	0.82	0.79

Table 4: Besides the core computing skills, have significant background in application areas such as databases, graphics and artificial intelligence.

Category	A	B	C	E	K
Technical Electives	0.60	0.67	1.00	0.60	0.60

Table 5: Communicate effectively in both oral and written modes.

Category	G
Required courses:	0.85

Table 6: Understand and respect the professional standards of ethics expected of a computer scientist as well as appreciate the social impact of computing.

Category	F	H	J
Required courses:	0.67	0.57	0.92

Table 7: Appreciate the intellectual environment offered by the University of New Mexico and adopt the goal of life-long learning in an ever-evolving world.

Category	I
Required courses:	0.92

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OUTCOMES ASSESSMENT REPORT

*GENERATED FOR ACCREDITATION YEAR 2009
(SUMMER 2008, FALL 2008, & SPRING 2009)*

Outcomes Legend: **A** = Math, Science, and Computing; **B** = Experiment; **C** = Design; **D** = Teamwork; **E** = Problem solving; **F** = Ethics; **G** = Communication; **H** = Computers and Society; **I** = Life long learning; **J** = Current Issues in Computing; **K** = Techniques and Tools

Category	A	B	C	D	E	F	G	H	I	J	K
Required Courses	0.75	0.43	0.69	0.81	0.77	0.57	0.65	0.57	0.48	0.67	0.76
CS251 and CS351 (software)	0.82	0.62	0.82	0.93	0.84	1.00	0.91	1.00	0.50	0.80	0.81
CS361 and CS362 (Algorithms)	0.88	0.00	0.89	-	0.88	-	0.00	-	-	-	0.88
Technical Electives	0.71	0.75	1.00	1.00	0.71	-	1.00	1.00	-	-	0.75

PROGRAM OBJECTIVES ASSESSMENT

Table 1: Have sufficient analytical skills and knowledge to make appropriate system and language choices for computer based problem solving.

Category	A	B	C	E	K
Required courses	0.75	0.43	0.69	0.77	0.76

Table 2: Possess algorithm development skills for effective problem solving and programming.

Category	A	B	C	E	K
CS361 and CS362 (Algorithms)	0.88	0.00	0.89	0.88	0.88

Table 3: Understand the software development process.

Category	A	B	C	E	K
CS251 and CS351 (Software)	0.82	0.62	0.82	0.84	0.81

Table 4: Besides the core computing skills, have significant background in application areas such as databases, graphics and artificial intelligence.

Category	A	B	C	E	K
Technical Electives	0.71	0.75	1.00	0.71	0.75

Table 5: Communicate effectively in both oral and written modes.

Category	G
Required courses:	0.65

Table 6: Understand and respect the professional standards of ethics expected of a computer scientist as well as appreciate the social impact of computing.

Category	F	H	J
Required courses:	0.57	0.57	0.67

Table 7: Appreciate the intellectual environment offered by the University of New Mexico and adopt the goal of life-long learning in an ever-evolving world.

Category	I
Required courses:	0.67

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The table entries represent the percentage of all assessments of a specific outcome where the goal was met or exceeded. The summary results are reviewed by the Undergraduate Curriculum Committee who recommends curriculum changes to the faculty. This review meeting is held once per year.

The formal assessment process is in place for all core courses including CS 152, 241, 251, 261, 293, 341, 351, 357, 361, and 362, as well as some technical electives including CS 422, 427, 433, 438 and 464.

The departmental committees involved in assessing departmental objectives and instituting changes in the curriculum and other remedies are as follows:

Undergraduate Curriculum Committee -- The committee with primary responsibility for objectives assessment. This includes identifying gaps in objectives assessment, and in identifying objectives with negative assessment which require identification of root causes and or design of remedies, e.g., by changes to the curriculum.

Members: Profs. Williams, Luger, and Stefanovic.

Programming Fundamentals and Software Academic Area Committee -- Academic Area Committee devoted to programming fundamentals and software engineering, including principal responsibility for CS 152, CS 251, CS 351, and CS 460.

Members: Profs. Ackley, Lane, Kniss, and Stefanovic.

Programming Languages Academic Area Committee -- Academic Area Committee devoted to the programming languages component of the curriculum, including principal responsibility for CS 357.

Members: Profs. Kapur, Stefanovic, and Williams.

Theory and Algorithms Academic Area Committee -- Academic Area Committee devoted to theoretical and algorithmic components of the curriculum, including principal responsibility for CS 261, CS 361, and CS 362.

Members: Prof. Moore, Luan, Hayes, and Saia.

Computer Systems Academic Area Committee -- Academic Area Committee devoted to computer systems and engineering components of the curriculum, including principal responsibility for CS 241, CS 341, and CS 481.

Members: Profs. Bridges, Arnold, and Crandall.

Applications Area Committee -- Academic Area Committee devoted to applications of computer science, including principal responsibility for technical electives.

Members: Profs. Ackley, Lane, Luan, Luger, Kniss, and Williams.

The overall process for objectives assessment is shown in Fig. 2. The process begins by faculty members preparing an Outcomes Assessment Table for each relevant course taught in the previous semester. Summary statistics are compiled annually from the Outcomes Assessment Tables, and these become the basis for the Objectives Assessment Summary Report communicated to the Undergraduate Curriculum Committee. In the annual Objectives Assessment Meeting, the Undergraduate Curriculum Committee reviews the Objectives Assessment Summary Report and makes a list of recommendations that are forwarded to the heads of the Academic Area Committees. These requests can be one of two types:

1. Assessment request - A request by the Undergraduate Curriculum Committee to an Academic Area Committee (and subsequently to an individual faculty member) to assess a specific outcome or set of outcomes in response to a recognized objective assessment gap.
2. Remedy request - A request by the Undergraduate Curriculum Committee to an Academic Area Committee to identify a cause and/or design a remedy for a negative objectives assessment.

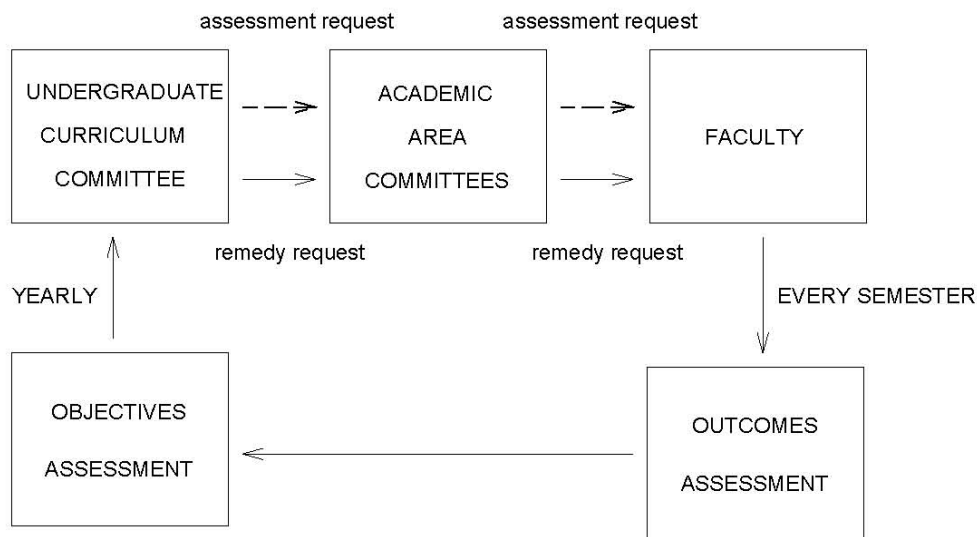


Figure 2

An assessment request will be communicated by the relevant Academic Area Committee to an individual faculty member, who will then devise either a targeted or integrative Outcome Assessment instrument for the necessary outcome. For example, in the Spring 2005 Objective Assessment Summary, there is a gap in the assessment of Objective 2, i.e., possessing algorithm and development skills for effective problem solving and programming, with respect to Outcome B, i.e., experimental design, as specifically assessed in CS 361 and CS 362. This gap will result in the issuance of an assessment request from the Undergraduate Curriculum Committee to the Theory and Algorithms Academic Area Committee.

The response by the relevant Academic Area Committee to a remedy request can range widely in complexity. As an example of a simple response, the Academic Area Committee might simply request that a specific topic be emphasized or reinforced through additional homework in an existing course, at the discretion of an individual faculty member. A more drastic remedy might require the introduction of a new course or a revision of the curriculum or of academic policies.

All changes recommended by the Undergraduate Curriculum Committee in consultation with the relevant Academic Area Committee must be approved by the department faculty. Any significant changes in the curriculum including addition of new courses, changes in the course descriptions, etc. must be approved by the appropriate faculty senate committee.

For example, in the Spring 2005 Objective Assessment Summary, there are two objectives where the rate of positive assessment is lower than 60 percent. These are: Objective 3, i.e., understanding the software development process; and Objective 4, i.e., application areas. The relative rate of negative assessment in the outcomes supporting the assessment of Objective 4 is primarily due to the (possibly) unrealistically high goals (100 percent target group) set by one faculty member in a single technical elective (CS 433). The remedy will most likely be a recommendation by the Undergraduate Curriculum Committee that the faculty member adopt more realistic target group percentages. In contrast, the remedy request in response to the shortcomings revealed by the assessment of Objective 3 is likely to be significantly more involved, and may require changes to the curriculum.

Later in this section we provide a summary of the major program changes that were driven by the previously described assessment mechanisms. These mechanisms include exit interviews with graduating students conducted by the Department Chair and Associate Chair, discussions between the Associate Chair and Undergraduate Committee regarding findings of the exit interviews, student feedback in course evaluations, students' meeting with the Department Advisory Committee, informal student feedback in classes as well as during advisement, assessment of drop, retake, and failure rates in courses. Many of our faculty are in touch with former students who return to visit or send us emails to let us know what they are doing. This is yet another informal avenue of feedback.

The exit interviews which were put into place after an earlier accreditation visit are a valuable tool that has led to many of the curriculum changes described below. The Associate Chair discusses significant findings from these interviews with the Undergraduate Curriculum Committee. In the case of the CS 201/361/461 sequence, for example, these discussions led to the formation of a subcommittee that drafted the proposed changes leading to the current CS 261/361/362 sequence now in effect. The exit interviews allow us to monitor the impact of these changes and have helped verify their effectiveness.

Exit Interviews

This formal instrument has been in place through two six-year cycles of accreditation visits. Announcements and repeated reminders are sent to all graduating students about the exit interviews. Students schedule the interviews themselves either with the Department Chair or the Associate Chair. The interviews, which typically last 15 to 20 minutes, begin with the interviewer asking the student for permission to take notes. Students are assured that the notes are confidential and used only to help us identify

trends and changes over time. We present all of the questions in advance and let the students choose the questions they want to respond to (and the order).

Interview Questions

1. What are your plans for next year?
2. What is your overall satisfaction with your UNM/CS experience?
3. How did your actual experience compare to your expectations about the CS degree and/or our department and/or UNM when you first started the program?
4. Curriculum: Do you have any comments about the curriculum? For example, were there any surprises about what is / is not in the curriculum?
5. Classes: Do you have any comments about the classes?
 - A. content
 - B. quality
 - C. fairness
6. Was there continuity between the classes?
7. Advising: Was advising accessible and helpful? Did you always know what you needed to do (e.g., what to take, when to take it and how to keep reasonable load balances)?
8. Did you have any notable good or bad experiences?
9. Do you have any complaints or criticisms?
10. Can you comment on the sense of community in the CS Department?
11. Do you have any recommendations for improving the program and/or the general experience of being in the CS Department?
12. Is there anything else you would like to comment on?

Notes taken at the interviews are reviewed by the Associate Chair to identify common themes occurring in the interviews. These are summarized and presented to the faculty at department meetings.

In the Fall 2001 -- Fall 2002 interviews, one theme stood out clearly from all of the others. A significant number of students expressed concern about the difficulty of our

theory sequence CS201/CS361/CS461. The aspects that came up consistently were the jump from CS201 and CS361 -- both the gap in time in the recommended schedule of classes and the jump in the level of material -- and the difficulty of CS461.

A direct consequence of this was to form a faculty committee to evaluate and redesign the theory sequence. This effort led to the creation of the CS261/CS361/CS362 sequence, which is discussed below.

In the Spring 2003 -- Fall 2004 interviews, numerous comments were made about the programming and programming languages sequence (CS152/CS251/CS257/CS351/CS451) in general, and the programming languages course CS451 in particular. Many students made a point of commenting on CS 451, but it is notable that the nature of the comments varied quite a bit. Many heaped praise on the course, while others criticized it. Evaluations of this course probably varied more than others depending on who taught it. As a result of this feedback, the Department formed a faculty committee to evaluate and redesign the programming and programming languages sequence (see below).

The following are the major program changes that have been implemented since the last departmental self study:

1. Reworking computer language paradigms curriculum. Beginning fall semester 2008, the faculty decided to change the course offerings for the senior level "Programming Paradigms" course, CS 451, and combine it with the Scheme course CS 257. The UG committee received a summary of exit interviews as well as much input from both students and faculty that the CS 257/451 sequence was in need of revision. Students were having difficulty with the sequence (especially CS 451) and faculty teaching the sequence felt a redesign was desirable. There also was a specific suggestion from the UNM 2000 Committee that all undergraduate programs be configured to help students complete them in four years time. Since 257 and 451 had both, in recent years, come to focus on functional programming, it was decided to combine them into one class CS 357. Some of the justifications follow:

- a. CS 451 had been offered once a year, usually in the second semester, and was considered to be a senior-level class. Any problems in this class, a student drop out or failing grade meant that graduation was delayed by at least one year. It was decided that CS 357, still taught once a year, should be taken by most students in the third year.

- b. The faculty also decided that most of the "harder" courses (351, 357, 362) should be offered in the junior year. Besides letting students understand better their graduation constraints this also allows them to focus on electives (there are now 9 credit hours of electives) their final year.

- c. As noted above, since both the old CS 257 and CS 451 had come to focus primarily on functional languages, the faculty felt that this could be handled adequately in one class, the new CS 357.

d. Finally, many graduate students, especially foreign students with inadequate undergraduate training, were filling up the CS 451 class and skewing the course towards their graduate needs. As a response, besides the new CS 357 a new graduate course was created to address this issue.

2. In response to the growing importance of computer security, the department hired a faculty member in this area and introduced a new undergraduate elective course in 2008.

3. Following UNM 2000 suggestions, we streamlined the undergraduate prerequisites tree to encourage graduation within a four-year time period.

4. In 2009, the requirements for the minor in computer science were relaxed and made more flexible to better meet the needs of students from the wider university community. The increasing importance of computer modeling in the sciences and the growth of digital media provide two examples of student cohorts we seek to reach with our more flexible minor.

5. The undergraduate course on scientific modeling was reorganized so that there is a greater emphasis on building real systems and programming in Matlab.

6. Following UNM 2000 suggestions and steady increases in undergraduate enrollment, the Department decided that several courses previously offered only once per year (sometimes less) would now be offered more frequently, *e.g.*, CS 261 is now offered every semester.

Chapter 3: Graduate Degree Programs, Curricula, and Student Performance Measures

In Section 3.1 we give an overview of the Masters Degree in Computer Science, describing the two different paths to completion (thesis and M.S. exam). We also present several “forms” we use to track each student’s progress. In Section 3.2 we describe the Ph.D. program, as well as present “forms” used by the department to track students’ progress.

The School of Engineering has recently developed educational outcomes for M.S. and Ph.D. programs within the school. We present the “forms” used by the department to assess these outcomes. First we discuss admission requirements for the graduate program in Computer Science.

Admission to the Graduate Program in Computer Science

In addition to the University-wide requirements for admission to graduate study, the prospective M.S. or Ph.D. candidate must submit verbal, quantitative and analytical GRE scores (general test) as well as satisfy the following criteria for admission to graduate study:

1. Knowledge of computer science equivalent to CS 152L, 261, 251L, 257L, 341L, 351L, 361L, 362, 441, 460 and 481.
2. Knowledge of mathematics essential to computer science equivalent to MATH 162, 163, 314 and STAT

Students lacking adequate undergraduate training may be admitted, at the discretion of the admissions committee, with the understanding that, course work required to remove the deficiencies in undergraduate background will not be credited toward the graduate degree.

Each student is assigned a graduate advisor. The student is expected to see his or her graduate advisor before registering for the first time. The student and the advisor together will work out a course of studies which meets the student’s career objectives and which constitutes a coherent program satisfying the graduation requirements. No course is counted toward the required semester hours that has not been agreed on by the student and the advisor as a part of this coherent program. It is the responsibility of the student to meet the requirements and to keep the department office informed of compliance with them; in particular, the student should meet with his or her graduate advisor at least once a semester to review progress toward the degree.

3.1 Requirements, Outcomes, and Assessment for the M.S. Program

The M.S. in Computer Science can be completed under Plan I or Plan II.

Graduation Requirements: (M.S. Plan I)

In addition to all Office of Graduate Studies requirements for the master's degree, the department also requires the following:

1. Thirty-two semester hours of approved graduate courses.
2. At least 2 semester hours of CS 592 (*Colloquium*), taken at the University of New Mexico.
3. At least 26 of the 32 hours must be in courses offered by the Computer Science Department at the 500 level or above.
4. Students graduating under Plan I must take a minimum of 6 hours of CS 599 and submit an acceptable thesis.

Only 6 hours of CS 599 may be counted toward the 32 hours.

5. Completion of a minimum of two courses from each category below:
 - a. Mathematical Methods – CS 500, CS 530, CS 550, CS 561
 - b. Empirical Methods – CS 512, CS 527, CS 529, CS 532, course in Complex Adaptive Systems (contact department for a list of acceptable courses).
 - c. Engineering/System Building Methods – CS 554, CS 580, CS 585, CS 587.
6. Passing the master's examination. For Plan I students, the master's examination is the defense of thesis. For Plan II students, the master's examination is an oral examination demonstrating mastery of core areas above.

Graduation Requirements: M.S. Plan II

In addition to all Office of Graduate Studies requirements for the master's degree, the department also requires the following:

1. Thirty-two semester hours of approved graduate courses.
2. At least 2 semester hours of CS 592 (*Colloquium*), taken at the University of New Mexico.
3. In addition to Colloquium, at least 24 of the 32 hours must be in courses offered by the Computer Science Department at the 500 level or above.
4. Students graduating under Plan II must take a minimum of 30 hours of coursework and two credit hours of CS 592 for a total of 32 hours.

5. Completion of a minimum of two courses from each category below:

- a. Theoretical Methods—CS 500, CS 530, CS 550, CS 561
- b. Empirical Methods—CS 512, CS 527, CS 529, CS 532, course in Complex Adaptive Systems (contact department for a list of acceptable courses).
- c. Engineering/System Building Methods—CS 554, CS 580, CS 585, CS 587

6. Passing the master's examination. For Plan I students, the master's examination is the defense of thesis. For Plan II students, the master's examination is an oral examination demonstrating mastery of core areas above.

M.S. Degree Program Assessment

Students receiving Masters degrees from the School of Engineering will:

- 1) Exhibit knowledge of engineering and science fundamentals appropriate for the discipline and/or specialization.
- 2) Be able to communicate effectively.
- 3) Demonstrate the ability to critically assess information in the discipline and/or specialization.

Assessment:

For outcome 1, M.S. students are assessed by meeting course requirements with appropriate grade point average. For outcomes 2 and 3, an example of independent work such as a term paper, project, etc. is solicited from each student. The form on Table 3.1 is used.

Table 3.1**Coursework Masters Outcomes Assessment Rubric**

Student: _____ Date: _____

Outcome	Unacceptable (0)	Marginal (1)	Acceptable (2)	Exceptional (3)	Rating
1) Knowledge of engineering/science fundamentals appropriate for discipline and specialization	No evidence of fundamental knowledge.	Rudimentary knowledge exhibited in written document and oral presentation.	Knowledge of fundamentals evident in written and oral presentation.	Demonstrates mastery of appropriate fundamentals for the discipline.	
2) Ability to communicate effectively	Document poorly written.	Document mostly clearly written. Presented main points clearly.	Well written and well organized document.	Excellent job of writing and organizing document discussion of results..	
3) Ability to critically assess information in discipline/ specialization	Rudimentary review of disciplinary information..	Some review of disciplinary information, but little critical evaluation.	Comprehensive review of disciplinary information with evidence of critical thinking about further needs for research in this area.	Extensive review of disciplinary information with critical evaluation comparable to a review article in literature.	
Overall Assessment	Unacceptable (1)	Marginal (2)	Acceptable (3)	Exceptional (4)	

Comments:

What curricular or process changes can you suggest to improve student performance in these areas?

Evaluator's Name _____ Date _____

In table 3.2 we present the form used to assess student progress in both Plan I and Plan II of MS degree.

Table 3.2

Master of Science Degree Computer Science

Choose two courses from each of the following core areas:

Mathematical Methods	Hours	Grade	Semester
Intro theory Computation CS 500			
Geometric/Probabilistic Methods CS 530			
Prog Languages & Systems CS 550			
Algorithms and Data Structures CS 561			
Software Foundations CS 558			

Empirical Methods	Hours	Grade	Semester
Advanced Image Synthesis CS 512			
Complex Adaptive Systems CS 523			
Artificially Intelligent Machines CS 527			
Intro Machine Learning CS 529			
Computer Vision CS 532			

Engr/System Bldg Methods	Hours	Grade	Semester
Compiler Construction CS 554			
Specification of Software Systems CS 580			
Computer Networks CS 585			
Advanced Operating Systems CS 587			

Complete six hours of CS elective courses, or with faculty approval, graduate courses from outside the department

CS Electives or Other	Hours	Grade	Semester
CS ____ or _____			
CS ____ or _____			

Complete six hours of CS elective courses or six thesis research hours

CS Electives or Thesis Hours	Hours	Grade	Semester
CS ____ or CS 599			
CS ____ or CS 599			

Complete two of CS 592, Colloquium

Colloquium	Hours	Grade	Semester
CS 592	1		
CS 592	1		

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Revisions to MS Program in the Last Five Years

The following are the major program changes that have been implemented in the last five years:

1. Because of the university's new emphasis on oral communication, the Dept. in 2008 decided to eliminate the written Masters exam and replace it with an oral exam based on the Coursework Masters Assessment Rubric. Each student is required to give a short oral presentation on a pre-approved topic from the M.S. curriculum of their choosing.
2. In 2008, the department redesigned the M.S. degree program requirements by identifying three core areas: mathematical methods, empirical methods, and engineering/system building methods. Students in the program are now required to take two courses in each of these three areas, rather than a prescribed curriculum.

3.2 Requirements, Outcomes, and Assessment for the Ph.D. Program

The Ph.D. in Computer Science is offered through a cooperative program involving the Computer Science Departments at the University of New Mexico, New Mexico State University (Las Cruces, NM) and the New Mexico Institute of Mining and Technology (Socorro, NM). Doctoral students at the University of New Mexico may specialize in areas of current interest to the University of New Mexico faculty, or, by special arrangement, they may work in areas of interest to faculty at either of the other two universities.

Graduation (Ph.D.)

In addition to all Office of Graduate Studies requirements for the Ph.D. degree the department also requires the following:

1. Exactly 4 semester hours of CS 592 (Colloquium), taken from the University of New Mexico. If the student enters the program with a master's degree, the requirement is reduced to 2 hours of CS 592.
2. At least 24 of the semester hours, exclusive of dissertation, must be completed at one of the three New Mexico universities.
3. At least 30 semester hours, exclusive of dissertation, must be in courses numbered 500 or above. Of these hours, at most 12 may come from individual study courses (at The University of New Mexico, CS 551 and CS 650). If the student enters the program with a master's degree, the requirement is reduced to 18 hours in courses numbered 500 and above—at most 9 of these hours may come from individual study courses.
4. Passing marks on the written comprehensive examinations, on the oral candidacy examination and on a final oral examination in the student's area of specialization.

5. Every student who has passed the written comprehensive examinations must give one Colloquium per year (scheduled as part of the regular departmental colloquium series) surveying the student's work to date.

6. Teaching requirement for the doctorate: As a requirement for the Ph.D. in Computer Science, all students are expected to complete a one-semester teaching assignment. Typically and preferably, this assignment involves running a class section, including classroom lecturing; there is, however, some flexibility in tailoring this assignment to each particular student. The student is encouraged to fulfill this requirement early in his or her studies, as the teaching experience is expected to help solidify the student's mastery of core Computer Science material. The Department has not enforced this requirement for several years, because it does not have adequate funds to support TA slots and other teaching experiences for all Ph.D. Students. Students will take three sets of examinations. The first is the comprehensive examination which tests the student's knowledge in the core areas of computer science (theory, systems and languages). Upon passing that exam, the student is allowed to work toward the doctorate. The student's advisor and the graduate advisor or department chairperson then appoint a doctoral committee which will determine the student's remaining program of study and conduct the candidacy examination. The candidacy examination verifies that the student possesses the specialized knowledge required for his/her area of research and ensures that the proposed dissertation topic is adequate in scope, originality and significance. The student is admitted to candidacy for the doctorate upon completion of the comprehensive and candidacy examination, with the approval of the doctoral committee and the Dean of Graduate Studies. Finally, the committee evaluates the student's doctoral dissertation and conducts the final oral examination on the student's area of specialization.

Ph.D. Degree Program Assessment

Students receiving the PhD in Computer Science will:

- 1) Exhibit knowledge of engineering and science fundamentals appropriate for the discipline and/or specialization.
- 2) Demonstrate a depth of knowledge in the specialization.
- 3) Have the ability to conduct independent research.
- 4) Have demonstrated the ability to perform a critical review of the literature in the area of specialization.
- 5) Be able to communicate effectively.

Assessment:

For students receiving a Ph.D. from the School of Engineering, the student's exam committee assesses whether the student has achieved the SOE outcomes based on the student's dissertation and defense. This is documented on a form, Table 3.3 below, that was developed for this purpose. It is to be filled out by a consensus of the committee (rather than by each individual member of the committee).

Table 3.3

PhD or MS/MEng (thesis/project) Outcomes Assessment Rubric

Student: _____ Date: _____

Outcome	Unacceptable (0)	Marginal (1)	Acceptable (2)	Exceptional (3)	Rating
1) Knowledge of engineering/science fundamentals appropriate for discipline and specialization	No evidence of fundamental knowledge.	Rudimentary knowledge exhibited in written document and oral presentation.	Knowledge of fundamentals evident in written and oral presentation.	Demonstrates mastery of appropriate fundamentals for the discipline.	
2) Depth of knowledge in specialization	Only rudimentary knowledge in specialization.	Some knowledge of specialization evidenced.	Demonstrates appropriate level of knowledge in specialization.	Demonstrates knowledge of specialization comparable to experienced practitioner.	
3) Ability to conduct research independently	No evidence of independent planning and execution of research program.	Some useful research results with some evidence of independent execution.	Carried out good research program, achieved useful and novel results.	Excellent planning and execution of research program.	
4) Ability to perform critical review of literature in area of specialization	Rudimentary literature review.	Some review of the literature, but little critical evaluation.	Comprehensive review of literature with evidence of critical thinking about further needs for research in this area.	Extensive review of literature with critical evaluation comparable to a review article in literature.	
5) Able to communicate effectively	Dissertation/thesis poorly written. Oral exam not well planned or presented. Unable to answer questions.	Dissertation/thesis mostly clearly written. Presented main points clearly. Able to answer most questions.	Well written and well organized dissertation/thesis. Well organized and clear presentation. Good ability to answer questions.	Excellent job of writing and organizing dissertation/thesis. Well organized talk. Able to respond to questions and facilitate further discussion of results.	
Overall Assessment	Unacceptable (1)	Marginal (2)	Acceptable (3)	Exceptional (4)	

Comments:

What curricular or process changes can you suggest to improve student performance in these areas?

Evaluator's Name _____ Date _____

Results of the outcomes assessment for each student will be evaluated by each department's graduate committee and/or faculty. The evaluations prepared by each departmental graduate committee will be reported to the SOE graduate committee for analysis, discussion, feedback, and any necessary action.

Table 3.4 is a form used to mark student's progress in the Ph.D. program and must be submitted before taking comprehensive exam.

Table 3.4

Prerequisite Courses to Ph.D. Comprehensive Exams

Class	Course Instructor*	Semester	Grade
Languages			
Software Foundations (558)			
Programming Languages and Systems (550)			
Compiler Construction (554)**			
Systems			
Modern Computer Architecture (CS341/441)			
Advanced Operating Systems (CS 587)			
Computer Networks (CS 485/585)**			
Theory			
Theory of computation (CS500)			
Data Structures and Algorithms (CS561)			
Geometric and Probabilistic Methods (CS530)*			

Chapter 4: Institutional Contributions

4.1 The Undergraduate Computer Science Program

The Computer Science Department offers courses on the undergraduate level that support the educational curricula of many other departments at the University of New Mexico. Although this support changes over the years as these other departments constantly revise their own curricula, this report lists many of the contributions the Computer Science Department has offered to other academic units at UNM.

- A. CS 150, a specialized course on software database, spreadsheet, and word processing, has been offered (often as a prerequisite to entering a degree program) to the Nursing School, Anderson School of Management, and other academic units.
- B. CS 151, a specialized course in the Introduction to Computing, currently taught in MatLab, has been offered as an introduction course to all other Departments in the School of Engineering as well as to the Mathematics Department. It is often used as an introduction by many of the other sciences, including Biology and Chemistry.
- C. CS 152, an Introduction to Computing course designed for Computer Science majors is also used as an introductory course for other Engineering departments, as well for Graduate students in Biology, and usually has a special section for the introduction to computing for Fine Arts students in the IFDM (Introduction to Film and Digital Media) program.
- D. The CS department offers a loosely structured Computer Science Minor for other University departments. This minor is intended to be a function of each student's needs, and must be agreed to by their CS advisor. It is intended to be a combination of five undergraduate courses that include several 300 level classes. (For example, students from Psychology or Linguistics often have different needs than students from Engineering, Mathematics, or the Physical Sciences.
- E. Many of the Computer Science courses are either cross listed with other departments (Physics, Biology, Psychology, Linguistics, for example) or taught alternatively by faculty in other departments (Operating Systems, Networking, Neural Networks, Graphics, etc.).

4.2 The Graduate Computer Science Program

The Computer Science Department participates actively in interdisciplinary graduate education programs across campus, particularly in the Biology and Biomedicine. There is significant interest nationally and at UNM in interdisciplinary education, and computing is a central player in many interdisciplinary activities. However, there are very few formal degree programs that are interdisciplinary at the University of New Mexico. What this means is that students must be members of one department at a time and take the courses and exams that meet the degree requirements of that department. They can take

courses from other academic units to complement their work in the first department but not be a full member of the second department. For example, a student in Computational Linguistics must satisfy all degree requirements of either the Computer Science or the Linguistics Department. This being said, there is wide collaboration between the Computer Science faculty and those of other Departments. See the research areas and faculty collaborations listed in Chapter 6. On the course level:

- A. Many of the Computer Science graduate courses are either cross listed with other departments (Physics, Biology, Psychology, Linguistics, for example) or taught alternatively by faculty in other departments (Operating Systems, Networking, Neural Networks, Graphics, etc.).
- B. Many CS faculty have courtesy appointments in other departments (see details listed with each faculty member presented in Chapter 6) and can as a result be on MS and PhD graduate committees for students in these other departments.
- C. Increasingly, students and faculty are co-teaching interdisciplinary courses that are shared among departments. In Spring 2010, for example, a CS Graduate Student, George Bezerra, is co-teaching a course on “Networks” with two other students from different departments (Anthropology and Biology).
- D. The Department regularly teaches a special topics course for students in the Medical Physics Program at UNM, which provides the quantitative background required by that program.

Chapter 5: Student Profile and Support Data

Chapter 5 is split into two sections, one describing the Computer Science Undergraduate program and the second describing the Graduate program. This is an important division because many of the recruiting, outreach, admission, advising, and retention approaches are quite different for each program. For example, most of our undergraduate students are native New Mexico students while most of our graduate students are either out of state or foreign. We discuss our student support and profile data for each of these groups next.

The department has one full time undergraduate advisor who also supports the graduate students. She is fully utilized, spending most of her time meeting with students, reviewing records, and compiling data. The department does not have staff support for student recruiting and other outreach. Because the department's student profile is so different from the rest of Engineering, this is a problem.

5.1 The Undergraduate Program in Computer Science

The majority of our undergraduate students are native New Mexican students and our recruiting and outreach approaches reflect this. Admission, advising, and retention are fairly standard for CS departments similar to ours.

- A. Outreach. The Computer Science department actively recruits talented secondary students in the Albuquerque area. The department does this through many venues. The departmental has occasionally hired a part-time recruiter to visit high school classes and student advisors throughout the Albuquerque area. We also have invited high school seniors, along with their parents, to open houses on campus, which include talks, demonstrations, and question periods. The department actively recruits through representatives, literature, and one-on-one meetings with prospective students on "Senior Days" and at other UNM sponsored recruiting events. The department also attends the weekly Lobo orientation sessions throughout the summer for entering UNM freshmen.
- B. Admission. Students are (typically) admitted to the undergraduate program in the middle of their sophomore year. This means that there is some active recruiting and preparation for admission of UNM freshman students. Those that self-select as CS undergraduates are described as the "University College CS Majors." Note that these students are not yet majors in the Computer Science Department, nor have they been accepted to the School of Engineering. Once they have successfully completed their calculus courses, many of their liberal arts University requirements, as well as the Introduction to Computing and the Discrete Mathematics classes, they are formally admitted as CS majors.
- C. Advising. The Computer Science Department believes that quality advising is essential to the successful completion of the CS undergraduate degree. We have a full-time Undergraduate Advisor on staff, who advises the CS pre-majors described in B above and meets with any other prospective majors who walk through the door. These students already have UNM supported advising, but this appears to be inadequate for the needs of our pre-majors. Advising is also

provided to our pre-majors through the School of Engineering, Engineering Support Services (ESS). This program is effective and services approximately 1/3 of our incoming majors. Once students are admitted to the CS program they are assigned a faculty advisor, but if the student finds a professor who he or she prefers, the Department tries to accommodate the preference. In addition to the staff Advisor, the Associate Chair of the CS department monitors student advising and progress and works closely with both the faculty advisor and the staff advisor, especially when problems arise.

- D. Retention. Once admitted, the computer science program is constructed (with timely course offerings and limited course prerequisites) so that students can graduate in four years. This, however, is not the norm for many students, since it requires that students be full-time, pass all prerequisite courses the first time they take them, and have no major interruptions (such as changing their major or minor) during the four years. Also, there are several rigorous courses required in the CS major, as well as minimum grade point requirements. Thus, no matter what our advising and retention efforts, some of our students either change their majors or don't graduate. The average time to completion for undergraduate CS majors over the past five years is presented in Table 5.14, below.

The following tables present cumulative data from the last five years related to admission, ethnicity, and retention of the CS undergraduate population.

Tables 5.1 A & B describe University College CS Majors by number, gender, and ethnicity. “University College CS Majors” includes a large number of the students that are later accepted to be CS majors, although many majors also come from other colleges across UNM.

Table 5.1.A

**University College CS Majors
By Gender and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	University College CS Majors	White non- Hispanic	Asian	Hispanic	Native American	Black
2004- 2005	F	19	12		6	1	
	M	75	43	2	28	2	
2005- 2006	F	10	2		7	1	
	M	68	32	.	28	4	1
2006- 2007	F	13	2	0	9	4	
	M	74	36	5	29	3	1
2007- 2008	F	9	3		6		
	M	81	40	5	33	1	2
2008- 2009	F	10	5		5		
	M	73	31	2	37	2	1

Table 5.1.B

Percent University College CS Majors by Ethnicity

Year	Gender	University College CS Majors	White non- Hispanic	Asian	Hispanic	Native American	Black
2004- 2005	F	19	58.5%	2.1%	36.2	3.2%	--
	M	75					
2005- 2006	F	10	43.5%	3.9%	44.9%	6.4%	1.3%
	M	68					
2006- 2007	F	13	43.7%	6.9%	43.7%	4.6%	1.1%
	M	74					
2007- 2008-	F	9	47.8%	5.6%	43.3%	1.1%	2.2%
	M	81					
2008- 2009	F	10	43.4%	2.4%	50.6%	2.4%	1.2%
	M	73					

Table 5.2 reports the total undergraduate enrollment by year: sophomore, junior, and senior. Remember that the typical student is not admitted until midway through his or her sophomore year, and that many majors are admitted even later.

Table 5.2

**CS Dept Admitted Declared Majors
Student Enrollments by Level
Fall 2004 - Spring 2009
Undergraduate**

Student Level	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
	Fall	Fall	Fall	Fall	Fall
Sophomore	32	13	28	12	40
Junior	30	24	35	43	36
Senior	40	36	26	40	47
Total	102	73	89	95	123

Table 5.3.A reports the raw number of newly admitted undergraduates for each year by gender and ethnicity, and Table 5.3.B represents this information as percentages.

Table 5.3.A

**CS Undergraduate New Declared Majors
Admissions by
Year, Gender, and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	New Admissions	White non-Hispanic	Asian	Hispanic	Native American	Black
2004-2005	F	5	5	--	--	--	--
	M	22	20	--	1	--	1
2005-2006	F	4	4	--	--	--	--
	M	26	16	3	5	1	1
2006-2007	F	3	1	2	--	--	--
	M	33	23	--	7	1	2
2007-2008	F	4	3	--	1	--	--
	M	30	25	1	4	--	--
2008-2009	F	15	10	1	4	--	--
	M	31	23	4	4	--	--

Table 5.3.B

Percent of CS Undergraduates by Ethnicity

Year	Gender	New Admissions	White non-Hispanic	Asian	Hispanic	Native American	Black
2004-2005	F	5	92.6%	--	3.7%	--	3.7%
	M	22					
2005-2006	F	4	66.7%	10%	16.7%	3.3%	3.3%
	M	26					
2006-2007	F	3	66.7%	5.6%	19.4%	2.8%	5.6%
	M	33					
2007-2008	F	4	82.4%	2.9%	14.7%	--	--
	M	30					
2008-2009	F	15	71.7%	10.9%	17.4%	--	--
	M	31					

Table 5.4.A reports the total number of students graduating with the Bachelor of Science in Computer Science each year by gender and ethnicity. Table 5.4.B represents this information as percentages.

Table 5.4.A

**Earned BSCS
By Gender and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	BSCS By Gender and Ethnicity	White non- Hispanic	Asian	Hispanic	Native American	Black
2004- 2005	F	8	4	2	2		
	M	33	25	4	4		
2005- 2006	F	4	2	1	2		
	M	17	10	1	4		1
2006- 2007	F	2	2				
	M	17	14	1	2		
2007- 2008	F	4	4				
	M	14	9	1	3		1
2008- 2009	F	2		2			
	M	31	25	1	3	1	1

Table 5.4.B**Percent Earned BSCS by Ethnicity**

Year	Gender	BSCS by Gender and Ethnicity	White non-Hispanic	Asian	Hispanic	Native American	Black
2004-2005	F	8	70.7%	14.6%	14.6%		
	M	33					
2005-2006	F	4	57.1%	9.5%	28.6%		4.8%
	M	17					
2006-2007	F	2	84.2%	5.3%	10.5%		
	M	17					
2007-2008-	F	4	72.2%	5.5%	16.7%		5.5%
	M	14					
2008-2009	F	2	75.8%	9.1%	9.1%	3%	3%
	M	31					

Table 5.5.A reports the number of students admitted each year by gender and whether these students completed their degrees, are still in the program (persistence), or have dropped out (attrition). Table 5.5.B describes the same numbers as percentages.

Table 5.5.A

**Bachelor's Student
Four Year Degree Completion,
Persistence (after 4 years), and Attrition**

Year Admitted	Gender	Admitted Enrolled	BS Degrees Completed by end of Spring 09	Persistence	Attrition
2004- 2005	F	5	--	1	4
	M	22	15	1	6
2005- 2006	F	4	1	1	2
	M	26	12	4	10
2006- 2007	F	3	1	1	1
	M	33	16	5	12
2007- 2008	F	4	--	2	2
	M	30	9	16	5
2008- 2009	F	15	--	13	2
	M	31	1	23	7

The above table indicates students that graduated by end of Spring 2009 semester. The Persistence number of students indicates students taking longer than four years to obtain their degree.

Table 5.5.B

Percent of BSCS Degrees Completed, Persistence, and Attrition

Year	Gender	Admitted Enrolled	BS Degrees Completed	Persistence	Attrition
2004- 2005	F	5	55.6%	7.4%	37%
	M	22			
2005- 2006	F	4	43.3%	16.7%	40%
	M	46			
2006- 2007	F	3	47.7%	16.7%	36.1%
	M	33			
2007- 2008-	F	4	26.5%	52.9%	20.6%
	M	30			
2008- 2009	F	15	2.2%	78.3%	19.6%
	M	31			

These data show that the department's retention rates have improved substantially over the past five years.

5.2 The Graduate Program in Computer Science

The majority of our graduate students are not native New Mexicans, and our recruiting, outreach, and admission approaches for graduate students reflect this. Advising and retention practices resemble those of other CS departments similar to ours.

- A. Outreach. The Computer Science Department advertises its graduate program both nationally and internationally. This is accomplished through widely distributed brochures, a sophisticated web presence, and word of mouth from faculty and student travels, presentations, and our international reputation. All application materials are available on the departmental web site, and the Department devotes resources to maintaining and improving this aspect of the web site.

- B. Admissions. The Computer Science Department has a small committee charged with admission responsibilities. The “cut off” for admissions is a quality-of-student issue, where the highest priority is ensuring that the students we accept can succeed in our program. Thus the “admissions” numbers on the tables below vary across years and are not a function of simply trying to maximize the total number of graduate students. The ten to fifteen top students admitted each year are supported through Teaching and Research Assistantships.
- C. Advising. Entering students are assigned an initial advisor. Once the student is acclimated in the department, he or she is encouraged to select an advisor who can possibly offer RA support or help guide the program of study in appropriate directions.
- D. Retention. A graduate student’s advisor is expected to help the student through the possible problems of graduate school. The Department encourages graduate students to focus early on the required classes, examinations, and projects or dissertations. There are strict requirements for graduate students and if they cannot maintain a satisfactory GPA or pass required examinations they asked to leave the program. The average time to completion for all graduate students for the past five years is presented in Table 5.14, below.

One issue facing the Department is TA/RA stipends. As Table 5.6 shows, graduate stipends at UNM are significantly below those of other CS departments throughout the country. This impacts the Department's ability to recruit strong graduate. Over the past three years, several outstanding students have declined offers to study at UNM because the stipends are lower than those offered elsewhere. In spite of declining budgets at UNM, raising stipends to a competitive level is a high priority.

Table 5.6

Fall 2008 AY Graduate Student Stipends by Department Rank (Mean)

	Teaching Assistantships	Research Assistantships
UNM CS Department	\$13,455.00	\$13,500.00
Top 1-12 US CS Depts.	\$19,564.00	\$22,380.00
Ranked 13-24 US CS Departments	\$16,470.00	\$20,677.00
Ranked 25-36 US CS Departments	\$16,954.00	\$16,977.00
Other US CS Departments	\$14,289.00	\$16,071.00

Source: 2007-2008 Taulbee Survey

The tables below can be broken, roughly, into three sections. First, in Tables 5.7 and 5.8 the general admissions data for the graduate program is presented. Admissions for M.S. and Ph.D. students are handled with one process (B, above); so we calculate the total number of applications, acceptances, and total number of students that actually enroll. . The second set of tables, 5.9, 5.10, and 5.11, describes the gender, ethnicity, and degree-completion statistics for M.S. students. The third set of tables, 5.12, 5.13, and 5.14, describes this information for Ph.D. students.

Tables 5.7 A, B, C, and D present application and admission data for the computer science graduate program. Note that about 40% of applications for the CS graduate program are never completed. This can be for financial reasons, the GRE or TOEFL is not submitted, or because reference letters are not received.

Table 5.7.A

Graduate Applications and Admissions Fall 2004-Spring 2009

Year	Total Number of Applications	Total Completed Applications	Total Incomplete Applications	Total Admitted Applicants	Total Refused Applicants	Total Enrolled Applicants
2004- 2005	294	167	127	106	61	32
2005- 2006	191	119	72	67	52	20
2006- 2007	183	115	98	70	45	29
2007- 2008	183	102	81	66	36	26
2008- 2009	168	123	45	91	31	38
5 year total	1019	626	393	399	225	146

Table 5.7.B

Percent of Admission Offers on Completed Applications

Year	Completed Applications	Admitted Applicants
2004-2005	167	63.5%
2005-2006	119	56%
2006-2007	115	61%
2007-2008	102	65%
2008-2009	123	74%
5 year total	626	64%

Table 5.7.C

Percent of Total Admitted Applicants Enrolled

Year	Admitted Applicants	Enrolled Applicants
2004-2005	106	30%
2005-2006	67	30%
2006-2007	70	41%
2007-2008	66	39%
2008-2009	91	42%
5 year total	399	37%

Table 5.7.D**Percent of Completed Applications Refused**

Year	Completed Applications	Applicants Refused Admission
2004-2005	167	36.5%
2005-2006	119	44%
2006-2007	115	39%
2007-2008	102	35%
2008-2009	123	25%
5 year total	626	36%

Table 5.8 indicates the number of graduate students that are full and part time. The department has a high percentage of part-time graduate students because these students are employer supported, often by Sandia or Los Alamos National Laboratories. These institutions each have excellent programs for supporting the graduate education of their employees.

Table 5.8**Student Enrollments by Level****Fall 2004-Spring 2009****Graduate**

Student Level	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
	Fall	Fall	Fall	Fall	Fall
Full-Time	101	85	69	71	90
Part-Time	92	56	47	42	34
Total	193	141	116	113	124

Table 5.9.A presents, by number, the gender and ethnicity of students in the Computer Science M.S. program. Table 5.9.B presents these data as percentages.

Table 5.9.A

**Master's Students
Admitted and Enrolled by Gender and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	Admitted Enrolled	White non- Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004- 2005	F	2		2				
	M	11	7	2				2
2005- 2006	F	2	2					
	M	10	7	1	1			1
2006- 2007	F	2		1				1
	M	14	4	4				6
2007- 2008	F	4		3				1
	M	10	5	4				1
2008- 2009	F	2		1	1			
	M	25	7	14	2			2

Table 5.9.B

**Percentage of Admitted/Enrolled
M.S. Students by Ethnicity**

Year	Gender	Admitted Enrolled	White non- Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004- 2005	F	15.4%	53.8%	30.8%	--	--	--	15.4%
	M	84.6%						
2005- 2006	F	16.7%	75%	8.3%	8.3%			8.3%
	M	83.3%						
2006- 2007	F	12.5%	25%	31.3%	--	--	--	43.7%
	M	87.5%						
2007- 2008-	F	28.6%	35.7%	50%	--	--	--	14.3%
	M	71.4%						
2008- 2009	F	7.4%	25.9%	55.6%	11.1%	--	--	7.4%
	M	92.6%						

Table 5.10.A presents the numbers of successfully graduating M.S. students by gender and ethnicity. Table 5.10.B presents these data as percentages.

Table 5.10.A

**Earned M.S. Degrees
by Gender and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	Earned Master's	White non-Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004-2005	F	7	2	4	1	--	--	--
	M	30	9	21	--	--	--	--
2005-2006	F	11	--	10	--	--	--	1
	M	35	7	24	1	--	--	3
2006-2007	F	2	--	2	--	--	--	--
	M	10	2	3	1	--	--	4
2007-2008	F	4	2	1	--	--	--	1
	M	16	9	5	--	--	--	2
2008-2009	F	5	1	2	2	--	--	--
	M	22	9	8	1	--	1	3

Table 5.10.B**Percent Earned M.S. Degrees By Ethnicity**

Year	Gender	Earned Master's	White non-Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004-2005	F	7	29.7%	67.6%	2.7%	--	--	--
	M	30						
2005-2006	F	11	15.2%	73.9%	2.2%	--	--	8.7%
	M	35						
2006-2007	F	2	16.7%	41.7%	8.3%	--	--	33.3%
	M	10						
2007-2008-	F	4	55%	30%	--	--	--	15%
	M	16						
2008-2009	F	5	37%	37%	11.1%	--	3.7%	11.1%
	M	22						

Table 5.11.A presents the numbers of M.S. students for each of the last five years, the number of students admitted, the number that graduate, the number of continuing students that didn't graduate (persistence) and the number of dropped students (attrition). Table 5.11.B presents these data as percentages.

Table 5.11.A

**M.S. Student
Degree Completion, Persistence, and Attrition**

Year	Gender	Admitted Enrolled	MS Degrees Completed	Persistence	Attrition
2004- 2005	F	2	2	--	--
	M	11	10	--	1
2005- 2006	F	2	2	--	--
	M	10	4	4	2
2006- 2007	F	2	2	--	--
	M	14	8	3	3
2007- 2008	F	4	1	3	--
	M	10	2	6	2
2008- 2009	F	2	--	2	--
	M	25	--	25	--

Table 5.11.B

Percent of M.S. Degrees Completed, Persistence, and Attrition

Year	Gender	Admitted Enrolled	MS Degrees Completed	Persistence	Attrition
2004- 2005	F	2	92.3%	--	--
	M	11			
2005- 2006	F	2	50%	33.3%	16.7%
	M	10			
2006- 2007	F	2	62.5%	18.75%	18.75%
	M	14			
2007- 2008-	F	4	21.4%	64.3%	14.3%
	M	10			
2008- 2009	F	2	--	100%	--
	M	25			

Table 5.12.A presents, by number, the gender and ethnicity of students in the Computer Science Ph.D. program. Table 5.12.B presents these data as percentages.

Table 5.12.A

**Ph.D. Students Admitted and Enrolled
by Gender and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	Admitted Enrolled	White non- Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004- 2005	F	2		2	--	--	--	--
	M	17	6	6	--	--	1	4
2005- 2006	F	2	--	1	1	--	--	--
	M	6	--	5	--	--	--	1
2006- 2007	F	2	1	1	--	--	--	--
	M	11	7	2	1	--	--	1
2007- 2008	F	2	--	1	--	--	--	1
	M	10	4	3	2	--	--	1
2008- 2009	F	2	1	1	--	--	--	--
	M	9	6	3	--	--	--	

Table 5.12.B

Percentage of Admitted/Enrolled Ph.D. Students by Ethnicity

Year	Gender	Admitted Enrolled	White non- Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004- 2005	F	10.5%	31.5%	42.1%	--	--	5.3%	21.1%
	M	89.5%						
2005- 2006	F	25%	--	75%	12.5%	--	--	12.5%
	M	75%						
2006- 2007	F	15.4%	61.5%	23.1%	7.7%	--	--	7.7%
	M	84.6%						
2007- 2008-	F	16.7%	33.3%	33.3%	16.7%	--	--	16.7%
	M	83.3%						
2008- 2009	F	18.2%	63.6%	36.4%	--	--	--	--
	M	81.8%						

Table 5.13.A presents the numbers of successfully graduating Ph.D. students by gender and ethnicity. Table 5.13.B presents these data as percentages.

Table 5.13.A

**Earned Ph.D. Degrees
By Gender and Ethnicity
Fall 2004-Spring 2009**

Year	Gender	Earned Ph.D.'s	White non-Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004-2005	F	2	1	--	1	--	--	--
	M	5	4	1	--	--	--	--
2005-2006	F	1	--	--	1	--	--	--
	M	3	1	--	--	--	--	2
2006-2007	F	1	--	--	1	--	--	--
	M	6	4	--	--	--	--	2
2007-2008	F	3	1	2	--	--	--	--
	M	2	2	--	--	--	--	--
2008-2009	F	--	--		--	--	--	--
	M	9	4	1	4	--	--	--

Table 5.13.B

Percent Earned Ph.D. Degree By Ethnicity

Year	Gender	Earned Ph.D.	White non-Hispanic	Asian	Hispanic	Native American	Black	Ethnicity Not Reported
2004-2005	F	2	71.4%	14.3%	14.3%	--	--	--
	M	5						
2005-2006	F	1	25%	--	25%	--	--	50%
	M	3						
2006-2007	F	1	57.1%	--	14.3%	--	--	28.6%
	M	6						
2007-2008	F	3	60%	40%	--	--	--	--
	M	2						
2008-2009	F	--	44.4%	11.1%	44.4%	--	--	--
	M	9						

Table 5.14.A presents the number of Ph.D. students for each of the last five years, the number of students admitted, the number that graduate, the number of continuing students that didn't graduate (persistence) and the number of dropped students (attrition). Table 5.14.B presents these data as percentages.

Table 5.14.A

**Ph.D. Student
Degree Completion, Persistence, and Attrition
Fall 2004-Spring 2009**

Year	Gender	Admitted Enrolled	PhD Degrees Completed	Persistence	Attrition
2004- 2005	F	2	--	1	1
	M	17	2	8	7
2005- 2006	F	2	--	2	--
	M	6	--	2	4
2006- 2007	F	2	--	1	1
	M	11	--	8	3
2007- 2008	F	2	--	2	--
	M	10	--	10	--
2008- 2009	F	2	--	2	--
	M	9	--	8	1

Table 5.14.B**Percent of Ph.D. Degrees Completed, Persistence, and Attrition**

Year	Gender	Admitted Enrolled	PhD Degrees Completed	Persistence	Attrition
2004- 2005	F	2	10.5%	47.4%	42.1%
	M	17			
2005- 2006	F	2	--	50%	50%
	M	6			
2006- 2007	F	2	--	69.2%	30.8%
	M	11			
2007- 2008-	F	2	--	100%	--
	M	10			
2008- 2009	F	2	--	90.9%	9.1%
	M	9			

Finally, Table 5.15 presents the average time taken for all students, B.S., MS, and Ph.D. to complete computer science degrees at UNM. The information for time to degree is from the time students were admitted to UNM. This information is tracked by the Computer Science Department and is comprised of the admission data and graduation data.

Table 5.15

**Average Time to Degree
Fall 2004-Spring 2009**

Ph.D. average time to degree	4.8 years
Master's average time to degree	3.3 years
Bachelor's average time to degree	4.9 years

Chapter 6: Faculty Matters

In Chapter 6 the computer science faculty are introduced. Section 6.1 presents the faculty profile, listing faculty by rank, gender, and ethnicity. We also describe policies for faculty hiring, use of emeriti, and so on. Section 6.2 presents, for each full-time faculty, their areas of expertise, outreach, and creative works. The two page resumes for faculty may be found in Appendix D.

6.1 Faculty Profile

Although the C.V. and areas of expertise of each faculty member are detailed in the following section, we give a brief overview here, as of Sept. 2009.

1. There are 4 Full Professors, 6 Associate Professors, 7 Assistant Professors, and two full-time Lecturers (one supported on soft money).
2. Of the 19 full time faculty 3 are female (one female resigned Dec. 2009).
3. The ethnic profile of computer science faculty is 14 Caucasian, 2 African American, and 3 other (2 Asian, 1 Indian).
4. There are 15 courtesy faculty appointments. These are drawn mostly from other departments of the university (joint faculty appointments) as well as from the two nearby national laboratories (courtesy appointments). The joint-appointment faculty members are able to serve as CS student advisors and members of graduate dissertation committees.

The Computer Science Department hires Adjunct Professors as needed to cover appropriate courses. For example, the department often hires M.S. and Ph.D. level practitioners from the national laboratories and industry to teach the software engineering classes. These are practical production programming courses and require teaching knowledge permanent faculty often don't have.

The recruitment and hiring of new faculty in computer science is a function of the department's mission and goals mentioned in Chapter 1.

In the faculty recruiting process, besides the listing in the local and national educational presses, current faculty are charged to use their individual national and international networking skills to locate appropriate new hires. Achieving appropriate ethnic and gender balance within the faculty population is a difficult task, given the profile of Ph.D. graduates each year, although the department has made great progress on this dimension over the past three or four years.

Faculty workload varies somewhat by faculty rank. Newer faculty are given lighter teaching and departmental responsibilities to allow them time to establish their research programs and prepare their classes. The balance of department-specific duties (committees, exam preparation, etc) is transferred to more senior faculty, although junior faculty are included in all major decisions except tenure and promotion, and they take the lead in matters that impact them the most. The accepted teaching load is 3 classes per

year for research-active faculty. As mentioned in the previous chapter, all full-time faculty share responsibility for student advising and mentoring.

The Department has actively worked to retain its quality personnel. During the past five years, three tenure-track faculty were recruited by other universities (Colorado, Michigan, and Stanford). Fortunately, the department was able to retain these three, although we have depleted the reserve funds we used for the retentions. Unfortunately, the Department recently lost one of its few female professors due to a spousal hire issue, which we were unable to respond to until it was too late.

Retiring computer science faculty stay involved with the department to varying degrees, including some who conduct funded research through the department, some who use office space and computing support offered to emeriti, and others who simply disappear.

Faculty development is handled in a number of ways. New faculty are given an appropriate start-up package, often use for summer research salary, Research Assistantships, and for attending academic conferences. After the start-up package is spent, the Department expects its faculty to support their research and travel expenses through extramural funding. Recently, the Department has begun returning a fraction of returned overhead from research grants to the individual PIs. The Department provides computer support and basic office services to faculty and students partially through I&G and partially through returned overhead. By contract, faculty are supported to take UNM courses in other university departments.

6.2 Faculty resumes and related activities

This section contains information about faculty publications, areas of expertise, and other academic activities. The faculty members are listed alphabetically by rank. Appendix D contains a two-page CV for each person. Following is a one page summary for each faculty member summarizing the following:

- A. Areas of expertise
- B. Interdisciplinary interests, including courtesy appointments
- C. Current departmental and university committee service
- D. Extracurricular activities related to academic objectives
- E. Major awards and recognitions of the past five years
- F. Outreach efforts and public service

Stephanie Forrest

Professor and Department Chair

A. Areas of Expertise

- Evolutionary Computation, Complex Systems, Biological Modeling, Computer Security

B. Interdisciplinary Interests

- Secondary appointment in UNM Biology
- External Faculty and Science Board member at the Santa Fe Institute
- Co-founder of UNM Program in Interdisciplinary Biological and Biomedical Science (PIBBS), an interdisciplinary graduate training program for students in the biomedical sciences.
- Senior Mentor with NIH COBRE Center for Evolutionary and Theoretical Biology at UNM

C. Current Departmental and University Committees

- None

D. Extracurricular Activities Related to Academic Objectives

- Editing: Journal of Machine Learning Research (Action Editor, 2005--present)
- Editing: Evolutionary Intelligence (Editorial Board, 2007-present)
- Editing: Evolutionary Computation (Associate Editor, 1995--2002)
- Editing: Journal of Artificial Intelligence Research (Editorial Board, 1998-2002)
- Editing: Artificial Life (Editorial Board, 1994--present)
- Program Committee: ACM Conference on Computer and Communications Security (2005)
- Program Committee: New Security Paradigms Workshop (2008)
- Program Committee: Hot Topics in Operating Systems (2005)
- Program Committee: International Conference on Artificial Immune Systems (2005, 2006, 2007, 2008, 2009, 2010)
- Computing Community Consortium (CCC) Council (2009-2012)
- NSF GENI/NetSE Council (2007-2009)
- NSF Advisory Committee for the Directorate for Computer and Information Science and Engineering (2006-2008)
- Senior Member of IEEE
- Invited talks: Syracuse University (2009); Nanyang Technological Univ., Singapore (2009); UC Berkeley (2007, 2009); Portland State University (2009); Microsoft (2008, 2009); Instituto Tecnológico Autónomo de México (2008); Tecnológico de Monterrey, Mexico City (2008); Santa Fe Institute (2005, 2007, 2008, 2009); Princeton Univ. (2008); Univ. of

Pennsylvania (2008); New Mexico State Univ. (2007); Knowledge Engineering Systems, Summer School on Computational Immunology, Vietri Italy (2007); Arizona State Univ. (2007); Carleton Univ. (2007); Boston Univ. (2006); Univ. of British Columbia (2006); Univ. of Alaska Anchorage (2006); Indiana Univ. (2005); Univ. of Utah (2005); Carnegie-Mellon Univ. (2005); Univ. of Costa Rica (2005).

E. Major Awards, Recognitions, etc from the past five years

- New Mexico Council on Technology, Women in Technology Award (2009)
- ACM SIGEVO GECCO Impact Award for highest impact paper published in the 1999 Genetic and Evolutionary Computation Conference (awarded in 2009 and shared with one other paper)
- "Humies" Gold Medal Award for human-competitive results produced by genetic and evolutionary computation (2009)
- IFIP TC2 Manfred Paul Award for Excellence in Software: Theory and Practice, 2009 (shared with 3 others)

F. Outreach Efforts and Public Service

- Most outreach and public service over that past five years has been in the context of Department Chair activities.

Deepak Kaupr

Professor

A. Areas of Expertise

- Formal Methods, Program Analysis, Automated Reasoning, Term Rewriting, Symbolic Computation, Unification, Polynomial Equational Solving

B. Interdisciplinary Interests

- Application of mathematics and logic to program analysis
- Application of term rewriting and automated reasoning for developing constructive methods in computational algebra

C. Current Departmental and University Committees

- Chair of Tenure and Promotion Committee
- Member of Graduate Recruitment and Admission
- Mentor to Junior Faculty in the Department

D. Extracurricular Activities Related to Academic Objectives

- Invited Speaker, *Third Summer School in Symbolic Computation*. Chengdu, China, August 2009.
- Invited Speaker, *Intl. Conference on Mathematics Mechanization -- in Honor of Prof. Wen-Tsun Wu's 90th Birthday (ICMM)*, 2009, Beijing, China.
- Invited Speaker, *Intl. Seminar on Symbolic Real Algebra and Trustworthy Computing (SRATC 2008)*, Shanghai, China, April 2008.
- Invited Speaker, *Symposium on Programs: Analysis, Technology, and Engineering (SPATE)*, TIFR, Mumbai, Jan. 2008.
- Invited Speaker, *WING 2007*, 1st International Workshop on Invariant Generation, 25-26 June 2007, RISC, Hagenberg, Austria.
- Invited Speaker, *Alpine Verification Workshop, 2007*, June 23-25, 2007, Aussois, France.
- Invited Speaker, GM India Science Lab. Workshop on *Next Generation Design and Verification Methodologies for Distributed Embedded Control Systems*, Bangalore, India, Jan 2007.
- Invited Speaker, IBM India Research Lab - TIFR Workshop on Next Generation Programming Languages and Environments, } New Delhi, India, Nov. 2006.
- Invited Speaker, *Calculus 2006 Symposium*, Genova, Italy, July 2006.
- Invited Speaker, *Mathematics, Algorithms and Proofs*, 2006 (MAP 2006), Castro-Urdiales, Spain, Jan. 2006.
- Editor-in-Chief, *Journal of Automated Reasoning*, 1993--2007.

- Member, Editorial Board, *Journal of Symbolic Computation*, 2008 onwards.
- Member, Editorial Board, *Journal of Automated Reasoning*, 2007 onwards.
- Editor, *Applicable Algebra in Engineering, Communication and Computer Science*.
- Editor, *Constraints*, 1996-2008.
- Editor, *Journal of Systems Science and Complexity*.
- Editor, *Sadhana*, Academy Proceedings in Engineering Sciences, Indian Academy of Sciences, 2005-2008.
- Member, Editorial Advisory Board, *Journal of Theory and Practice of Logic Programming*, 2001--2006.
- Chair, *Ninth Asian Symposium on Computer Mathematics*, Singapore, Dec. 2007.
- Chair, *Logic, Mathematics, and Computer Science: Interactions*, Symposium in honor of Bruno Buchberger's 60th Birthday, RISC-Linz, Hagenberg, Austria, Oct. 22-24, 2002.
- Chair, *Eleventh International Conference on Automated Deduction*, June 1992.
- Member, Program Committee of the *5th International Joint Conference on Automated Reasoning (IJCAR)*, Edinburgh, August, 2010; a part of FLOC 2010.
- Member, Program Committee of the *22th International Conference on Automated Deduction (CADE)*, Montreal, August 2009.
- Member, Program Committee, *7th International Workshop on Automated Deduction in Geometry*, Shanghai, September 2008.
- Member, Program Committee of the *4th International Joint Conference on Automated Reasoning (IJCAR)*, Australia, August, 2008.
- Member, Program Committee, *Calculus 2008 Symposium*, Birmingham, UK, August 2008.
- Member, Program Committee of the IJCAR'08 Workshop on Practical Aspects of Automated Reasoning (PAAR-2008), Australia, August, 2008.
- Member, Program Committee of the *Foundations of Software Technology and Theoretical Computer Science (FSTTCS)*, New Delhi, India, Dec. 2007
- Member, Program Committee of the *18th International Conference on Rewriting Techniques and Applications (RTA)*, Paris, 2007.
- Member, Program Committee, *6th International Workshops on Frontiers of Combining Systems (FROFOS 2007)*, 2007, Liverpool, UK.
- Member, Program Committee, *Verification Workshop (Verify'07)*, Bremen, Germany, 2007.
- Member, Program Committee, *14th International Conference on Logic for Programming, AI and Reasoning (LPAR)*, Armenia, 2007.
- Member. Program Committee of the *7th International Workshop on the ACL2 Theorem Prover and its Applications*, Austin, Nov. 2007.

- Member, Program Committee, *Calcuemus 2007 Symposium*, Hagenberg, Austria, June 2007.
- Member, Program Committee, *8th International Conference on Artificial Intelligence and Symbolic Computation (AISC)*, Beijing, China, September, 2006.
- Member, Program Committee of the *3rd International Joint Conference on Automated Reasoning (IJCAR)*, part of FLOC, Seattle, August 2006.
- Member, Program Committee of the *17th International Conference on Rewriting Techniques and Applications (RTA)*, Seattle, August 2006.
- Member, Program Committee of the *Disproving Workshop*, Seattle, August 2006.
- Member, Program Committee, 4th IFIP Intl. Conf. on Theoretical Computer Science, WCC 2006, Santiago, Chile, August 2006.
- Member, Program Committee, *Verification Workshop (Verify'06)*, FLOC 06, Seattle, 2006.
- Member. Program Committee of the 6th International Workshop on *the ACL2 Theorem Prover and its Applications*, Seattle, August 2006
- Member, Program Committee, *6th International Workshop on Automated Deduction in Geometry*, Vigo, Spain, September 2006.
- Member, Program Committee, *Calcuemus 2006 Symposium*, Genova, Italy, July 2006.
- Member, Program Committee, *Geometric Computing and Reasoning: ACM Conference on SAC 2006*, Dijon, France, April 2006.
- Member, Program Committee of the *20th International Conference on Automated Deduction (CADE)*, Estonia, July 2005.
- Member, Program Committee, *11th International Conference on Logic for Programming, AI and Reasoning (LPAR)*, Uruguay, March 2005.
- Member, Program Committee, *5th International Workshops on Frontiers of Combining Systems (FROCCOS)*, 2005.

E. Major Awards, Recognitions, etc. from the past five years

- Herbrand Award, the highest award for contributions to automated reasoning and theorem proving

F. Outreach Efforts and Public Service

- N/A

George Luger

Professor and Associate Chair

A. Areas of Expertise

- Artificial Intelligence, Cognitive and Computational Neuroscience, and Computational Linguistics
- Created, with NSF support, a first-order and Turing-complete stochastic modeling language.

B. Interdisciplinary Interests

- Joint appointments in the Departments of Psychology and Linguistics. Have designed and taught senior/graduate level joint listed courses with these two departments.

C. Current Departmental and University Committees

- Associate Chair of the Computer Science Department
- Organizer of Masters Comprehensive Exams
- Member of the Undergraduate Committee and Awards Committee
- Library Liaison

D. Extracurricular Activities Related to Academic Objectives

- Invited Keynote Speaker, 2008 India International Conference on AI, Invited lectures in China (three one-month lecture series), and Invited lecturer in one-week symposium UAE, Quito, Ecuador.
- Published six editions of Artificial Intelligence: Structures and Strategies for Complex Problem Solving. This textbook, for a senior/graduates courses in Artificial Intelligence is old world-wide, with sales over 100,000 and translations into five languages.

E. Major Awards, Recognitions, etc from the past five years

- UNM Library award, 2008, for outstanding scholarship.
- Nominated for university-wide teaching award.
- Nominated for College of Engineering teaching award.

F. Outreach Efforts and Public Service

- Participated in CS Department recruiting efforts with local secondary schools.

Cris Moore

Professor

A. Areas of Expertise

- Theoretical Computer Science, Quantum Computing, Social Networks, Statistical Physics

B. Interdisciplinary Interests

- Joint appointment with Physics and Astronomy
- Resident Faculty, Santa Fe Institute
- Taught cross listed course, CS571: Intro to Quantum Computation
- Taught cross listed course, CS573: Physics and Computation

C. Departmental and University Committees

- Faculty Search Committee

D. Extracurricular Activities Related to Academic Objectives

- Invited plenary speaker, Latin American Theoretical Informatics Symposium (LATIN) 2010.
- International Symposium on Complex Systems Science. Paris, September 2009.
- Los Alamos Workshop on Physics of Algorithms. Santa Fe, September 2009.
- UC Berkeley Computer Science Theory Seminar, April 2009.
- Aspen Center for Physics colloquium, June 2008.
- CNLS conference on Classical and Quantum Information Theory, April 2008.
- MIT Quantum Information Science seminar. MIT, October 2007.
- Workshop on Advances in Quantum Algorithms, University of Waterloo, June 2007.
- CNLS symposium on Algorithms, Inference, and Statistical Physics, May 2007.
- Syracuse University Physics Colloquium and Condensed Matter Seminar, April 2007.

- DIMACS/Georgia Tech Workshop on Complex Networks and their Applications, January 2007.
- Editorial Board, SIAM Journal on Discrete Mathematics, 2010--
- Editorial Board, Journal of Statistical Mechanics: Theory and Experiment, 2004--2007.
- Program Committee, Symposium on Discrete Algorithms (SODA) 2010.
- Program Committee, Machines, Computations, and Universality (MCU) 2010.
- Steering Committee, Quantum Information Processing (QIP) 2008, 2009 (Chair), 2010
- Program Committee, Workshop on Analysis of Dynamic Networks, December 2008.
- Co-organizer (with Aaron Clauset), Statistical Inference in Networks. Santa Fe Institute, 2008.
- Co-organizer (with Sue Coppersmith, Jon Machta, and Alan Middleton), Workshop on Complexity, Disorder, and Algorithms. Aspen Center for Physics, Summer 2008.

E. Major Awards, Recognitions, etc from the past five years

- UNM School of Engineering Outstanding Senior Faculty Award for Excellence in Research, 2007

F. Outreach Efforts and Public Service

- N/A

Dave Ackley
Associate Professor

A. Areas of Expertise

- Artificial Life, Robust System Design

B. Interdisciplinary Interests

- Relationships between computational systems and living systems

C. Current Departmental and University Committees

- MS examination evaluation (Departmental)
- Faculty Search (Departmental)

D. Extracurricular Activities Related to Academic Objectives

- Editorial boards: Artificial Life; Journal of Adaptive Behavior.
- CS colloquium

E. Major Awards, Recognitions, etc from the past five years

- UNM School of Engineering Senior Teaching Excellence Award, 2008

F. Outreach Efforts and Public Service

- Outreach to hobbyist, DIY, artist, and other non-CS communities
- Assist in design of robust and distributed open-source hardware; design and implementation of associated user-friendly open-source software.

Patrick Bridges
Associate Professor

A. Areas of Expertise

- Operating systems design and implementation; Computer networking; High performance computing; Distributed systems

B. Interdisciplinary Interests

- Computational modeling, control, and optimization of energy generation and distribution systems
- Statistical modeling of failure in sensor network systems

C. Current Departmental and University Committees

- University Information Technology (IT) Cabinet
- School of Engineering Graduate Committee
- Computer Science Department Awards Committee (Chair)

D. Extracurricular Activities Related to Academic Objectives

- Program Committee Member: ACM/IEEE International Conference on Supercomputing 2010; Workshop on System-level Virtualization for High Performance Computing (HPCVirt) 2010, 2008, 2007; Applied Computing 2007; International Conference on Parallel Programming (ICPP) 2006; International Symposium on Parallel and Distributed Processing and Applications (ISPA), 2006; Los Alamos Computer Science Institute Symposium (LACSI), 2004, 2003
- Grant Review Panelist, National Science Foundation, 2004, 2005, 2006, 2009
- Guest Editor, Operating Systems Review (OSR), 2006, 2008 Paper Referee: IEEE Transactions on Parallel and Distributed Systems (TPDS) 2009; Concurrency and Computation: Practice and Experience: 2009; International Conference on Parallel Processing (ICPP) 2005; International Conference on Dependable Systems and Networking (DSN) 2004; International Conference on Cluster Computing (Cluster) 2004

E. Major Awards, Recognitions, etc. from the past five years

- UNM School of Engineering Outstanding Junior Faculty Instructor, 2008-2009
- Best Paper/Best Student Paper Nomination, Supercomputing 2008
- UNM Outstanding Teacher of the Year Nomination, 2007-2008

F. Outreach Efforts and Public Service

- Project Judge, New Mexico Supercomputing Challenge, 2009

Terran Lane
Associate Professor

A. Areas of Expertise

- Machine Learning, Data Mining, Computational Neuroscience/Neuroinformatics, Computational Biology/Bioinformatics, Artificial Intelligence

B. Interdisciplinary Interests

- Courtesy appointment: UNM ECE
- Cross-department Research: UNM Biology, UNM Psychology, Mind Research Network (MRN), NMT Dept of Geology, UNM Anthropology
- Lectured in the Program in Interdisciplinary Biological and Biomedical Sciences (PIBBS) course and upcoming PIBBS networks course
- Faculty mentor for UNM postbaccalaureat research experiences program (PREP)

C. Current Departmental and University Committees

- Departmental: curriculum committee (programming track)
- CS department chair meta-search committee (chair)
- Faculty Hiring Committee
- Department web page coordination
- Undergraduate tutoring program coordinator
- University: Internal competition review committee

D. Extracurricular Activities Related to Academic Objectives

- Advisory board: CRCNS Neuroscience Data Sharing Consortium
- Chair: AAAI Doctoral Consortium (2007) Editorial board: Machine Learning Journal Reviewer: Nature Methods; Journal of Machine Learning Research; Journal of Artificial Intelligence Research; Journal of Theoretical Biology; Intelligent Data Analysis; IEEE Transactions on Knowledge and Data Engineering; IEEE Systems, Man, and Cybernetics; Knowledge and Information Systems; PLOS Computational Biology; BMC Bioinformatics.
- Program committees: International Conference on Machine Learning (ICML); National Conference on Artificial Intelligence (AAAI); ACM SIGKDD International Conference on Knowledge Discovery and Data Mining
- Invited talks/colloquia: Los Alamos National Labs; Universidad Autonoma de Madrid; Universidad Complutense de Madrid; Society for Neuroscience; University of Texas at Austin; University of Kentucky; University of Oklahoma; Mind Research Network.

E. Major Awards, Recognitions, etc from the past five years

- Best paper runner-up (Best Inter/Multidisciplinary Research), IEEE Conf on Bioinformatics and Bioengineering (BIBE), 2007.
- University of New Mexico Regents' Lectureship, 2006-2008. Best paper award, Int'l Conf on Grid and Pervasive Computing (GPC), 2006.

F. Outreach Efforts and Public Service

- Lecturer at National Youth Science Camp
- International Science Fair Judge (IEEE Computer Society Organization)
- UNM site PI for NSF-sponsored Research Experiences for Undergraduates (REU) program

Jared Saia
Associate Professor

A. Areas of Expertise

- Theory and Algorithms, Probability, Distributed and Randomized, Algorithms, Graph Theory, and Spectral Methods, Distributed Algorithms

B. Interdisciplinary Interests

- Published papers with two faculty in the Electrical and Computer Engineering Department at UNM and with an Ecologist at Princeton.

C. Departmental and University Committees

- Tenure and Promotion (Departmental)
- Department Chair Search (Departmental)
- Admissions

D. Extracurricular Activities Related to Academic Objectives

- Program committee for Symposium on Parallel Algorithms and Architecture (SPAA), 2010; International Parallel and Distributed Processing Symposium (IPDPS), 2007, 2009; Principles of Distributed Computing (PODC), 2005 and 2006; ACM/SIGMOBILE International Workshop on Foundations of Mobile Computing (DIALM-POMC), 2004.
- Workshops organized: SIAM International Conference on Data Mining (SDM): Workshop on Analysis of Dynamic Networks(ADN), 2009; International Conference on Data Mining (ICDM): Workshop on Analysis of Dynamic Networks (ADN), 2008
- Invited talks at: Bertinoro Workshop on Algorithms and Data Structures, Neural Information Processing Systems (NIPS), University of Maryland, University of Southern California, Microsoft Research Labs, University of Barcelona, University of Rome Sapienza, Rutgers, Santa Fe Institute, University of Tel Aviv, Dartmouth, University of Georgia, University of Victoria, University of Illinois at Chicago, Sandia Labs, Los Alamos Labs, and IBM Labs.
- Research covered in the popular press: “Social Networking Software Tracks Zebras and Consumers”, in ACM Technical News, washingtonpost.com, Newswise Website, FOREX Trading, Healthcare Industry Today, and Ecademy Daily News, 9/6/07 - 9/10/07; “Professor Fights a Mathematical Battle to Keep the Virtual World Running Smoothly”, ACM Technical News, 2/26/07 and UNM Today, 2/27/07;

“Professor Goes to War”, front page article in University of New Mexico Daily Lobo, 3/2/07

- Co-organizer of Discrete Algorithms Group (DAG) seminar, a joint seminar between UNM and Sandia Labs.
- Served as reviewer for the following conferences and journals: Foundations of Computer Science (FOCS), Principles of Distributed Computing(PODC), Symposium on Discrete Algorithms(SODA), International Colloquium on Automata, Languages and Programming (ICALP),Symposium on Parallel Algorithms (SPAA), Symposium on Distributed Computing(DISC), Joint Conference of the IEEE Computer and Communications Societies (InfoComm), Journal of Experimental Algorithms(JEA), Journal of Algorithms(JOA), Journal of Computing(JOC), Journal of Distributed Computing (JODC), Journal of Networking (JON), and IEEE Transactions on Computing.

E. Major Awards, Recognitions, etc from the past five years

- NSF Early Career Award
- School of Engineering Junior Faculty Research Excellence Award

F. Outreach Efforts and Public Service

- Primary organizer of UNM CS Recruitment Day for local high school students, 2006, 2007, 2008. Over 100 high school students attend annually.
- Author of distributed computing research blog, Machinations, which covers major conferences and workshops, reviews of important papers, student and career advice, etc. The blog has had just over 3,000 unique page views since July and has been recently mentioned in the ACM SIGACT Distributed Computing News column.

Darko Stefanovic
Associate Professor

A. Areas of Expertise

- Programming Languages, Compilers, Run-Time Systems, Memory Management, Molecular Computing, Scientific Modeling

B. Interdisciplinary Interests

- Member, UNM Center for Biomedical Engineering (CBME)
- Participating faculty, UNM graduate program in Nanoscience and Microsystems (NSMS)
- Research in collaboration with Prof. Graves, UNM Dept. of Chemical and Nuclear Engineering, and faculty in Chemistry, Physics, Medicine, Biochemistry at several US universities.

C. Departmental and University Committees

- Undergraduate committee (departmental)
- MS examination committee (departmental)
- PhD examination committee (departmental)
- Undergraduate honors thesis committee (departmental)
- Faculty hiring committee (departmental)
- Graduate admissions committee (departmental)
- Software track committee (departmental)
- Associate dean for research search committee (School of Engineering)

D. Extracurricular Activities Related to Academic Objectives

- By invitation, creating a page on ribozyme computing on Scholarpedia
- Invited talk: “Stochastic Simulation of Multivalent Chemical Walkers”, M. Olah, D. Stefanovic, and M. N. Stojanovic, invited oral presentation, *14th International Meeting on DNA Computing*, Praha, Cesko, June 2008.
- Invited talk: “Biomolecular Automata Using Deoxyribozymes for Solution and Surface Computation”, ERCIM InterLink Workshop, Eze, France, May 2007.
- Invited talk: “Biomolecular Automata Using Deoxyribozymes: Accomplishments and Open Problems”, Unconventional Computation: Quo Vadis? (Center for Nonlinear Studies, Los Alamos National Laboratory), Santa Fe, New Mexico, March 2007.

- Invited talk: “Biomolecular Automata Using Deoxyribozymes: Accomplishments and Open Problems”, Workshop “Automata and formal languages for DNA computation and bioinformatics” (European Science Foundation Auto Math A Program), Como, Italy, October 2006.
- Invited talk: “Biomolecular Automata” (invited tutorial), Unconventional Computing Conference, York, England, September 2006.
- Conference committee: BIC-TA 2007, 2nd annual conference on Bio-Inspired Computing: Theories and Applications, Zheng Zhou, China
- Conference committee: BIC-TA 2008, Australia
- Conference committee: Unconventional Computing 2009, Ponta Delgada, Portugal
- Conference committee: PLDI 2009, Dublin, Ireland (External Review Committee)
- Conference committee: DNA Computing 2010, Hong Kong
- Conference committee: Unconventional Computing 2010, Tokyo
- Conference committee: Co-organizer and host, Workshop on Living Matter as Computing Media, July 2008.
- Conference committee: Host, DaCapo PI meetings, January 2003 and January 2006.
- Conference committee: Host, Next Generation Virtual Machine meeting, January 2006.
- Reviewer for: NSF panels.
- Reviewer for Journals: ACM Transactions on Computer Systems; ACM Transactions on Architecture and Compiler Optimizations; IEEE Transactions on Parallel and Distributed Systems; IEEE Transactions on Computers; Journal of the American Chemical Society; Nucleic Acids Research; BioSystems; Nano Letters; Science; Theoretical Computer Science; Royal Society Interface; Nature Nanotechnology; International Journal of Computer Mathematics; PLoS Computational Biology.
- Conferences: Architectural Support for Programming Languages and Operating Systems (ASPLOS); Object-Oriented Programming Systems, Languages, and Applications (OOPSLA); Programming Language Design and Implementation (PLDI); Parallel Architectures and Compilation Techniques (PACT); International Conference on Supercomputing (ICS); European Compiler Construction Conference; High Performance Computer Architectures (HPCA); International Symposium on Computer Architecture (ISCA); International Symposium on Performance Analysis of Systems and Software; International Symposium on Microarchitecture (MICRO); Workshop on Hot Topics in Operating Systems (HotOS); International Meeting on DNA Computing.

E. Major Awards, Recognitions, etc from the past five years

- N/A

F. Outreach Efforts and Public Service

- Intel International Science Fair, judge
- Jefferson Middle School Science Fair, judge
- work with Albuquerque Public Schools' Career Enrichment Center
- Maxwell Museum of Anthropology, Clark Field Library, volunteer
- Magnifico Art Forward, Steering Committee

Lance Williams
Associate Professor

A. Areas of Expertise

- Human and Computer Vision, Computational Neuroscience, Digital Image Processing, Sketch-Based Interfaces, Mathematical Biology, Distributed Computing, Virtual Worlds, Artificial Life

B. Interdisciplinary Interests

- The Human Visual System
- Published articles in journals devoted to chemistry or biology.
- Worked with Sang Han of the UNM Dept. of Chemical and Nuclear Engineering on automatic analysis of atomic force microscopy images of surface features of silicon crystals.
- Worked with Jan Oliver and Bridget Wilson of the UNM Cancer Research Center on modeling the distribution of proteins on cell membranes for deduction of inter- and intra-cell signaling networks.

C. Departmental and University Committees

- Undergraduate Curriculum Committee
- Programming Languages Ph.D. Comprehensive Exam Committee
- Ad Hoc Committee on Undergraduate Accreditation

D. Extracurricular Activities Related to Academic Objectives

- Colloquia and Invited Talks: Implementing Scheme in a Virtual World, Dept. of Computer Science, Bowling Green State Univ., Toledo, OH, 2009; Beyond Visualization: Reified Computations in a Virtual World, School of Art, Bowling Green State Univ., Toledo, OH, 2009; Implementing Scheme in a Virtual World, Dept. of Computer Science, Univ. of Massachusetts, Amherst, MA, 2008.; Implementing Scheme in a Virtual World, Dept. of Computer Science, Smith College, Northampton, MA, 2007.

E. Major Awards, Recognitions, etc from the past five years

- N/A

F. Outreach Efforts and Public Service

N/A

Dorian Arnold

Assistant Professor

A. Areas of Expertise

- High Performance Computing
- Distributed Systems
- Software Tools and Middleware Infrastructure
- System Fault Tolerance and Reliability

B. Interdisciplinary Interests

- N/A

C. Current Departmental and University Committees

- Graduate Admissions Committee
- Graduate Students Recruiting

D. Extracurricular Activities Related to Academic Objectives

- CSCadSWorkshop, June 2009
- Los Alamos National Laboratory, July 2009
- Paradyn/DyninstWeek, University of Maryland, April 2009
- University of New Mexico Computer Science Colloquium, February 2009
- Sandia National Laboratory, February 2009
- ISC 2011
- Supercomputing 2010
- HIPS 2010
- Program Committee, 11th IEEE International Conference on High Performance Computing and Communications (HPCC 2009)
- Program Committee, 21st International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD 2009)
- Program Committee, 4th international Workshop on Automatic Performance Tuning (iWAPT2009)
- Reviewer: IEEE TNSM Journal, PACT 2009, SC 2007, DSN 2006, EuroPVM/MPI 2005, DSN 2004, PDP 2003, EuroPVM/MPI 2002, Euro-Par 2002.

E. Major Awards, Recognitions, etc from the past five years

- Intel Ph.D. Fellow, 2006-2008 (41 fellows chosen in 2006)

F. Outreach Efforts and Public Service

- Judge, 2009 New Mexico Supercomputing Challenge
- Finance Chair, Parallel Architectures and Compilation Techniques (PACT '09)
- Committee Member, Supercomputing 2008

Jedidiah Crandall

Assistant Professor

A. Areas of Expertise

- Computer Security and Privacy, Computer Architecture

B. Interdisciplinary Interests

- Working with an Information Theorist who is visiting the ECE Department as the Prince of Asturias Chair.
- Working with a Control Theory expert in the ECE Department
- Joint Publication with an ecologist from the Santa Fe Institute
- Have worked with political scientists and human rights advocates in various capacities regarding Internet censorship.

C. Current Departmental and University Committees

- 2010 hiring committee, co-organize the colloquium with Darko Stefanovic

D. Extracurricular Activities Related to Academic Objectives

- Invited talks on Internet censorship at Sandia National Laboratories, Asilomar Microcomputing Workshop, and the Santa Fe Institute
- Brought in colloquium speakers sponsored by the CRAW-CDC and by the UNM Regents' Speaker Endowment
- Served on the program committees of the 2009 IEEE Symposium on Security and Privacy, the 2010 ACM Conference on Computer and Communications Security
- Reviewer for many conferences and journals

E. Major Awards, Recognitions, etc. from the past five years

- NSF CAREER Award 2009
- U.C. Davis Computer Science Best Graduate Student Researcher Award 2006
- GAANN Fellowship 2002

F. Outreach Efforts and Public Service

- Regularly speak to various groups who visit the campus about computer science.
- Ronald E. McNair program advisor for undergraduate student.

Tom Hayes
Assistant Professor

A. Areas of Expertise

- Theory of Computing, Probability & Markov Chains, Online Algorithms, Machine Learning

B. Interdisciplinary Interests

- Worked on a joint paper in submission with V. Calhoun of the Mind Institute (machine learning with applications to feature identification in medical images)
- Invited talk at ITA (information theory and applications)
- Invited talk at INFORMS (operations research and management science)

C. Current Departmental and University Committees

- Graduate Student Advisement (gang of 4) (Departmental)
- Graduate Admissions (Departmental)
- Graduate Recruiting (Departmental)

D. Extracurricular Activities Related to Academic Objectives

- Invited talk at ITA 2009 (information theory and applications)
- Invited talk at INFORMS 2009 (operations research and management science)
- Reviewed papers for COLT 2009, RANDOM 2009, SODA 2010, STOC 2010
- Invited talk at "Physics of Algorithms" workshop, Santa Fe, 2009
- Consulting visit to Microsoft Research, August 2009

E. Major Awards, Recognitions, etc from the past five years

- NSF Postdoctoral Fellowship in Mathematical Sciences, 2004-2006

F. Outreach Efforts and Public Service

- N/A

Wenbo He
Assistant Professor

- A. Areas of Expertise
- Systems, Networking, Pervasive and Ubiquitous Computing
- B. Interdisciplinary Interests
- Taught CS585/485/ECE 440 in Fall 2009.
- C. Current Departmental and University Committees
- N/A
- D. Extracurricular Activities Related to Academic Objectives
- Served on technical program committees for several conferences and workshops including INFOCOM'10, IWQoS'09, WCPS'09, ICCCN'09, WiMD'09, ICSS'09, AdHocNets'09, and RTCSA'09 (publicity chair).
 - Reviewed journal articles for ACM Transactions on Sensor Networks (ToSN), IEEE Transactions on Mobile Computing (TMC), ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP), IEEE Transactions on Parallel and Distributed Systems (TPDS).
- E. Major Awards, Recognitions, etc. from the past five years
- Best paper award of the IEEE Transactions on Industrial Informatics (TII) for year 2008
 - C.W. Gear Outstanding Graduate Student Award, by Department of Computer Science, University of Illinois at Urbana-Champaign 2007
 - NSF TRUST Fellowship for summer program on ubiquitous secure technology, Cyber-security and privacy 2007 and 2009
 - Vodafone-U.S. Foundation Graduate Fellowship, by School of Engineering, University of Illinois at Urbana-Champaign 2005 - 2006, 2006 - 2007, 2007 - 2008
 - Mavis Memorial Fund Scholarship Award, by School of Engineering, University of Illinois at Urbana-Champaign 2006
- F. Outreach Efforts and Public Service
- N/A

Joe Kniss
Assistant Professor

A. Your Areas of Expertise

- Scientific Visualization, Computer Graphics, and Uncertainty Analysis

B. Your Interdisciplinary Interests

- Contributing faculty in the Interdisciplinary Film and Digital Media Program and UNM.
- Co-lead the curriculum design for the program and actively advises students and teaches core classes in the program.
- On the faculty counsel for the Art Research Technology and Science Lab at UNM.

C. Departmental and University Committees

- CS Awards Committee
- IFDM Liaison
- ARTS Lab faculty Committee
- Undergraduate & Graduate Advising committee

D. Extracurricular Activities Related to Academic Objectives

- Dagstuhl Visualization Workshop: 4 invited talks
- International Symposium on Biomedical Imaging, invited talk
- Papers Committee: ACM Siggraph Sketches, IEEE Visualization, IEEE Transactions on Visualization and Computer Graphics.

E. Major Awards, Recognitions, etc from the past five years

- N/A

F. Outreach Efforts and Public Service

- Outreach and engineering/science recruiting at ARTS Lab.
- Associate Director of 3rd Street Arts (Non-profit community art studio & performance space).

Shuang (Sean) Luan

Assistant Professor

A. Areas of Expertise

- Biomedical Engineering, Computational Geometry, Computer Algorithms, and Medical Physics

B. Interdisciplinary Interests

- Biomedical Engineering and Medical Physics
- Joint appointment in UNM Radiology
- Volunteer faculty member of UNM Medical Physics Master Program

C. Current Departmental and University Committees

- Graduate Admissions Committee Chair
- PhD Comprehensive Exam Theory Section Committee

D. Extracurricular Activities Related to Academic Objectives

- Committee of the 12 Annual International Computing and Combinatorics Conference (COCOON'06), the 3rd and 5th Annual International Frontiers of Algorithmic Workshop (FAW). Panelist for National Science Foundation Review Panel, 2007.
- Reviewer for the following journals and conferences: ACM Journal of Experimental Algorithms, International Journal of Computational Geometry and Applications, Journal of Combinatorial Optimization, Medical Physics, Physics in Medicine and Biology, Radiation Oncology, Radiotherapy and Oncology, Technology in Cancer Research and Treatment, International Computing and Combinatorics Conference (COCOON), Symposium on Discrete Algorithms (SODA).

E. Major Awards, Recognitions, etc from the past five years

- QForma Endowed Lecturer, 2009

F. Outreach Efforts and Public Service

- N/A

Melanie Moses

Assistant Professor

A. Areas of Expertise

- Biological Modeling, Biologically Inspired Computation, Ant Colony Optimization, Distributed Search Algorithms

B. Interdisciplinary Interests

- Secondary Appointment to the Department of Biology
- Affiliated faculty with the UNM Program of Interdisciplinary Biological and Biomedical Science (PIBBS)
- Affiliated faculty with the UNM Center for Evolutionary and Theoretical Immunology (CETI)
- Interdisciplinary Teaching: CS 593 Complex Adaptive Systems (25% of course enrollment from other departments)
- Interdisciplinary Teaching: CS 390/590 Programming for Biologists (primarily Biology students enrolled)
- Interdisciplinary Teaching: Co-taught the PIBBS interdisciplinary seminar, cross-listed in 5 departments
- Interdisciplinary Research with the Santa Fe Institute and UNM Department of Biology Metabolic Scaling Group

C. Departmental and University Committees

- Department Graduate Student Advising Committee
- Education Liaison between the UNM Medical School Spatiotemporal Modeling Center and main campus

D. Extracurricular Activities Related to Academic Objectives

- Co-Vice Chair Gordon Research Conference on the Metabolic Basis of Ecology (2008-2010)
- Invited talk: Human Macro Ecology Symposium at the Ecological Society of America Annual Conference
- Invited talk: Department of Homeland Security 1st and 3rd workshop on Biologically Inspired Approaches to Modeling Social Dynamics.
- Invited talk: University of Wyoming Department of Biology Seminar
- Invited talk: Scaling in Biological and Social Networks Workshop at the Santa Fe Institute, NM
- Invited talk: AAAS Annual Meeting, Symposium on Universal Laws Governing Biological Systems, San Francisco, CA.

- Grant Reviewer for NSF CDI (2008) and CETI seed grants (2009)
- Journal reviewer for: Nature, Proceedings of the National Academy of Science, Ecology Letters, The Royal Society Interface, Physica A, Journal of Theoretical Biology, Bulletin of Mathematical Biology, The American Naturalist, Proceedings of the Royal Society B, Oecologia, Functional Ecology, Networks and Spatial Economics, PLoS ONE.

E. Major Awards, Recognitions, etc from the past five years

- 2008 Microsoft New Faculty Finalist
- 2008 New Mexico Academy of Sciences Distinguished Lecturer

F. Outreach Efforts and Public Service

- Outreach to Project GUTS (Growing Up Scientifically) at the Santa Fe Institute, which trains New Mexico middle school teachers and students in agent based modeling and complex systems science. Collaboration includes participation in GUTS trainings and workshops, involving middle school students in field studies and computer modeling of ant colonies, and mentoring students to develop science fair projects and projects for the New Mexico Supercomputing Challenge. (2008-present)**

Joel Castellanos

Lecturer

A. Areas of Expertise

- Classroom teaching
- Design and development of educational software for the mathematical sciences
- Scientific modeling

B. Interdisciplinary Interests

- Published educational software with faculty and researchers from outside the computer science department including: Jonathan Wolfe, Fractal Foundation, Albuquerque New Mexico, Joe Austin, Dept. of Education, Rice University, Richard Tapia, Dept. of Computational and Applied Mathematics, Rice University, John Polking, Dept. of Mathematics, Rice University.

C. Current Departmental and University Committees

- Curriculum Committee (Departmental)
- Outreach Committee (Departmental)
- New Mexico State Business Articulation Curriculum Committee (University)

D. Extracurricular Activities Related to Academic Objectives

- Guest lecturer at the ATLANTYKRON Summer Academy of Learning in Romania.
- Served as a pre-publication reviewer for a number of textbooks on hyperbolic geometry, and multi-dimensional geometry including:
“*Hyperbolic Geometry: Springer Undergraduate Mathematics Series*” by James W. Anderson (Nov, 2007), “*The Annotated Flatland: A Romance of Many Dimensions*” by Ian Stewart (Jul, 2008), and
“*Experiencing Geometry: In Euclidean, Spherical and Hyperbolic Spaces*” by David W. Henderson (Jul, 2000).

E. Major Awards, Recognitions, etc from the past five years

- N/A

F. Outreach Efforts and Public Service

- Given presentations and workshops in many Albuquerque area high schools
- Maintaining educational software that is hosted by the Computer Science department computers at the University of New Mexico and the software is available for free download and educational use via the World Wide Web.
- Coached high school teams in the New Mexico Supercomputer Challenge and in Science Olympiad.
- Volunteered as a judge of computer related, high school science fair projects.

Andree Jacobson

Senior Lecturer

A. Areas of Expertise

- Undergraduate education in programming, High Performance Computing

B. Interdisciplinary Interests

- Interdisciplinary Film and Digital Media (IFDM) designated faculty
- Teaching summer school at Los Alamos National Laboratories (LANL) through the New Mexico Consortium (LANL, UNM, New Mexico Tech., New Mexico State University).

C. Current Departmental and University Committees

- Undergraduate committee (departmental, member)
- ABET Programming Sequence Committee (departmental, member)
- Computer Science Articulation Taskforce (UNM, member)
- Programming Sequence subcommittee (Chair)
- The IFDM (Art Research Technology and Science Lab + Center for Advanced Research Computing) Faculty Council
- Hiring subcommittee (member)
- Probation and suspension committee (UNM, member)

D. Extracurricular Activities Related to Academic Objectives

- Frequently review books for publishers

E. Major Awards, Recognitions, etc from the past five years

- SOE Junior Faculty Teaching Excellence, 2007
- UNM 2007-2008 Outstanding Lecturer of the Year Award, 2008

F. Outreach Efforts and Public Service

- Participant in most open houses and high school events the department has.
- Recruiting through IFDM program
- The LANL summer program

6.3 Research Activity

The faculty in our department are active in research. During the past year, faculty and students published papers in many of the most prestigious journals and conferences, including Nature, Science, the Proceedings of the National Academy of Sciences, and top-tier field-specific conferences and journals. In the current highly competitive climate for research funding, obtaining adequate research support is a challenge. However, research expenditures increased this year by \$369,000, almost 13% (Table 6.1). The department has a diverse profile of funding sources, including the National Science Foundation, National Institutes of Health, Department of Energy, the Department of Defense, and several industrial sources. With almost one third of the faculty hired within the past three years, we expect a temporary dip in research expenditures while these new professors establish their research programs.

Professors in the department continue to be recognized for their excellence in research. In the past year Distinguished Professor, Deepak Kapur, received the Herbrand Award, in recognition of his seminal contributions to several areas of automated deduction; Professor Stephanie Forrest received the IFIP TC2 Manfred Paul Award for excellence in software theory and practice; and Prof. Jedidiah Crandall received an NSF CAREER Award. Also, Professor Melanie Moses was selected as one of nine finalists nationwide for the Microsoft New Faculty Fellowship in 2008.

Computer Science students were also recognized with numerous scholarships and awards. These included the Tom L. Popejoy Dissertation Prize, awarded to Robert Abbott for the best UNM dissertation; the Dean's Dissertation Fellowship for 2009-1010, awarded to Amitabh Trehan; a Computing Innovation Fellowship awarded to Sushmita Roy, one of 50 given out nationwide; and the New Mexico Space Grant Consortium Scholarship awarded to ThanhVu Nguyen. CS Department student James Horey was selected as one of two Convocation speakers for the School of Engineering Fall graduation, the fifth time in a row that a computer science student has been selected for this honor.

Table 6.1

Amount of New Awards & Research Expenditures (2004-2009)

	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009
Total Expenditures	\$2,123,641	\$3,109,889	\$2,786,572	\$2,901,545	\$3,270,642
Total Awards	\$2,748,153	\$3,501,615	\$2,991,262	\$4,469,978	\$2,525,842

Chapter 7: Facilities and Resources

Chapter 7 describes the facilities and resources of the Computer Science Department. We note that student enrollment levels have fluxuated dramatically over the past decade (see the enrollment information in Chapter 6 for the past five years). The staffing and other support comments that follow have this data as its foundation.

In Fiscal Year 2009, the CS Dept.'s received \$2.3 million in Instructional and General (I&G) funds from the State; \$134,000 in returned overhead known as Facilities and Administration (F&A) from the Research Office; \$59,000 in Course Fees; and \$78,000 in gifts and donations. I&G funds support faculty salaries, staff salaries, teaching assistants, and office expenses. F&A funds support graduate fellowships, renovations, faculty search expenses, faculty start up packages, and many operational expenses for which we do not have adequate I&G funding. Course Fees are dedicated to improving the student computing infrastructure in the department. Gifts and donations are dedicated primarily to scholarships. During Fiscal Year 2009, the department's Research Expenditures were \$3.2 million.

7.1 Facilities

The department occupies the first and third floors of the Farris Engineering Center. The Department also occupies a small amount of space in the Mechanical Engineering Building and a shared research laboratory in the Electrical and Computer Engineering Building. The department does not have its own department-controlled classrooms, which is an increasing problem for our computer programming courses. The department cannot ordinarily schedule university-controlled classrooms with computing facilities for more than 50 minute periods, but current pedagogy encourages hands-on laboratory sessions where students develop computer programs under instructor supervision. In addition, several of our courses require specialized software, which is not easily available in the university-controlled computer classrooms. Thus, there is a need for instructional laboratories that can be scheduled in long blocks similar to Chemistry Laboratories with computer hardware, software, and networking controlled by the department to accommodate specialized instructional needs.

The Farris Engineering Center is a 40-year old facility with numerous safety and code violations, basic infrastructure issues such as inadequate heating and cooling, poorly insulated windows, poor plumbing, and an unreliable elevator. The space assigned to CS was originally designed for radically different uses, and has been incrementally remodeled as the department expanded. At this point, the departmental space needs to be reprogrammed to meet the needs of a modern research-active and technologically aggressive department.

Current square foot total for the department is 15,977.3. It is allocated as follows:

Faculty Offices	= 3616.6
Student Offices	= 4857.0
Administrative	= 1402.4
Common Research Areas	= 2876.7
Conference Rooms	= 689.6
Computer Support	= 1402.4
Computer Lab	= 820.1

7.2 Staff

There are currently five staff members in the front office of the CS Department, including the Department Administrator, two Administrative Assistants, a full-time student Advisor and an Accountant. There is also a half-time student aide. This staff is adequate for current departmental needs with two exceptions. The Department lacks dedicated resources for outreach and recruiting. Although everyone pitches in to help with infrequent recruiting events, the Department does not have an adequate outreach and recruiting effort. It also lacks a dedicated development officer in the Department. Traditionally, the School of Engineering has provided college-wide development services, which the Department is obligated to contribute to. However, fundraising in the computing field seems to be quite different from the other Engineering departments in the School, and the Department is woefully lacking in private donations. The staff was severely stretched during the last period of high enrollment, in particular, the student Advisor. As enrollment trends upward again, it may become necessary to add an additional Advisor.

The computer support staff for the CS department consists of two full-time employees and two work-study students. One of these employees is 25% supported from nonrecurring funds, a recent change dictated by budget reductions. In addition to providing basic services, such as student computing laboratories, networking, storage, backup, security, application software and e-mail, the departmental network is used sporadically as a research and teaching laboratory, when, for example, a professor might wish to collect usage data or test a prototype intrusion-detection system in a production setting. The department embraces this philosophy, and it enhances our department network by increasing the user's sense of responsibility and ownership. Maintaining a fully functional network in the department is an important educational resource for our students.

This staffing level is adequate for current needs. However, with rising enrollment and a full complement of research-active faculty, staffing levels for computer support may need to be revisited, and a second machine room will be needed in the near future. In addition, the staff are asked from time to time to help support computing services in other departments throughout the college. There are two outstanding issues with the current computer support staff. First, one of the full-time positions is supported by grants and returned overhead. This was noted during our previous ABET accreditation visit, and we were told to address it. A second pressing issue concerns the departmental web site, which until about a year ago was supported by a part-time employee. When he resigned

to move out-of-state, we were not allowed to replace him because of UNM's pause-and-hold policy on administrative hires. In the interim we have hired a graduate student to provide minimal ongoing maintenance, but as time passes, our web site is degrading, which ultimately will damage recruiting efforts.

7.3 Libraries

The mission: The University of New Mexico (UNM) University Libraries (UL) is a dynamic leader in connecting customers to information, collections, and instruction anyplace and anytime, as well as providing and maintaining exceptional facilities for the evolving education, research, and service needs of UNM and the wider community.

UNM UL is a member of the prestigious Association of Research Libraries. The UL is composed of four separate facilities: Centennial Science and Engineering Library; Parish Business and Economics Memorial Library; Fine Arts and Design Library; and Zimmerman Library, the Education, Social Sciences, and Humanities Library. In addition to the University Libraries, students and faculty also have access to the Health Sciences Library & Informatics Center and the Law Library.

The UL collections consist of over 2 million volumes, access to 300 online bibliographic/full text databases, and subscriptions to approximately 55,000 current journals. Where feasible we are moving exclusively to online formats.

Personalized services include instruction sessions, held in fully equipped classrooms in the libraries, teaching students and faculty how to utilize the library's resources and collections efficiently and effectively, and in-depth comprehensive research assistance. Introductions to library resources are provided through the UL's LibGuides subject pages. Individualized library instruction/tours are also available upon request. Reference services desks are open 60 hours per week and staffed with professionals who help with research problems, devising search strategies, and finding and using various print and electronic resources.

The Parish Business and Economics Memorial Library is now open 24 hours a day, 5 days a week. The UL provides numerous computers for student use and circulates laptops to students for use in the libraries. UNM affiliated users can use the UL resources from anywhere using their UNM network identification.

Borrowing of materials not held at UNM is done through Interlibrary Loan/Library Express. UNM belongs to a consortium of libraries which delivers most journal articles and book chapters within 24 hours and books within 4 days. This is a free service for students, faculty, and staff. Library Express is a new service that delivers scanned copies of articles or chapters held within the UL to users at no charge. Users request the materials by using the link for Interlibrary Loan/Library Express on the UL web page.

The most important library branch for Computer Science (CS) is the Centennial Science and Engineering Library (CSEL). The following *LibGuide* provides guidance in finding and using resources available to CS personnel: <http://libguides.unm.edu/cs> .

Important resources for CS that are available online are the ACM Digital Library, Books 24/7 (nearly 7000 books from 80 publishers in computer programming and other technology subjects), IET/IEEE Electronic Library, Lecture Notes in Computer Science, and the Springer eBook Collection.

Budgetary constraints have had a major impact on the UL's ability to retain and add important bibliographic databases and journal subscriptions. One positive note is that libraries and publishers are exploring new ways of paying for and providing access to journals. In 2010, for example, UL will be able to access the Elsevier Freedom Collection, which includes numerous important CS journals. New electronic book collections are also being explored.

7.4 Summary

The library and related resources at UNM are satisfactory, especially the ILLIAD inter library loan program. All current faculty as well as most all computer science students are Internet savvy and are usually able to locate appropriate research reference resources even without physically visiting the library.

The Department's faculty, student, and support staff office space has grown and changed over the past two years. After almost a decade with CS faculty distributed across three UNM buildings on several floors, the department is now almost completely located on two floors in one building, an improvement made possible by the construction of the new Centennial Engineering building. This is a vast improvement, especially for junior faculty who in the past were often isolated in remote locations. Although the current space is adequate for housing departmental offices and most of the laboratories (one professor's lab is still located in a different building, separated from his office), the physical space is in poor condition. The building itself needs an overhaul of all major systems, including plumbing, ventilation, heating and cooling, illumination, elevators, and insulation. Beyond these basic infrastructure problems, the departmental space desperately needs to be reconfigured, remodeled, and refurnished. It is essential that money be found to remodel and update the physical space to better serve the needs of faculty, staff and students. Finally, the department has no department-controlled classrooms or colloquium space, and it desperately needs classroom space with appropriate state-of-the-art computer and audio-visual equipment, which can be scheduled in long blocks of time suitable for laboratory sessions.

With the two recent budget rescissions imposed by the current state of the economy, and several earlier budget cuts that were never reinstated, one of the CS department's eighteen faculty slots is not funded and not filled. As the economy improves, receiving funding for this position will be the Department's highest priority.

Finally, most national funding agencies, such as NSF, DARPA, and DOE, now require significant matching support from the University before awarding research and educational funds. Matching commitments are seldom available at a level that lets us compete with other institutions. The UNM Research Office will need to address this problem for the computer science department to remain competitive on the national level.

In summary, and with a careful eye on enrollment trends, the Computer Science Department has the following high-priority needs:

- A. Full funding of computer science technical support staff lines.
- B. Full funding of the existing eighteen computer science tenure-track faculty lines (at least).
- C. Funding to modernize the existing departmental physical space and new space for department-controlled classrooms.
- D. Increased institutional commitments for matching requirements in national research and educational funding programs.

Chapter 8: Comparison with Peer and Regional Institutions

The goal of this section is to compare and contrast our degree programs with those of peer and regional institutions. The University of New Mexico is a moderately large state university in the southwestern United States with a Computer Science Department dedicated to excellence in both research and teaching. For the purposes of this comparison, we selected the following universities to serve as peer institutions: Colorado State University, University of Arizona, University of California Santa Cruz, University of Delaware, and University of Idaho. In addition to these peer institutions, we also chose to compare and contrast ourselves with a set of regional institutions. These include: University of Arizona, University of Colorado, University of Utah and New Mexico State University. This set is intentionally diverse; it includes some universities whose national ranking exceeds our own and which we might be inclined to emulate, and some with solid degree programs but (as yet) no national name recognition.

It is not practical in a document of this size to make all comparisons between all degree programs at all institutions on all possible dimensions. For this reason, we focused on two different kinds of comparisons with different objectives. The first is a detailed comparison of our undergraduate curriculum with that of the Dept. of Computer Science at the University of Arizona. We chose the University of Arizona because it is both a peer institution and a regional institution and it has nationally prominent degree programs and a solid reputation for excellence. In this first comparison, we present the two undergraduate curricula in schematic form and compare and contrast their respective degree requirements, prerequisite structure, and areas of emphasis.

In the second comparison, we compare quantifiable attributes of the Ph.D. degree programs of all of the peer and regional counterparts related to the production of Ph.D. graduates during the 5-6 year period preceding this self-study for which reliable data are readily available, namely, the years 2000-2005 (inclusive).

8.1 Comparison of UNM's and UA's Undergraduate Curricula

This comparison begins by presenting the curricula of the two institutions in schematic form. Although an undergraduate education involves coursework in many different subject areas, and comparing these other aspects would no doubt prove illuminating (especially the degree requirements in mathematics and written communication), we confine ourselves to courses in the core subject area of computer science.

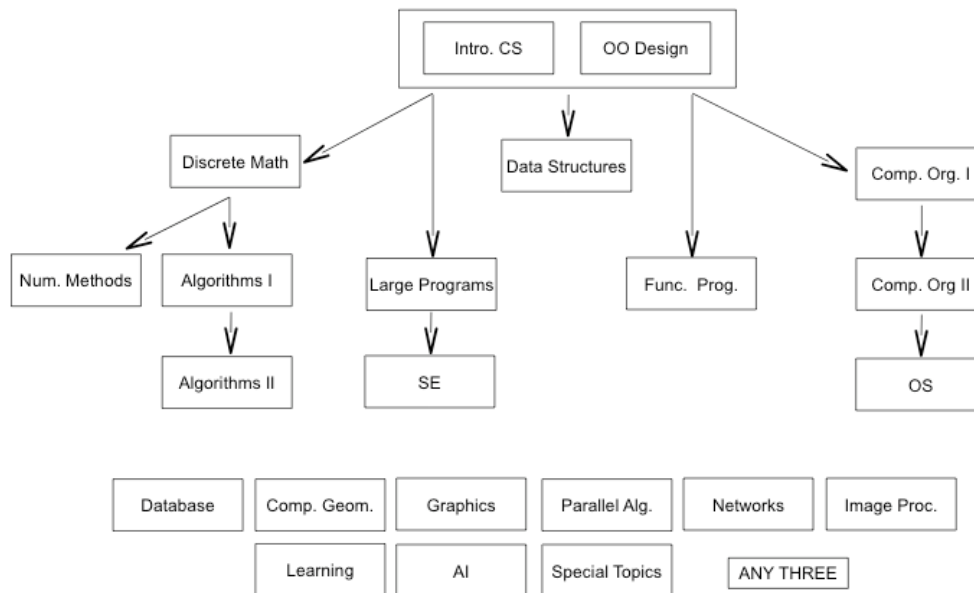


Figure 8.1

Let us first examine the University of New Mexico's curriculum, depicted in Figure 8.1. In its first year, students who intend to major in computer science typically take two courses. The first is an introduction to computer programming and problem solving and is no doubt broadly similar to the introductory course taught in most computer science departments across the country. The second is a course in object-oriented design using Java. The faculty believe that early exposure to this programming paradigm and to the use of data structures viewed as abstract data types encourages correct thinking and allows students to focus on problem solving rather than implementation details. These details come soon enough, in the second year course on data structures in C, which is also the year when students are introduced to discrete mathematics and computer organization. The third year of UNM's curriculum is arguably the most challenging. In addition to required courses on numerical methods, algorithms, and assembly language programming (the second course in the computer organization sequence), students take a course on functional programming (where they are taught both Scheme and Haskell), and a course on design of large programs, which requires them to work in teams and write programs where mastery of the important principles of modularity, information hiding, and unit testing are essential for completion of the projects. In the fourth year, students are required to take courses in operating systems, software engineering, and the second course in the algorithms sequence. Also, during the last two years of their degree programs, students take three technical electives from a wide range of alternatives, e.g., databases, computer graphics, artificial intelligence, which are regularly offered.

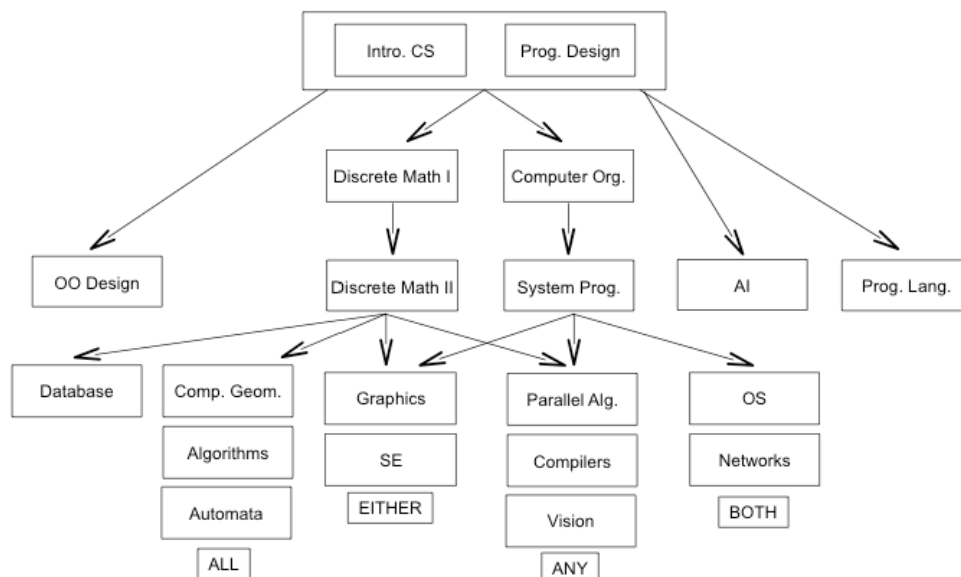


Figure 8.2

The University of Arizona's approach is somewhat different. See Fig. 8.2. In their first year, UA students take two courses with the twin goals of introducing students to computer science and the design of programs. The UA curriculum is organized less by year and more by a detailed prerequisite structure. Like students at UNM, students in their second year of study at UA generally take introductory courses in discrete mathematics and computer organization. However, they also take required courses on object oriented design, programming languages, and artificial intelligence. In their third year, UA students take a second course in discrete mathematics, and courses in algorithms, operating systems, and systems programming. They also take several courses on a list of topics that at UNM are considered to be technical electives. These include databases, computational geometry, automata theory, and networks. Finally, UA students must choose one elective from a list of two (either computer graphics or software engineering) and one elective from a list of three (compilers, computer vision, and parallel algorithms).

There are major differences in the two curricula both in areas of emphasis and the latitude given students in choosing technical electives. UNM's curriculum has three distinct two course sequences: one in algorithms, one in software engineering (beginning with the course on design of large programs), and one in computer organization. The only recognizable two course sequence in UA's curriculum is in discrete mathematics.

Another difference is in required courses. No UA student graduates without taking required courses in databases, computational geometry, automata theory, artificial intelligence, and computer networks. This seems reasonable. However, UA students do not study functional programming in depth but only as part of a required course on programming languages. Nor do they study numerical methods. Most remarkably, they

can graduate without having taken a single course in software engineering (whereas a UNM student must take two).

Finally, there is the matter of student choice. UNM's curriculum allows students to choose three courses from a large list of technical electives including many so-called special topics courses which, although irregularly offered, are often closely related to the research interests of individual faculty. As such, these courses often directly involve undergraduate students in the research of the faculty, which is one reason many students choose to pursue a university education instead of one at a four year college. In contrast, UA students, since they must choose one elective from a list of two and a second from a list of three, have comparatively little latitude to customize their degree programs or be exposed to faculty research through elective course offerings.

8.2 Comparison of Ph.D. Programs Based on Quantifiable Attributes

The statistics used in this comparison are derived from the following three sources:

- 1) The Integrated Postsecondary Education Data System (IPEDS) is an annual, comprehensive set of surveys of all colleges and universities in the United States. The surveys are conducted by the National Center for Education Statistics. The figures cited here are for the years 2001-2005.
- 2) The NSF/NIH/NEH/USED/USDA/NASA Survey of Earned Doctorates (SED) is an annual survey of all new recipients of doctorates from US universities at graduation. The average of the response rates for the 2000-2004 surveys was 92%.

We recognize that the above reports are rather old; however, these are the most recent reports available online summarizing statistics for computer science departments nationwide. Note: the definitive report comparing computer science programs nationwide is that of the National Research Council (NRC) which was last released in 1993. Until a new version of this report is available, the above cited sources remain the most complete and recent.

The raw data collected from the above sources is displayed in Table 8.1. The meaning of the column headings are as follows:

- 1) Years to Degree (yrs). Median time lapse from entering graduate school at the doctorate-granting institution to receipt of doctorate in years. Note that time spent obtaining a master's degree at a different institution is not counted (SED, 2000-2004).
- 2) Cost Per Year (cost/yr). Low yearly cost (tuition, fees, room and board, other expenses) for an in-state student living off campus. This figure assumes median tuition (IPEDS, 2001-2005).
- 3) Research Assistantships (%RA). The percentage of doctorate recipients reporting a research assistantship as their primary form of support (SED, 2000-2004).

4) Percentage of Female Doctorate Recipients (%female). The percentage of doctorates awarded to women between 2001 and 2005. Not used in ranking (IPEDS, 2001-2005).

5) Percentage of Underrepresented Minority Doctorate Recipients (%minorities). The percentage of doctorates awarded to underrepresented minorities (US citizens only) between 2001 and 2005 (IPEDS, 2001-2005).

6) Percentage of Doctorate Recipients with Temporary Visas (%foreign)

The percentage of doctorates known to have been awarded to non-US citizens with temporary visas between 2001 and 2005 (IPEDS, 2001-2005).

7) Number of Faculty (faculty). Total number of graduate faculty (tenured or tenure track) based on lists included on individual departmental web pages.

8) Doctorates Granted per Year (phds/yr). The average number of doctorates granted by the program per year between 2001 and 2005 (IPEDS, 2001-2005).

9) Doctorates Granted per Year (phds/yr). The average number of doctorates granted by the program per year between 2001 and 2005 (IPEDS, 2001-2005).

Table 8.1

Raw Data Comparing Peer Institutions

	yrs	cost/yr	% RA	% female	% minorities	% foreign	phds/yr
UNM	*6.1	\$12,710	0.6	0.16	0	0.32	3.8
Colorado State	5.9	\$9,987	0.56	0.25	0	0.33	2.4
U. Arizona	4.9	\$14,704	0.67	0.14	0	0.57	1.4
UC Santa Cruz	5.7	\$19,184	0.6	0.32	0.13	0.35	6.2
U. Delaware	5.8	\$9,995	0.6	0.22	0	0.52	4.6
U. Colorado	5.7	\$12,490	0.58	0.03	0.03	0.59	7.2
U. Utah	5.9	\$10,780	0.59	0.11	0	0.36	5.6
U. Idaho	3.9	\$13,384	0.48	0.15	0.08	0.31	2.6
NM State	5.5	\$14,300		0.14	0.14	0.57	1.4

*We recognize this number is different than the statistic cited in Chapter 5. However, this number refers to the period 2001-2005 while that number referred to the period 2004-2009.

In Table 8.2 we first compute the actual numbers of Ph.D.'s granted in the period 2001-2005 at the peer and regional institutions. This was done by multiplying doctorates granted per year times five. We multiplied by five because there are five years in the period 2001-2005 and we were interested in absolute numbers. For example, we see that the Univ. of Colorado awarded the most doctorates and the Univ. of Arizona and New Mexico State the fewest.

By multiplying the number of Ph.D.'s granted by the percentage of female, minority, and foreign Ph.D.'s granted we can compute the actual number of female, minority, and foreign students who were granted PhD's. Curiously, for the period 2001-2005, the University of Colorado (the largest degree program) is tied with the Univ. of Arizona and New Mexico State (the smallest) in having the smallest number of Ph.D.'s awarded to women. The program awarding the largest number of Ph.D.'s to women was UC Santa Cruz.

In numbers of PhD's granted, the University of New Mexico is very close to the median with four programs granting more (Univ. of Colorado, UC Santa Cruz, Univ. of Delaware and Univ. of Utah) and four granting fewer (Colorado State, Univ. of Arizona, Univ. of Idaho, New Mexico State). With respect to Ph.D.'s awarded to females UNM is also at the median with two programs granting more (UC Santa Cruz and Univ. of Delaware) and four granting fewer (Univ. of Arizona, Univ. of Colorado, Univ. of Idaho, and New Mexico State).

Table 8.2 Absolute Numbers of Ph.D.s by Category

	Ph.D Graduates	Ph.D Graduates (Minority)	Ph.D Graduates (Women)	Ph.D Graduates (Foreign)
UNM	19	0	3	6
Colorado State	12	0	3	4
U. Arizona	7	0	1	4
UC Santa Cruz	31	4	10	11
U. Delaware	23	0	5	12
U. Colorado	36	1	1	21
U. Utah	28	0	3	10
U. Idaho	13	1	2	4
NM State	7	0	1	4

Although these data show that we didn't graduate any self-reported minority Ph.D.'s in 2001-2005 based upon the numbers reported in the IPED's survey, we know that our numbers in subsequent years are significantly higher. In fact, as Table 3 shows, for the three-year period 2006-2009, four out of eighteen Ph.D's awarded were to women (over 22%), and four out of eighteen Ph.D.s awarded were to minorities (over 22%), although there was some overlap between these two groups.

The information in Table 8.3 was provided by the Registrar's Office at the University of New Mexico.

Table 8.3

Recent Absolute Numbers of Ph.Ds by Category

		W	Min	Other	Total
No. Applicants to Ph.D. Program	2006-07	13	2	48	61
	2007-08	42	1	114	146
	2008-09	40	10	140	180
No. Applicants accepted by Program	2006-07	4	1	20	24
	2007-08	10	1	29	39
	2008-09	10	3	55	65
No. that matriculated	2006-07	2	1	13	15
	2007-08	6	1	19	25
	2008-09	7	3	41	48
No. students who withdrew	2006-07	0	0	4	4
	2007-08	1	1	4	5
	2008-09	0	0	0	0
No. Ph.D.s awarded	2006-07	1	1	4	5
	2007-08	3	0	2	5
	2008-09	0	3	8	8
Enrollment	Fall 2008	9	7	53	62

Legend: W-Women; Min - minorities

Chapter 9: Primary Strengths of the Department and How we Plan on Building on these Strengths.

9.1 Strengths of the Department

Since its inception the Department has emphasized high-quality high-expectation teaching, and this remains a core strength of the department. Our programs are rigorous and not for every student, but those who complete a degree program in the department are well prepared for their subsequent careers. Over the past five years, some of the most prestigious companies in information technology, including Microsoft and Google, have made targeted recruiting visits to the department, based on our reputation and track record. Almost uniformly, our alumni express gratitude for the CS education they received at UNM and say that it has served them well over the years. We can build on this strength by recruiting top high-school students more aggressively to enter our undergraduate program, and by offering more competitive fellowships for entering graduate students.

Since the early 1990s, the department has emphasized research excellence and dedicated itself to enhancing its research profile without compromising its educational standards. We have achieved this through careful faculty hires, and by adding two high-quality lecturers to help cover some of our undergraduate courses. 100% of our faculty members are now research active, and the department legitimately has an international reputation in several areas, as described in Chapter 6 and seen in faculty resumes.

The department committed early in its development to interdisciplinary research, which has paid off, both in enhancing the department's reputation and our ability to obtain extramural research funding. Our faculty are successful and we have retained them; and we have been able to recruit high-quality new hires and graduate students. Northern New Mexico is a world-renowned center for interdisciplinary studies, beginning with the Manhattan Project at Los Alamos during WWII and continuing today with the high-profile Santa Fe Institute (SFI). Proximity to Los Alamos and Sandia National Laboratories as well as SFI is a strength for the department, and one that we have built on in our research and teaching programs.

UNM is a minority serving institution, New Mexico is one of the early minority-majority states, and the department benefits from an unusually diverse student body (see Chapter 5 for details).

9.2 Areas of Concern and How We Will Address These Concerns

Although our student body is diverse, until recently our faculty was not. Over the past three years, we hired two female faculty (the first female tenure-track hires since Prof. Forrest was hired 20 years ago) and two minority faculty (one of these is also counted as a female). However, we recently lost one of the new female hires, and the other female was recruited by Stanford University. Retaining the hires we've made and continuing to increase diversity of the faculty is an important goal, one that is being addressed by committed leadership in the department.

Funding is a second area of concern. Grants are increasingly competitive, and new funding models tend to squeeze out small departments such as ours. The funding picture has changed significantly in the past ten years, with more emphasis on large institution-wide and cross-institutional grants, which require significant institutional commitments. Although we can compete on an individual basis, we struggle to obtain adequate institutional commitments to compete for larger grants.

The department receives little funding from private or industrial donations. This is a weakness and prevents us from preparing adequately for inevitable decreases in public support for education. Part of the issue is that we are a young department with relatively few alumni, and the other part of the problem is that fund raising for CS seems to work differently than for the other engineering disciplines. The department believes that we cannot fully address this issue until we have our own development officer, hired with deep expertise in fund raising in information technology.

Many years of cuts to the department's I & G budget have left us with one tenure-track faculty line that we do not have funds to fill. The line was never cut explicitly, but major cuts during the 1990s, together with a series of direct and indirect cuts over the past 4 years, have left us with inadequate funds to hire in this position. This is our single most pressing problem.

Over the past ten years, interest across campus in interdisciplinary research and teaching has exploded. This, together with projected increased enrollments for STEM fields, has created demand for additional CS faculty. At the center of nearly all interdisciplinary activities is a significant computing component---computer modeling of scientific phenomena; extraordinary computational demands for collecting, storing, and managing large data sets; and computational algorithms to analyze large complex data sets. Although the Department emphasizes interdisciplinary research and teaching, the current faculty is overstretched, and there are many more opportunities on campus for cross-department and cross-college collaborations and for CS supervised Research Assistantships than the current faculty can reasonably support. At the same time, the field of computer science proper continues to expand, placing new demands on faculty for service courses (e.g., supporting the IFDM program) and to offer a complete curriculum to CS undergraduate majors and graduate students. The Department currently has no specialists in large data systems (e.g., data-base, semantic web, or data mining), no specialists in software engineering (a key request from local industry), and only one professor specializing in machine learning.

Related to this, is a demographic issue. The department currently has only 4 full professors, with one very close to retirement. This creates a multitude of leadership and mentoring problems, which would be well addressed by funding to hire a senior professor into the department's unfunded line.

The department occupies physical space that badly needs renovation and reconfiguration. We have the worst space in the School of Engineering, both for faculty research and for students. We share Farris Engineering Center with another department, which was

allocated several new laboratories in the recently completed building. The department was not allocated any space in the new building, despite promises during the planning process, and has had to give up space in EECE since the building was completed. We have no appropriate space to hold departmental colloquia, no department-controlled instructional space, insufficient lab space for some of our new hires, and the space we have has significant problems, including plumbing, ventilation, heating and cooling, and configuration. Computer Science students complain about not having space to convene near the faculty, and the poor quality of our space has demonstrably hurt recruiting. The department had saved up a significant amount of F&A return (\$1 million) to be contributed to remodeling efforts promised by the previous Dean. However, most of those funds were "harvested" by the upper administration or reallocated to avoid losing them.

9.3 Any Anticipated Changes in the Department

The department has undergone dramatic changes in the past three years, with the retirement of nearly 1/3 of the faculty and the subsequent hiring of 6 Assistant Professors. Integrating these new faculty, mentoring them, and adjusting our curriculum to accommodate their interests and expertise is our major current focus. Leadership in the department is a looming issue, as the current Chair is near the end of her term, and the Associate Chair is eligible to retire. With our skewed demographics, there are not obvious replacements amongst the current faculty, and an external Chair search may be the best option.

Computer Science enrollments at UNM fluctuate similarly to those in the rest of the country. We are currently rebounding from the precipitous decline that followed the dot com bust a few years ago, and we anticipate that they will continue to grow over the next few years.

9.4 A Short Summary of Immediate and Long Term Plans to Achieve Academic Mission and Goals

The computer science department's immediate plans include the following:

1. Continue to support our recent hires and help them launch successful independent research programs.
2. Plan for the Chair succession, most likely by conducting an External Chair Search.
3. ABET re-accreditation in 2011-2012.
4. Obtain support for renovating the Department's physical space.
5. Develop a 4+1 B.S. + M.S. program.

Finally, longer-term plans include enhancing outreach to K-12 students (something the department has tried in fits and starts but never fully succeeded with); increasing interactions between the department and local information-technology businesses; and increasing donations from corporate and private sources.

Appendix A

UNM Strategic Plan



Strategic Framework

For 2008 and Beyond

- **Mission** -
- **Vision** -
- **Values** -
- **Strategies** -
- **Priorities** -
- **Goals** -

Mission:
Our Highest Purposes for Existing

UNM's statement of mission articulates our highest purposes for existing:

The mission of the University of New Mexico is to serve as New Mexico's flagship institution of higher learning through demonstrated and growing excellence in ***teaching, research, patient care, and community service***.

UNM's ongoing commitment to these ***cornerstones of purpose*** serves to:

- Educate and encourage students to develop the values, habits of mind, knowledge, and skills that they need to be enlightened citizens, contribute to the state and national economies, and lead satisfying lives.
- Discover and disseminate new knowledge and creative endeavors that will enhance the overall well-being of society.
- Deliver health care of the highest quality to all who depend on us to keep them healthy or restore them to wellness.
- Actively support social, cultural, and economic development in our communities to enhance the quality of life for all New Mexicans.

Vision:

Our Greatest Aspirations for the Future

UNM's vision describes the future state to which we, as an institution, aspire. Our aim is for this to be a vision that is "alive," serving to inform and align all of our goals, activities, decisions, and resources, as well as inspiring and encouraging initiative, innovation, and collaboration.

We aspire to a future in which we are known for:

Strength through Diversity

We lift up our cultural and ethnic diversity as the unique strategic advantage it is, providing the environment in which our students learn with one another to generate new knowledge that helps the world's people leverage and celebrate the value of difference.

Student Success through Collaboration

We are seen as committed partners with those whose mission it is to educate New Mexico's citizens, helping to assure that each individual has the opportunity and resources to develop the confidence and skills that open the door to higher learning.

Vital Academic Climate

We are known for our dynamic, interactive, and passionate academic climate, punctuated by the virtue of academic freedom that is a hallmark of all the world's great universities.

Excellence through Relevance

We are seen as the university of choice for the brightest students, offering nationally-recognized programs at the undergraduate, graduate, and professional levels that will remain relevant throughout the 21st century and beyond.

Research for a Better World

We utilize the geography of our southwestern landscape and culture, as well as our expansive international connections, as important platforms for research that lead to economic development and improved quality of life; from sources of sustainable energy to cures for disease; from state-of-the-art digital and film technologies to nano-technologies.

Health and Wellness Leadership

We are an unmatched health and wellness resource in New Mexico, ensuring access to all, providing state-of-the-art facilities and care, and engaging in research that leads to new ways to preserve wellness, as well as treat and cure disease.

International Engagement

We recognize and maximize the value of our location in the United States and the western hemisphere and are seen as a hub for international initiatives that touch all parts of the globe.

As a result of achieving this vision, UNM will become the first minority/majority university in the country to attain membership in the prestigious Association of American Universities (AAU).

Core Values: *The Principles that Guide Our Decisions*

UNM's values describe the “evergreen” principles that guide our decisions, actions, and behaviors. These are essential and enduring tenets, not to be compromised for short-term expediency. By stating these values publicly, we are openly committing to upholding them and to be held accountable accordingly.

Excellence demonstrated by our people, programs, and outcomes, as well as by the quality of our decisions and actions.

Access with Support to Succeed that gives all who desire the opportunity to take full advantage of the wealth of resources at UNM and to be fully included in the UNM community.

Integrity that holds us accountable to our students, the community, and all who serve UNM's mission, to manage our resources wisely and keep our promises.

Diversity that enlivens and strengthens our university, our community, and our society.

Respectful Relationships that build trust, inspire collaboration, and ensure the teamwork that is essential to UNM's success.

Freedom of speech, inquiry, pursuit of ideas, and creative activity.

Sustainability so that as we meet the needs of the present, we are not compromising the well being of future generations.

Institution-wide Strategies: ***How We Will Achieve the Vision***

UNM's institution-wide strategies describe a few critical commitments and areas of focus that are necessary to achieving our vision and fully activating the mission. Some of our strategies will build the infrastructure and culture necessary for sustainable success, while others will propel us ever closer to achieving our highest aspirations.

Connectivity to Purpose

Every member of the campus community will gain understanding of, connect with, and take accountability for his or her individual contributions to our mission, vision, values, and strategies.

Intercultural Competency

Actively deepen and share our understanding of the diverse cultures that come together at the University of New Mexico and the value they add to society.

Synergistic Partnerships

Identify, nurture, and strengthen partnerships with those institutions and individuals in the community whose missions are aligned with and complement our own, with the result of becoming stronger and more successful collectively than we could have become individually.

Student Centered Decision-making

Every major decision made will begin with the question: "How does this enhance the ability of our students to be successful?"

Campus Vitality

Students, faculty, and staff will be encouraged, supported, and rewarded for contributing to the energy and vitality of our university community by enthusiastically engaging in the exploration and exchange of ideas.

Innovative Research-to-Application Platforms

Create and sustain the conditions under which the brightest and best innovative research will be conducted and applied for the benefit of New Mexico, the country, and the world.

Mission- and Vision-Aligned Investments

All investments of time, energy, and resources will be made with clear understanding and articulation of how the investment serves the mission and contributes to achieving the vision.

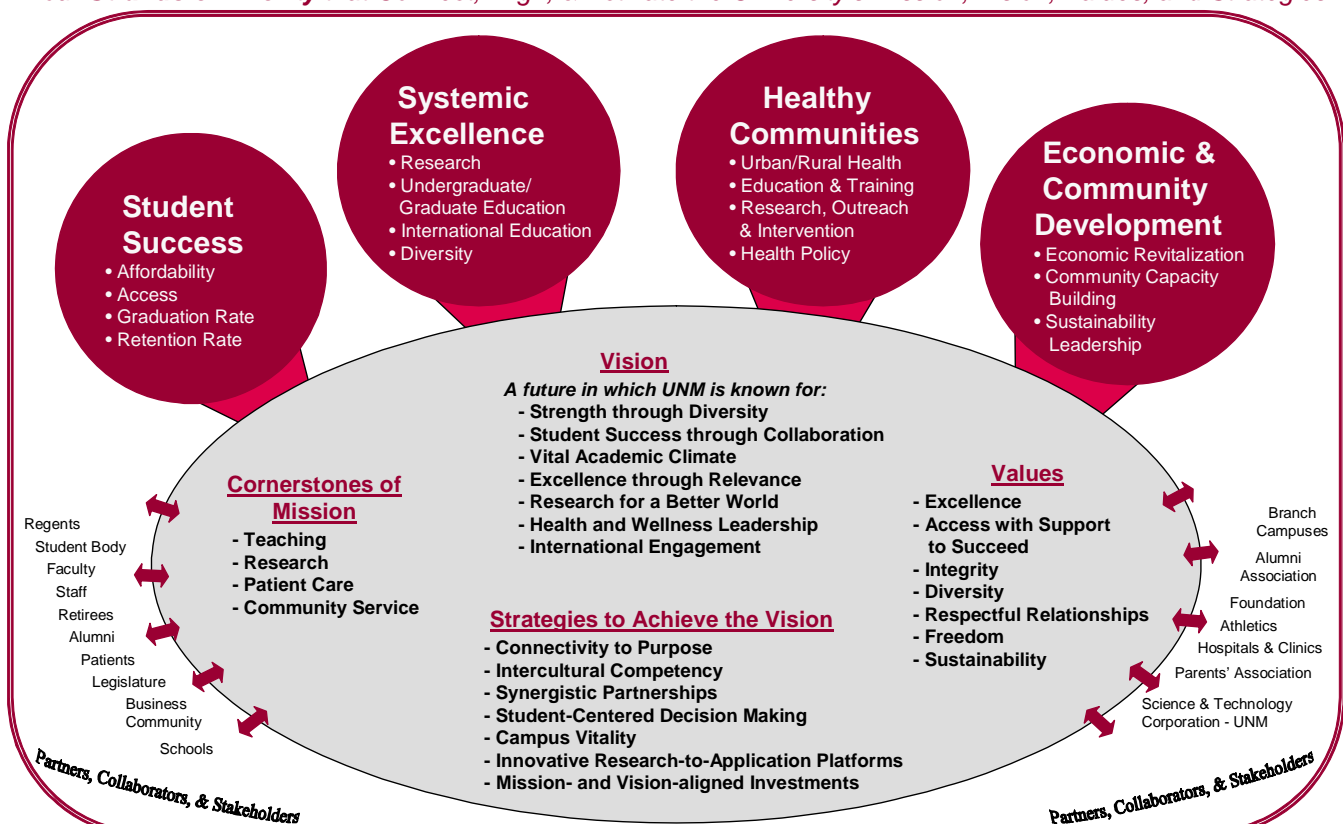
Four Strands of Priority: *That Connect, Align, and Activate* *UNM's Mission, Vision, Values, and Strategies*

If we are to be successful in achieving the vision for UNM's future, priorities must be identified that will inform our decisions, align our activities, and drive everything from our conversations to our resource investments. For each of the following "strands of priority", major milestones must be identified and met, serving as indicators that we are making progress toward attaining our highest aspirations for UNM.

Student Success
Systemic Excellence
Healthy Communities
Economic and Community Development

A Conceptual Framework

Four Strands of Priority that Connect, Align, & Activate the University's Mission, Vision, Values, and Strategies



THE UNIVERSITY of NEW MEXICO



Regents' Goals for the President:

A Roadmap for Success

As part of a comprehensive strategy to attain UNM's vision, the following goals have been set forth by the UNM Board of Regents for the President of the University of New Mexico. These goals provide us with a roadmap for success. Details of the year-to-year objectives and milestones/benchmarks for each of these goals can be found on the UNM website at <http://www.unm.edu/president/>, then click on the "Regents Goals and Milestones" link at the left of the screen.

Goal 1 - Mission, Vision, and Strategic Plan

Review and refine the mission, vision, and strategic plan for the University of New Mexico.

Strategy to Achieve this Goal:

A. **Strategic Framework** - Create a "Strategic Framework" that will serve to articulate, clarify, and communicate the mission, vision, values, strategies, and goals of the University of New Mexico.

Goal 2 - Accountability

Continue to develop an organizational and leadership infrastructure at UNM that creates and reinforces a culture of accountability, continuous process improvement, and transparency, with measurement- and results-driven performance.

Strategies to Achieve this Goal:

A. **Stable and Effective Leadership Team** - Establish a stable and committed senior leadership team accountable for executing UNM's strategy and modeling a culture of accountability.

B. **University-wide Alignment** - Establish processes to engage and align the activities of the university community with UNM's strategic direction.

C. **Decision Support** - Establish and ensure ongoing processes for the collection, analysis, and reporting of data to continuously assess progress and support sound decision-making.

D. **Budget Control Policies** - Develop and implement budget policies and processes to both support and ensure fiscal control and accountability.

Goal 3 - Academics

Establish an integrated system of services to prepare, recruit, enroll, develop, retain, and graduate both undergraduate and graduate students at the University of New Mexico, with special focus on the recruitment of high-achieving students and national merit scholars.

Strategies to Achieve this Goal:

A. **Enrollment Management** - Establish a fully-functioning, student-centered Division of Enrollment Management that serves to integrate and streamline all enrollment processes.

B. **Recruitment of Top Talent** - Establish programs, messages, and partnerships to identify, recruit, and retain top faculty and student talent from New Mexico and beyond.

C. **Infrastructure for Student Success** - Develop and execute a systemic approach for ensuring the success and graduation of students once they are enrolled, with special attention to the strategic partnerships, physical, curricular, and cultural elements that must be in place and wholly integrated to create a fully supportive environment.

Goal 3B - Research

Continue to promote research growth at UNM based on the highest ethical values and founded in the research and educational strengths of the faculty. Make our research administration user friendly and among the best in the nation.

Strategies to Achieve this Goal:

- A. **Research Support Infrastructure** – Develop a research administration office capable of supporting a first class research enterprise at UNM.
- B. **Research Partnerships** – Develop and nurture close relationships and partnerships with national laboratories and other research institutions that will result in a strong portfolio of research collaborations.
- C. **Research Diversification and Growth** - Develop and execute a comprehensive plan to expand transdisciplinary research efforts, diversify UNM's research portfolio, and increase extramural awards.

Goal 4 - Diversity of Leadership, Faculty, and Staff

Develop and execute a plan to ensure that UNM is able to recruit and retain diverse and talented leaders, faculty, staff, and students that reflect the diversity of the state of New Mexico.

Strategy to Achieve this Goal:

- A. **Division of Institutional Diversity** – Establish a fully-functioning Division of Institutional Diversity whose role it is to develop, execute, and communicate a university-wide diversity action plan.

Goal 5 - Community Engagement

Initiate personal outreach to and active engagement with communities throughout the State of New Mexico and beyond.

Strategies to Achieve this Goal:

- A. **Coordinated Communications** – Develop and execute a strong, consistent, and integrated infrastructure and plan for UNM public relations, marketing, and communications.
- B. **Synergistic Community Relationships** – Establish an infrastructure capable of meeting, involving, linking, and nurturing relationships with key internal and external community partners, such as parents; retirees; alumni; tribes, nations and pueblos; elected and appointed decision-makers; business communities; and urban and rural communities throughout the state.

Goal 6 - Legislative Role

Establish and sustain positive relationships with the New Mexico Legislature that result in beneficial support and outcomes for UNM.

Strategy to Achieve this Goal:

- A. **Comprehensive Legislative Approach** – Develop and execute a coordinated legislative approach under centralized management that will result in a vision-, mission-, and strategy-aligned legislative agenda.

Goal 6B - Federal Relations and National Issues

Establish closer relationships with federal funding agencies and our congressional delegation. Continue to increase UNM's reputation and visibility world-wide.

Strategy to Achieve this Goal:

A. **Confidence Through Competence** – Develop and execute a plan to gain the confidence of New Mexico's congressional delegation, as well as key national and international agencies, by demonstrating the competence of UNM's President and Executive Team to lead UNM into the future.

Goal 7 - Fundraising

Apply knowledge and expertise to design, organize, launch, and actively participate in a comprehensive fundraising strategy and executable program that produces positive results for UNM.

Strategy to Achieve this Goal:

A. **Foundation for Friend- and Fund-Raising** – Develop an organizational infrastructure and comprehensive plan that establishes a solid foundation for a multi-year friend- and fund-raising campaign, resulting in a growing and sustained donor base.

Goal 8 - Economic & Resource Development

Develop and execute plans to fully maximize UNM's economic and resource development opportunities.

Strategies to Achieve this Goal:

A. **Principles and Priorities** – Develop a comprehensive set of economic and resource development principles, priorities, and goals for UNM that will inform decisions and resource investments for both the short and long term.

B. **Private and Public Sector Access** – Establish an “open doorway” structure that invites and encourages private sector access to, and engagement with, UNM.

Goal 9 - UNM Rio Rancho Campus

Develop the vision, curriculum, and programs for UNM's Rio Rancho campus that will serve the needs of the community and enhance the overall strength and vitality of the University of New Mexico.

Strategies to Achieve this Goal:

A. **Strategy and Structure** – Develop a comprehensive vision and strategy for the Rio Rancho campus, followed by a structure and plan to execute both.

B. **Community and Legislative Engagement** – Establish communications and relationships with community members and key decision-makers that facilitate the engagement of both groups as active partners in ensuring the success of the Rio Rancho initiative.

Goal 10 - Health Sciences Center

Provide visible and active leadership and support in developing the future of the Health Sciences Center.

Strategies to Achieve this Goal:

- A. **Leadership Integration** – Fully integrate the leadership teams of the HSC and Main Campus to create the conditions, conversations, shared knowledge, and momentum that will lead to the success of future cooperative ventures.
- B. **Strategy Prioritization and Deployment** - Identify and execute key HSC strategic activities that will lead to the overall success of the HSC strategic plan.

Goal 11 - Athletics

Develop and implement a plan to improve the academic performance, retention, and graduation rates of UNM's student athletes, in all athletic programs.

Strategies to Achieve this Goal:

- A. **Athletics Organizational Infrastructure** – Develop and implement a new organizational structure that integrates athletics into the overall university infrastructure.
- B. **Academic Success Action Plan** – Create and execute a comprehensive plan to support and ensure the academic success of our student athletes.

Goal 11B - Athletics

There are other important issues that need to be addressed beyond the student success of student athletes. These relate to NCAA compliance, pricing of athletic events, and continued development of athletic facilities.

Strategies to Achieve this Goal:

- A. **Revenue Generation** – Develop and execute a plan to market and price UNM's athletic events to increase both the fan base and the revenues generated.
- B. **Cost Management** – Establish and implement a plan to balance the athletics budget and implement cost controls, going forward.
- C. **Program Integrity** – Create a system of checks and balances to ensure compliance with NCAA rules and the overall integrity of the UNM athletics program.

Goal 12 - Relationship and Communications with Board of Regents

Propose refinements, additions, and modifications to the behavioral and structural guidelines proposed by the Regents for discussion and adoption at the August 2007 meeting, and then build the agreements into UNM's ongoing operations.

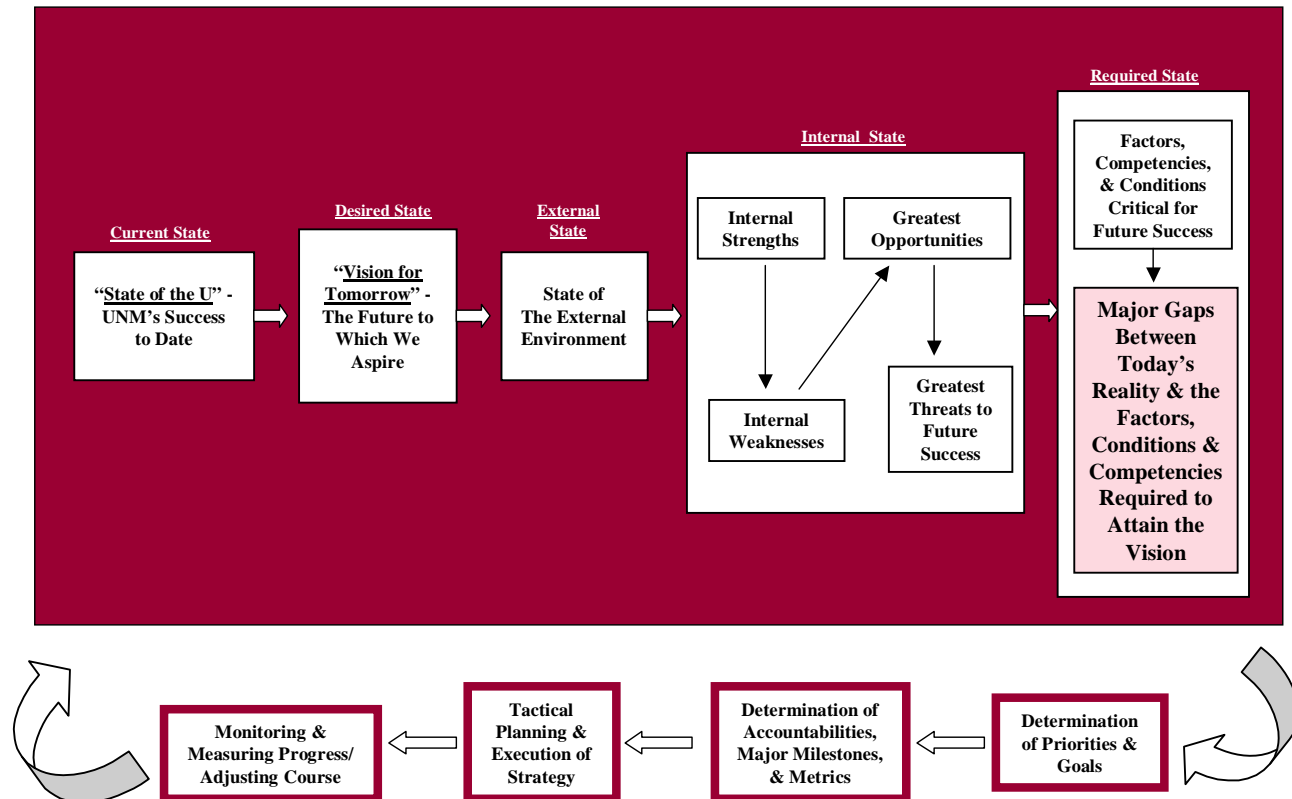
Strategies to Achieve this Goal:

- A. **Role and Accountability Clarification** – The Board and the President review and agree on the most appropriate roles and accountabilities for each to ensure the overall success of the university.
- B. **Communications for Continuous Improvement** – The Board and the President will develop and implement a system of communications that will ensure ongoing feedback, conversation, learning, and continuous improvement to advance the mission and attain the vision.

Layers of Planning



UNM Environmental Assessment/SWOT Analysis, Planning, & Execution Cycle



Appendix B

Program of Studies

THE UNIVERSITY OF NEW MEXICO
The Office of Graduate Studies
PROGRAM OF STUDIES FOR: MASTER'S DEGREE/GRADUATE CERTIFICATE

Submit one completed form to OGS. The original is retained by OGS; a copy is returned by OGS to the graduate unit after approval.
Please print legibly or type this form completely. Leaving any question blank will result in a delay of approval.
Courses used for a master's degree may not be more than 7 years old at the time of graduation; departments may impose stricter limits.
DEADLINES: March 1 for Summer, July 1 for Fall, and October 1 for Spring.
Early submission to your department or graduate unit is strongly recommended, as your faculty will need time to approve the form.
Failure to submit this form on time will delay your graduation.
This form must be approved by OGS before a student may take the master's examination.

1. Personal Information

UNM ID Number: _____ Date: _____

Name (as it appears on UNM record: _____
First Middle Last

Other Names Used at UNM: _____
First Middle Last

Local Address: _____
Street City State Zip Telephone

Permanent Address: _____
Street City State Zip Telephone

Email Address: _____

2. Department or Graduate Unit: a) _____ b) _____

3. List all degrees you currently hold (include both undergraduate and graduate degrees, major, institution, and date conferred for each):

Degree	Major	Institution	Date Conferred (mm/dd/yyyy)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

4. Select appropriate option (Required): (list exactly as shown in the *University Catalog*)

☐ **Master's Degree** ☐ **Dual Degree** ☐ **Master's Degree** (plus Graduate Certificate) ☐ **Graduate Certificate Only**

Degree Abbreviation (Primary Program)	Major	Banner Major Code
_____	_____	_____
Degree Abbreviation (Secondary Program) – Dual Degree	Major	Banner Major Code
_____	_____	_____
Degree Abbreviation (Certificate)	Major	Banner Major Code
_____	_____	_____

5. Concentration #1: _____ **6. Minor (if any):** _____
Concentration #2: _____
If declaring a formal minor, additional paperwork is required

7. Plan I (with thesis) ☐ **8. Semester and year that you expect to**
Plan II (without thesis) ☐ **complete all requirements for this degree:** _____
Semester of Graduation Year

9. You must choose a UNMCatalog/Graduate Bulletin. You must meet all program degree requirements specified in a UNM catalog/bulletin in effect since your admission/readmission (see POS Guidelines for details and restrictions).

Which publication have you selected? ☐ 2001-2003 ☐ 2003-2005 ☐ 2005-2006 ☐ 2006-2007 ☐ 2007-2008 ☐ 2008-2009

[illegible]

11. Applied Credit: List courses used to fulfill graduate degree requirements while in non-degree, extension or undergraduate status at UNM. Please see the section on APPLIED GRADUATE CREDIT in the *University Catalog*.

*	Dept & Course #	Course Title	Sem Hrs	Grade	Sem/Year (e.g. Fall/2006)	Instructor

12. Transfer Courses: List courses completed at an institution other than UNM but used to fulfill requirements for this degree. Official transcripts required.

*	Dept & Course #	Course Title	Sem Hrs	Grade	Sem/Year (e.g. Fall/2006)	Instructor

13. Transcribed Graduate Certificate Courses: List courses completed to fulfill the requirements established by the certificate program as listed on front page.

*	Dept & Course #	Course Title	Sem Hrs	Grade	Sem/Year (e.g. Fall/2006)	Instructor

14. Language and/or Skill Requirements: (this section to be completed by Faculty Graduate Director only)

If your program requires a language and/or skill, has this student met the requirement? Yes ☐ No ☐ n/a ☐

Signature of Faculty Graduate Director

- Credits used to fulfill requirements for any other degree may not be applied toward this degree

- You are responsible for knowing all UNM graduate regulations and requirements, as well as those specific to your graduate program. You are encouraged to obtain a *University Catalog* and obtain copies of your program's particular graduate requirements

15. APPROVALS (Unit #1 – Primary)

Signature of Student Date

Signature of Major Advisor Date

Major Advisor (printed or typed name) Date

Signature of Faculty Graduate Director or Graduate Unit Chair Date

Signature of Dean of Graduate Studies Date

16. APPROVALS (Unit #2 – Dual/Certificate)

Signature of Student Date

Signature of Major Advisor Date

Major Advisor (printed or typed name) Date

Signature of Faculty Graduate Director or Graduate Unit Chair Date

Signature of Dean of Graduate Studies Date

FOR OGS USE ONLY**Time limit for completion of degree:**

Entered: _____

Degree: _____ Major: _____ Major Code: _____

Plan I ☐ Plan II ☐

Coursework [] _____ Required Courses: _____

Diss/Thesis [] _____

500 Min [] _____

Prob Max [] _____

Master's hrs [] _____

Lang/Skill (1) _____ (2) _____ Transf / ND / Ext / UG _____

GPS (3.0) _____ Instr. (50%) _____ Time Limit _____ Extension _____

Post Masters _____ 18 hrs after _____ 24 @ UNM _____ Doc / MFA Comp _____

Processor _____ Approved as presented this date _____

Appendix C

ABET Report



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Baltimore, MD 21202

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accreditation@abet.org

Applied Science Accreditation Commission
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August 21, 2006

Joseph L. Cecchi
Dean
School of Engineering
MSC 01 1140
Farris Engineering Center, Room 107
University of New Mexico
Albuquerque NM 87132

Dear Dr. Cecchi:

The Computing Accreditation Commission (CAC) of ABET recently held its 2006 Summer Meeting to act on the program evaluations conducted during 2005-2006. Each evaluation was summarized in a report to the Commission and was considered by the full Commission before a vote was taken on the accreditation action. The results of the evaluation for University of New Mexico are included in the enclosed Summary of Accreditation Actions. The Final Statement to your institution that discusses the findings on which each action was based is also enclosed.

The policy of ABET is to grant accreditation for a limited number of years, not to exceed six, in all cases. The period of accreditation is not an indication of program quality. Any restriction of the period of accreditation is based upon conditions indicating that compliance with the applicable accreditation criteria must be strengthened. Continuation of accreditation beyond the time specified requires a reevaluation of the program at the request of the institution as noted in the accreditation action. ABET policy prohibits public disclosure of the period for which a program is accredited. For further guidance concerning the public release of accreditation information, please refer to Section II.L. of the *2005-2006 Accreditation Policy and Procedure Manual* (available at www.abet.org).

A list of accredited programs is published annually by ABET. Information about ABET accredited programs at your institution will be listed in the forthcoming ABET Accreditation Yearbook and on the ABET web site (www.abet.org).

ABET
Computing Accreditation Commission

Summary of Accreditation Actions
for the
2005-06 Accreditation Cycle

University of New Mexico
Albuquerque, NM

Computer Science (BS)

Accredit to September 30, 2012. A request to ABET by January 31, 2011 will be required to initiate a reaccreditation evaluation visit. In preparation for the visit, a Self-Study Report must be submitted to ABET by July 1, 2011. The reaccreditation evaluation will be a comprehensive general review.

ABET
Computing Accreditation Commission

FINAL STATEMENT

to

UNIVERSITY OF NEW MEXICO
Albuquerque, NM

Dates of Visit: October 2-4, 2005

Team Chair: Robert E. Beck
Villanova University
Villanova, PA

Program Evaluators: Debra Brum
California State Polytechnic University
Pomona, CA

Curtis A. Carver, Jr.
United States Military Academy
West Point, NY

UNIVERSITY OF NEW MEXICO

FINAL STATEMENT 2005-2006 EVALUATION

This is a confidential statement from the Computing Accreditation Commission to the University of New Mexico. It is intended for internal use only and is not for release except as allowed by policies of ABET, Inc.

I. INTRODUCTION

The University of New Mexico is one of the three research universities in the state and is included in the Carnegie classification Doctoral/Research Universities—Extensive. Located in central Albuquerque adjacent to Historic Route US 66, the institution serves about 26,000 students with a faculty of 1730 FTE members. The University is noted as a Hispanic-serving university with about half its undergraduates coming from minority groups.

The Department of Computer Science is located in the School of Engineering, one of the ten academic schools and colleges of the University. The School of Engineering consists of five academic departments along with an extensive student support and advising staff. Students are admitted to matriculated status in the Computer Science program after completing general first-year studies and satisfying entrance requirements in mathematics and science. There are about 110 students matriculated in the program and an equal number with declared intent to join the program as soon as prerequisite courses are completed.

The Computer Science Program at the University of New Mexico was evaluated by the Computer Science Accreditation Commission (CSAC) of CSAB in the 1999-2000 cycle and was accredited at that time.

The Computing Accreditation Commission (CAC) of ABET evaluated the BS Degree in Computer Science of the University of New Mexico during the 2005-06 cycle for possible accreditation under the CAC/ABET "Criteria for Accrediting Computing Programs", dated November 1, 2004.

II. REPORT OF FINDINGS FROM THE CAC EVALUATION VISIT

The *Criteria* are divided into seven major *categories*, each containing a statement of *intent* and *standards*. The intents provide the underlying principles that each program must meet to be accredited. The standards provide a description detailing how a program can meet the intent. A program can meet an intent by either satisfying all the associated standards or by demonstrating an alternate implementation.

results of the process at each stage are not clearly documented. This is especially true for the assessments and actions that are based on data other than those gathered from the in-class testing and project activities. The visiting team was not able to find documentation of the results of the assessments, the use of data other than the in-class activities, or the actions taken as a consequence of the survey data collected. Thus, the team has a concern that the results and actions for some components of the assessment process are not being documented (*Standard I-6*).

B. Student Support

Intent: Students can complete the program in a reasonable amount of time. Students have ample opportunity to interact with their instructors. Students are offered timely guidance and advice about the program's requirements and their career alternates. Students who graduate the program meet all program requirements.

The program meets the intent of the Student Support Category by satisfying all associated standards with no concerns.

Both the required courses and choices for computer science electives are offered frequently enough that the students have no difficulty in completing the program in a timely manner (*Standard II-1*). The interaction between students at all levels and faculty members is notable. All faculty members seemed genuinely concerned and actively involved in the development of their students (*Standard II-2*). The catalog, the department web site, and the department brochure provide clear statements about completing the program. The faculty members are involved in the advising process each semester and provide further help and guidance about appropriate choices for completing the program and for choices beyond the degree (*Standards II-3 and II-4*). Much of the success of the advising program for the department, which the students agree provides excellent service, is due to the attentiveness and thoroughness of the professional advisor on the department staff. Processes are in place in the department and the School of Engineering to verify that students meet the requirements of the program. The Registrar's Office assists by checking the university's general education requirements for each student (*Standard II-5*).

C. Faculty

Intent: Faculty members are current and active in the discipline and have the necessary technical breadth and depth to support a modern computer science program. There are enough faculty members to provide continuity and stability, to cover the curriculum reasonably, and to allow an appropriate mix of teaching and scholarly activity.

The program meets the intent of the Faculty Category by satisfying all associated standards with no concerns.

There are fourteen full-time faculty members with primary commitment to the program, which is quite sufficient for the number of students enrolled (*Standard III-1*). In fact, faculty commitment to the undergraduate program is a strength of the department and evident in course content and

Computer Science

The computer science core consists of 20 credits including programming, data structures, computer architecture, and mathematical foundations (*Standard IV-5*). In addition to these topics, there is basic coverage of algorithms and software design and the fundamental constructs of programming languages within the core courses (*Standard IV-6*). Throughout the core courses, the instructors stress appropriate theoretical foundations, problem analysis and solution design (*Standard IV-7*). Students do their initial programming in Java and later are introduced to C and Scheme. They work in the Windows and UNIX environments. Most of their complex programming is done in Java, and they become proficient in that language (*Standard IV-8*). Students take at least 21 credits of advanced computer science courses that build on the core, perhaps more depending on their choice of technical electives (*Standard IV-9*). One of these courses is software engineering, which the faculty agrees is essential to the program. However, the usual instructor for the course has left the university, so the department is currently reallocating teaching assignments and looking for a long-term solution.

Mathematics and Science

The curriculum requires 17 credits of mathematics including one year of calculus, one semester of discrete structures taught within the Department of Computer Science, and one semester of statistics. The latter course includes work in probability as demonstrated by the syllabus and sample course work (*Standards IV-10 and IV-11*). The students are also required to take a one-year laboratory science sequence designed for science and engineering majors. This sequence with the other required science courses gives the students at least 12 credits of science (*Standards IV-12, IV-13, and IV-14*).

Additional Areas of Study

Oral presentation skills are developed in General Education courses. The application of these skills is called for on course information forms of several computer science courses: three required courses and two elective courses. The course display materials showed evidence of oral presentations with graded feedback for one required course but not for the number of presentations specified in the course syllabus. The display materials for the second required course did not have evidence of feedback for its oral presentation. The display materials for the third required course were incomplete. The students who met with the visiting team reported that they were not required to do any significant oral presentation within the computer science portion of the program. Consequently, the visiting team has a concern that the extent of the application and development of oral communications skills only minimally satisfies the standard and may not be meeting the corresponding objectives of the program. The concern contributes to a weakness in the Curriculum Category (*Standard IV-15*).

The written communication required of students appears to be exceptional (*Standard IV-16*). Several courses require research papers, and the instructors give detailed feedback on the quality of the writing.

faculty members. The faculty members regularly attend meetings appropriate to their research areas. Furthermore, their publication records confirm their competence as teachers and scholars (*Standard VI-2*). Their research activities are supported through low teaching loads and a university infrastructure that helps with obtaining grants (*Standard VI-3*). Significant scholarly activities are required for tenure and promotion.

The department employs five administrative support staff people, which the faculty finds quite adequate for their purposes (*Standard VI-4*). The department chair teaches one course each semester and uses the additional time to administer the program and to pursue his research program. He finds this arrangement satisfactory (*Standard VI-5*).

The resources to support the library holdings and information retrieval systems are solid. The move to more use of digital libraries has allowed the reallocation of resources in more effective ways (*Standard VI-8*).

The upper-level administration is committed to continuing support for the program (*Standard VI-9*). The administration believes that it is essential to have a quality undergraduate program in computer science at the state's flagship university. The administration has committed funds to support the program even in the face of declining enrollments. Although detailed plans were not available to the visiting team, the team understood that the administration was committed to making more space available to the department once the new building was completed (*Standard VI-6*).

The visiting team is concerned about general and specialized laboratory space (*Standard VI-7*). Currently, the sole laboratory allocated to the program is used for major programming projects in software engineering and other upper division courses. There is no space allocated for specialized laboratories to support various undergraduate courses such as artificial intelligence, networks, architecture, system administration, and graphics. As a consequence, the computer science students do not have a space to gather for studying, for project team meetings, and for informal collaborative learning, whereas the students in the other departments in the School of Engineering do. From the visiting team's discussions with students and faculty, this lack of a sense of a community and the facilities necessary to engender it is identified as the most serious shortcoming of the program.

G. Institutional Facilities

Intent: Institutional facilities including the library, other electronic information retrieval systems, computer networks, classrooms, and offices are adequate to support the objectives of the program.

The program meets the intent of the Institutional Facilities Category by satisfying all associated standards with no concerns.

The Centennial Library serves as an excellent resource for the program by maintaining online access to appropriate databases and digital libraries (*Standard VII-2*). The book collection is

well-documented feedback to the students, the concern regarding oral presentations as described in *Standard IV-15* remains.

IV. OBSERVATIONS

As assessment processes mature, it is necessary to include direct measurements of program outcomes and, where possible, of program educational objectives. If you have not included direct measurements, it is strongly advised that you consider doing so as soon as possible.

V. CONCLUSIONS

The Computer Science program at the University of New Mexico is a strong, vibrant program with an excellent faculty. The screening process for entry into the program yields a group of students who work hard and learn well as shown by their success on the upper level projects they are assigned. Of particular note is the university's commitment to the Hispanic and Native American communities. As a consequence, the computer science program enrolls a large number of students from underrepresented groups within computing.

The following is a summary of the current status of the program relative to the continuing concerns from the 1999-2000 visit:

1. Half the upper division classes are large and exceed the maximum specified in the CSAC/CSAB criteria.

Status: No longer a concern.

The program meets the intent for all categories in the *Criteria* by satisfying the associated standards. However, the following concerns associated with some of the standards were identified.

1. (*Standard I-3*) The formal assessment process includes some data other than those collected from in-class assessments but the process of gathering of summary data from exit interviews and longitudinal data from repeated alumni and employer surveys is not well-established and tested over several assessment cycles.
2. (*Standard I-6*) The revised documentation for the assessment process describes a process that has not been observed and tested especially for the newly phrased program objectives. Also, the plan for documenting the actions carried out based on the assessments has not been observed.
3. (*Standard IV-15*) The structures of the courses in the program in which the oral communication skills of the students are applied are in flux or depend heavily on the faculty members assigned to teach them.

Appendix D

Faculty CVs

STEPHANIE FORREST

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Education

Ph.D. Computer and Communication Sciences, Univ. of Michigan, Ann Arbor, MI, 1985.

M.S. Computer and Communication Sciences, Univ. of Michigan, Ann Arbor, MI, 1982.

B.A. St. John's College, Annapolis, MD and Santa Fe, NM, 1977.

Recent Employment and Affiliations

1990–present. The University of New Mexico, Albuquerque, NM. Chairman, 2006–present; Professor, 1999–present; Associate Professor, 1994–1999; Assistant Professor, 1990–1994; Secondary appointment in Dept. of Biology, 2001–present.

2003–present. Santa Fe Institute, Santa Fe, NM. External Professor, 2006–present; Research Professor, 2003–2006; Interim Vice President for Academic Affairs, 1999–2000.

1996–1997. Artificial Intelligence Laboratory, Massachusetts Institute of Technology, Cambridge, MA. Visiting Associate Professor (sabbatical leave).

1988–1990. Center for Nonlinear Studies and Computing Division, Los Alamos National Laboratory, Los Alamos, N.M. Director's Postdoctoral Research Fellow.

1985–1988. Teknowledge, Inc., Palo Alto, CA. Research and Advanced Development.

Selected Honors and Awards

New Mexico Council on Technology, Women in Technology Award (2009).

ACM SIGEVO GECCO Impact Award for highest impact paper published in the 1999 Genetic and Evolutionary Computation Conference (awarded in 2009).

“Humies” Gold Medal Award for human-competitive results produced by genetic and evolutionary computation, \$5000 shared with 3 co-authors (2009).

IFIP TC2 Manfred Paul Award for Excellence in Software: Theory and Practice, \$1024 EU shared with 3 co-authors (2009).

Senior Fellow of the Intl. Soc. for Genetic and Evolutionary Computation (2003).

UNM Regents Lecturer, 1994–97. UNM College of Engineering Research Achievement Award (Junior Faculty Award, 1993; Senior Faculty Award, 2000).

NSF Presidential Young Investigator Award, 1991–96.

Selected Recent Publications

W. Weimer, T. Nguyen, C. Le Goues, and S. Forrest “Automatically finding patches using genetic programming.” ICSE '09: Proceedings of the 2009 IEEE 31st International Conference on Software Engineering, pp. 364–374. IEEE Computer Society, Washington, DC. (2009). ACM SIGSOFT Distinguished Paper Award.

F. Esponda, S. Forrest, and P. Helman “Negative representations of information.” *International Journal of Information Security* 8:2 pp. 1615–5262 (2009).

- M. Moses, S. Forrest, A. L. Davis, M. Lodder, and J. H. Brown “Scaling theory for information networks.” *J. of the Royal Society Interface* 5:29, pp. 1391-1510 (2008).
- J. Karlin, J. Rexford, and S. Forrest “Autonomous security for autonomous systems” *Computer Networks* 52:29082923 (2008).
- P. Holme, J. Karlin, and S. Forrest “An integrated model of traffic, geography and economy in the Internet.” *ACM SIGCOMM Computer Communication Review* 38:3, pp. 7-15 (2008).
- E. Trias, J. Navas, E. Ackley, S. Forrest, and M. Hermenegildo “Negative ternary set sharing” International Conference on Logic Programming (ILCP) (2008).
- P. Holme, J. Karlin, and S. Forrest “Radial structure of the Internet.” *Proc. Royal Society A* 463:1231-1246 (2007).
- S. Forrest and C. Beauchemin “Computer Immunology.” *Immunol. Rev.* 216:176-197 (2007).
- R. Gerety, S. Spencer, K. Pienta, and S. Forrest “Modeling somatic evolution in tumorigenesis.” *PLoS Computational Biology* 2:8 e108 (2006).
- D L. Chao, M. P. Davenport, S. Forrest, A. S. Perelson “The effects of thymic selection on the range of T cell cross-reactivity” *European Journal of Immunology* 35:3452-3459 (2005).
- G. Barrantes, D. Ackley, S. Forrest, and D. Stefanovic “Randomized instruction set randomization” *ACM Transactions on Information Systems Security (TISSEC)* 8:1, pp. 3-40 (2005).
- J. Balthrop, S. Forrest, M. Newman, and M. Williamson. “Technological networks and the spread of computer viruses.” *Science* 304:527-529 (2004).

Students and Collaborators

Ph.D. students graduated: T. Jones, R. Hightower, D. Smith, M. Oprea, S. Hofmeyr, W. Hordijk, P. D’haeseleer, A. Somayaji, D. Chao, C. Warrender, G. Barrantes, H. Inoue, F. Esponda, K. Ingham, R. Abbott, T. Kaplan, E. Trias, J. Karlin.

Post-doctoral fellows: D. Dasgupta, A. Kosoresow, D. Smith, C. Maley, M. Glickman, C. Beauchemin, M. Moses, P. Holme, H. Mitchell.

Non-UNM Co-authors and co-PIs during the last 48 months: D. Boneh (Stanford), H. Chen (UC Davis), F. Chong (UC Santa Barbara), M. P. Davenport (Univ. New South Wales), J. Davidson (UVA), A. Davis (Utah), D. Evans (UVA), J. Feigenbaum (Yale), J. Knight (UVA), F. Koster (Lovelace Respiratory Research Inst.), C. LeGoues (UVA), K. Levitt (UC Davis), A. Nguyen-Tuong (UVA), A. S. Perelson (LANL), K. Pienta (U. Michigan), M. Newman (U. Michigan), M. Reiter (UNC), J. Rexford (Princeton), j. Rowe (UC Davis), D. Song (UC Berkeley), S. Spencer (MIT), Z. Su (UC Davis), M. Williamson (Sana Security), W. Weimer (UVA), F. Wu (UC Davis).

Ph.D. advisor: John Holland.

Synergistic Activities

Santa Fe Institute, Santa Fe, NM (Science Board); Computing Community Consortium (CCC) Council 2009-present; NSF/CISE Advisory Committee 2006-2008; Co-organizer of DIMACS working group on “Analogies between computer viruses and immune systems and biological viruses and immune systems.” DARPA ISAT advisory group 2001-2004. Co-founder of UNM Program in Interdisciplinary Biological and Biomedical Science (PIBBS), an interdisciplinary graduate training program for students in the biomedical sciences. NIH COBRE Center for Evolutionary and Theoretical Biology at UNM.

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University of New Mexico
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Education

Ph.D., 1980, Massachusetts Institute of Technology (MIT), Cambridge, MA.
M. Tech., 1973, and B. Tech., 1971, Indian Institute of Technology (IIT), Kanpur, India.

Employment

August 2007: Distinguished Professor, Department of Computer Science,
University of New Mexico, Albuquerque, NM.
Jan. 1999–June 2006: Chair, Department of Computer Science, University of New Mexico,
Albuquerque, NM.
1988–1998: Professor of Computer Science, State University of New York, Albany, NY.
1988–1998: Founder and Director of *Institute for Programming and Logics*,
State University of New York, Albany, NY.
1980–1987: Research Staff, Computer Science, G.E. R&D Center, Schenectady, New York.

Research Interests

Formal Methods. Program Analysis. Automated Reasoning. Term Rewriting. Unification. Algebraic and Geometric Reasoning. Elimination Methods. Polynomial Equation Solving.

Honors

- *Herbrand Award*, 2009, the highest award in the field of automated reasoning and deduction.
<http://www.cadeinc.org/HerbrandAward.html>.
- *Excellence in Research Award*, the University at Albany, SUNY, 1998.
http://www.albany.edu/feature98/excellence_awards/kapur.html.

Publications

Books: 4; Journal and Book Chapters: 60; Conference Proceedings: 130.

Ph.D. Dissertations Supervised

S. Falke, *Term Rewriting with built-in Numbers and Collection Data Structures*. August 2009, University of New Mexico.

M. Marron, *Modeling the Heap: A Practical Approach*, August 2008, University of New Mexico. Marron is a researcher at IMEDEA Software, Madrid, Spain.

E. Rodriguez-Carbonell, *Automatic Generation of Polynomial Invariants for System Verification*, May 2006, Universitat Polytechnica de Catalunya (UPC). Unofficial advisor with Prof. R. Nieuwenhuis

as the official advisor. Carbonell is a post doctoral fellow at UPC, Barcelona.

A. Chtcherba, *A New Sylvester-type Resultant Method based on the Dixon-Bezout Formulation*, July 2003, University of New Mexico. Chtcherba is a software manager at Bloomberg, NY.

T. Saxena, *Efficient Variable Elimination using Resultants*, 1996. Dr. Saxena is a manager at Verizon Research.

M. Subramaniam, *Failure Analyses of Inductive Theorem Provers*, 1996. Dr. Subramaniam is an Associate Professor in the Computer Science Department of the University of Nebraska, Omaha.

M.R. Krishna Rao, *Termination Characteristics of Logic Programs*, 1993, University of Bombay, India. Unofficial advisor with Prof. R.K. Shyamasundar, TIFR, Bombay, India. Rao is an Associate Professor in the Department of Information and Computer Science, King Fahd Univ. of Petroleum and Minerals, Dhahran, Saudi Arabia,

H. Zhang, *Reduction, Superposition and Induction: Automated Reasoning in an Equational Logic*, 1988. Zhang was awarded the prestigious NSF's Young Investigator Award in 1993. He is a professor in the Department of Computer Science at the University of Iowa.

A. Kandri-Rody, *Effective Methods in the Theory of Polynomial Ideals*, 1984. Dr. Kandri-Rody is a professor in the Department of Mathematics, Marrakech University, Marrakech, Morocco.

Synergistic Activities

- Editor, *Journal of Symbolic Computation*, *Journal of Automated Reasoning*, *Journal of Systems Science and Complexity*, *Journal of Applicable Algebra in Engineering, Communication and Computer Science*.
- Editor-in-Chief, *Journal of Automated Reasoning*, 1993-2007.
- Chair, *8th Asian Symposium on Computer Mathematics (ASCM)*, 2007.
Chair, *11th International Conference on Automated Deduction*, 1992.
Member, Program Committees of the *International Conferences on Automated Deduction*, 1988, 1990, 1997, 1998, 1999, 2000, 2002, 2003, 2005, 2007, 2009.
Member, Program Committee, *Automated Deduction in Geometry*, 2000, 2002, 2004, 2006, 2008, and 2010.
Member, Program Committees of *Intl. Joint Confs. on Automated Reasoning*, 2001, 2004, 2006, 2008, and 2010.
Member, Program Committee, *Asian Symp. on Computer Mathematics (ASCM)*, 2000, 2001, 2003, 2009.
Member, Program Committees of the *International Conferences on Rewriting Techniques and Applications* 1987, 1989, 1995, 1998, 2006, 2007.

Research Funding

National Science Foundation, Sandia National Labs., Los Alamos Computer Science Institute, Computer Science Research Institute, Office of Naval Research, Air Force Office of Scientific Research, General Electric Corporate Research Center,

Consulting

IBM, General Electric Corporate Research, SRI Intl, RPI, SUNY, Albany.

Professor George F. Luger

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EDUCATION:

University of Edinburgh, Edinburgh UK, 1974-1979
Post Doctoral Research Fellow, Department of Artificial Intelligence
University of Pennsylvania, Philadelphia, PA, 1969-1974
Ph.D., Computer Science, Psychology, Mathematics.
University of Notre Dame, South Bend, Indiana, 1968-1969,
MS Mathematic, 1969
Gonzaga University, Spokane, Washington, 1960-1966
MS, Mathematics, 1966; **BA**, Mathematics and Philosophy, 1964

PROFESSIONAL EXPERIENCE:

1979-present, **Faculty of Computer Science**, University of New Mexico,
Teaching in CS. Supervising MS & PhD projects. **Co-organizer Intelligent Systems Emphasis** in CS
Department. Research in Artificial Intelligence, Cognitive Science, Promoted to **Professor**, 1986.
1984-present, **Professor of Psychology**, **Professor of Linguistics**, 1994
Teaching graduate courses in Departments of Psychology and Linguistics and director of PhD committees.

LIST OF SELECTED PUBLICATIONS:

Kshanti A. Greene, Joseph M. Kniss, George F. Luger, Carl R. Stern. *Satisficing the masses: Applying game theory to large-scale democratic decision problems*, IEEE Social Computing Conference, Social Intelligence in Applied Gaming workshop. Available as [CS report TR-CS-2009-08](#)
Kshanti A. Greene, George F. Luger *Agreeing to disagree: Leveraging consensus and divergence in Bayesian belief aggregation*, AAAI Spring Symposium, Technosocial Predictive Analytics workshop 2009. Available as [CS report TR-CS-2008-15](#)
Luger, George F. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, 6th edition, Boston: Addison-Wesley Pearson Education, 2009.
Luger, George F. and Stubblefield, William. A. *AI Algorithms, Data Structures, and Idioms in Prolog, Lisp, and Java*. Boston: Addison-Wesley Pearson Education. 2009.
Sakhanenko, N.A., Rammohan, R.R., Luger, G. F. Stern, C.R. "A New Approach to Model-Based Diagnosis Using Probabilistic Logic," in Proceedings of the 21st International Florida Artificial Intelligence Research Society Conference (FLAIRS-21), Palo Alto: AAAI Press, 2008.
Sakhanenko, N. A., Rammohan, R. R., Luger, G. F., and Stern, C. R. "A Context-Partitioned Stochastic Modeling System with Causally Informed Context Management and Model Induction". in Proceedings of the 3rd Indian Int. Conf. on Artificial Intelligence (IICAI-07), pp 2172-2191, 2007.
Luger, G.F. and Chakrabarti, C., "From Expert Systems to Graphical Models". A chapter in *Handbook of Probability: Theory and Applications*, T. Ruda (ed). Sage Publications, 2008.
Ritthaler, M., Luger, G. F., Young, R., McGraw, J. and Zimmer, P. "Bayesian Belief Networks for Astronomical Object Recognition and Classification in CTI-II". In Astronomical Data Analysis Software and Systems XVI, ASP Conference Series, Vol XXX, 2006.
Chakrabarti, C., Pless, D. J., Rammohan, R., and Luger, G. F. "Diagnosis Using a First-Order Stochastic Language That Learns." In Expert Systems with Applications. Elsevier Press. 32 (3). June 2007. (to appear).
Sakhanenko, N.A., Luger, G.F., Stern C. R. 2007. "Managing Dynamic Contexts Using Failure-Driven Stochastic Models." In Proceedings of FLAIRS Conference, AAAI Press.
Luger, G.F., 2006. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, 5th edition, Chinese Translation. Pearson Education (UK).

Sakhanenko, N.A., Luger, G.F., Makaruk, H.E., Aubrey, J.B. and Holtkamp, D.B., 2006. "Shock Physics Data Reconstruction Using Support Vector Regression." In *International Journal of Modern Physics C*, (17), 9. World Scientific.

Pless, D. J., Chakrabarti, C., Rammohan, R., and Luger, G. F. "The Design and Testing of a First-Order Stochastic Modeling Language." In *International Journal on Artificial Intelligence Tools*, Vol. 15, No. 6 (2006) 979-1005. World Scientific Publishing Company.

Chakrabarti, C., Rammohan, R., and Luger, G. F. "A First-Order Stochastic Prognostic System for the Diagnosis of Helicopter Rotor Systems for the US Navy". In *Proceedings of the 2nd Indian International Conference on Artificial Intelligence*. Pune, India. December 2005. Elsevier Publications.

Kanglin Xu and George Luger. "Properties of the Affinity Matrix for Multiple Closed Contour Segmentation." In *Proceedings of the 12th Int. IEEE Conf. on Advanced Robotics*, July 18-20, 2005.

Chakrabarti, C., Rammohan, R., and Luger, G. F. "A First-Order Stochastic Modeling Language for Diagnosis" In the 18th International FLAIRS Conference, Clearwater Beach, FL 2005. AAAI Press.

Xu, Kanglin and Luger, George F. "A Tool for Kinematic Error Analysis of Robots/Active Vision Systems" In *10th International Conference on Robotics and Remote Systems for Hazardous Environments*, American Nuclear Society, March 2004.

Pless, D., and Luger, G., "EM Learning of Product Distributions in a First-Order Stochastic Logic Language." *Artificial Intelligence and Soft Computing: Proceedings of the IASTED International Conference*. IASTED/ACTA Press, 2003.

Luger, George F., Lewis, Joseph A., and Stern, Carl "Problem Solving as Model Refinement: Towards a Constructivist Epistemology" In *Brain, Behavior, and Evolution*, Winter 2001.

Harrison, Carol D. and Luger, George F. *Data Mining Using Web Spiders*, Submitted, 2002.

Pless, Dan and Luger, George F. "Toward General Analysis of Recursive Probability Models", Published in the *Proceedings of the Uncertainty in Artificial Intelligence Conference-2001*, San Francisco: Morgan Kaufmann, 2001.

Lewis, J.A. and Luger, G.F. "A Learning Architecture for Intelligent Behavior in a Robot ". *Submitted to Advances in Intelligent Data Analysis Symposium (AIDA 2001) at the Computational Intelligence Modeling and Applications Conference (CIMA 2001) of the International Computer Science Conventions in Bangor, Wales, UK from June 19-22, 2001*.

Klein, W.B., Stern, C.R., Luger, G.F., and Pless, D. "Teleo-Reactive Control for Accelerator Beamline Tuning". In *Proceedings of the IASTED International Conference*. Zurich: IASTED/ACTA Press (2000).

Lewis, J.A. and Luger, G.F. "A Constructivist Model of Robot Perception and Performance". In *Proceedings of the Conference of the Cognitive Pless, D., Luger, G.F., and Stern, C.R. "A new Object-Oriented Stochastic Modeling Language". In Proceedings of the IASTED International Conference*. Zurich: IASTED/ACTA Press (2000).

Rogati, M., Lewis, J., and Luger G. "A Deformable Semantic Network as a Tool for Context-Based Ambiguity Resolution", Presented at the *2nd Annual PURSUE Student Conference* at UNM, (2000).

Klein, W.B., Westervelt, R.T., & Luger G.F., "A General Purpose Intelligent Control System for Particle Accelerators", *Journal of Intelligent & Fuzzy Systems*, New York: John Wiley, 1999.

Matek, J. & Luger, G.F. "An Expert System Controller for Gas Chromatography Automation", *Instrumentation Science & Technology*, 1997.

Kleban, S.D., Luger, G.F., & Watkins, R.D. "Expert System Support for Environmental Assessment of Manufacturing Products and Facilities", *J. of Intel. Manufacturing*, London: C. & H., 1996.

Skinner, J.M., and Luger, G.F. "Contributions of a Case Based Reasoner to an Integrated Reasoning System", *Journal of Intelligent Systems*, London: Freund, 1995.

Ballance R.A., Giancola, A.J., Luger, G.F., and Ross, T.J., "A Framework-Based Environment for Object-Oriented Codes", *Scientific Programming*, New York: John Wiley, 1994.

Cristopher Moore

Professional Preparation

Northwestern University	Physics, Mathematics, & Integrated Science Program (Departmental Honors in all three)	B.A. 1986
Cornell University	Physics : Unpredictability and undecidability in dynamical systems	Ph.D. 1991

Appointments

Professor, Computer Science Dept, University of New Mexico, Albuquerque	8/08–present
Associate Professor, Computer Science Dept, University of New Mexico, Albuquerque	8/05–8/05
Assistant Professor, Computer Science Dept, University of New Mexico, Albuquerque	1/00–8/05
Joint Appointment, Dept of Physics and Astronomy, University of New Mexico, Albuquerque	5/00–present
External Faculty, Santa Fe Institute, Santa Fe	1/00–present
Research Professor, Santa Fe Institute, Santa Fe	9/98–12/99
Postdoctoral Researcher, Santa Fe Institute, Santa Fe	1/92–9/98
Lecturer, Cornell University, Ithaca	1/91–5/91

Visiting Professorships

Santa Fe Institute, Santa Fe	Fall 2007, 2008, 2009
University of Michigan, Ann Arbor	September–October 2005
École Normale Supérieure du Lyon	June 2004
Institut Universitaire de France	June 2003
Université Paris 7 (Denis Diderot)	June 2001 and 2002
École Polytechnique	September 1999

Publications Primary to Proposed Research

Note: articles in theoretical Computer Science almost always use alphabetical author order.

- 1A. A. Clauset, C. Moore, and M. E. J. Newman, “Hierarchical structure and the prediction of missing links in networks.” *Nature* 453 98–101 (2008).
- 2A. Y. Park, C. Moore, and J.S. Bader, “Dynamic networks from hierarchical Bayesian graph clustering.” *PLoS One*, to appear.
- 3A. A. Clauset and C. Moore, “Accuracy and scaling phenomena in Internet mapping.” *Physical Review Letters* 94 (2005) 018701.
- 4A. C. Moore, G. Ghoshal, and M. E. J. Newman, “Exact solutions for models of evolving networks with addition and deletion of nodes.” *Physical Review E* 74 (2006) 036121.
- 5A. C. Moore and M.E.J. Newman, “Exact solution of site and bond percolation on small-world networks.” *Physical Review E* 62 (2000) 7059–7064.

Other Significant Publications

- 1B. R.M. D’Souza, P.L. Krapisky, and C. Moore, “The power of choice in growing trees.” *European Journal of Physics B* 59 535–543 (2007).
- 2B. C. Moore, A. Russell, and P. Śniady, “On the impossibility of a quantum sieve algorithm for Graph Isomorphism.” *Proc. 39th Symp. on Theory of Computing (STOC ’07)*, 536–545.
- 3B. D. Achlioptas, A. Clauset, D. Kempe, and C. Moore, “On the bias of traceroute sampling: or, powerlaw degree distributions in regular graphs.” *Journal of the ACM* 56(4) (2009).
- 4B. D. Achlioptas and C. Moore, “Two moments suffice to cross a sharp threshold.” *SIAM Journal on Computing* 36 (2006) 740–762. Journal version of “The asymptotic order of the k-SAT threshold.” *Proc. 43rd Foundations of Computer Science (FOCS ’02)* 779–788.
- 5B. C. Moore and J. Machta, “Internal diffusion-limited aggregation: parallel algorithms and complexity.” *Journal of Statistical Physics* 99 (2000) 661–690.

Synergistic Activities

1. **Interdisciplinary Research** - Cristopher Moore's research focuses on the interdisciplinary boundary between computer science and physics. This began at Cornell, where his Ph.D. thesis gave the first examples of undecidable problems in dynamical systems. Since then he has worked in computer science, physics, and mathematics, exploring and deepening the analogies between these fields. Prof. Moore is frequently asked to lecture on the connections between computer science and physics. In the past three years, he has given invited plenary talks at Quantum Information Processing (QIP), the European Symposium on Algorithms (ESA), and the European Conference on Complex Systems (ECCS). His joint appointment in the Computer Science and Physics Departments at UNM gives him a unique opportunity to develop a research program and curriculum that builds bridges between these two disciplines. His research group combines rigorous mathematical proof with computational experiments, and includes graduate students from both departments.

2. **Theoretical Contributions** - Many NP-complete problems have *phase transitions* when the density of constraints passes a critical threshold. With Dimitris Achlioptas, Moore proved the long-standing conjecture that the threshold density for k -SAT is proportional to 2^k , and provided the best-known lower bound on the 3-colorability transition in random graphs. Moore has also made contributions to statistical physics, including the study of topological defects in the Potts model and slow relaxation in glassy systems.

3. **Social Network Theory** - Moore has played an important role in the theory of social networks, including exact solutions of epidemic spreading models, fast algorithms for detecting community structure, an analysis of inherent biases in topological studies of the Internet, and algorithms to infer hierarchical structure and predict missing links. Much of this work has been with Mark Newman of the University of Michigan, and with Moore's former Ph.D. student Aaron Clauset, now a postdoc at the Santa Fe Institute and soon to be an Assistant Professor at the University of Colorado.

4. **Quantum Computing** - In the years after Shor's factoring algorithm first appeared, many people thought that a similar algorithm could work for Graph Isomorphism, because of tempting mathematical analogies between the two problems. Moore hunted for an efficient quantum algorithm for the Graph Isomorphism problem. With Alexander Russell of the University of Connecticut, Leonard J. Schulman of Caltech, and several other coauthors, Moore showed that no "Shor-like" algorithm, which works by creating and measuring a coset state, can solve Graph Isomorphism.

Collaborators and Co-Editors (past 48 months)

Dimitris Achlioptas (Santa Cruz)	David Kempe (USC)	Jared Saia (UNM)
Gorjan Alagic (Waterloo)	Paul Krapivsky (Boston)	Vishal Sanwalani (Microsoft)
Joel Bader (John Hopkins)	Stephan Mertens (Magdeburg)	Leonard J. Schulman (Caltech)
Tanya Berger-Wolfe (Illinois)	Michael Nauenberg (Santa Cruz)	Pranab Sen (Tata)
Aaron Clauset (Santa Fe Institute)	Mark Newman (Ann Arbor)	Cosma Shalizi (Carnegie Mellon)
Amin Coja-Oghlan (Edinburgh)	Yongjin Park (Johns Hopkins)	Piotr Sniady (Wroclaw)
Raissa D'Souza (Davis)	Dana Randall (Georgia Tech)	Darko Stefanovic (UNM)
David Galvin (Notre Dame)	Martin Rötteler (NEC)	Moshe Y. Vardi (Rice)
Sean Hallgren (UPenn)	Daniel Rockmore (Dartmouth)	Umesh Vazirani (Berkeley)
Gabriel Istrate (Timisoara)	Jean-Baptiste Rouquier (ISC Paris)	
Vamsi Kalapala (Google)	Alex Russell (Connecticut)	

Graduate Advisors and Postdoctoral Sponsors

Postdoctoral Advisor: Philip Holmes (Princeton)

Thesis Advisor and Postgraduate-Scholar Sponsor

Graduate Students Advised: 0 Ph.D. Students supervised: 5

Aaron Denney (Physics, current) University of New Mexico; Haixia Jia (Computer Science, 2007, NSF Graduate Fellow) Currently at Sandia National Laboratory; Aaron Clauset (Computer Science, 2006) Currently a postdoc at the Santa Fe Institute, and soon to be an Assistant Professor at the University of Colorado; Vishal Sanwalani (Computer Science, 2005) Microsoft; Manuel Campagnolo (Computer Science, 2001). Currently a Professor at Technical University of Lisbon.

DAVID H. ACKLEY

Dept. of Computer Science, Univ. of New Mexico, Albuquerque, NM 87131

ackley@cs.unm.edu

<http://www.cs.unm.edu/~ackley>

Education

Ph.D. Computer Science. Carnegie Mellon University, Pittsburgh, PA, 1987.

M.S. Computer Science. Carnegie Mellon University, Pittsburgh, PA, 1981.

B.S. *magna cum laude*. Applied Mathematics. Tufts University, Medford, MA, 1979.

Recent Employment

2007–present. Santa Fe Institute, Santa Fe, NM. External Professor.

2000–2001. Distributed Cognition and Human Computer Interaction Laboratory, University of California San Diego, La Jolla, CA. Visiting Researcher (sabbatical leave).

1994–present. The University of New Mexico, Department of Computer Science, Albuquerque, NM. Associate Professor.

1987–1994. Cognitive Science Research Group and Computer Graphics and Interactive Media Research Group, Bellcore, Morristown, NJ. Member of technical staff.

Selected Honors and Awards

UNM School of Engineering Senior Teaching Excellence Award, 2000, 2008.

Computer Science Students' Favorite Faculty Award, 1999, 2000, 2001. (Award not presented since 2001)

UNM General Library's Faculty Recognition Award, 1998.

Conference award for "Most Lifelike Creatures": The Second Artificial Life Workshop, August, 1990.

Five Publications Related to Proposal

Forrest, S., Balthrop, J., Glickman, M., & Ackley, D.H. Computation in the Wild. In E. Jen (ed.) *Robust Design: A Repertoire of Biological, Ecological, and Engineering Case Studies*, 207–230. Oxford University Press. (2004)

Van Belle, T. & Ackley, D.H. Adaptation and Ruggedness in an Evolvability Landscape. In *The Proceedings of GECCO-2003* 150–151. (2003, July)

Ackley, D.H. Real Artificial Life: Where we may be. In M. Bedau, J. McCaskill, N. Packard & S. Rasmussen (eds.) *Artificial Life VII*. (Proceedings of the Seventh International Conference), The MIT Press, Cambridge, MA (2000).

Forrest, S., Somayaji, A., & Ackley, D.H.. Building diverse computer systems. At the *Sixth Workshop on Hot Topics in Operating Systems*. (1997).

Ackley, D.H. (1996) ccr: A network of worlds for research. In C.G. Langton & K. Shimohara (eds.) *Artificial Life V*. (Proceedings of the Fifth International Workshop on the Synthesis and Simulation of Living Systems), 116–123, The MIT Press, Cambridge, MA (1996).

Five Other Publications

Barrantes, E.G., Ackley, D.H., Forrest, S., & Stefanović, D. Randomized Instruction Set Emulation. In *ACM Transactions on Information Security* **8**(1), pp.3–40, (2005).

Van Belle, T. & Ackley, D.H. Imitation and Inequity in Avoiding the Tragedy of the Commons. In J. Pollack, M. Bedau, P. Husbands, T. Ikegame, et al, (eds.) *Artificial Life IX*. (Proceedings of the Ninth International Conference on the Simulation and Synthesis of Living Systems.), 274–279, The MIT Press, Cambridge, MA, (2004).

Van Belle, T. & Ackley, D.H. Code Factoring and the Evolution of Evolvability. In *The Proceedings of GECCO-2002* 1383–1390, (2002, July).

Ackley, D.H., & Littman, M.L. Altruism in the evolution of communication. In R.A. Brooks & P. Maes (eds.) *Artificial Life IV* (Proceedings of the Fourth International Workshop on the Synthesis and Simulation of Living Systems), 40–48, The MIT Press, Cambridge, MA, (1994).

Ackley, D.H., & Littman, M.L. Interactions between learning and evolution. In C.G. Langton, C. Taylor, C.D. Farmer, & S. Rasmussen (eds.), *Artificial Life II (Proceedings Volume X in the Santa Fe Institute Studies in the Sciences of Complexity)* 487–509, Addison-Wesley, Reading, MA, (1992).

Students and Collaborators

Ph.D. students graduated: T. van Belle, J. Helfman.

Co-authors and co-PIs during the last 48 months: J. Balthrop (UNM), E.G. Barrantes (UNM), S. Forrest (UNM), M. Glickman (UNM), T.S. Palmer (UNM), D. Stefanović (UNM), T. Van Belle (UNM), D.D. Zovi (UNM).

Ph.D. advisor: Geoffrey Hinton.

Synergistic Activities

Santa Fe Institute, Santa Fe, NM (External Faculty);

Patrick G. Bridges
Computer Science Department
University of New Mexico
Albuquerque, NM 87131-1386
bridges@cs.unm.edu
<http://www.cs.unm.edu/~bridges>

Professional Preparation

Ph.D. in Computer Science, University of Arizona
B.S. in Computer Science, Mississippi State University

Tucson, AZ, Dec. 2002
Mississippi State, MS, May 1994

Appointments

Associate Professor, Computer Science Department
University of New Mexico

Albuquerque, NM
July 2009 – present

Assistant Professor, Computer Science Department
University of New Mexico

Albuquerque, NM
January 2003 – June 2009

Graduate Assistant, Computer Science Department
University of Arizona

Tucson, AZ
May 1997 – May 2002

NSF Graduate Research Fellow, Computer Science Department
University of Arizona

Tucson, AZ
August 1994 – May 1997

Honors

UNM School of Engineering Outstanding Junior Faculty Instructor, 2008–2009

Best Paper/Best Student Paper Nomination, Supercomputing 2008

UNM Outstanding Teacher of the Year Nomination, 2007–2008

National Science Foundation Graduate Research Fellow, 1994–1997

Recent Professional Service

Program Committee Member: Supercomputing 2010; HPCVirt 2010, 2008, 2007; AC 2007; ICPP 2006; ISPA 2006; LACSI Symposium 2004, 2003

Grant Review Panelist, National Science Foundation, 2004, 2005, 2006, 2009.

Guest Editor, Operating Systems Review (OSR), 2006, 2008.

Paper Referee: TPDS 2009; CCPE 2009; ICPP 2005; DSN 2004; Cluster 2004

Recent Publications

- Jack Lange, Kevin Pedretti, Trammell Hudson, Peter Dinda, Zheng Cui, Lei Xia, Patrick Bridges, Andy Gocke, Steven Jaconette, Mike Levenhagen, and Ron Brightwell. Palacios and kitten: New open source tools for scalable high performance computing. In *Proceedings of the 24th IEEE International Parallel and Distributed Processing Symposium*, 2010. Accepted for publication.
- Edgar A. León, Rolf Riesen, Arthur B. Maccabe, and Patrick G. Bridges. Instruction-level simulation of a cluster at scale. In *Proceedings of the 2009 ACM/IEEE International Conference on Supercomputing (SC 2009)*, November 2009.
- Patrick G. Bridges, Matti A. Hiltunen, and Richard D. Schlichting. Cholla: A framework for composing and coordinating adaptations in networked systems. *IEEE Transactions on Computers, Special Issue on Autonomic Network Computing*, 58(11):1456–1469, November 2009.
- Mohammed I. Al-Saleh, Patrick G. Bridges, and Jedidiah R. Crandall. Architectural support for securing sensor networks against remote attacks. In *Proceedings of the First Conference on First International Conference on Sensor Network and Applications*, November 2009.
- Manjunath Gorentla Venkata and Patrick G. Bridges. Using application communication characteristics to drive dynamic MPI reconfiguration. In *Proceedings of the 2009 Workshop on Communication Architectures for Clusters (CAC 2009)*, May 2009.
- Wenbin Zhu, Patrick G. Bridges, and Arthur B. Maccabe. Lightweight application monitoring and tuning with embedded gossip. *IEEE Transactions of Parallel and Distributed Systems (TPDS)*, 20(7):1038–1049, July 2009.
- Rolf Riesen, Ron Brightwell, Patrick G. Bridges, Trammell Hudson, Arthur B. Maccabe, Patrick M. Widener, and Kurt B. Ferreira. Designing and implementing lightweight kernels for capability computing. *Concurrency and Computation: Practice and Experience*, 21(6):791–817, April 2009.
- Kurt B. Ferreira, Ron Brightwell, and Patrick G. Bridges. Characterizing application sensitivity to OS interference using kernel-level noise injection. In *Proceedings of the 2008 ACM/IEEE Conference on Supercomputing (Supercomputing’08)*, November 2008.
- Patrick G. Bridges, Matti A. Hiltunen, Richard D. Schlichting, Gary T. Wong, and Matthew Barrick. A configurable and extensible transport protocol. *ACM/IEEE Transactions on Networking*, 15(6):1254–1265, December 2007.
- Manjunath Gorentla Venkata and Patrick G. Bridges. MPI/CTP: A reconfigurable MPI for HPC applications. In Dieter Kranzlmüller, Peter Kacsuk, Jack Dongarra, and Jens Volkert, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface: 13th European PVM/MPI Users’ Group Meeting*, volume 4192 of *Lecture Notes in Computer Science*. Springer-Verlag, 2006.
- Galen M. Shipman, Timothy S. Woodall, Richard L. Graham, Arthur B. Maccabe, and Patrick G. Bridges. Infiniband scalability in OpenMPI. In *Proceedings of the 20th IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2006.

Terran D. R. Lane

University of New Mexico, Department of Computer Science

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Phone: +1 505 277-9609

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web: <http://www.cs.unm.edu/~terran/>

Professional Preparation

Undergraduate:	Purdue University	Electrical & Computer Engr.	BSCEE	1994
Graduate:	Purdue University	Electrical & Computer Engr.	Ph.D.	2000
Postdoctoral:	MIT	Artificial Intelligence		2000-2002

Appointments

Jun 2008–current Associate Professor, Department of Computer Science, University of New Mexico

Aug 2002–May 2008 Assistant Professor, Department of Computer Science, University of New Mexico

Related Publications

1. Roy, S., Lane, T., Werner-Washburne, M., and Martinez, D., "Inference of Functional Networks of Condition-Specific Response: A Case Study Of Quiescence In Yeast,". *Proc. 2009 Pacific Symposium on Biocomputing (PSB 2009)*.
2. Kim, D. I., Burge, J., Lane, T., Kiehl, K. A. and Pearlson, G. D. and Calhoun, V. D., "Hybrid ICA-Bayesian Network approach reveals distinct effective connectivity differences in schizophrenia," *NeuroImage* 42(4), 2008. doi: 10.1016/j.neuroimage.2008.05.065
3. Burge, J., Lane, T., Link, H., Qiu, S., and Clark, V. P., "Bayesian Classification of fMRI Data: Evidence for Altered Neural Networks in Dementia,". *Human Brain Mapping*, 2007. doi: 10.1002/hbm.20490
4. Burge, J. and Lane, T., "Improving Bayesian Network Structure Search with Random Variable Aggregation Hierarchies,". *Proceedings of the Proceedings of the Seventeenth European Conference on Machine Learning (ECML-2006)*, Berlin, Germany. Sep 2006. doi: 10.1007/11871842
5. Qiu, S. and Lane, T., "Implications of Phase Transitions in Knockdown Networks of Transitive RNAi,". *IEEE Transactions on Nanobioscience*. 6(1), Mar 2007. pp 68–76. doi: 10.1109/TNB.2007.891904

Other Publications

1. Yackely, B., Corona, E., and Lane, T., "Function Approximation Using a Metagraph Kernel,". *Advances in Neural Information Processing Systems 21 (NIPS 2008)*.
2. Eaton, E., desJardins, M., and Lane, T. "Modeling Transfer Relationships Between Learning Tasks for Improved Inductive Transfer," *Proceedings of the Nineteenth European Conference on Machine Learning (ECML-2008)*, pp 317–332. Antwerp Belgium, Sep 2008. doi: 10.1007/978-3-540-87479-9_39

3. Roy, S., Werner-Washburne, M., and Lane, T., "A system for generating transcription regulatory networks with combinatorial control of transcription,". *Bioinformatics*, 2008. In press; available online. doi: 10.1093/bioinformatics/btn126
4. Qiu, S., Yang, C., and Lane, T., "Efficient Target Detection for RNA Interference,". *The Journal of Supercomputing*, 42, pp 303–319. 2007. doi: 10.1007/s11227-007-0121-9
5. Qiu, S. and Lane, T., "The RNA String Kernel for siRNA Efficacy Prediction,". *Proc. 2007 IEEE Conf. on Bioinformatics and Bioengineering (IEEE BIBE 2007)*. Oct 2007. (**Best paper honorable mention**)

Synergistic Activities

- Lecturer at the National Youth Science Camp (NYSC) and secretary of NYSC Alumni Association. The NYSC is an annual interdisciplinary camp for top high school science students drawn from across the nation. 2009 is its forty-sixth year of operation, and camp alumni now include over seven hundred PhDs and MDs.
- Member of the UNM Program in Interdisciplinary Biological & Biomedical Science (PIBBS) program; joint lecturer in interdisciplinary science course.
- Mentor in the UNM Post baccalaureate Research Education Program (PREP), a pre-graduate preparatory program for students with interdisciplinary research interests.
- Co-Chair of 2006 AAAI/SIGART Doctoral Consortium and Chair of the 2007 AAAI/SIGART Doctoral Consortium.
- Judge at the 2007 Intel International Science Fair for the IEEE Computer Society.
- Established peer tutoring program for UNM Computer Science undergraduate program.
- Author of freely available Matlab and Java toolboxes for Markov decision processes (MDPs). Available from
<http://www.cs.unm.edu/~terran/research/software.html>

Collaborators and Other Affiliations

Adema, Cooenrad, U. of New Mexico
 Andreasen, Nancy, U. of Iowa
 Blum, Avrim, Carnegie Mellon U.
 Burge, John, Google
 Chawla, Shuchi, Carnegie Mellon U.
 Fagg, Andrew, U. of Oklahoma
 Forsythe, J. Christopher, Sandia NL
 Kaelbling, Leslie Pack, MIT
 Lauriello, John, U. of New Mexico
 Link, Hamilton, U. of New Mexico
 Manoach, Dara, Harvard
 Meyerson, Adam, Carnegie Mellon U.
 Murphy, Kevin, U. of British Colombia
 Roy, Sushmita, U. of New Mexico
 Smart, William, Washington U. of St. Louis
 Wagstaff, Kiri, NASA JPL
 Werner-Washburne, Maggie, U. of New Mexico
 Yang, Cundong, U. of New Mexico
 Yackley, Benjamin, U. of New Mexico

Allen, Chris, U. of New Mexico
 Aragon, Anthony, U. of New Mexico
 Brodley, Carla E., Tufts U.
 Bustillo, Juan, U. of New Mexico
 Clark, Vincent P., U. of New Mexico
 Forrest, Stephanie, U. of New Mexico
 Hougen, Dean, U. of Oklahoma
 Karger, David R., MIT
 Lim, Kelvin, U. of Minnesota
 Magnotta, Vincent, U. of Iowa
 McGovern, Amy, U. of Oklahoma
 Minkoff, Maria, MIT
 Qiu, Shibin, Pathworks Diagnostics
 Schmidt, David, Los Alamos NL
 Van Lent, Colleen, Cal. State Long Beach
 Wassink, Thomas, U. of Iowa
 Wilson, Andrew, Sandia NL
 Zhao, Wenzhong, Los Alamos NL
 Corona, Eduardo, New York Univ.

Jared Saia

Contact Information

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206-255-1277 (home)
206-277-6927 (fax)
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Postal Address

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Farris Engineering Bldg.
Albuquerque, NM 87131-1386

Professional Preparation

Stanford University, Computer Science, B.S. 1993.

University of Washington, Computer Science, Ph.D. 2002

Appointments

2002-present, Assistant Professor, Computer Science, *University of New Mexico*

1993-1994, Researcher, *Advanced Telephony Research Labs in Nara, Japan*

Selected Publications

Former and current students are indicated with an underline. The following list is out of about 40 publications and total citations to these publications number over 600. In theory conferences and journals, author names are always in alphabetical order.

Publications Related to Proposed Research

- Josep Diaz, Dieter Mitsche, Navin Rustagi and Jared Saia, "On the Power of Mediators". In *Workshop on Internet and Network Economies (WINE)*, 2009.
- Valerie King and Jared Saia. "Fast, scalable Byzantine agreement in the full information model with a Nonadaptive adversary". In *International Symposium on Distributed Computing (DISC)*, 2009
- Tom Hayes, Jared Saia and Amitabh Trehan. "The Forgiving Graph: A Distributed Data Structure for Low Stretch under Adversarial Attack". In *Principles of Distributed Computing (PODC)*, 2009. (pdf)
- Bruce Kapron, David Kempe, Valerie King, Jared Saia and Vishal Sanwalani, "Fast Asynchronous Byzantine Agreement and Leader Election with Full Information". In *Symposium on Discrete Algorithms (SODA)*, 2008. **Invited submission to *Transactions on Algorithms* best papers of SODA 2008**
- Valerie King, Jared Saia, Vishal Sanwalani and Erik Vee, "Towards Secure and Scalable Computation in Peer-to-peer Networks" in *Foundations of Computer Science (FOCS)*, 2006.

Other Publications

- Tom Hayes, Navin Rustagi, Jared Saia and Amitabh Trehan. "The Forgiving Tree: A Self-Healing Distributed Data Structure". In *Principles of Distributed Computing (PODC)*, 2008.
- Valerie King, Cynthia Phillips, Jared Saia and Maxwell Young. "Sleeping on the Job: Energy-Efficient and Robust Broadcast for Radio Networks". In *Principles of Distributed Computing (PODC)*, 2008.
- James Aspnes, Navin Rustagi and Jared Saia, "Worm versus alert: Who wins in a battle for control of a large-scale network?". In *International Conference of Principles of Distributed Systems (OPODIS)*, 2008.
- Amos Fiat, Jared Saia and Maxwell Young. "Making Chord Robust to Byzantine Faults" to appear in *European Symposium on Algorithms (ESA)*, 2005.

- Amos Fiat and Jared Saia, “Censorship Resistant Peer-To-Peer Content Addressable Networks” in *Proceedings of the 13th Annual Symposium on Discrete Algorithms (SODA)*, 2002. **Invited Submission to *Theory of Computing*, best papers of SODA 2002.**

Service and Synergistic Activities

- Program committee for Symposium on Parallel Algorithms and Architecture (SPAA), 2010; International Parallel and Distributed Processing Symposium (IPDPS), 2007, 2009; Principles of Distributed Computing (PODC), 2005 and 2006; ACM/SIGMOBILE International Workshop on Foundations of Mobile Computing (DIALM-POMC), 2004.
- Workshops organized: SIAM International Conference on Data Mining (SDM): Workshop on Analysis of Dynamic Networks(ADN), 2009; International Conference on Data Mining (ICDM): Workshop on Analysis of Dynamic Networks (ADN), 2008
- Invited talks at: Bertinoro Workshop on Algorithms and Data Structures, Neural Information Processing Systems (NIPS), University of Maryland, University of Southern California, Microsoft Research Labs, University of Barcelona, University of Rome Sapienza, Rutgers, Santa Fe Institute, University of Tel Aviv, Dartmouth, University of Georgia, University of Victoria, University of Illinois at Chicago, Sandia Labs, Los Alamos Labs, and IBM Labs.
- Research covered in the popular press: *Social Networking Software Tracks Zebras and Consumers*, in ACM Technical News, washingtonpost.com, Newswise Website, FOREX Trading, Healthcare Industry Today, and Ecademy Daily News, 9/6/07 - 9/10/07; *Professor Fights a Mathematical Battle to Keep the Virtual World Running Smoothly*, ACM Technical News, 2/26/07 and UNM Today, 2/27/07; *Professor Goes to War*, front page article in University of New Mexico Daily Lobo, 3/2/07
- Co-organizer of Discrete Algorithms Group (DAG) seminar, a joint seminar between UNM and Sandia Labs.
- Primary organizer of UNM CS Recruitment Day for local high school students, 2006, 2007, 2008. Over 100 high school students attend annually.
- Author of distributed computing research blog, *Machinations*, which covers major conferences and workshops, reviews of important papers, student and career advice, etc. The blog has had just over 3,000 unique page views since July and has been recently mentioned in the ACM SIGACT Distributed Computing News column.
- Served as reviewer for the following conferences and journals: Foundations of Computer Science (FOCS), Principles of Distributed Computing(PODC), Symposium on Discrete Algorithms(SODA), International Colloquium on Automata, Languages and Programming (ICALP), Symposium on Parallel Algorithms (SPAA), Symposium on Distributed Computing(DISC), Joint Conference of the IEEE Computer and Communications Societies (InfoComm), Journal of Experimental Algorithms(JEA), Journal of Algorithms(JOA), Journal of Computing(JOC), Journal of Distributed Computing (JODC), Journal of Networking (JON), and IEEE Transactions on Computing.

Collaborators and Other Affiliations

Collaborators and Co-Authors: Eric Anderson, HP Labs; James Aspnes, Yale; Yosi Azar, U. Tel Aviv; Tanya Berger-Wolfe, U. Illinois at Chicago; Michael Collins, Sandia Labs; Amos Fiat, U. Tel Aviv; Steve Gribble, U. Washington; Joe Hall, U. Washington; Bill Hart, Sandia Labs; Jason Hartline, U. Washington; Michael Hobbes, HP Labs; Anna Karlin, U. Washington; Jonathan Katz, U. Maryland at College Park; David Kempe, U. Southern California; Valerie King, U. Victoria; Frank McSherry, U. Washington; Cris Moore, U. New Mexico; Cindy Phillips, Sandia Labs; Vishal Sanwalani, U. Waterloo; Stefan Saroiu, U. Toronto; Ram Swaminathan, HP Labs; Erik Vee, IBM Labs; John Wilkes, HP Labs.

Graduate Advisors: Anna Karlin, PhD Advisor, University of Washington; Bernard Moret, MS Advisor, University of New Mexico.

Thesis Advisors: Steve Gribble, University of Washington; Anna Karlin, University of Washington; Richard Ladner, University of Washington.

Darko Stefanovic (darko@cs.unm.edu)

Department of Computer Science, University of New Mexico

January 2010

Professional Preparation

Dipl.Ing. Elec. Eng. and Comp. Sci., University of Belgrade, 1989
M.S. Computer Science, University of Massachusetts Amherst, 1994
Ph.D. Computer Science, University of Massachusetts Amherst, 1999
Postdoc. Elec. Eng., Princeton University, 1998-2000

Appointments & Affiliations

2009- Member, Center for Biomedical Engineering, University of New Mexico
2006- Assoc. Prof., Computer Science, University of New Mexico
2004- Regents' Lecturer, University of New Mexico
2000-06 Asst. Prof., Computer Science, University of New Mexico
1998-00 Postdoctoral Research Associate, Elec. Eng., Princeton University
1992-93 Visiting Scholar, Computer Science, Carnegie Mellon University
1985 System Analyst, Burroughs Corporation, Milano, Italy

Publications Since 2006

1. M. Marron, R. Majumdar, D. Stefanovic, and D. Kapur, "Shape Analysis with Reference Set Relations", *VMCAI2010, Verification, Model Checking, and Abstract Interpretation*, Madrid, Spain, January 2010.
2. D. Stefanovic, "Molecules that reason", *Nature Nanotechnology* (News & Views), 10(4), 625–626 (2009).
3. J. Macdonald, D. Stefanovic, and M. Stojanovic, "Molecular Automata", in "Encyclopedia of Complexity and System Science", R. A. Meyers, (ed.) Springer, 2009.
4. R. Pei, A. Shen, M. J. Olah, D. Stefanovic, T. Worgall, and M. N. Stojanovic, "High-resolution Cross Reactive Array for Alkaloids", *Chemical Communications*, 22, 3193–3195 (2009).
5. M. L. Fanning, J. Macdonald, and D. Stefanovic, "Evolving The Deoxyribozyme-Based Logic Gate Design Process Through MAYA II Reconstruction", *15th International Meeting on DNA Computing*, Fayetteville, Arkansas, June 2009.
6. S. M. Blackburn, K. S. McKinley, R. Garner, C. Hoffmann, A. Khan, R. Bentzur, A. Diwan, D. Feinberg, D. Frampton, S. Z. Guyer, M. Hirzel, A. Hosking, M. Jump, H. Lee, J. E. B. Moss, A. Phansalkar, D. Stefanovic, T. VanDrunen, D. von Dincklage, and B. Wiedermann, "Wake Up and Smell the Coffee: Evaluation Methodology for the 21st Century", *Communications of the ACM* (Research Highlights), 51 (8), 83–89 (2008).
7. D. Stefanovic, "Emerging models of computation: directions in molecular computing", in "Challenges for Software-Intensive Systems and New Computing Paradigms", M. Wirsing, J.-P. Banâtre, M. Hölzl, and A. Rauschmayer (eds.), Springer (LNCS Vol. 5380), 2008.
8. J. Sager, J. Farfel, and D. Stefanovic, "Nanocomputing", in "NanoBioTechnology: BioInspired Devices and Materials of the Future", O. Shoseyov and I. Levy (eds.), Humana Press, 2008.
9. J. Macdonald, D. Stefanovic, and M. N. Stojanovic, "DNA Computers for Work and Play", *Scientific American*, 299(5), 84–91 (2008).
10. M. Marron, M. Méndez-Lojo, M. Hermenegildo, D. Stefanovic, and D. Kapur, "Sharing Analysis of Arrays, Collections, and Recursive Structures", *PASTE2008, 8th ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering*, Atlanta, Georgia, November 2008.
11. M. Marron, D. Stefanovic, D. Kapur and M. Hermenegildo, "Identification of Heap-Carried Data Dependence Via Explicit Store Heap Models", *LCPC 2008, Languages and Compilers for Parallel Computing (LCPC) 21st Annual Workshop*, Edmonton, Alberta, Canada, July–August 2008.

12. M. Marron, M. Hermenegildo, D. Stefanovic, and D. Kapur, "Efficient Context-Sensitive Shape Analysis with Graph Based Heap Models", *Compiler Construction*, Budapest, Hungary, April 2008.
13. M. Marron, D. Stefanovic, M. Hermenegildo, and D. Kapur, "Heap Analysis in the Presence of Collection Libraries", *PASTE2007, 7th ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering*, San Diego, California, June 2007.
14. J. Macdonald, D. Stefanovic, and M. N. Stojanovic,, "Solution-Phase Molecular-Scale Computation With Deoxyribozyme-Based Logic Gates and Fluorescent Readouts", in "Fluorescent Energy Transfer Nucleic Acid Probes", V. V. Didenko (ed.), *Methods in Molecular Biology Series*, Humana Press, 2006.
15. M. Marron, D. Kapur, D. Stefanovic and M. Hermenegildo, "Static Heap Analysis for Automatic Parallelization", *LCPC 2006, The 19th International Workshop on Languages and Compilers for Parallel Computing*, New Orleans, Louisiana, November 2006.
16. S. M. Blackburn, R. Garner, C. Hoffmann, A. Khan, K. S. McKinley, R. Bentzur, A. Diwan, D. Feinberg, D. Frampton, S. Z. Guyer, M. Hirzel, A. Hosking, M. Jump, H. Lee, J. E. B. Moss, A. Phansalkar, D. Stefanovic, T. VanDrunen, D. von Dincklage, and B. Wiedermann, "The DaCapo Benchmarks: Java Benchmarking Development and Analysis", *Object-Oriented Programming Systems, Languages, and Applications*, Portland, Oregon, November 2006.
17. E. Green, M. J. Olah, T. Abramova, L. R. Williams, D. Stefanovic, and M. N. Stojanovic, "A Rational Approach to Minimal High-Resolution Cross-Reactive Arrays", *Journal of the American Chemical Society*, 128(47), 15278–15282 (2006).
18. J. Sager, M. Young, and D. Stefanovic, "Characterization of Transverse Channel Concentration Profiles Obtainable With a Class of Microfluidic Networks", *Langmuir*, 22(9), 4452–4455 (2006).
19. J. Macdonald, Y. Li, M. Sutovic, H. Lederman, K. Pendri, W. Lu, B. L. Andrews, D. Stefanovic, and M. N. Stojanovic, "Medium Scale Integration of Molecular Logic Gates in an Automaton", *Nano Letters*, 6(11), 2598–2603 (2006).
20. H. Lederman, J. Macdonald, D. Stefanovic, and M. N. Stojanovic, "Deoxyribozyme-Based Three-Input Logic Gates and Construction of a Molecular Full Adder", *Biochemistry*, 45(4), 1194–1199 (2006).
21. M. Hertz, S. M. Blackburn, J. E. B. Moss, K. S. McKinley, and D. Stefanovic, "Generating Object Lifetime Traces with Merlin", *ACM Transactions on Programming Languages and Systems*, 28(3), 476–516 (2006).

Synergistic Activities Since 2006

1. Participated (2003–present) in the development of the DaCapo benchmark suite for memory management and other performance studies of Java virtual machine implementations.
<http://dacapobench.org>
2. Participated (2001–2006) in the design and implementation of JikesRVM, an open-source virtual machine for Java applications, in particular in its port to the 64-bit PowerPC architecture.
<http://jikesrvm.org>

PhD Advisor: J. Eliot B. Moss, University of Massachusetts.

Postdoctoral Advisor: Margaret Martonosi, Princeton University.

PhD Advisees: Marcus Calhoun-Lopez, UNM; Hsien-Chieh (Bryan) Cheng, UNM; Leigh Fanning, UNM; Mark Marron, IMDEA Software; Mark Olah, UNM; Oleg Semenov, UNM; Peiyu Song, UNM.

LANCE WILLIAMS

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Education

Ph.D. Computer Science, University of Massachusetts, Amherst, MA, 1994.

M.S. Computer and Information Science, University of Massachusetts, Amherst, MA, 1988.

B.S. with Honors in Computer Science, Pennsylvania State University, University Park, PA, 1985.

Recent Employment

1997–present. University of New Mexico, Albuquerque, NM. Department of Computer Science. Current title: Associate Professor.

1993–1999. NEC Research Institute, Princeton, NJ. Post-doctoral Scientist, 1993–1997; Visiting Scientist, Summers 1998, 1999.

May 1996. Dept. of Applied Mathematics, Weizmann Institute for Science, Rehovot, Israel. Visiting Scientist.

Selected Publications

Abbott, R.G. and L.R. Williams, Multiple Target Tracking with Lazy Background Subtraction and Connected Components Analysis, *Machine Vision and Applications* **20**(2), pp. 93-101, 2009.

Zhang, J., Steinberg, S.L., Wilson, B.S., Oliver, J.M., and L.R. Williams, Markov Random Field Modeling of the Distribution of Proteins on Cell Membranes, *Bulletin of Mathematical Biology* **70**(1), pp. 297-321, 2008.

Wiley, K. and L.R. Williams, Representing Interwoven Surfaces in $2\frac{1}{2}$ D Drawings, *IEEE Computer Graphics and Applications* **27**(4), pp. 70-83, 2007.

Zweck, J.W. and L.R. Williams, Euclidean Group Invariant Computation of Stochastic Completion Fields Using Shiftable-Twistable Functions, *Journal of Mathematical Imaging and Vision* **21**(2), pp. 135-154, 2004.

Williams, L.R., and J.W. Zweck, A Rotation and Translation Invariant Discrete Saliency Network, *Biological Cybernetics* **88**(1), pp. 2-10, 2003.

Mahamud, S., Williams, L.R., Thornber, K.K., and K. Xu, Segmentation of Multiple Salient Closed Contours from Real Images, *IEEE Trans. on Pattern Analysis and Machine Intelligence* **25**(4), pp. 433-444, 2003.

Williams, L.R. and K.K. Thornber, Orientation, Scale, and Discontinuity as Emergent Properties of Illusory Contour Shape, *Neural Computation* **13**(8), pp. 1683-1711, 2001.

Thornber, K.K. and L.R. Williams, Characterizing the Distribution of Completion Shapes with Corners Using a Mixture of Random Processes, *Pattern Recognition* **33**, pp. 543-553, 2000.

Williams, L.R. and K.K. Thornber, A Comparison of Measures for Detecting Natural Shapes in Cluttered Backgrounds, *Intl. Journal of Computer Vision* **34**(2/3), pp. 81-96, 1999.

Williams, L.R. and D.W. Jacobs, Stochastic Completion Fields: A Neural Model of Illusory Contour Shape and Saliency, *Neural Computation* **9**(4), pp. 837-858, 1997.

Collaborators and Students

Rob Abbott (SNL), Dave Ackley (UNM), Sang Han (UNM), Mark Olah (UNM), Jan Oliver (UNM), Kyle Solis (UNM), Torsten Staab (LANL), Darko Stefanovic (UNM), Stan Steinberg (UNM), Milan Stojanovic (Columbia), Brian Swartzenruber (SNL), Keith Wiley (UNM), Bridget Wilson (UNM), Jun Zhang (UNM)

Fields of Interest

Computer vision, digital image processing, computational neuroscience, mathematical biology, functional programming, virtual worlds.

Dorian C. Arnold

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■ Research Interests

High-performance computing, large scale software systems, fault-tolerance, software tools and infrastructure. My research focuses on scalable, robust autonomic systems for the effective utilization of extremely large scale high-performance computing resources.

■ Professional Preparation

PhD (computer science), *University of Wisconsin*, Madison, WI, 2008.

MS (computer science), *University of Tennessee*, Knoxville, TN, 1998.

BS (math, computer science), *Regis University*, Denver, CO, 1996.

AS (math, physics, chemistry), *St. John's Junior College*, Belize City, Belize, 1994.

■ Appointments

Assistant Professor, *Department of Computer Science*, University of New Mexico, Since 2009.

Visiting Scientist, *Center for Applied Scientific Computing*, Lawrence Livermore National Laboratory, Since 2009.

Technical Scholar, *Center for Applied Scientific Computing*, Lawrence Livermore National Laboratory, Summer 2006.

Research Associate, *Innovative Computing Laboratory*, University of Tennessee, 1999 – 2001.

■ Selected Publications

Dorian Arnold and Barton Miller, “A Failure Recovery Model for Scalable Data Aggregation,” in *International Parallel and Distributed Processing Symposium 2010*. To appear.

Gregory Lee, Dong Ahn, Dorian Arnold, Bronis de Supinski, Matthew Legendre, Barton Miller, Martin Schulz and Ben Liblit, “Lessons Learned at 208K: Towards Debugging Millions of Cores,” in *Supercomputing 2008 (SC 2008)*, Austin, TX, November 2008.”

Aroon Nataraj, Allen D. Malony, Alan Morris, Dorian C. Arnold and Barton P. Miller, "In Search of Sweet-Spots in Parallel Performance Monitoring", in *IEEE Cluster 2008*, Tsukuba, Japan, September 2008.

Dorian Arnold, Dong Ahn, Bronis de Supinski, Gregory Lee, Barton Miller, Martin Schulz, “Stack Trace Analysis for Large Scale Debugging,” in *International Parallel and Distributed Processing Symposium*, Long Beach, CA, March, 2007.

Dorian Arnold, Gary Pack, and Barton Miller, “Tree-based Overlay Networks for Scalable Applications,” in *11th International Workshop on High-Level Parallel Programming Models and Supportive Environments*, Rodos, Greece, April 2006.

Manish Parashar, Rajeev Muralidhar, Wonsuck Lee, Dorian Arnold, Jack Dongarra, and Mary Wheeler, “Enabling Interactive and Collaborative Oil Reservoir Simulations on the Grid,” in *Concurrency - Practice and Experience*, 17(11):1387–1414, 2005.

Phillip Roth, Dorian Arnold, and Barton Miller, “MRNet: A Software-based Multicast/Reduction Network for Scalable Tools,” in *SC 2003*, Phoenix, AZ, Nov. 2003.

Dorian Arnold, Henri Casanova, and Jack Dongarra, “Innovations of the NetSolve Grid Computing System,” in *Grid Computing Environments. Special Issue of Concurrency and Computation: Practice and Experience*, 14(13–15):1457–1479, 2002.

Elias Houstis, Ann Catlin, Nitesh Dhanjani, John Rice, Jack Dongarra, Henri Casanova, Dorian Arnold, and Geoffrey Fox, “Problem-solving Environments,” in *The Sourcebook of Parallel Computing*, Chapter 14: pp. 409–442. Morgan Kaufmann, 2002.

Mary Wheeler, Wonsuck Lee, Clint Dawson, Dorian Arnold, and Manish Parashar, “Parallel Computing in Environment and Energy,” in *The Sourcebook of Parallel Computing*, Chapter 6: pp. 145–166. Morgan Kaufmann, 2002.

Dorian Arnold, Sathish Vadhiyar, and Jack Dongarra, “On the Convergence of Computational and Data Grids,” in *Parallel Processing Letters*, 11(2,3):187–202, 2001.

Dorian Arnold, Dieter Bachmann, and Jack Dongarra, “Request Sequencing: Optimizing Communication for the Grid,” in *6th International Euro-Par Conference – Parallel Processing (Euro-Par 2000)*, Munich, Germany, September 2000, pp. 1213–1222.

Dorian Arnold, Susan Blackford, Jack Dongarra, Victor Eijkhout, and Tinghua Xu, “Seamless Access to Adaptive Solver Algorithms,” in *16th IMACS WORLD CONGRESS 2000 on Scientific Computation, Applied Mathematics and Simulation*, Aug. 2000.

■ Teaching

CS 591: Extreme Scale Distributed Systems. Spring '10.

CS 587: Advanced Operating Systems. Fall '09.

CS 481: Operating System Principles. Spring '09.

■ Current Students

Taylor Groves (Phd)

Dewan Ibtesham (Phd)

Joshua Goehner (Masters)

■ Former Students

Samuel Gutierrez, M.S. 2009 (Now at The Los Alamos National Laboratory)

JEDIDIAH R. CRANDALL

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Education

Ph.D. Computer Science, Univ. of California at Davis, 2007.
Thesis title: Capturing and Analyzing Internet Worms.
B.S. Computer Science, Embry-Riddle Aeronautical University, Prescott, AZ, 2002.

Recent Employment

2007–present. The University of New Mexico, Albuquerque, NM. Assistant Professor.

Selected Honors and Awards

NSF CAREER Award, 2009.
Best Graduate Student Researcher Award, University of California at Davis Computer Science Department, 2006.
GAANN (Graduate Assistance in Areas of National Need) Fellowship, 2002-2003.

Program Committee Memberships

2010 ACM Computer and Communications Security Conference (CCS).
2010 European Workshop on System Security (EUROSEC).
2009 IEEE Symposium on Security and Privacy (Oakland).
2009 European Workshop on System Security (EUROSEC).

Conflicts of interest

Ph.D. advisors: F.T. Chong (U.C. Santa Barbara), Z. Su (U.C. Davis), and S.F. Wu (U.C. Davis).
Other collaborators over the past 48 months: E. Barr (U.C. Davis), J. Brevik (CSU Long Beach), P. Bridges (UNM), M. Byrd (U.C. Davis), R. East (Independent Researcher), R. Ensafi (UNM), S. Forrest (UNM), Y.J. Heo (ETRI, Korea), R. Iwahashi (U.C. Davis), J.S. Jang (ETRI, Korea), J. Karlin (BBN Technologies), J. Ladau (Santa Fe Institute), J.T. Oh (ETRI, Korea), D.A.S. de Oliveira (U.C. Davis), J. Park (UNM), J. Saia (UNM), B. Shebaro (UNM), V. Shmatikov (UT Austin), G. Wassermann (U.C. Davis), E. Witchell (UT Austin), S. Ye (U.C. Davis), D. Zinn (U.C. Davis).

Synergistic Activities

Invited talks at the Santa Fe Institute, the Asilomar Microcomputing Workshop, Sandia National Laboratories, and the Workshop on Rapid Malcode.
Participated in the Dept. of Energy's Cyber Security Research Needs for Open Science Workshop in June 2007 and the ARO-DARPA-DHS Special Workshop on Botnets, June 2006.

Five Publications Related to Proposal

M.I. Al-Saleh, P.B. Bridges, and J.R. Crandall. "Architectural Support for Securing Sensor Networks Against Remote Attacks." *In the Proceeding of the ISCA First International Conference on Sensor Networks and Applications (SNA 2009)*.

J.R. Crandall, J. Brevik, S. Ye, G. Wassermann, D.A.S. de Oliveira, Z. Su, S.F. Wu, and F.T. Chong. "Putting Trojans on the Horns of a Dilemma: Redundancy for Information Theft Detection." *Transactions on Computational Science IV: Special Issue on Security in Computing. Springer Lecture Notes in Computer Science (Springer LNCS 2009)*, Volume 5430, pages 244–262.

J.R. Crandall, G. Wassermann, D.A.S. de Oliveira, Z. Su, S.F. Wu, and F.T. Chong. "Temporal Search: Detecting Hidden Malware Timebombs with Virtual Machines." *In the Proceedings of the Twelfth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2006)*.

J.R. Crandall, F.T. Chong, and S.F. Wu. "Minos: Architectural Support for Protecting Control Data." *ACM Transactions on Architecture and Code Optimization (ACM TACO 2006)*. Volume 3, Issue 4.

J.R. Crandall, Z. Su, S.F. Wu, and F.T. Chong. "On Deriving Unknown Vulnerabilities from Zero-Day Polymorphic and Metamorphic Worm Exploits." *In the proceedings of the 12th ACM Conference on Computer and Communications Security (CCS 2005)*.

Five Other Publications

J.R. Crandall, R. Ensafi, S. Forrest, J. Ladau, and B. Shebaro. "The Ecology of Malware." *In the Proceedings of the New Security Paradigms Workshop (NSPW 2008)*.

D.A.S. de Oliveira, J.R. Crandall, G. Wassermann, S. Ye, F. Wu, Z. Su, and F.T. Chong. "Bezoar: Automated Virtual Machine-based Full-System Recovery from Control-Flow Hijacking Attacks." *In the Proceedings of the 2008 IEEE/IFIP Network Operations and Management Symposium (NOMS 2008)*.

J.R. Crandall, D. Zinn, M. Byrd, E. Barr, and R. East. "ConceptDoppler: A Weather Tracker for Internet Censorship." *In the Proceedings of the 14th ACM Conference on Computer and Communications Security (CCS 2007)*.

J.R. Crandall and F.T. Chong. "Minos: Control Data Attack Prevention Orthogonal to Memory Model." *In the Proceedings of the 37th International Symposium on Microarchitecture (MICRO 2004)*. (18%)

J. Oliver, R. Rao, P. Sultana, J. Crandall, E. Czernikowski, L. Jones IV, D. Franklin, V. Akella, and F.T. Chong. "Synchroscalar: A Multiple Clock Domain, Power-Aware, Tile-Based Embedded Processor." *In the Proceedings of the 31st International Symposium on Computer Architecture (ISCA 2004)*.

Teaching activities: Computer Organization and Design (Fall 2007, Fall 2008, Fall 2009); Computer Security and Privacy (Spring 2008, Spring 2009, Spring 2010).

Thomas P. Hayes

CONTACT INFORMATION	Department of Computer Science Mail stop: MSC01 1130 1 University of New Mexico Albuquerque, NM 87131-0001	Cell: +1 (505) 819-8673 Office: +1 (505) 277-9328 E-mail: hayes@unm.edu Web: www.cs.unm.edu/~hayes
EMPLOYMENT	Assistant Professor, University of New Mexico Research Assistant Professor, TTI Chicago NSF Postdoctoral Research Fellow, U.C. Berkeley Visiting Assistant Professor, TTI Chicago	August 2008 to present September 2006 to July 2008 July 2004 to August 2006 September 2003 to May 2004
EDUCATION	Ph.D. in Computer Science, University of Chicago Thesis: <i>Rapidly Mixing Markov Chains for Graph Colorings</i> Advisors: László Babai and Eric Vigoda M.S. in Mathematics, University of Chicago B.A. in Mathematics, Michigan State University	August 2003 1994 1993
RESEARCH INTERESTS	Markov chain Monte Carlo algorithms, online optimization, algorithms and complexity theory, machine learning, probability theory, statistical group theory, distributed and network algorithms	
AWARDS AND FELLOWSHIPS	NSF Postdoctoral Fellowship in Mathematical Sciences, 2004-2006 Danny Lewin best student paper award, ACM STOC 2003 National Science Foundation Graduate Fellowship, 1993-1998 McCormick Fellowship, 1993-1996 Alumni Distinguished Scholar, Michigan State University 1989-1993	
SELECTED PUBLICATIONS	[Full list with reprints available at http://www.cs.unm.edu/~hayes/papers] <i>How Nonnegativity Supports Sparsity</i> with V. Potluru, S. Plis and V. Calhoun. Submitted to conference, 2010. <i>Liftings of Tree-Structured Markov Chains</i> with Alistair Sinclair. Submitted to conference, 2010. <i>The Forgiving Graph: A distributed data structure for low stretch under adversarial attack</i> with J. Saia and A. Trehan. In: Proceedings of Twenty-Eighth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2009). <i>The Adwords Problem: Online Keyword Matching with Budgeted Bidders under Random Permutations</i> with Nikhil R. Devanur. In: Proceedings of Tenth Annual ACM Conference on Electronic Commerce (EC 2009). <i>Local Uniformity Properties for Glauber Dynamics on Graph Colorings</i> Submitted to journal, 2009. <i>The Forgiving Tree: A Self-Healing Distributed Data Structure</i> with N. Rustagi, J. Saia and A. Trehan. In: Proceedings of Twenty-Seventh Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2008).	

Stochastic bandit linear optimization

with V. Dani and S. M. Kakade.

In: Proceedings of 21st Annual Conference on Learning Theory (COLT 2008).

High probability regret bounds for online optimization

with P. Bartlett, V. Dani, S. M. Kakade, A. Rakhlin, and A. Tewari

In: Proceedings of 21st Annual Conference on Learning Theory (COLT 2008).

Minimizing Average Latency in Oblivious Routing

with P. Harsha, H. Narayanan, H. Räcke, and J. Radhakrishnan

In Proc. 18th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2008), 200–207.

The price of bandit information for online optimization

with V. Dani and S. M. Kakade

In Proceedings of *Advances in Neural Information Processing Systems 20* (NIPS 2007).

Randomly coloring planar graphs with fewer colors than the maximum degree

with Juan C. Vera and Eric Vigoda

In Proceedings of the 39th Annual ACM Symposium on Theory of Computing (STOC 2007)
450–459.

TEACHING

University of New Mexico

Assistant Professor, Computer Science

CS 510 *Randomized Algorithms*

Spring 2010

CS 591 *Special Topics: Online Algorithms*

Spring 2009

CS 361 *Data Structures and Algorithms*

Fall 2008, Fall 2009

Sachnoff & Weaver, Ltd. (law firm)

Short course on the Java Virtual Machine

Winter 2002

University of Chicago

Lecturer, Computer Science

CS 11600 *Introduction to Computer Programming II (C++)*

Winter 2003

CSPP 53500 *User Interfaces in Java*

Summer 2001

Teaching assistant for a number of courses in Computer Science.

2002–2003

Lecturer, Mathematics

Math 195-196 *Mathematical Methods for Social Sciences*

Fall 2001–Winter 2002

Math 151-153 *Calculus*

Fall 1999–Spring 2000

Math 131-133 *Elementary Functions and Calculus*

Fall 1998–Spring 1999

Math 110-111 *Studies in Mathematics*

Fall 1996–Spring 1997

PROFESSIONAL ACTIVITIES

Program Committee, 49th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2008).

Program Committee, 11th International Workshop on Randomization and Computation (RANDOM 2007).

I have reviewed papers for the following journals and conferences: ACM-SIAM Symposium on Discrete Algorithms (SODA), ACM Symposium on Theory of Computing (STOC), Annals of Mathematics and Artificial Intelligence (AMAI), Annals of Probability, Annual Conference on Learning Theory (COLT), IEEE Symposium on Foundations of Computer Science (FOCS), International Colloquium on Automata, Languages and Programming (ICALP), International Workshop on Randomization and Computation (RANDOM), SIAM Journal on Computing (SICOMP).

Wenbo He

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RESEARCH INTERESTS

Computer Networks, Pervasive and Mobile Computing, Privacy & Security, Cyber-physical Systems, etc.

PROFESSIONAL EXPERIENCE

Assistant Professor, *August 2008 - December 2009*
Department of Computer Science, University of New Mexico

Intern Researcher, *May 2007 - August 2007*
Microsoft Research, Redmond, WA (Networked Embedded Computing Group)

Software Engineer, *August 2000 - January 2005*
Cisco Systems, Inc., Champaign, IL (Network Security Management Group)

EDUCATION

University of Illinois at Urbana-Champaign, Ph.D., Urbana, IL *January 2005 — August 2008*

University of Illinois at Urbana-Champaign, Master of Science, Urbana, IL *August 1998 — August 2000*

Tsinghua University, Master of Engineering, Beijing, China *September 1995 — June 1998*

Harbin Engineering University, Bachelor of Engineering, Heilongjiang, China *September 1991 — July 1995*

SELECTED AWARDS

Vodafone-U.S. Foundation Fellowship, *2005 - 2006, 2006 - 2007, 2007 - 2008*
by School of Engineering, University of Illinois at Urbana-Champaign

C. W. Gear Outstanding Graduate Student Award, *2007*
by Department of Computer Science, University of Illinois at Urbana-Champaign

NSF TRUST Fellowship *2007, 2009*
for summer program on ubiquitous secure technology, Cyber-security and privacy

Mavis Memorial Fund Scholarship Award , *2006*
by School of Engineering, University of Illinois at Urbana-Champaign

Meritorious Award, *1993*
in the Mathematical Contest in Modeling, Consortium for Mathematics and Its Applications(COMAP)

REPRESENTATIVE PUBLICATIONS

ChainFarm: A Novel Authentication Protocol for High-rate Any Source Probabilistic Broadcast.
Ying Huang, **Wenbo He**, and Klara Nahrstedt.
The 6th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS'09), Macau SAR, P.R.C.,
October 2009.

GreenCloud: A New Architecture for Green Data Center.
Liang Liu; Xue Liu; and **Wenbo He**.
The 6th International Conference on Autonomic Computing and Communications, Barcelona, Spain, June 2009.

SMOCK: A Scalable Method of Cryptographic Key Management for Mission-critical Wireless Ad Hoc Networks.
Wenbo He, Ying Huang, Ravishankar Sathyam, Klara Nahrstedt and Whay C. Lee.
IEEE Transactions on Information Forensics and Security, Volume 4, Issue 1, pp 140-150, March 2009.

Optimizing File Retrieval in Delay-Tolerant Content Distribution Community.

Ying Huang, Yan Gao, **Wenbo He** and Klara Nahrstedt.

The 29th International Conference on Distributed Computing Systems (ICDCS'09), June 22-26, Monteval, Quebec, Canada.

Energy-Aware Server Provisioning and Load Dispatching for Connection-Intensive Internet Services.

(in alphabetic order) Gong Chen, **Wenbo He**, Jie Liu, Suman Nath, Leonidas Rigas, Lin Xiao, and Feng Zhao.

The 5th USENIX Symposium on Networked Systems Design and Implementation (NSDI'08), San Francisco, CA, April, 2008. (**This work has been reported on newscientist.com**)

ORTEGA: An Efficient and Flexible Online Fault Tolerance Architecture for Real-Time Control Systems.

Xue Liu, Qixin Wang, Sathish Gopalakrishnan, **Wenbo He**, Lui Sha, Hui Ding, and Kihwal Lee

IEEE Transactions on Industrial Informatics (TII), Vol 4, No. 4, pp 213-224, 2008 (**Best paper award** of IEEE TII 2008).

End-to-End Delay Control of Multimedia Applications over Multi-hop Wireless Links.

Wenbo He, Klara Nahrstedt, and Xue Liu.

ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP) Volume 5, Issue 2, November 2008.

DoS-Resistant Broadcast Authentication Protocol with Low End-to-end Delay.

Ying Huang, **Wenbo He**, Klara Nahrstedt, Whay C. Lee,

The 2nd IEEE Workshop on Mission-Critical Networking, in conjunction with IEEE INFOCOM 2008, (acceptance rate = 28%), Phoenix, Arizona.

PDA: Privacy-preserving Data Aggregation in Wireless Sensor Networks.

Wenbo He, Xue Liu, Hoang Nguyen, Klara Nahrstedt, and Tarek Abdelzaher.

Proceedings of the 26th Annual IEEE Conference on Computer Communications (INFOCOM'07), Anchorage, Alaska, May 2007.

Optimal Real-Time Sampling Frequency Assignment for Wireless Sensor Networks.

Xue Liu, Qixin Wang, **Wenbo He**, Marco Caccamo, and Lui Sha.

ACM Transactions on Sensor Networks (ToSN), Vol. 2(2), 2006.

Impact of Upper Layer Adaptation on End-to-end Delay Management in Wireless Ad Hoc Networks.

Wenbo He, and Klara Nahrstedt.

Twelfth IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS'06), San Jose, CA, May 2006.

PROFESSIONAL ACTIVITIES

Technical Program Committee for several conferences and workshops including INFOCOM'10, PerCom'10, IWQoS'09, WCPS'09, ICCCN'09, WiMD'09, ICSS'09, AdHocNets'09, and RTCSA'09 (publicity chair).

Reviewer for several journals including IEEE Transactions on Wireless Communications (TWC), IEEE Transactions on Information Forensics and Security, IEEE Transactions on Computers (TC), ACM Transactions on Sensor Networks (ToSN), IEEE Transactions on Mobile Computing (TMC), ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP), IEEE Transactions on Parallel and Distributed Systems (TPDS).

TEACHING & STUDENT SUPERVISORY

Computer Networks: Fall 2008, Fall 2009

Advanced Topics in Distributed and Embedded Systems: Spring 2009

Ph.D. students: Michael Groat (with Professor Stephanie Forrest), Hongwei Wang, Mai Ren, Xing Xing (Visiting Student), Zhichun Jia (Visiting Student)

Joe Michael Kniss, Ph.D. _____ November 2009

University of New Mexico, Department of Computer Science
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Albuquerque, NM 87131-0001
jmk@cs.unm.edu • Phone: 505-277-2967
<http://www.cs.unm.edu/~jmk>

Research Interests _____

I am currently conducting research on high-quality, interactive visualization of extremely large 3D datasets from science and medicine. The primary focus of this research covers three critical aspects of the volume visualization pipeline: large-scale parallelism, feature extraction/representation, and advanced rendering models. My current work emphasizes decision making in the visualization pipeline and techniques for assessing uncertainty in this process.

Education _____

Ph.D.,	Computer Science,	University of Utah,	Summer 2006.
	<i>Dissertation Title: Quantitative Volume Visualization.</i>		
M.S.,	Computer Science,	University of Utah,	Fall 2002.
	<i>Thesis Title: Interactive Volume Rendering Techniques.</i>		
B.S.,	Math and Computer Science,	Idaho State University,	Spring 1999.

Professional Experience _____

Fall 2006 - present	University of New Mexico	Assistant Professor
Fall 2003 - Summer 2006	University of Utah	DOE Research Fellow
Summer 2004	Lawrence Livermore National Lab	Practicum
Summer 2002	Nvidia	Research Associate
Summer 2000, 2001	Los Alamos National Lab	Research Associate
Fall 1999 - Spring 2003	University of Utah	Research Assistant
Spring 1997 - Fall 1999	Idaho National Engineering Lab	Research Associate

Selected Publications _____

1. "Real-Time Volume Graphics", K. Engel, M. Hadwiger, J. Kniss, C. Rezk-Salama, D. Weiskopf. AK Peters, 2006.
2. "Managing Uncertainty in Visualization and Analysis of Medical Data", Joe Kniss. In *IEEE International Symposium on Biomedical Imaging: From Nano to Macro*, 2008
3. "Manifold Distance Segmentation", Joe Kniss, Guanyu Wang. In *IEEE Transactions on Visualization and Computer Graphics*, 2009 (under final review)
4. "IStar: A Raster Representation for Scalable Image and Volume Data", Joe Kniss, Warren Hunt, Kristin Potter, Pradeep Sen. in *Transactions on Visualization and Computer Graphics, Proceeding of Visualization 2007*

Funding

1. “Visualization with Uncertainty”, PI, NSF CCF 06-585, Award number 0702787, \$206,688. 2007-2009.
2. “A Consortium for Full Dome Development”, Co-PI, NSF CCF 06-585, Award number 0702787, \$206,688. 2009–2011.

Professional Activities

Committee Member:

ACM Siggraph Technical Sketches Committee, 2005 and 2006.

Graduate Student Advisory Committee, Fall 2000-Spring 2001.

Reviewer:

ACM Siggraph

IEEE Visualization

IEEE Transactions on Visualization and Computer Graphics

IEEE Transactions on Computers

IEEE Computer Graphics and Applications

Eurographics-IEEE VGTC EuroVis

Eurographics

Eurographics Symposium on Rendering

Graphics Interface

Journal of Graphics Tools

Volume Graphics

GPU Gems I, II, and III

Other:

Member, IEEE Computer Society.

Member, ACM, ACM Siggraph

Member, Sigma Xi Scientific Research Society

Biographical Sketch

Shuang (Sean) Luan

Shuang (Sean) Luan, Assistant Professor of Computer Science and Assistant Professor of Radiology, University of New Mexico, Albuquerque, NM 87131; email: sluan@cs.unm.edu; telephone: (505) 277-9620; FAX: (505) 277-6927; <http://www.cs.unm.edu/~sluan>

Education

Dr. Luan received his B.S. degree in Computer Science and Engineering from the Harbin Institute of Technology, Harbin, China, in 1998, and his M.S. and Ph.D. degrees in Computer Science from the University of Notre Dame, Notre Dame, Indiana in 2002 and 2004, respectively.

Appointments

After receiving his Ph.D. degree in May 2004, Dr. Luan has been an Assistant Professor in the Department of Computer Science with a joint appointment in the Department of Radiology at the University of New Mexico, Albuquerque, New Mexico. Dr. Luan was a consultant for Siemens Oncology, May-June 2008, and for the Department of Radiation Oncology, University of Maryland School of Medicine during the summers of 2002~2007. He was a Visiting Professor at the Department of Radiation Oncology, University of California San Francisco School of Medicine in the summers of 2008 and 2009, and a Guest Scientist at the German Cancer Research Center (DKFZ), Heidelberg, Germany June-July 2009.

List of 5 Publications Most Relevant to the Research Project

1. **Luan S**, Swanson N, and Ma L. Dynamic Gamma Knife Radiosurgery, *Physics in Medicine and Biology*, 54 (2009), 1579-1591. (Feature article of March 2009 by *Physics in Medicine and Biology*.)
2. Wang C, **Luan S**, Tang G, Chen D, Earl M, Yu C. Arc-modulated Radiation Therapy (AMRT): a single-arc form of Intensity-Modulated Arc Therapy. *Physics in Medicine and Biology*. Vol 53, No. 22, Nov. 2008, pages 6291-6304. (Top 25 most downloaded paper in 2008 and chosen as part of *Physics in Medicine and Biology Highlights of 2008 collection*. Runner-up for the prestigious Robert's Prize by *Physics in Medicine and Biology*.)
3. Chen D, Hu X, **Luan S**, Wang C, and Wu X. Mountain Reduction, Block Matching, and Medical Applications, *International Journal of Computational Geometry and Applications (IJCGA)*, Vol. 18, Nos. 1-2 (2008), 63-106.
4. **Luan S**, Wang C, Cao D, Chen D, Shepard D, and Yu C. Leaf-sequencing for intensity-modulated arc therapy using graph algorithms, *Medical Physics*, Vol 35, No. 1, 2008, 61-69.
5. Cao D, Earl M, **Luan S**, and Shepard D. Continuous Intensity Map Optimization (CIMO): A Novel Approach to Leaf Sequencing in Step and Shoot IMRT. *Medical Physics*, 33(2006), pages 1199-1212.

Other 5 Significant Publications

1. Tang G, Earl M, **Luan S**, Wang C, Cao D, Yu C, and S.A. Naqvi. Stochastic vs. deterministic kernel based superposition approaches for dose calculation of intensity-modulated arcs. *Physics in Medicine and Biology*, 53 (2008), 4733-4746
2. **Luan S**, Wang C, Chen D, Hu X, Naqvi S, and Yu C. A New MLC Segmentation Algorithm for Step-and-Shoot IMRT without Tongue-and-Groove Leakage. *Medical Physics*. 33 (2006), 1199-1212.
3. Chen D, Hu X, **Luan S**, Misiolek E, and Wang C. Shape Rectangularization Problems in Intensity-Modulated Radiation Therapy. 17th International Symposium on Algorithms and Computation (ISAAC'06).
4. Chen D, Hu S, **Luan S**, Wu X, and Yu C. Optimal Terrain Construction Problems and Its Application in Intensity-Modulated Radiation Therapy. *Algorithmica*, 42 (2005), pages 265-288.
5. **Luan S**, Wang C, Chen D, Hu X, Naqvi S, Lee C, and Yu C. A New MLC Segmentation Algorithm/Software for Step-and-Shoot IMRT Delivery. *Medical Physics*, 31(2004), pages 695-707.

Synergistic Activities

1. Over five years of full-time teaching experience in computer science. Developed 7 graduate/undergraduate courses in computer algorithms, theoretical computer science, applied mathematics, computational medicine, and computational geometry.
2. Served on the Program Committees of the *12th Annual International Computing and Combinatorics Conference (COCOON 2006)* and the *3rd International Frontiers of Algorithms Workshop (FAW 2009)*, and the review panel of research proposals for computational geometry of the National Science Foundation (NSF).
3. Inventors and co-inventors of 5 US patents: (1) US Patent 7,283,611 B1: Segmentation Algorithmic Approach to Step-and-Shoot Intensity Modulated Radiation Therapy; (2) US Patent: 7,466,797: Error control in Algorithmic Approach to Step-and-Shoot Intensity Modulated Radiation Therapy, (3) System and Method for using a Dynamic Gamma Knife for Radiosurgery (Pending), and (4) PCT/US08/005028: Single Arc Dose Painting for Precision Radiation Therapy. (Pending.) This patent has been licensed by Varian for commercialization. (5) A Method of Enhancing Photon Beam Focusing Power for Radiotherapy and Radiosurgery Delivery (provisional patentent).
4. Developed software based on the patent applications (1) and (2) above. This software has been used for clinical cancer treatment in the Department of Radiation Oncology, University of Maryland Medical Center, Baltimore, MD (starting at May 2003) and the Helen P. Denit Cancer Center, Montgomery General Hospital, Olney, MD (starting at September 2003).
5. Consulted for the Department of Radiation Oncology, University of Maryland School of Medicine in 2002-2007 and Siemens Oncology in 2008. Visited Department of Radiation Oncology, University of San Francisco School of Medicine in 2008 and 2009, and the German Cancer Research Center (DKFZ), Heidelberg University in 2009.

Scientists Collaborated with Shuang Luan in the Last Four Years:

Cao D, Ph.D. (Swedish Medical Center, Seattle, Washington), Chen D, Ph.D. (University of Notre Dame), DeMarco J, Ph.D. (University of California Los Angeles School of Medicine), D'Souza W, Ph.D. (University of Maryland School of Medicine), Earl M, Ph.D. (University of Maryland School of Medicine), Heintz P, Ph.D., (University of New Mexico School of Medicine), Heywood G, M.D. (University of New Mexico Cancer Center), Holzscheiter M, Ph.D. (The German Cancer Research Center (DKFZ)), Hu X, Ph.D. (University of Notre Dame), Ketai L, M.D. (University of New Mexico Cancer Center), Lee C, Ph.D. (Accuray Inc.), Li K, Ph.D. (Ohio St. University School of Medicine), Ma L, Ph.D. (University of California San Francisco School of Medicine), Mohiuddin M, M.D. (University of Maryland School of Medicine), Naqvi S, Ph.D., (University of Maryland School of Medicine), Rio C, M.D. (University of New Mexico Cancer Center), Saia J, Ph.D. (University of New Mexico), Shepard D, Ph.D. (Swedish Medical Center, Seattle, Washington), Wang C, Ph.D. (University of Notre Dame), Wong G, M.D., (University of New Mexico Cancer Research and Treatment Center), Wu X, Ph.D., (University of Iowa), Wu X, Ph.D. (University of Alabama at Birmingham School of Medicine), Xing L, Ph.D. (Stanford University School of Medicine), Yu C, D.Sc. (University of Maryland School of Medicine).

Graduate Students Supervised or Under Supervision:

Proctor J (M.S. with distinction, 2005, Sandia National Lab), McGuire R (M.S. with distinction, 2007, Apple Inc.), Gaur V (M.S., 2007, Rockwell Collins), Fanning M (Female, M.S., 2007), Potluru V (M.S., 2007), Trestrail E (M.S. in Medical Physics, 2008), Swanson N (Ph.D., with distinction, 2009, GeoEye Inc.), Chen Z (M.S., in progress), Riofrio D (M.S., in progress), Keys R (Ph.D. in Medical Physics, in progress), Gonzalo Cabal (Ph.D. in progress), Viktor Chekh (Ph.D. in progress).

Ph.D. Thesis Advisor: Chen D, University of Notre Dame, Notre Dame, Indiana.

Melanie E. Moses

University of New Mexico, Department of Computer Science, Albuquerque, NM 87131
melaniem@unm.edu
cs.unm.edu/~melaniem

Education

1989-1993 Stanford University, B.S. Symbolic Systems
2000-2005 University of New Mexico, Ph.D Biology with distinction, advisor Bruce Milne
2005-2006 University of New Mexico, Postdoctoral research, Departments of Biology (advisor James H. Brown) and Computer Science (advisor Stephanie Forrest)

Professional Positions

2007 to present, Assistant Professor, Computer Science, University of New Mexico
2008 to present, joint appointment to the Department of Biology, UNM

Selected Awards

2008 Microsoft New Faculty Fellowship Finalist
2004- 2005 Ford Foundation Dissertation Diversity Fellow
2002-2005 New Mexico Alliance for Graduate Education and the Professoriate Fellow
2000 EPA Science to Achieve Results (STAR) Fellow

Five Most Relevant Publications

Moses, M. E. "Engineering: World Wide Ebb" (in Being Human Essay Series). *Nature* 457: 660-1. (2009).

Arora, T., and Moses, M.E. "Ant Colony Optimization for Power Efficient Routing in Manhattan and Non-Manhattan VLSI Architectures." In Proceedings of the 2009 IEEE Swarm Intelligence Symposium, March 2009, Nashville. ISBN: 9781424427628. (2009).

Hamilton, M.J., O. Burger, J.P. deLong, R. S. Walker, M. E. Moses, and J.H. Brown. "Population stability, cooperation, and the invasibility of the human species." *Proceedings of the National Academy of Sciences* 106(30):12255-12260. doi: 10.1073/pnas. 0905708106. (2009).

Samaniego, H. and M.E. Moses. "Cities as Organisms: Allometric Scaling of Urban Road Networks in the USA." *Journal of Transport and Land Use* 1:1. (2008).

Moses, M.E., S. Forrest, A.L. Davis, M. Loder and J.H. Brown. "Scaling Theory for Information Networks" *Journal of the Royal Society's Interface* 5(29):1469-1480. doi 10.1098/rsif.2008.0091. (2008).

Five Other Publications

Banerjee, S. & M. E. Moses. "A Hybrid Agent Based and Differential Equation Model of Body Size Effects on Pathogen Replication and Immune System Response." *Proceedings of the 8th International Conference on Artificial Immune Systems (ICARIS)*, LNCS 5666: 14-18. (2009).

Hou, C., W. Zuo, M. E. Moses, J.H. Brown and G. B. West. "Energy Uptake and Allocation During Ontogeny." *Science* 332(5902):736-739. DOI:10.1126/science.1162302. (2008).

Moses, M.E., C. Hou, W.H. Woodruff, G.B. West, J.C. Nekola, W. Zuo, and J.H. Brown. "Revisiting a Model of Ontogenetic Growth: Estimating Model Parameters from Theory and Data." *The American Naturalist* 171(5):632-645. doi: 10.1086/587073. (2008).

Charnov, E.L., R. Warne and M.E. Moses. "Lifetime reproductive effort in mammals and lizards." *The American Naturalist* 170: E129-E142. DOI: 10.1086/522840. (2007).

Moses, M.E. and J.H. Brown. "Allometry of Human Fertility and Energy Use." *Ecology Letters* 6: 295-300. (2003).

Synergistic Activities

Interdisciplinary teaching and outreach: New Mexico Academy of Science Annual Distinguished Lecturer (2008); Developed new grad/undergrad course, "Programming for Biologists"; Seminar speaker and affiliated faculty, UNM Program in Interdisciplinary Biological and Biomedical Science (2006-8), AAAS Symposium on Metabolic Ecology (2007)

External service: 2008-2012 Co-Vice Chair Gordon Research Conference on the Metabolic Basis of Ecology; 2006 Invited presentation to the National Research Council Committee on Defining and Advancing the Conceptual Basis of Biological Sciences in the 21st Century, Conceptual Basis of Biology Workshop; Examples of Review Service: *Nature*, *Proceedings of the National Academy of Science*, *Ecology Letters*, *The Royal Society Interface*, *Biotropica*, *Public Library of Science ONE*, *Physica A*, *Journal of Theoretical Biology*

Graduate Student Outreach: Worked to increase minority enrollment in graduate and undergraduate science programs, through outreach and training with the New Mexico Alliance for Graduate Education and the Professoriate and Minority Access to Research Careers (2002-2005). Led graduate student recruitment day, orientation and advising for UNM Computer Science (2007-2008).

High school outreach: Active member of Young Women United, a grass roots group to educate and reduce violence against teenage women of color in Albuquerque (2001-2004). Collaborate with Project GUTS (Growing Up Scientifically), at the Santa Fe Institute, which trains NM middle school teachers and students in agent based modeling and understanding complex systems, including involving middle school students in field studies and computer modeling of ant colonies.

Graduate Students and Post Docs

Dr. Horacio Samaniego, postdoc January 2007 – March 2008
Soumya Banerjee, Ph.D. student August 2007-present
Matthew Fricke, Ph.D student August 2007-present
Tamanna Arora, Masters student August 2007 – present
Kenneth Letendre, Masters student May 2008-present
Josh Hecker, Ph.D. student August 2008 - present

Collaborators and Other Affiliations (outside of UNM)

Al Davis, Department of Computer Science, University of Utah
Mike Lodder, Department of Computer Science, University of Utah
Chen Hou, Santa Fe Institute
Geoffrey West, Santa Fe Institute
William Woodruff, Los Alamos National Lab
Brian Enquist, Department of Ecology and Evolutionary Biology, University of Arizona
Jessica Cable, Department of Botany, University of Wyoming
Van Savage, Department of Systems Biology, Harvard Medical School
Ethan White, Department of Biology, Utah State University
S.K. Morgan Ernest, Department of Biology, Utah State University
Ethan Decker, Department of Biology, University of New Mexico
Andrew Kerkoff, Department of Biology, Kenyon College

Joel Castellanos

Dept. of Computer Science, University of New Mexico, Albuquerque, NM 87131
joel@cs.unm.edu

Education

M.S. Computer Science, University of New Mexico, Albuquerque, New Mexico 2005

B.S. Physics and Computer Science, Wilkes University, Wilkes-Barre, Pennsylvania 1985

Recent Employment

2007-present. University of New Mexico, Albuquerque, NM. Lecturer, Dept. of Computer Science.

2000-2007. ASRC Communications and Aerospace, Albuquerque, NM. Senior Software Engineer in 3D Visualizations, Modeling and Simulations.

1999-2000. Lockheed Martin Aeronautical Systems, Fort Worth, Texas. Senior Analyst of visualizations of experimental aircraft maneuverability and observability.

1997-1999. Central Wyoming College, Riverton Wyoming. Adjunct Professor, dept. of Mathematics.

1995-1997. Albuquerque Academy, Albuquerque New Mexico, Teacher, dept of Physics.

1990-1995. Rice University, Houston, Texas. Research Scientist I. Dept. of Computer Science.

1985-1989. Gill/St. Bernard's High School, Gladstone, New Jersey. Teacher, Science Dept., Coach Athletic Dept.

Selected Publications

Joel Castellanos; “*Computing for Business Students - A Laboratory Manual*” Pearson Publishing Company, July, 2009. ISBN-13: 978-0-558-39213-0.

Jonathan Wolfe, Joel Castellanos, Jared Tarbell; “*Fractals, Complex Systems and Chaos: New Mexico State High School Curriculum*”. <http://fractalfoundation.org/OFC/>, July, 2008

Joel Castellanos; “*System Design of a Trending Tool for Satellite State of Health Telemetry*”. GSAW 2005 (Ground System Architectures Workshop), March, 2005

Joel Castellanos, Lance R. Williams, “*Automatic Synthesis of Isotropic Textures on Surfaces from Sample Images*” University of New Mexico, TR-CS-2003-07, July 2003

Leslie Miller, Joel Castellanos; “*Use of Technology for Science and Mathematics Collaborative Learning*”. School Science and Mathematics Journal (SSMA), February, 1996, Volume 96, Number 2.

Joel Castellanos; “*Hyperbolic Geometry in the High School Classroom*”. The Institute for Advanced Study/Park City Mathematics Institute (IAS/PCMI) Conference Proceedings, Park City, Utah, July 1997.

Joe Austin, Joel Castellanos, Ervan Darnell, Maria Estrada; “*An Empirical Exploration of the Poincaré Model for Hyperbolic Geometry*”. Mathematics and Computer Education, Winter 1993, Volume 27, Number 1.

Joel Castellanos; “*An Empirical Exploration of the Poincaré Model for Hyperbolic Geometry*”. Computers in Geometry Classrooms National Conference Proceedings, St. Olaf College, Minnesota, U.S.A., July 1992.

Joel Castellanos; “*Thinking Through Writing*”. The Science Teacher, March 1989.

Andree Jacobson

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Department of Computer Science
MSC01 1130, Albuquerque, NM 87131
Office: (505) 277-3052, Fax: (505) 277-6927

PROFESSIONAL PREPARATION

THE UNIVERSITY OF ARIZONA, Tucson, Arizona
Master of Science, Computer Science

December 2002

LULEÅ UNIVERSITY OF TECHNOLOGY, Luleå, Sweden
Master of Science, Computer Science and Engineering

May 2000

APPOINTMENTS

THE UNIVERSITY OF NEW MEXICO, Albuquerque, New Mexico
Senior Lecturer.

August 2005 – Current

Teach various courses in the undergraduate computer science curriculum, with main focus on introductory programming (Java, Python, C) classes and as well as computer architecture and design. Student enrollments are usually around 150 students per semester throughout three classes. Teaching efforts were recognized in 2007 through the School of Engineering “*Junior Teaching Excellence Award*”, and in 2008 through the “*UNM 2007-2008 Outstanding Lecturer of the Year Award*”. Participate in the development and evaluation of current undergraduate curriculum. Serve as an undergraduate student adviser. Organize and coordinate the efforts of undergraduate teaching assistants, and participate in, and organize outreach efforts for the department.

LOS ALAMOS NATIONAL LABORATORY (through NM Institute of Advanced Studies), Los Alamos, New Mexico
Instructor & Coordinator: Computer System, Cluster, and Networking Summer Institute. Summer 2007 – 2009

Teach and evaluate a pilot course on high performance computer clusters and networks. The typical supercomputer these days is a complex structure of software and computer hardware, often with specialized high speed interconnect networks. The class aims to familiarize students with the technologies used in such systems through hands-on laboratories, and invited guest speakers from the field. Topics covered include: Linux Administration, Infiniband, 10Gig-Ethernet, MPI Programming, Parallel I/O, machine-room issues, and performance evaluation.

THE UNIVERSITY OF ARIZONA, Tucson, Arizona
Application Systems Analyst, Senior.

September 2003 – August 2005

Work with the Terrestrial Biophysics and Remote Sensing Laboratory (TBRS) in the Department of Soil, Water, and Environmental science included mostly design, development, and implemented of high-performance processing systems for earth observing satellite data systems, through the NASA MODIS project. Supervise activities of algorithm developers, science analysts, and students within the TBRS lab in the processing of satellite-based, time series data for environmental applications. Administer two SGI Mainframes running IRIX 6.5, backup and organize 15TB disk system, maintain a number of other Linux, and Windows based computers, all part of the lab research network. Main product developed was the *MOD13C1* – Coarse resolution, 16 day, Climate Modeling Grid, which helps scientists track the effects of global climate changes. In current production with NASA.

THE UNIVERSITY OF ARIZONA, Tucson, Arizona
Adjunct Lecturer.

Jan 2004 – Dec 2004

Teaching a number of classes in computer organization and design, as well as introductory computer science. Position include organizing graduate and undergraduate teaching assistants and graders.

PUBLICATIONS

Andree Jacobson. **Metrics in Ad Hoc Networks**. Master’s thesis, Luleå University of Technology, 2000. ISSN: 1402-1617

URL:<http://epubl.luth.se/1402-1617/2000/146/index-en.html>

Abstract: Ad hoc networks can form whenever two or more devices capable of communicating start exchanging data. All nodes have to act as routers, forwarding packets for the other nodes. However, traditional internet routing protocols will not work in mobile environments. This thesis presents two metrics that can be used to evaluate performance of ad hoc routing protocols.

SYNERGISTIC ACTIVITIES

I am teaching four required classes in the UNM undergraduate curriculum on a regular rotating basis. Through these classes, I am exposed to practically all students that pass through our program, and I see most students in at least three classes throughout their early studies. I also serve as departmental faculty advisor for about 20 students, and I am one of four faculty serving on the departmental undergraduate committee. Many students come to me for advice and recommendations, even though they may not be my assigned advisees. I feel I have a unique connection to the students, and understand their goals and mentality well. Due to my appointment, I am in a unique position to develop and to integrate the proposed modules in our curriculum.

I also have had the great opportunity to be the faculty coordinator for the Computer System, Cluster, and Networking Summer Institute at Los Alamos for the past two summers. In the process of leading students through this summer program, I have been required to develop a substantial amount of new material pertaining both to underlying theory and practical application of those theories. Over the past two summers, we have had 18 students (9 each summer) as participants. Out of the first set of students, every single one was offered either a follow-up internship, or a full time position at LANL. In the second batch at least three students went on to graduate school; as far as I know four of them will be coming back to Los Alamos this summer. Overall, this has been a tremendously successful program for all parties involved.

COLLABORATORS AND CO-EDITORS

None.

GRADUATE AND POSTDOCTORAL ADVISORS

None.

THESIS ADVISOR AND POSTGRADUATE-SCHOLAR SPONSOR

None.