DARPA’s New Cognitive Systems Vision

By Ron Brachman and Zachary Lemnios

The impact of the Defense Advanced Research Projects Agency (DARPA) on computing over the past 40 years has been profound. Led by the visionary J.C.R. Licklider and his innovative successors in the Information Processing Technology Office (IPTO), DARPA initiated work that ultimately put personal computers on millions of desktops and made the global Internet a reality. In fact, the original IPTO, which lasted from 1962 to 1985, was in large part responsible for establishing Computer Science as a field.

DARPA has recently re-energized IPTO (now the Information Processing Technology Office), and has re-directed its attention to modern Computer Science by looking both to its roots and to a dramatic vision of the future. Licklider imagined computers and humans working closely together in a form of symbiosis. The new, 21st century IPTO wants to realize this vision by giving computing systems unprecedented abilities to reason, to learn, to explain, and to react, in order to finally create systems able to cope robustly with unforeseen circumstances.

IPTO’s goal is to create a new generation of cognitive systems.

Mired in Moore’s Law?

One benefit of such cognitive systems would be their help in extracting us from a corner into which our success seems to have painted us. The research that has helped the industry follow Moore’s “Law” has created processors that are remarkably fast and small, and data storage capabilities that are vast and cheap. Unfortunately, these incredible developments have cut two ways. While today’s computers are more powerful than ever, we have been lured by processing power and inexpensive memory into creating systems that are enormously large and complex. Many of today’s systems are virtually impossible for humans to understand, use, or maintain.

Beyond the resulting maintenance problem, with the total lifetime cost of systems now heavily dominated by after-production costs, this complexity has also led to serious vulnerabilities. More complexity means greater opportunity for intruders. More elements mean more ways that things can go wrong: systems crash and software rots. And the training burden and level of expertise required to cope with systems both keep growing. In order to make our systems more reliable, more secure, and more understandable, and to continue making substantial contributions to society, we need to do something dramatically different.

The Promise of Cognitive Systems

IPTO is attacking this problem by driving a fundamental change in computing systems. By giving systems more cognitive capabilities, we believe we can make them more responsible for their own behavior and maintenance. Ideally, in the next generation, a computer system will be cognizant of its role in a larger organization or team (and of the overarching goals of that team), capable of acting autonomously, and able to interact rationally with other systems and humans in real time. It will also be able to take care of itself in a self-aware and knowledgeable way. Ultimately, these new capabilities will be the basis for artificial systems that can respond as robustly to surprise as natural systems can. A cognitive computer system should be able to learn from its experience, as well as by being advised. It should be able to explain what it was doing and why it was doing it, and to recover from mental blind alleys. It should be able to reflect on what goes wrong when an anomaly occurs, and anticipate such occurrences in the future. It should be able to reconfigure itself in response to environmental changes.

And it should be able to be configured, maintained, and operated by non-experts. All of these potential cognitive systems vision

Continued on Page 8

The Intel Research Network: An Innovative Model of Industry-University Collaboration

By Hans Mulder

This is another in a series of CRN articles describing the activities of CRA’s industry laboratory members. Others are posted at: http://www.cra.org/report/.

Intel has a long history of funding academic research through sponsored programs and grants. Today more than 250 Intel-sponsored research engagements are underway at universities throughout the world. Recently we have developed a bold new approach to conducting joint research with universities in an open collaborative environment. We believe this innovative model will accelerate Intel’s exploratory research efforts, while addressing the most pressing concerns of all parties involved in collaborative initiatives between companies and universities.

Formation of Intel Research

In 1999, David Tennenhouse joined Intel and was charged with launching a new internal organization, Intel Research, to explore the disruptive and emerging technologies that could advance Intel’s business and create new markets and opportunities. Tennenhouse had been chief scientist and director of the information technology office at the Defense Advanced Research Projects Agency (DARPA), an organization known for its ability to catalyze innovation by funding highly targeted university research projects.

The Vision of Proactive Computing

Tennenhouse arrived at Intel with a vision of a future world of proactive computing, in which billions of devices embedded throughout the environment will anticipate people’s needs and take action on their behalf. Intel Research set out to translate that vision into reality.

The research model developed for this long-term and exploratory program uses Intel funding to sample the broad array of university research. However, just sponsoring university research would not be sufficient to...
Expanding the Pipeline

Award Validates Berkeley's Diversity Programs

By Sheila Humphreys

Berkeley’s “ECEs Excellence and Diversity; win Student Programs” were recently awarded the 2002 Women in Engineering Programs Award (WIEP) by WEPAN (Women in Engineering Programs and Advocacy Network). At a time when diversity programs are under attack, such an award validates Berkeley’s programs for women. The passage of Proposition 229 in California, which prohibits programs that confer educational benefits based solely on gender or ethnicity, has led to a perceived shift away from diversity efforts. Further, the continuing economic downturn in California undermines all academic programs, but particularly diversity programs, which lie outside core instructional activities.

The WIEP Award recognizes Berkeley’s “sustained national impact” in several areas, including: 1) attracting women to electrical engineering and computer science at Berkeley; 2) providing orientation and sustained academic support to women students in ECES; 3) fostering a sense of community for undergraduates and graduate women; 4) encouraging undergraduate women to apply for graduate programs through research; 5) conducting outreach to pre-college women; and 6) developing new policies to serve women students. In this article, we limit the discussion to our efforts and successes in fostering a sense of community and engaging undergraduate women and minorities in research.

Background

The box above shows highlights of the ECEs women’s programs, from the appointment of Professor Susan Graham in 1973 to the formal creation of a diversity program in 1986 by Professor Eugene Wong, and now the 25th anniversary of our women’s graduate group, WICSE, this year. Our programs have been greatly enriched by synergy with all of CRA-W’s programs, including research programs DMP, CREW, and the Distinguished Lecturer Series, as well as the Hopper and Tapia Conferences and CRA Outstanding Undergraduate Awards and Career Mentoring Workshops.

Fostering Community: WICSE and the Alumnae Connection

Twenty-five years ago a group of women students founded the graduate group WICSE (Women in Computer Science and Engineering), which continues to form the cornerstone of our programs for graduate women. The effectiveness of WICSE derives in part from its continuity, departmental support, and meaningful contact with CS alumnae and other prominent women in CS. The ECEs Department provides WICSE with staff assistance, space, facilitation of conference travel, a guaranteed voice at the annual Faculty Retreat, and funding to support its activities.

Since 1977, WICSE has helped to organize six major conferences for women in CS and engineering. WICSE members have been active at each of the four Grace Hopper conferences, their numbers increasing from seven in 1994 to 22 who attended the 2002 conference in Vancouver. WICSE guest speakers over the past three years have brought our students in contact with women at the forefront of CS. Past speakers include: Ruzena Baxa, Fran Berman, Susan Egers, Deborah Estrin, Barbara Liskov, Maria Klawe, Valerie Taylor, and Tandy Warnow, among others.

Recently, we followed up on our women CS Ph.Ds. for the purpose of raising our students’ awareness of them. Of the 137 alumnae respondents, 50 are teaching in research universities. Berkeley CS graduates hold tenured and tenure-track positions in most major programs, including Harvard, Carnegie Mellon, MIT, Stanford, UCLC, Washington, Wisconsin, UC Berkeley, UC Davis, UCLA, UC Irvine, University of Illinois, Georgia Tech, Northwestern, and UT Austin. An updated web page with links to these alumnae provides a virtual network for the Berkeley students aspiring to follow their path.

WICSE’s core activity is a weekly lunch meeting, which ensures that women students gather on a regular basis. ATWICSE, the Association of Undergraduate Women in Computer Science and Engineering, was established 10 years ago. A Mentoring Lunch is held once a month for WICSE and ATWICSE to meet together. New policies have been one result of regular gatherings of women students. For example, in the mid-90s a number of women graduate students struggled with graduate degree timelines and expectations while dealing with infant care. The Parent Policy, championed by WICSE members at a CS Faculty Retreat, was first adopted by our faculty and later by the entire Berkeley campus. This policy provides a safety net for graduate students who are parents, allowing them the flexibility of slowing down their degree progress without losing financial aid or research momentum.

Undergraduate Research Programs

Where the Computer Science Diversity Program was unfortunately phased out in 1996 due to Proposition 229, alternative means of bringing more women into graduate study had to be considered. Thus, we initiated new programs to encourage undergraduate women to engage in research. A series of workshops was created to address basic issues of how to find academic-year and summer research, approach faculty to ask for research, develop a project, and present research. We instituted undergraduate research poster sessions, now scheduled each semester, and enthusiastically advertised NSF Research Experiences for Undergraduates Programs, as well as the C.W.-DMP and CREW programs.

www.cra.org/Research/DivPe/Questions

Contact: survey@cra.org

Berkeley Milestones

1977 Susan Graham appointed Assistant Professor of Computer Science.
1977 WICSE (women’s graduate group) founded by CS graduate students.
1978 Working in Engineering and Computer Science: A conference for women attended by 500 students.
1983 Computer Science Diversity Program Established by Computer Science Division to increase number of women graduate students.
1986 EECs (Prof. Eugene Wong) creates “Excellence and Diversity Student Programs.”
1987 WICSE 10th Anniversary; MIT Professor Dresselshaus, speaker.
1992 ATWICSE founded by women undergraduates; Professor Katherine Yelick appointed.
1994 Faculty pass Parent Policy allowing graduate student parents to modify their academic program.
1996 CS Reentry Program phased out because of Proposition 229.
2000 CS 15 Students in Grace Hopper Celebration of Women in Computing.
2001 Jennifer Mankoff appointed Assistant Professor of CS; Berkeley establishes a Virtual Development Center.
2002 WICSE celebrates 25th year. Maria Klawe visits CS as Regents’ Lecturer. CS sends 22 students to Hopper Conference; Barbara Grosz visits as McKay Professor in Computer Science.

REMINDER TO CS/CE CHAIRS

Please make certain your survey has been submitted to: www.cra.org/Survey/FillOut

Questions?

Contact: survey@cra.org
Results of CRA Industrial Salary Survey of CS Research Labs

By David Waltz

In November 2001, CRA conducted its fifth Industrial Salary Survey of CS Research Laboratories. Eleven organizations representing 689 researchers responded. (In 2000, fourteen organizations with 1,189 researchers participated.) Of these 689 researchers, 72 percent held Ph.Ds, 24 percent M.S. degrees, 4 percent B.S. degrees, and <0.1 percent other degrees.

Organizations were asked to provide data about salary, total cash compensation (which includes items such as bonuses), and total non-cash compensation (e.g., the value of stock options). Respondents were asked to report means and medians for each category. Companies that completed the survey received detailed results in January 2002. A summary of the results is presented in Tables 1, 2 and 3.

Table 1 (a comparison of base compensation) is non-problematic, but Tables 2 and 3 need explanation. In both 2000 and 2001, significant amounts of reported income came from non-cash compensation, primarily stock options. We calculated the value of this non-cash compensation assuming stock prices would appreciate at 15 percent per year. The large resulting 2001 non-cash compensation values raised apparent total compensation significantly, even though options were granted to fewer than 10 percent of the researchers (from 3 of 11 reporting organizations). However, it is highly likely that all options granted in 2001 are worthless today (i.e., far below the exercise price), making Table 3 very misleading. Consequently the interpretive comments below are drawn from Table 2, our best estimate of actual realized income (Caveat: Clearly the compensation in Table 2 isn’t perfect—it is likely that some options granted in 2000 also proved worthless, so the total compensation for 2000 is probably overstated somewhat.)

Observations

The main finding of the 2000 survey was that compensation—both base and total—had soared across the board. In 2001, there were some gains in base salaries, but total compensation dropped significantly except for new Ph.Ds.

More specifically, I would like to highlight four year-on-year changes in 2001:

1) Total compensation dropped significantly—14% to 21%—for researchers with 1 or more years of experience.
2) Mean and median base compensation rose for researchers with 1 to 5 years of experience, with the largest increases—6% to 8%—for those with 6 to 10 years’ experience.
3) Starting base salaries decreased slightly (-5% for the median, -2.4% for the mean), although starting total compensation did not show a clear trend.
4) Observations

Survey Results

Continued on Page 20

Table 1. Base Salaries in Industrial Research Labs by Years of Post-PhD Experience (thousands of dollars)

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<tr>
<th>Experience</th>
<th>Median</th>
<th>Mean</th>
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<td>New PhD</td>
<td>102.6</td>
<td>101.2</td>
<td>97.5</td>
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<tr>
<td>1-5 Years</td>
<td>104.0</td>
<td>101.7</td>
<td>105.2</td>
<td>107.1</td>
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<tr>
<td>6-10 Years</td>
<td>114.8</td>
<td>118.8</td>
<td>124.3</td>
<td>126.3</td>
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<tr>
<td>11-15 Years</td>
<td>122.0</td>
<td>132.6</td>
<td>134.2</td>
<td>134.3</td>
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<tr>
<td>16+ Years</td>
<td>145.6</td>
<td>146.6</td>
<td>138.0</td>
<td>139.3</td>
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</table>

Table 2. 2000 Total Compensation* and 2001 Total Cash Compensation** by Years of Post-PhD Experience (thousands of dollars)

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<tr>
<td>New PhD</td>
<td>103.8</td>
<td>117.6</td>
<td>105.7</td>
<td>107.1</td>
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<tr>
<td>1-5 Years</td>
<td>132.3</td>
<td>133.2</td>
<td>113.1</td>
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<td>6-10 Years</td>
<td>164.2</td>
<td>170.0</td>
<td>133.1</td>
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<tr>
<td>11-15 Years</td>
<td>182.9</td>
<td>170.0</td>
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<tr>
<td>16+ Years</td>
<td>169.9</td>
<td>186.6</td>
<td>147.2</td>
<td>150.2</td>
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</table>

*Total Compensation is base salary plus additional cash (e.g., bonus) and non-cash (e.g., stock options) items.

**Total Cash Compensation is base salary plus additional cash (e.g., bonus) items.

Table 3. 2000 Total Compensation* and 2001 Total Cash Compensation** by Years of Post-PhD Experience (thousands of dollars)

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<th>Experience</th>
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<td>New PhD</td>
<td>103.8</td>
<td>117.6</td>
<td>113.2</td>
<td>113.8</td>
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<tr>
<td>1-5 Years</td>
<td>132.3</td>
<td>133.2</td>
<td>135.0</td>
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<tr>
<td>6-10 Years</td>
<td>164.2</td>
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<tr>
<td>11-15 Years</td>
<td>182.9</td>
<td>170.0</td>
<td>184.0</td>
<td>190.4</td>
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<td>16+ Years</td>
<td>169.9</td>
<td>186.6</td>
<td>197.0</td>
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*Total Compensation is base salary plus additional cash (e.g., bonus) and non-cash (e.g., stock options) items.

The International Trading Agent Competition: Focus on RoxyBot

By Amy Greenwald

Amy Greenwald, Brown University, is the fifth CRA Digital Government Fellow. The following article is a synopsis of her presentation to the Auctions Fellowship. The following article is a synopsis of her presentation to the Auctions Fellowship.

The international trading agent competition, the TAC software platform was redesigned by the Intelligent Systems Laboratory at the Swedish Institute of Computer Science, led by Erik Aurell.

Rules

The TAC competition (http://www.sics.es/tac and http://tac.eecs.umich.edu) consists of a series of game instances, each of which pits eight autonomous bidding agents against one another. Each TAC agent simulates a travel agent with eight clients who were interested in traveling from TACtown to Boston and home again during a five-day period. Each client is characterized by a random set of preferences for the possible arrival and departure dates, hotel rooms (The Grand Hotel and Le Fleabag Inn), and entertainment tickets (symphony, theater, and baseball). A TAC agent’s score in a game instance is the difference between the total utility it obtains for its clients, based on its clients’ preferences, and the agent’s expenditures. To minimize the effects of randomization, agents’ scores are averaged across several game instances during TAC competitions.

In order to obtain utility for a client, an agent constructs a complete travel package for that client by purchasing airline tickets to and from TACtown and securing hotel reservations. It is also possible to obtain

Continued on Page 10

Page 3
Historical Trends from Taulbee Surveys: Early Employment of Doctorates

By Jay Vegso

This is the fourth in a series of articles on data trends from CRA’s Taulbee Survey and its antecedents, which stretch back to 1970.

The Taulbee Survey tracks demographic data and salaries at doctorate-granting computer science and computer engineering (CS/CE) departments in the United States and Canada. Earlier articles dealt with faculty salaries, the proportion of women among degree recipients and faculty members, and the ethnicity of Ph.D. students and recipients. This article concerns the employment of computer science and computer engineering doctorates in the first year after they received their degrees.

The Taulbee Survey, which is conducted each fall, asks for the current employment status of those who received Ph.D. degrees during the previous academic year (AY).

As changes in the survey, including the addition of new employment categories, it is difficult to trace employment trends before AY1984/85. Table 1 shows the results from AY1984/85 onward as percentiles, since these are more useful for tracking trends than raw numbers. These figures exclude the approximately 15 to 20 percent of doctorates whose employment status was unknown each year, as well as those who were listed as unemployed (which average to only 1 percent).

Figure 1 illustrates the proportion of doctorates who were employed outside of academia (i.e., if self-employed, or in industry or government), within academia (i.e., in Ph.D.- and non-Ph.D.-granting CS/CE departments, as well as in non-CS/CE departments), and outside North America.

Two trends in particular are worth noting. The first is that starting with the AY1990/91 graduates, a greater proportion of students found early employment outside of academia than in it. This trend increased particularly during the early 1990s, peaking with the AY1996/97 graduates. Since then, however, the share of doctorate-holders going into non-academic jobs has decreased, while the proportion going into academia has increased.

Another interesting trend is the decrease since the mid-1990s in the proportion of doctorates who found early employment outside of the United States and Canada. This has occurred even as the proportion of doctorates granted to nonresident aliens steadily increased over the same period—45 percent of CS/CE doctorates granted in AY2000/01 were to nonresident aliens, 47 percent the year before that.

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<td>10%</td>
<td>4%</td>
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<td>1985/1986</td>
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<td>9%</td>
<td>3%</td>
<td>37%</td>
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<td>1986/1987</td>
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<td>1987/1988</td>
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The Federal Budget Cycle—A Primer

By Peter Harsha

This is the first of a two-part series explaining the Federal budget process. Part 2, The President’s Budget in Congress, will appear in the January 2003 issue of CRN.

Part One—Writing the President’s Budget

On February 4, 2002, President George W. Bush unveiled his fiscal year 2003 budget proposal, a plan for spending nearly $2 trillion packaged in a flag-bedecked stack of documents more than five inches tall.

The stack—a compendium of justifications and accounting for every dollar of federal spending at every federal agency and office—represents the culmination of nearly a year’s work by the executive branch and its agencies, but only the beginning of the annual cycle of debate and legislation necessary to fund the operations of government.

At this writing, the final budget for FY 2003 has not yet been decided and is unlikely to be resolved until Congress returns to Washington after the November 5th Congressional elections. Work on legislation to create a new Department of Homeland Security (still unresolved) and disagreements among the House leadership about a final total spending number—in essence, a decision about how much to exceed the President’s budget request in appropriations—delayed consideration of all 13 of the annual Appropriations bills necessary to fund the federal government in FY 2003, and have made the post-election return necessary. Until Congress returns, it is impossible to know the final disposition of many of the programs important to computing research. Instead, this lull in activity provides an opportunity to examine the mechanics of the budget process—how the administration produces its plan, and how the Congress disposes of it.

The President’s Budget

Work began on the President’s FY 2003 budget almost a year prior to its introduction last February. Indeed, shortly after the release of the current FY 2003 budget, analysts at the White House’s Office of Management and Budget (OMB) had already opened the book on the FY 2004 budget by producing guidance for federal agency officials charged with drafting budgets for their own agencies. Although each agency draws up its own budget request, OMB must approve all agency budgets before they can be included in the President’s budget. The process of creating an agency budget and having it vetted by OMB will take the bulk of the year, and will require input from a number of sources.

For federal research and development agencies, the budget process is coordinated through the White House’s Office of Science and Technology Policy (OSTP), headed by the President’s Science Advisor (currently Dr. John Marburger), in addition to the normal vetting by OMB. OSTP runs the coordinating Federal Budget Cycle.
Homeland Security

By Peter A. Freeman

Homeland security is perhaps the most urgent and immediate issue facing our nation today.

There are, of course, many issues facing us, as there always seem to be in the world in which we live—health care, quality of education, erosion of privacy, economic stability, world peace. While our field contributes to addressing all of these issues, it is particularly in computing that we are in a unique position to contribute to homeland security in a more direct and immediate way than we can to any other single, compelling issue.

Very simply, this is because in the war on terrorism in which we are now engaged, information is at the heart of all efforts to protect us from a usually unknown and often unknowable enemy. Obtaining relevant information in a timely manner and then disseminating it to those who can act on it to protect us is the core of all homeland defense efforts, ranging from airport screening to determining if the spread of an infectious disease is actually bio-terrorism. Devising algorithms to process information and designing the machines to implement those algorithms (to use as simple an example as possible, the definition of computing research) is, of course, what we do. Many branches of the U.S. Government are now focused on contributing to homeland security, and as they work on carrying out their missions they are discovering a pressing need for new technology, new ideas, and a new set of people who understand cutting-edge science and engineering. NSF, for the past year, has been trying to serve as a middleman to put agencies with a need in touch with those in the community whose research and knowledge may be able to address those needs. Our near-term strategy is to highlight the value of basic research by making linkages between our basic research and mission agency needs. This is working successfully and will benefit basic research over the long term.

On the one hand, researchers often don’t understand the needs of those in operational agencies, but could make an impact if they did. On the other, the operational agencies need the depth of expertise that exists in the NSF community.

Many CISE researchers have been delighted at the opportunity to contribute, and the mission agencies have been pleased to have access to leading research. NSF has been making connections in a variety of ways, including holding workshops that include PIs and government personnel, bringing government technology managers together to discuss their research needs so that we and others can start relevant funding programs, making presentations at conferences and workshops, and having NSF personnel work closely with other agencies as they explore new technology relevant to their missions. Areas include biology, physics, electrical engineering, social science, and many areas of computer science and engineering. Commensurate with my opening comments, an area of high interest to many agencies is the general area of knowledge discovery and dissemination; but there is hardly an area covered by the programs of CISE that isn’t of interest.

As you might expect, the work of some of the agencies requesting assistance is heavily classified. NSF does not support classified work and does not intend to do so, but the organic act that created NSF and provides our basic mission clearly indicates our responsibility to support national defense: “To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.”

We have noted an eagerness on the part of many in the community to contribute to homeland defense, including in some cases obtaining security clearances so they can be of maximum assistance. In a similar manner, agencies are not only eager to tap into the great reservoir of ideas and people in the S&E research community, but in some cases are quite willing to fund unclassified, basic research. A certain amount of this funding has already taken place through supplements to existing NSF grants using funds supplied by other agencies. We anticipate more of this in the coming year.

NSF has also been trying to refocus programs and develop new programs, where appropriate, that can contribute to homeland security. Some of these are obvious, such as network security, trusted systems, data mining, and database security. On the whole, however, we are trying to keep our focus on the long-term research that is the hallmark of NSF. This is entirely consistent with the prevailing view that homeland security is an issue that will be with us for many years and for which many new and fundamental discoveries are needed.

All of us in computing have an opportunity to contribute to our society in a direct and meaningful way because of the centrality of our discipline to homeland security efforts. If you are invited to participate in a workshop on the topic or asked to meet with an operational agency, I encourage you to do so. If you have an idea that you think could contribute to some aspect of homeland security, I urge you to bring that to the attention of the appropriate people.

As you might imagine, that may not be an easy task, but we at NSF may be able to help. I suggest you first talk with your Program Director or someone else at NSF who knows you and your work, or an equivalent person at DARPA or other agencies. They should be able to help you locate the right place to take your idea. If they are not able to do this, then feel free to contact Dr. Gary Strong (gstrong@nsf.gov) or me.

Our field, in many ways, is helping create the world of the future. It is our firming that we also have the opportunity and responsibility to help make that world a more secure place. I strongly encourage you to help do that through your research and educational activities.

Peter Freeman (pfreeman@nsf.gov) is Assistant Director—CISE at the National Science Foundation.

CRA Forms Grand Challenges Steering Committee

Following the success of the first CRA Grand Challenges Conference in June 2002, the CRA board of directors voted to incorporate such conferences as an ongoing CRA activity. The board has appointed a steering committee to provide direction for future conferences.

Chaired by board member David Patterson (UC Berkeley), other committee members include Randy Bryant (Carnegie Mellon), Barbara Grosz (Harvard), Mary Jane Irwin (Penn State), Christos Papadimitriou (UC Berkeley), and Bob Sproull (Sun Microsystems).

The steering committee’s mandate is to:

• Clarify the objectives of the conferences.
• Define a process for soliciting, reviewing, and accepting conference topic proposals.
• Provide policies and guidance for conference organizing committees.
• Assist in appropriate evaluation of each conference.
• Provide a list of Grand Challenges Conferences.

CRAs current plan is to hold a Grand Challenges Conference every other year, alternating years with the CRA Conference at Snowbird. To start this cycle, a second conference is planned for late spring/summer 2003, contingent upon funding.

Each Grand Challenges Conference will have its own organizing committee. This group will work with CRA to write the proposal for funding and to run the conference. The CRA steering committee will help conference organizers to sharpen their ideas, and will provide critical feedback and advice.

The purpose of these conferences is to provoke “out-of-the-box” thinking as a way of articulating the grand challenges in computer science and engineering in a compelling way. Information about the first Grand Challenges Conference, whose theme was systems, is posted on the CRA website at:

http://www.cra.org/cgrn

More on Computing > Computer Science

By Jim Foley

The September issue of CRN carried a piece I wrote entitled “Computing > Computer Science.” Three things have happened since that article was published:

1. I updated my original article based on discussions with colleagues Elizabeth Myntt and Janet Kolidser at Georgia Tech.
2. Bob Glass (Editor-Emefitus, Journal of Systems and Software; Editor/Publisher, The Software Practitioner) responded to me with the view that the discipline of computing consists of three major fields: computer science, information systems, and software engineering.
3. CRA recommended to the National Research Council that in the next assessment of doctoral programs, there be a sixth category called “Computer and Information Science and Engineering” parallel to the five current categories: Engineering, Physical Sciences and Math, Arts and Humanities, Social and Behavioral Sciences, and Biological Sciences. Computer Science would fall in this new category. (See related story in this issue “CRA Comments on Proposed NRC Study of U.S. Ph.D. Programs.”) We used the CISE acronym rather than Computing because CISE is already well known to the NSF-supported research community. But the spirit is the same — there is a larger discipline that includes computer science.

Jim Foley is chair of the CRA board.
The Computing Research Association is once again undertaking a study of Ph.D. programs at research universities in the United States. The last study, commonly referred to as the “NRC Rankings,” was released in 1995 (http://bob.nap.edu/html/researchcock). According to the NRC, the purpose of the current study is primarily to provide university administrators and faculty with a set of common measures, both quantitative and reputational. Additional information about the assessment is available on the Web at: http://www7.nationalacademies.org/bhei/RedDose_about.html.

The Computing Research Association was invited by the NRC’s Committee to Examine the Methodology for the Assessment of Research-Doctorate Programs (http://www7.nationalacademies.org/bhei/RedDose_conc.html) to provide comments and suggestions on the proposed assessment prior to the committee’s meeting on September 10. Reprinted below is the text of the letter submitted to the chair of the NRC committee, Dr. Jeremiah F. Ostriker, by CRA board chair Jim Foley.

Andrew Sutter, Program Associate

The Computing Research Association (CRA) welcomes the opportunity to provide input to the National Research Council’s assessment of doctoral programs at research universities. CRA is an association of more than 200 North American academic departments, six computing societies (American Association for Artificial Intelligence, Association for Computing Machinery, Canadian Association of Computer Science, IEEE Computer Society, Society for Industrial and Applied Mathematics, and USENIX Association), and twenty-three industrial laboratories and institutes all engaged in computing research. CRA’s mission focuses on representing and strengthening research and graduate education in the computing fields. CRA members are very aware of the NRC rankings and the importance of the results.

Your letter asks “...how might the next (NRC) study incorporate interdisciplinary programs [and] identify emerging areas that were not included in the 1995 study?” Since 1995, the year the last NRC rankings were released, computing has experienced great change. The emergence of new research areas, sub-disciplines, and interdisciplinary fields within the computer science and engineering fields has reached a critical mass and now requires a new categorization and new methods of assessment. For example, a brief survey of CRA member departments finds computing programs housed in nine different college units from Arts and Sciences to Engineering to Information Technology and Engineering. Our IT Deans’ group includes Deans from about 40 computing units that report directly to a Provost or similar official. The names of these units [http://www.cra.org/Activities/indices/participants.html] reflect the breadth of computing. Also, the attached article “Computing > Computer Science” [see p. 6 at http://www.cra.org/CRN/news/ 0204.pdf] is my own take on the intellectual breadth of computing.

CRA suggests that the committee establish the higher-level category “Computer and Information Science and Engineering” under which doctoral programs in computer science, computer engineering, information science, information technology, human-computer interaction, computational science, etc., would be assessed and ranked. In addition, some multidisciplinary programs such as bio-informatics and other “x”-informatics programs may be appropriately housed under this new category.

Our suggestion mirrors the policy of the National Science Foundation which, in 1986, reorganized to create CS&E— the Directorate for Computer and Information Science and Engineering— in recognition of computing as an important cluster of disciplines on a par with the traditional disciplines housed in the other Directories of Engineering, Math and the Physical Sciences, the Biological Sciences, and the Social, Behavioral and Economic Sciences.

In response to the question of how the next NRC study should address the scholarly reputation of doctoral programs, CRA endorses a rigorous evaluation process that takes into account the differences between computing and other research disciplines in terms of publication modalities. Attached is the CRA white paper “Best Practices in Evaluating Computing Scientists and Engineers for Promotion and Tenure” [http://www.cra.org/reports/tenure_review.html]. As noted in this paper, although “…standard publication is one indicator of academic achievement, other forms of publication, specifically conference publication, and the dissemination of artifacts [such as computer programs and systems] also transmit ideas.” Conference publication is both rigorous and prestigious. Assessing artifacts requires evaluation from knowledgeable peers. Quantitative measures of impact are possible, but they may not tell the entire story.” CRA strongly recommends that the committee take these differences in academic culture and procedure into consideration when judging a program’s “scholarly reputation.”

In conclusion, CRA recommends that the committee:
1. create the new category “Computer and Information Science and Engineering” to properly capture and classify Ph.D. programs in the widening areas of computing education and research,
2. specify a rigorous evaluation of computing programs that takes into account the assessment practices of computing science and engineering, [end of letter text]

According to the NRC, the first phase of the NRC study will investigate new measures and methodologies so that the second phase, to be conducted in 2003-05, may accurately reflect changes in scholarship and graduate education that have occurred over the past 20 years.
One of our DMP students, Emily Chung, received Honorable Mention in the CRA Outstanding Undergraduate competition in 2001.

Focus on Minorities

Since 1990, EECS has operated a summer research program, SUPERB-IT (Summer Undergraduate Program in Engineering Research at Berkeley—Information Technology). A minority-serving program, the goal of SUPERB is to develop competitively qualified graduate applicants through undergraduate research. Founded by our own African American EECS graduate students, SUPERB has been supported by the NSF REU Program. Our is one of the very few REU sites focusing on underrepresented students. Of students in the SUPERB program, 41 percent are women, compared with an 18 percent enrollment of undergraduate women in the EECS Department. African Americans have comprised almost half of our REU students, and more than 20 percent come from underrepresented institutions. Cited by NSF as an “exemplary program,” SUPERB has brought 113 students to Berkeley since 1990. They joined CS and EE graduate research groups, with mentorship provided by faculty and graduate student researchers.

Leveraging Summer Research

Results are clearly positive: 66 percent of former SUPERB students have pursued a graduate degree. The positive correlation between undergraduate research and the pursuit of graduate degrees in science and engineering is well known. Since 1990, 113 students participated in SUPERB and have been mentored by 56 EECS faculty. Of these students, 78 percent were underrepresented ethnic minorities. Four SUPERB alumni have received doctorates as well as MS degrees, and nine doctors are pending just at Berkeley.

SuperB has contributed significantly to the diversity of the graduate-student body both here and elsewhere. SUPERB continues to bring women and minority students to our graduate program. Five of the women entering our graduate program in 2001 and 2002 are SUPERB alumnus, including a student from Howard University.

Changing the Climate

A long-standing program like SUPERB has a positive effect on the departmental climate. In 1995, matching students to faculty research groups was difficult; now, after 12 years, CS faculty are receptive to SUPERB students. Fifty percent of the faculty who have mentored SUPERB students are Repeaters, attesting to their enthusiasm for the program. Both graduate students and faculty have discovered talented students from universities unfamiliar to them. Further, two women students from two other nearby institutions have continued their research with their Berkeley faculty during their senior year.

Giving CS a Context: The Berkeley Virtual Development Center

Our newest program for women is the Virtual Development Center (VDC) established by EECS in January 2001 in partnership with the Institute for Women and Technology. Our VDC focuses on the technology needs of disabled women. The motivation to create such a center is to offer to students, especially women, a needed context for understanding the applications of their theoretical studies. The VDC course “User Interface Design and Development” was taught by CS Professor James Landay. About 40 percent of the students enrolled in this class in spring 2002 were women, a much higher ratio of women to men than is customary in CS classes. The students used contextual inquiry methods to solicit input from a group of disabled women from the community; they brainstormed with that community about what technology products would be useful to them. Twelve teams of students developed innovative projects, which are posted at: http://vuit.berkeley.edu/courses/cs160/spring2002/projects.htm

Students commented on the value of directly connecting the special users' needs to the design process, instigated by the VDC's focus. One student wrote, "I really feel that designing for the disabled teachers a lot more about other people, and it really teaches about good user-centered design since the designers can't shoot from the hip and use their own experience, but rely more upon the user's feedback.

The Admissions Bottleneck

Contrary to popular opinion, it is not lack of interest in CS by talented high school women that presents a serious challenge, impeding our efforts to diversify the computer science pipeline. Rather, it is the difficulty they face in gaining admission to UC Berkeley. The table on page 8 shows how the number of freshmen applicants who are women has hovered around 150 for the past five years, with a fairly constant number of women admitted. The selectivity is so high that only 19 percent of freshman applicants were admitted in fall of 2002. Our 45 percent yield rate (admitted students who choose to enroll at Berkeley) reflects effective recruitment. Although the percentage of undergraduate women enrolled in EECS has slowly crept to 18 percent, this percentage will not increase significantly unless more applicants gain admission. The percentage of undergraduate women in CS is in our Letters and Science Program is 23 percent (compared with 18 percent in the EECS Engineering Program). In seeking to broaden the definition of qualified applicants, a group of faculty and staff lobbied to remove from consideration the criterion of “prior computing experience,” since it affects women applicants disproportionately. Other CS programs, for example at Carnegie Mellon University, have investigated broader admissions criteria with very positive results.

EECS Freshmen Women Admissions University of California at Berkeley

![Graph showing EECS Freshmen Women Admissions University of California at Berkeley](image)

Shelia Humphreys (sheila@eeecs.berkeley.edu) is Academic Coordinator for Student Matters, Center for Undergraduate Matters, Department of Electrical Engineering and Computer Sciences, University of California at Berkeley.

FEBRUARY 12 DEADLINE FOR CRA SERVICE AWARD NOMINATIONS

The Computing Research Association invites nominations for the CRA Distinguished Service Award and the A. Nico Habermann Award for the year 2003.

Distinguished Service Award

CRA makes an award, usually annually, to a person who has made an outstanding service contribution to the computing research community. This award recognizes service in the areas of government affairs, professional societies, publications or conferences, and leadership that has a major impact on computing research.

A. Nico Habermann Award

CRA makes an award, usually annually, to a person who has made an outstanding contribution to aiding members of underrepresented groups within the computing research community. This award recognizes work in areas of government affairs, educational programs, professional societies, public awareness, and leadership that has a major impact on advancing these groups in the computing research community.

For a list of previous winners of these awards, see: [http://www.cra.org/main/craawards.html](http://www.cra.org/main/craawards.html)

Nomination Procedure

The deadline for receipt of nominations is February 12, 2003. Nominations should not exceed two pages in length and should describe the contributions on which the nomination is based. Letters in support of the nomination are welcome but not required. Questions or comments may be addressed to awards@cra.org.

Send nominations electronically to: awards@cra.org (in plain text or as a Word attachment). Alternatively, mail or fax to:

CRA Service Awards
Computing Research Association
1100 17th Street, NW, Suite 507
Washington, DC 20036-4632
Tel. 202-234-2111
Fax: 202-667-1066
E-mail: awards@cra.org
improvements in system capability should help us make a serious dent in the maintenance and complexity problems we face today.

In a nutshell, we want to transform computing systems from those that are simply extensions of to those that are truly cognitive. Our ultimate goal is to create systems that know what they're doing.

Where We're Going

New research in cognitive systems has the potential to revolutionize the way we design, deploy, and depend on computing systems. A long-term research agenda might be structured in stages. For example, we might strive first to consider software systems that were in some measure self-aware. This kind of system could help in its own debugging, and might be extensible through a high-level, goal-oriented dialogue with its programmer. Next, we might imagine building cognitive network systems that are able to understand their overall goals and capable of making adaptive, effective use of limited resources. Beyond that, we are interested in building autonomous, perceiving agents, which could explain their reasoning and engage in natural dialogues with human partners that would allow them to increase their functionality and performance over time. Finally, we want to build truly intelligent, multi-component systems whose overall operation would be more efficient and more easily extensible.

The initial focus of our work will be on "assistant" or "associate" systems. The idea is to create an artificial system that could be a persistent, long-term partner for a person; this associate system would share experiences with its user and learn from those experiences. By being cognizant of the experiences of the user, the assistant system could become more effective in its communication. One could imagine an artificial executive assistant that becomes more and more personalized to its user over time, or a battlefield commander's associate that would become a dedicated partner for a battlefield commander, helping to anticipate his or her needs and removing the burden of administrative overhead.

Our effort will of necessity be multi-disciplinary, and will need to draw on many aspects of Computer Science. Despite its high-level focus on cognition, it will need serious participation from the systems, networking, security, and software communities, among others. The notion of architecture will be important throughout this work—true cognitive systems are likely to be complex combinations of reactive processes, more thoughtful, deliberative processes, and reflexive processes that capture self-awareness and help make the system robust in the face of unforeseen circumstances. Core technology will include learning, knowledge representation, reasoning, communication, perception, and multi-agent systems.

Why Now?

Many of the goals of our Cognitive Systems initiative are familiar. What makes us think that we are in a substantially better position to accomplish them now than we were before? We see several key factors: 1) improvements in computer hardware will soon give us computer substrates with the size and power to match the computational capability of animal and perhaps human brains; 2) the "Decade of the Brain" has brought us unprecedented insights from neuroscience, giving us new models of how the brain actually works; and 3) there have been numerous successful deployments of a wide variety of artificial intelligence and cognitive technologies, ranging from autonomous control of deep space missions to pragmatic machine learning improvements in speech understanding and data mining applications. While none of these or other factors is individually definitive, we believe that the convergence of computing power, knowledge of the brain, and practical experience in deploying reasoning and learning technology is remarkable.

As in many research endeavors, there is significant risk in this kind of initiative, but we also believe that truly cognitive systems are likely to be complex combinations of reactive processes, more thoughtful, deliberative processes, and reflexive processes that capture self-awareness and help make the system robust in the face of unforeseen circumstances. Core technology will include learning, knowledge representation, reasoning, communication, perception, and multi-agent systems.

Cognitive Systems Vision from Page 1

transitions and Awards

Alfred Aho, recently of Lucent Technologies, Bell Labs, has returned to Columbia University as a professor in the Computer Science Department.

Peter Bloniarz, associate professor of Computer Science, University at Albany, has been named a Collins Fellow for 2002. The award is given for extraordinary and substantial contributions to the University and its community.

Leah Jamieson, Rikenbuck Professor of ECE, is currently serving as Interim Chair of ECE at Purdue. Jamieson has received a Women and Hi Tech Leading Light award for achievements likely to inspire girls and women to pursue technology-related careers.

Maria Klawe has been named dean of the School of Engineering and Applied Science at Princeton University, effective January 1, 2003. She also will be appointed a professor in the Department of Computer Science. Klawe has been at the University of British Columbia since 1986, serving as the head of the Department of Computer Science, as vice president for academic and academic services, and since 1996, as dean of science.

Mark L.T. Smith has been appointed head of the Department of Electrical and Computer Engineering at Purdue University, effective January 1, 2003. Smith was formerly executive assistant to the president at the Georgia Institute of Technology, where he served as department chair from 1993 to 2001.

Jeffrey S. Vitter has been named the Frederick W. McLafferty Professor and Dean of Purdue University’s School of Science, effective September 1, 2002. Vitter, a CRA board member, was formerly the Gilbert, Louis and Edward Lehrman Professor of Computer Science at Duke University, where he served as department chair from 1993 to 2001.

Ron Bruchman is Director and Zachary Lemnis is Deputy Director of ITT at DARPA.

To learn more, contact Dr. Bruchman at rbruchman@darpa.mil or Dr. Lemnis at zlemnis@darpa.mil.

2003 Federated Computing Research Conference

June 7–14, 2003
San Diego, California
http://www.acm.org/sigs/conferences/fcrc/

NSF Doubling Put on Hold

A bill that would authorize the doubling of research funding at the National Science Foundation over the next five years stalled in the Senate after an anonymous senator placed a "hold" on consideration of the legislation.

H.R. 4664, the "Investing in America's Future" Act, would provide authorization for increases of 15 percent per year to NSF's core research accounts—including information technology research—for fiscal years 2003-07. While not a guarantee of increased funding, it would provide congressional appropriators with the authority to provide the increases should funds be available. The measure passed the House 397 to 25 in early June.

The Senate approved posed for quick consideration of the bill after two Senate committees granted their approval. However, after Senate leaders placed the bill on the Senate calendar for consideration as a " unanimous consent" request—a special status reserved for bills expected to be non-controversial—staffers learned a hold had been placed on the bill by an anonymous senator (later learned to be Sen. Jon Kyl (R-AZ), according to Democratic Senate staff). Kyl was apparently acting at the behest of the White House's Office of Management and Budget, which expressed concern about the word "doubling" in the bill's description and the bill's five-year time span, but apparently no objection to the funding levels in the bill.

It is unclear what effect the hold will have on the measure's chances for final passage. Both the House and Senate have adjourned until the November 5th elections. It is not known whether House and Senate committee members will work to allow CMB's concerns about the measures when they return. For the latest developments, check the CRA Government Affairs website at http://www.cra.org/govaffairs.

CRA Distributed Mentor Project

Deadline for Applications

February 14, 2003

http://www.cra.org/Activities/craw/
bridge the gap between the world of university ideas and Intel's R&D. To succeed, we need to create an environment in which we could focus on some of the most promising technologies, then work on them together. With that in mind, and with the University of Washington as an addition, we would need to create a research environment within Intel that could move some of these collaborative projects downstream, towards products.

Launching a Network of University Labs

After a year of exploring possibilities, we launched a new model of industry-university collaboration in the form of the Intel Research Network of university labs. These project-focused labs, wholly owned and funded by Intel, are located near major universities. The universities were selected for their expertise in specific areas of computer science and information technology research that support our proactive computing research agenda, and for their willingness to experiment with an open collaborative model of joint research.

Currently the network consists of four labs located adjacent to UC Berkeley, the University of Washington, Carnegie Mellon University, and Cambridge University. Each lab explores a different aspect of proactive computing, from new technologies for ubiquitous computing environments to software for widely distributed storage systems.

The labs’ directors are top academic faculty with tenured appointments in their respective departments. During their tenure as Intel lab directors, they are Intel employees, on partial leave from their faculty positions. Each lab will have approximately 20 Intel researchers and an equal number of university researchers when fully built out. They will collaborate closely in an environment that promotes sharing of knowledge, a commitment to timely publication of results, and broad dissemination of research results. The research agenda of each lab will be focused on some of the most promising technologies, then work on them together in the labs, and develop the form of the Intel Research Network that can either take lab technologies to market or license them to Intel for full portfolio advantage. They will keep the agenda fresh.

At the CRA Snowbird Conference in July, the popular argument that computer science research generates substantial revenue for universities was deconstructed by J. Strother Moore of the University of Texas at Austin. Moore analyzed the licensing income and concluded that, while IP is indeed a powerful revenue generator for universities, only a fraction of the fees come from licensing computer science or electrical and computer engineering innovations. A similar analysis done by Dave Hedges, former Dean at UC Berkeley, led to significant changes in the flexibility of UC campuses in negotiating sponsors’ rights to university intellectual property developed in CSEE-based sponsored research.

The major point of licensing income is generated by other fields—most prominently, biotechnology, agriculture, and health technology—in which each product embodies a single, clearly defined, patentable invention. By contrast, CSEE products may rely on hundreds or thousands of ideas in various configurations. This makes it difficult to extract royalties, since each patent is a minor contributor and it is often possible to substitute alternative technologies. Furthermore, attempting to go the alternative technologies that would sponsor university research if it weren’t for all the restrictions. In fact, some companies have even lost their research sponsorships as a result of these limitations.

The sticking point in all university-industry collaboration relationships is intellectual property rights. The history of university-industry collaboration is rife with cases of protracted negotiations on technology transfer, including misunderstandings and exorbitant fees. In some cases, no collaboration happens at all.

For the purpose of the network of labs, some principles we have established are that: 1) collaboration—not just throwing money over the wall—should be the norm; 2) Under the agreement we collaborate on should be non-exclusive; 3) there are many areas of research where, for the sake of collaboration, we will define boundaries that are non-IP protective at all; and 4) proprietary advantage should be generated when the principles take idea downstream—for example, through internal R&D programs.

Not all universities, licensing offices, and professors will be able to agree to these principles. Some professors like to keep their IP exclusive so they can use it to start their own companies. Some licensing offices are not willing to share benefits for third parties to participate. Some companies that would sponsor university research if it weren’t for all the restrictions. In fact, some companies have even lost their research sponsorships as a result of these limitations.

One company that would in fact Sponsor university research is Intel. Intel has created an open collaborative model of joint research. The OCR Agreement

The OCR agreement provides a framework for Intel and the universities to conduct joint research in the open. Under the agreement, Intel and principal investigators within the university can propose and initiate computer science and information technology research projects they wish to jointly undertake. Each project is defined in a project document that specifies the boundaries of the project—specifically, what research is to be conducted in the open—with the expectation that the results will be published and made widely available.

The OCR provides the master agreement that addresses how these projects are carried out. The agreement, including the information of specific facilities and researchers involved. Our intention is to make it fast and easy for researchers on both sides to collaborate and move freely between Intel and campus to conduct joint research projects.

The emphasis of the agreement is on acceleration of research, bringing together the combined strengths of both Intel and the university, and on the timely publication of research results. Though patents are expected to arise, the focus of the collaboration is on openness, the document “agreement” instead of the patent granting terms and conditions.

The OCR agreement further encourages collaboration following for third parties to participate in the agreement. For example, UC Berkeley's CTRIS program may consider the CTRIS agreement as a guide for managing the IP issues surrounding that project. In short, the OCR agreement is designed to make collaboration easy.

Everyone Wins

As the foregoing suggests, our open collaborative model provides benefits for all participants. It allows university researchers to amplify their thinking and their work—and potentially see it translated to industry products—without having to leave academia. It enables Intel to accelerate research in areas we find interesting and worthy of-mention by conducting research concurrently in the labs and within our company. By facilitating synergy and open exchange of ideas, the model will enable Intel and the participating universities to jointly lead the industry, to generate breakthroughs that will continue to advance the state of the art. The open nature of the model of industry-university collaboration, we believe everyone wins. It is important to note, though, that we apply the OCR model to university engagements in exploratory CS/IT research. It is an open question whether or not our principles and this collaboration model can be applied to other engagements.

Other companies and industry groups have expressed interest in our open approach, and we are developing standard agreements governing university-industry collaboration. We believe this would be beneficial, both for our industry and for universities. We encourage others to build on the foundation we have laid, and to use our agreements as a starting point for building a set of standard agreements covering a variety of research relationships.

Hans Mulder, Ph.D., is a Sector Director within Intel Research, responsible for driving research into ubiquitous computing and distributed systems. He is also a co-director of Intel Research Berkeley, one of four labs currently in the Intel Research Network. For more information about the labs and their people and projects, visit www.intel-research.net.

* CTRA Workshop on Post-9/11 Research Practices

On September 21, CRA hosted a workshop aimed at developing recommendations to strengthen computer science research infrastructure in areas that are critical importance to national security. A broad consortium of industry, academia, and government participated.

Hans Mulder, Ph.D., is a Sector Director within Intel Research, responsible for driving research into ubiquitous computing and distributed systems. He is also a co-director of Intel Research Berkeley, one of four labs currently in the Intel Research Network.

The workshop focused on three general topics, including imitation of efforts for setting up better communication and information fusion, research on how to facilitate interaction between research and practice, and recommendations on how to facilitate interaction between research and policy. The program was structured as a series of working sessions, including presentations, followed by group discussion aimed at identifying key problems and recommendations.

The conclusions of the workshop will be detailed in a forthcoming report.
Table 2. RoxyBot-01’s High-Level Strategy

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ping server for updates on current holdings and current prices in each open auction.</td>
</tr>
<tr>
<td>2</td>
<td>Based on current and historical price trajectories, estimate clearing price distributions for each open auction.</td>
</tr>
<tr>
<td>3</td>
<td>Generate a bidding policy • Run the generalized comparator to determine the quantity of flights, hotels, and entertainment tickets to buy and sell, given the set of estimated clearing price distributions. • Compute bid and ask prices as average marginal utilities, across samples from the set of estimated clearing price distributions.</td>
</tr>
<tr>
<td>4</td>
<td>Place online bids and asks according to the bidding policy.</td>
</tr>
<tr>
<td>Until game over</td>
<td></td>
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</tbody>
</table>

RoxyBot-01 (see Table 2) generalizes RoxyBot-00 by computing policies not simply from price point estimates, but rather from estimated price distributions. RoxyBot-01 determines a set of goods that is likely to be of value under many samples of its estimated price distributions. (This algorithm proceeds by determining an initial set of goods that is desired under many samples, adding that set to the set of current goods, and repeating. A larger and larger set of goods is built up by conditioning on those goods that were desired in earlier iterations.) Bid and ask prices are computed by averaging marginal utilities across many samples of the estimated price distributions.

Table 3. RoxyBot-02’s High-Level Strategy

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Ping server for updates on current holdings and current prices in each open auction.</td>
</tr>
<tr>
<td>2</td>
<td>Based on current and historical price trajectories, estimate clearing price distributions for each open auction.</td>
</tr>
<tr>
<td>3</td>
<td>Repeat • Generate a bidding policy a la RoxyBot-01, or RoxyBot-02, obtaining a set of price point estimates by sampling from estimated price distributions. • Compute the value of this policy by averaging its score across many samples of the estimated price distributions. Until bidding cycle time out.</td>
</tr>
<tr>
<td>4</td>
<td>Place online bids and asks according to the best bidding policy seen in step 3.</td>
</tr>
<tr>
<td>Until game over</td>
<td></td>
</tr>
</tbody>
</table>

The trading agent competition is an exciting domain in which to study artificial intelligence (AI) techniques. Some TAC agent designs are based on straightforward applications of AI, such as the travel domain has been the focus of the trading agent competition for three years running. At TAC-2003, this game will take a back seat, and a new game based on supply chain management will be introduced. In next year’s competition, each TAC agent will act as a PC assembler, buying computer parts piecemeal from suppliers, and compiling its inventory into custom-specific products for its clients. This game is being designed by Norman Sadeh and Raghu Aravanschalam at Carnegie Mellon’s e-Commerce Institute, in conjunction with the SICS development team. Game details will be announced in mid-October.

Amy Greenside is an Assistant Professor in the Department of Computer Science at Brown University. Email: amygreen@cs.brown.edu; URL: http://www.cs.brown.edu/~amygreen/

The CRA Digital Government Fellowship is supported by the National Science Foundation’s Digital Government Program, and is intended to build ties between academic and industrial computing research communities.
Office for several interagency research initiatives, including the National Information Technology Research and Development program (NITRD), which comprises all of the federal government’s IT research programs. OSTP also provides guidance to agencies on the President’s priorities for R&D funding for future budgets, although this guidance is heavily influenced by OMB.

In May 2002, agency directors received a memo-emailed “FY 2004 Interagency Research and Development Priorities,” co-signed by OSTP Director Marburger and OMB Director Mitch Daniels. The memo set forth the Administration’s position on R&D priorities (which include continued support for NITRD initiatives) and spelled out the tests the Administration will apply to all R&D programs to see whether they warrant the Administration’s continued support. The tests are called from the President’s Management Agenda, a document released by OMB in August 2001, which spells out the President’s desire to develop R&D performance measures, or “investment criteria,” that will help improve R&D program management, better inform R&D program funding decisions, and ultimately increase public understanding of the possible benefits and effectiveness of the federal investment in R&D.” The three tests—relevance, quality, and performance—are to be applied to all R&D programs agency directors hope to include in the President’s budget.

Agency directors must also keep presidential priorities in mind when putting together their budgets. For FY 2004, OSTP and OMB have indicated six interagency initiatives to be included in the President’s budget and submit them to the President by early fall. OMB then spends several months sifting through the budgets, deciding what programs to accept and reject. The process is held completely within the executive branch, and agency officials are not permitted to discuss with Congress or any other interested party what they have submitted to the President or any feedback they may have received. OMB then sends the budgets back to the agencies (called a “passback”) for changes, and to give the agencies one more opportunity to justify items in the proposed budget that OMB may have changed or eliminated completely. Although this is a confidential process, it is not unusual for details about disappointing passbacks to find their way to the affected communities, and for those communities to lobby against those changes even though they have not been made public.

Agencies typically have until December to return the budgets to OMB with required alterations, and many will spend the time until the deadline arguing against the changes, sometimes appealing to the President himself. After the final budgets are accepted and included in the President’s budget, all arguments about the administration typically end, and agency directors present a unified front in defending the budget in Congress in the later spring.

This need—and requirement—to unite behind the President’s budget can put agency directors in the position of arguing against benefits to their agencies—increases proposed by Congress, for example—that they themselves may have proposed in the budget approval process. This year, for example, the President’s budget contained only a modest 1.4 percent increase above National Science Foundation (NSF) FY 2003 over FY 2002. Congress, which has just completed a five-year effort to double the budget for the life sciences, now finds itself favorably disposed to do the same for the physical sciences (including computing research) at NSF. The House passed a measure authorizing the doubling of NSF over five years in late July.

As this article goes to press, two Senate committees have approved a similar plan and the measure is ready to head to the Senate floor. However, because the bill includes an authorization for FY 2003 that is significantly higher than the level requested by the President, NSF Director Rita Colwell has written to the Senate Commerce, Science and Transportation Committee asking that they oppose the nearly 15 percent increase already approved for her agency by the committee in favor of the significantly smaller increase proposed by the President.

After the formal introduction of the President’s FY 2004 budget on the first Monday in February 2003, the agency heads will once again unite behind the President’s plan, even as they begin their work on the next year’s budget (FY 2005). The work on FY 2004 is hardly over—they will be called to testify on behalf of their agencies before Congress in defense of their budgets. But their influence on the process is now secondary compared to the actions of key congressional committees and members.

(See January 2003 CRN for Part 2—The President’s Budget in Congress.)

CRA Welcomes New Academic Members
Cornell University (ECE)
Miami University (CS)
Massachusetts Institute of Technology (Aeronautics & Astronautics)
The MOVES Institute, Naval Postgraduate School

CISE Newsletter Rekindled
After an absence of several years, CISE/NF is again providing a newsletter to inform the community of new CISE programs, NSF-wide programs of interest, personnel changes, and other news in the directorate. You can view the newsletter at: http://www.cise.ncf.gov/cise_newsletter/index.html Any comments or suggestions should be sent to: cisenews@nsf.gov

In addition, you may wish to subscribe to the CISE news list, which has short, occasional messages for the CSE research community.
To subscribe, send a message to: join-cise-announce@lists.nsf.gov
Armstrong Atlantic State University
School of Computing

Faculty Position

The School of Computing invites applications for an Assistant Professor in Computer Science. Candidate should have a Ph.D. in Computer Science or a related field. We are particularly interested in candidates with expertise in Information Technology. Candidates should have a Ph.D. in MIS or Information Technology, or a related field. Two-year teaching positions available. Interviews are ongoing and are expected to continue until filled.

Bucknell University

Computer Science Department

Assistant/Associate Professor

Applications are invited for a tenure-track position beginning fall 2003. A Ph.D. in computer science or computer engineering is required. The Department of Computer Science at Bucknell University is an active and growing department with a dynamic and collaborative faculty. The department is located in a new building with state-of-the-art facilities. The department has 14 full time faculty members and approximately 200 undergraduate and 100 graduate students. The Department of Computer Science is part of the Mathematics and Computer Science Division, which also includes Mathematics. We are seeking candidates who are committed to excellence in teaching and research. Our faculty has an interest in cooperative education, software engineering, and interaction design. Faculty members work closely with students and are highly visible on campus. We expect the department to grow significantly over the next several years. Applications are invited from qualified candidates, especially women and minority candidates.

Clemson University

Department of Computer Science

Assistant/Associate Professor

Clemson University’s School of Operations Research and Information Engineering and the Department of Computer Science are jointly seeking candidates for a tenure-track faculty position in Information Technology. Rank will depend on experience and qualifications. Candidates should have a Ph.D. in computer science or a closely related field. Applications should provide a curriculum vitae, letters of recommendation, and teaching/curriculum vita, a statement of administrative experience, and a demonstrated interest in diversity. Women and minority candidates are especially encouraged to apply.

BROOKLYN
City University of New York

BROOKLYN
City College of the City University of New York is a liberal arts college offering a full range of undergraduate and graduate degrees to a diverse student body. As a part of CUNY, the Department of Computer Science also provides liberal education courses for students of all backgrounds.

The Department of Computer and Information Science (CIS) is seeking to fill two tenure-track faculty positions, one in Computer Science and one in Information Technology. The new faculty members will join an active and diverse faculty engaged in teaching, research, and service.

We are seeking two individuals specializing in any area of computer science. A successful candidate must have a Ph.D. in computer science or a closely related field. For an appointment as an Associate Professor, a candidate should have a Ph.D. in computer science or a closely related field. For an appointment as an Assistant Professor, a candidate should have a M.S. in computer science or a closely related field.

Please arrange to have at least three letters of recommendation sent to: phenders@butler.edu. In addition, please supply a URL pointing to your online resume and publications. Butler University is an equal opportunity employer and is committed to enhancing the diversity of its faculty and staff. Women and minority members are strongly encouraged to apply.

The Citadel, Military College of South Carolina

Department of Mathematics and Computer Science

Assistant/Associate Professor

Applications are invited for the position of Assistant or Associate Professor in Computer Science, to begin Fall 2003. A Ph.D. in computer science or a closely related field is required. Preferred areas of interest include operating systems, software engineering, and distributed systems. The position is tenure-track. The Citadel is a coeducational, independent college affiliated with the United States Corps of Cadets. The college is located in Charleston, South Carolina, near the beaches of the Lowcountry. Women and minority candidates are especially encouraged to apply.

Clemson University

Department of Computer Science

Assistant/Associate Professor

Clemson University’s School of Operations Research and Information Engineering and the Department of Computer Science are jointly seeking candidates for a tenure-track faculty position in Information Technology. Rank will depend on experience and qualifications. Candidates should have a Ph.D. in computer science or a closely related field. Applications should provide a curriculum vitae, letters of recommendation, and teaching/curriculum vita, a statement of administrative experience, and a demonstrated interest in diversity. Women and minority candidates are especially encouraged to apply.

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November 2002

Professional Opportunities

Drexel University Department of Computer Science

Drexel University invites applications for multiple tenure-track faculty positions. Interests include: Computer Graphics and Human-Computer Interaction, Computer Vision and Image Processing, Software Engineering, Networks, Systems and Security. Strong applicants in other areas are also encouraged to apply.

Drexel’s Computer Science Department has rapidly expanded its graduate programs in Software Engineering, Graphics, HCI, AI, Networks, Security, and Scientific Computing. Our Department emphasizes both interdisciplinary and applied research and is supported by major targeted research grants from NSF, DoD, and NIST, as well as by private sources.

One of our faculty is recipients of the NSF CAREER Award. The University plans for significant growth in tenure-track Computer Science faculty over the next few years. Send cover letter, CV along with names and addresses of three references to Faculty Search Chair Computer Science Department Drexel University Philadelphia, PA 19124 Email: c-s39@drexel.edu WWW: http://www.cis.drexel.edu

We will continue to build upon a strong, highly collaborative group in experimental systems. We are particularly interested in all areas of experimental systems including computer networks and protocols, Internet environments and services, wireless computing, distributed systems, computer security, compilers and programming languages, and operating systems.

To apply in a position, please be sure to indicate the expanded capabilities of our vibrant and growing Department. For more information about the faculty, facilities and other resources, please refer to www.drexel.edu.

Applications should be submitted by email with PDF attachments. Applications should include a current vita, list of publications, and copies of the most important publications. Drexel University is an Equal Employment Opportunity/Affirmative Action employer.

Duke University Department of Computer Science Experimental Systems Facility Position

We invite applications and nominations for a tenure-track or tenured faculty position at any rank in the Department of Computer Science at Duke University, to start September 2003. Preference will be given to applicants in the various areas of experimental systems and experimental architecture.

We continue to build upon a strong, highly collaborative group in experimental systems. We are particularly interested in all areas of experimental systems including computer networks and protocols, Internet environments and services, wireless computing, distributed systems, computer security, compilers and programming languages, and operating systems.

This faculty line will be in a position to help guide and influence the continued expansion of our vibrant and growing Department. For more information about the faculty, facilities and other resources, please refer to www.duke.edu.

Applications should be submitted via email with PDF attachments. Applications should include a current vita, list of publications, and copies of the most important publications. Drexel University is an Equal Employment Opportunity/Affirmative Action employer.

Emory University Mathematics and Computer Science Department Tenure or Tenure-Track Position in Computer Science

The Department of Mathematics and Computer Science, Emory University, invites applications for an exceptional tenure track Assistant Professorship or a terminal appointment at the rank of Associate Professor or Professor, beginning Fall 2003. Applicants must have a Ph.D. in computer science or a closely related area of study. Emory University is a rapidly growing institution and the computer science program is progressing toward expansion. Emory’s dedication to computer science instruction. The department offers degrees at the BS, MS, and PhD levels. Our salary and benefits package is highly competitive.

Applications, including a letter of interest, curriculum vitae, a list of publications, and three letters of reference, should be sent to:

Professor Douglas Shafer, Search Committee Department of Mathematics and Computer Science Emory University Atlanta, GA 30322

Screening of applications will begin on December 15, 2002, with interviews planned for mid-January and continuing until positions are filled.

Emory University is an Affirmative Action/Equal Opportunity Employer.

Duke University Department of Computer Science

Florida International University School of Computer Science Faculty Positions

Applications are invited for tenure-track and tenured faculty positions at the level of Assistant or Associate Professor. A Ph.D. in computer science or a closely related area is required. Candidates are sought in all areas of computer science. Research activities could be given to database systems, software engineering, software systems, security, and distributed computing. Florida International University is the State University System of Florida with over 34,000 graduate students and schools, and is one of the largest universities in the United States. FIU is one of the four public universities in Florida named by the President’s Committee on National Service to be a center of excellence.

The Florida International University School of Computer Science is the second-largest Computer Science program in the state. We have a 15 faculty members and 100 graduate students. Areas of research include software engineering, database systems, multimedia networking, security, and distributed systems.

Candidates are encouraged to apply. Applications, including a letter of interest, current vitae, a list of publications, and at least 3 letters of reference, should be sent to:

Chairperson, Recruitment Committee School of Computer Science Florida International University Miami, Fl, 33199

Florida International University is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply.

Drexel University Department of Computer Science

Faculty Search Chair

C/o John J. Dugan, Assistant Director for Human Resources University of Minnesota, Digital Technology Center 599 Walter Library, 117 Pleasant St. SE, Minneapolis, MN 55455

You may also apply electronically to jobs@dtc.umn.edu

Review of completed applications will begin immediately with the search remaining open until the positions are filled.

University of Minnesota The University of Minnesota is an Equal Opportunity/Affirmative Action Employer and Educator.

The Florida State University Department of Computer Science Tenure-Track and Non-Tenure Track Positions

The Department of Computer Science invites applications for several tenure-track positions at the rank of Assistant Professor and one non-tenure-track position, beginning August 2003. Exceptional candidates may be considered for the rank of Associate Professor.

Applications for tenure-track positions should hold a Ph.D. in Computer Science or a closely related field, and have excellent research and teaching accomplishments / potential. Areas of priority are: architecture, embedded systems, distributed systems, multimedia networking, security, parallel computing, operating systems, virtual reality, and biomedical computing. We are particularly interested in candidates whose research and teaching interests overlap with any of these areas.

Applications for tenure-track positions will be expected to contribute to the School’s advanced graduate teaching mission of the department.

The department offers degrees at the B.S., M.S., and Ph.D. levels. It is part of a major research effort by a range of Florida’s colleges and universities. The Florida State University is an equal opportunity/affirmative action employer. Women, minorities and persons with disabilities are encouraged to apply.

Georgia College & State University Department of Mathematics and Computer Science Assistant/Associate Faculty Position in Computer Science

The Department of Mathematics and Computer Science invites applications for a tenure-track position in the faculty of computer science. Salary and rank will be commensurate with qualifications. Excellent in teaching, scholarly activity, and community service are requirements for promotion and tenure. A Ph.D. is required in computer science or a computer related field. Candidates from all areas of computer science and technology are welcome to apply.

The department has approximately 130 computer science majors. The department is part of a vibrant new graduate organization, a chapter of the UPE honor society and excellent computer facilities dedicated for computer science students. The program is proposing toward CASB accreditation for computer science, is actively revising and reviewing curriculum and in planning for future growth and development. The Georgia College & State University (GC&SU) is the state’s Public Liberal Arts University (PLAU). GC&SU is the state’s Public Liberal Arts University (PLAU). We encourage visits to our campus.

Applications should be submitted by email with PDF attachments. Applications should include a current vita, a list of publications, and at least 3 letters of reference to:

Dean, College of Liberal Arts

December 21, 2002, and continue until the positions are filled.

Questions can be e-mailed to recruit@cs.gcsu.edu. Also, please arrange for at least 3 letters of recommendation to be sent to:

Application Form at: http://www.cis.dsu.edu/ postsdocapply.html

Florida International University

The Florida State University is an Equal Opportunity/Affirmative Action Employer committed to diversity in hiring, and a Public Liberal Arts University.

Georgia College & State University

Assistant/Associate Faculty Position in Computer Science

Questions can be e-mailed to recruit@cs.gcsu.edu. Also, please arrange for at least 3 letters of recommendation to be sent to:

Chairperson, Recruitment Committee Computer Science Department Florida State University Tallahassee, Fl

The Florida State University is an Equal Opportunity/Affirmative Action Employer committed to diversity in hiring, and a Public Liberal Arts University.
**Professional Opportunities**

Gustavus Adolphus College

**Department of Mathematics and Computer Science**

**Chair, Computer Science Search Committee**

To: Dr. Jeff Rosoff, Chair Computer Science

Gustavus Adolphus College invites applications for tenure-track faculty positions in the areas of databases, embedded systems, networking and programming languages. In addition our new, privately endowed, pervasive technology labs will be creating new opportunities for the College, and across the University and information technology communities.

The Department of Computer Science and Engineering at Michigan State University is part of the University’s strategic plan, established new opportunities for the College, and across the University and information technology communities. The Department occupies a spacious limestone building with extensive state-of-the-art computing facilities. The attractive wooded campus of Indiana University is located in Bloomington, chosen as one of the most cultural and livable cities in the US, and only one hour from the Indianapolis airport. To learn more about the department please visit our web site at www.indiana.edu.

Please send a detailed CV and a list of references to:

**Assistant Professor**

Dr. Jeff Rosoff, Chair

Computer Science Department

Indiana University

Lindley Hall 215

Bloomington, IN 47405-7104

email: search@cs.indiana.edu

The Computer Science Department strongly encourages applications from women and minorities.

Ithaca College

Computer and Information Sciences Department

Ithaca College invites applications for a tenure-track position in Computer Science starting 2003-04 academic year. The successful candidate is expected to teach computer science and information system courses at a variety of undergraduate levels.

The Department of Computer Science and Information Technologies at Ithaca College is a quickly growing 25 faculty member department fully accredited by the Accrediting Commission of the Association of Computing Machinery. Ithaca College, a selective, residential liberal arts college with a strong commitment to diversity, is located in the environmentally diverse Greater Ithaca Area, and is consistently ranked among the top Comprehensive Institutions in the nation by the U.S. News and World Report.

The Computer Science Department is expected to continue to grow rapidly through the hiring of several tenure-track faculty members. The Department is committed to mentoring and supporting junior faculty members. The successful candidate will be expected to engage in scholarly research and to effectively communicate ideas and concepts to students.

Qualifications: A Ph.D. in Computer Science or a closely related field is required. The successful candidate will be expected to contribute to research and teaching activities in the department. The position carries a regular teaching load and is full time.

Salary: Competitive and dependent on qualifications.

To apply, send a letter of application, vita, statement of research interests, and three names of professional references to:

Dr. Jeff Rosoff, Chair

Computer Science Department

Indiana University

Lindley Hall 215

Bloomington, IN 47405-7104

email: search@cs.indiana.edu

Ithaca College enjoys a large, park-like campus with many outdoor research facilities and natural areas. The greater Lansing area has approximately 20,000 students, and the University of Michigan is proactive in exploring opportunities for the employment of spouses, both inside and outside the University.

Candidates should submit a cover letter, curriculum vitae, the names of three references, and a statement of research and teaching interests. Applications should be received by January 15, 2003.

Michigan State University

Department of Computer Science and Engineering

Tenure-Stream Faculty Positions

The Department of Computer Science and Engineering (CSE) at Michigan State University invites applications for several tenure-stream faculty positions. Applications are invited in August 2002. Candidates from all areas of specialization in computer science will be considered. Successful candidates will be expected to contribute to both research and teaching activities in the department. The position carries a regular teaching load and is full time.

Salary: Competitive and dependent on qualifications.

To apply, send a letter of application, vita, statement of research interests, and three names of professional references to:

**Assistant Professor**

Dr. Jeff Rosoff, Chair

Computer Science Department

Indiana University

Lindley Hall 215

Bloomington, IN 47405-7104

email: search@cs.indiana.edu

Ithaca College enjoys a large, park-like campus with many outdoor research facilities and natural areas. The greater Lansing area has approximately 30,000 students, and the University of Michigan is proactive in exploring opportunities for the employment of spouses, both inside and outside the University.

Candidates should submit a cover letter, curriculum vitae, the names of three references, and a statement of research and teaching interests. Applications should be received by January 15, 2003.
November 2002 COMPUTING RESEARCH NEWS

New Mexico State University Department of Computer Science

Opening for a tenure-track assistant professor

The department has an opening for an assistant professor in any area of specialty, depending on the department's teaching needs. The successful candidate must have a Ph.D. degree or the equivalent in computer science, or a closely related discipline. A strong commitment to both research and teaching is required for a tenure-track position. Candidates for tenure-track positions should hold or be completing a Ph.D. with at least 2 years of research experience.

Successful candidates at all ranks are expected to engage in high-quality research and to contribute significantly to the teaching programs of the department. Applicants should include a vitae and the names of at least three references. All applications should be sent to:

Desh Ranjan, Faculty Search Committee
New Mexico State University
Department of Computer Science
Computer Science Building
Las Cruces, NM 88003-8001

Screening will begin November 16th. finalists will be considered until the positions are filled.

Assistant Professor, tenure-track positions

The Department of Computer Science at Purdue University invites applications for tenure-track positions beginning August 2003. Positions are available in assistant professor level; senior positions will be considered for highly qualified applicants. Applications from outstanding candidates in all areas of computer science will be considered. Areas of particular interest include security, mobile and wireless systems, computer and computer architecture, and computer engineering.

Applications are invited for the position of Department Head. The Department Head will supervise the academic and administrative operations of the Department. The Department Head is expected to strengthen the Department's research program and to develop new research initiatives. The successful candidate will hold a Ph.D. degree or the equivalent in computer science or a closely related discipline.

Applicants should hold a Ph.D. in Computer Science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree or the equivalent in computer science or a closely related discipline and be committed to excellence in both teaching and research. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree in computer science, or in a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. in computer science, or in a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. in computer science, or in a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applications should be received by December 1st, 2002.

Ohio State University Department of Computer and Information Science Assistant and Full Professors

The Department of Computer and Information Science invites applications for several tenured-track positions. The department focuses on computer science and related disciplines, including information technology, software engineering, computer systems, computer science, and computer science education. Applicants in any of these areas will be considered, with priority given to candidates with strong expertise in artificial intelligence, machine learning, computer systems, computer networks, and software engineering.

Applicants at all ranks will be considered. Applicants for assistant professor positions should have at least 2 years of research experience. Applicants for assistant professor level should be committed to excellence in teaching and research. Applicants for assistant professor level should have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree in computer science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Qualifications: Qualifications include a Ph.D. degree in computer science, or a closely related discipline, and at least 3 years of postdoctoral research experience. Applicants should have a strong commitment to both research and teaching. Successful candidates should have a strong track record of research and teaching excellence.

Applicants should hold a Ph.D. degree in computer science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree in computer science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree in computer science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree in computer science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

Applicants should hold a Ph.D. degree in computer science, or a closely related discipline, and be committed to excellence in teaching and research. Applicants should have strong potential for excellence in research. Salary and benefits are competitive. Successful candidates for assistant professor level will have completed their Ph.D. degree at the time of appointment. Successful candidates for senior positions will have demonstrated strong and successful research programs.

The University of Alabama at Birmingham (UAB) Department of Computer Science

The University of Alabama at Birmingham (UAB), a public institution, is a Carnegie Doctoral Research University. UAB has strong programs in computer science, computer engineering, and electrical and computer engineering. The university is the largest employer in the state with over 16,500 employees. It is a major corporate research institution and a leader in research and development.

The Department of Computer Science at Rice University invites applications for tenure-track assistant professor positions. Candidates for tenure-track assistant professor positions should have a Ph.D. degree in computer science or a closely related discipline and be committed to excellence in teaching and research. Successful candidates for tenure-track assistant professor positions will be evaluated and recommended for promotion to full professor.

The Department of Computer Science at Rice University invites applications for tenure-track assistant professor positions. Candidates for tenure-track assistant professor positions should have a Ph.D. degree in computer science or a closely related discipline and be committed to excellence in teaching and research. Successful candidates for tenure-track assistant professor positions will be evaluated and recommended for promotion to full professor.

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University of California, Riverside

Computer Science Department

Chair Faculty Positions

The University of California, Riverside invites applications for tenured-track faculty positions in the Computer Science Department. Applicants are encouraged to articulate and promote the department’s participatory management style, and the ability to work effectively with diverse faculty, students, staff, and colleagues. The University seeks candidates who are interested in opportunities to become involved in the management of the department. Successful candidates will be expected to develop externally funded research programs and to actively contribute to the diversity and excellence of the academic community through their research, teaching, and service.

Minimum Qualifications: For the Assistant Professor positions, applicants should hold a Ph.D. in computer science or a closely related field. For the Associate Professor position, applicants should have a Ph.D. in computer science or a closely related field and demonstrate outstanding accomplishments in their research area. For the Full Professor position, applicants should have a Ph.D. in computer science or a closely related field and have a strong record of research and teaching.

Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Review of applications will begin immediately and continue until the position is filled. For further details about the School of Engineering at UCSC, see http://www.soe.ucsc.edu/.

University of California, Santa Barbara

Biomaterials, Biomedical Materials, Bioengineering

The University of California, Santa Barbara seeks highly creative, innovative, and productive candidates for a new faculty opening in the areas of Biomaterials, Biomedical Materials, and Bioengineering. Strong candidates will have a Ph.D. and a strong background in at least one of the following areas: Biomaterials, Biomedical Materials, and Bioengineering. Successful applicants are expected to have a track record of excellence in research and teaching.

Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Further details about the University of California, Santa Barbara can be found at http://www.ucsb.edu/.

University of California, San Diego

Computers, Mathematical Sciences, Biotechnology

The University of California, San Diego seeks applications for a tenure-track position in Biotechnology. Applicants are expected to have a Ph.D. in computer science, computer engineering, or a closely related field, and demonstrate outstanding accomplishments in research and teaching.

Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Further details about the University of California, San Diego can be found at http://www.ucsd.edu/.

University of California, Santa Cruz (UCSC)

Computer Science & Engineering Department

Assistant Professor, Associate Professor, Full Professor

As part of the University of California, Santa Cruz (UCSC) Computer Science & Engineering Department (CSE), we seek candidates for faculty positions at the Assistant Professor, Associate Professor, and Full Professor levels. The positions advertised here are in addition to the new faculty openings at the junior and senior levels in fields related to robotics, computer systems, and bioinformatics. UCSC is the UC center for excellence in computer science, with a strong commitment to research with the computer industry. Researchers are expected to develop influential and successful careers in robotics, computer systems, artificial intelligence, and bioinformatics. UCSC is an active affiliate of the National Center for Research in Computing and Technology. Applicants are expected to develop innovative and influential research programs, demonstrate a commitment to excellence in research and teaching, and contribute to a diverse and inclusive academic community.

Minimum Qualifications: Ph.D. in computer science or a closely related field and a strong track record of research and teaching are required. In addition, candidates are expected to develop externally funded research programs.

Salary: Competitive salaries are available.

Deadline: Application materials must be received by December 15, 2003. Further details about the University of California, Santa Cruz can be found at http://www.ucsc.edu/.

University of California, Santa Barbara

Computers, Mathematical Sciences, Bioinformatics

The University of California, Santa Barbara seeks applications for a tenured-track position in Computer Science and Computer Engineering. Applicants are expected to have a Ph.D. in computer science, computer engineering, or a closely related field, and demonstrate outstanding accomplishments in research and teaching.

Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Further details about the University of California, Santa Barbara can be found at http://www.ucsb.edu/.

University of California, Santa Cruz (UCSC)

Computer Science & Engineering Department

Assistant Professor

As part of the University of California, Santa Cruz (UCSC) Computer Science & Engineering Department (CSE), we seek candidates for a position at the Assistant Professor level. The positions advertised here are in addition to the new faculty openings at the junior and senior levels in fields related to robotics, computer systems, and bioinformatics. UCSC is the UC center for excellence in computer science, with a strong commitment to research with the computer industry. Researchers are expected to develop influential and successful careers in robotics, computer systems, artificial intelligence, and bioinformatics. UCSC is an active affiliate of the National Center for Research in Computing and Technology. Applicants are expected to develop innovative and influential research programs, demonstrate a commitment to excellence in research and teaching, and contribute to a diverse and inclusive academic community.

Minimum Qualifications: Ph.D. in computer science or a closely related field and a strong track record of research and teaching are required. In addition, candidates are expected to develop externally funded research programs.

Salary: Competitive salaries are available.

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University of California, Santa Barbara

Computers, Mathematical Sciences, Biotechnology

The University of California, Santa Barbara seeks applications for a tenured-track position in Biotechnology. Applicants are expected to have a Ph.D. in computer science, computer engineering, or a closely related field, and demonstrate outstanding accomplishments in research and teaching.

Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Further details about the University of California, Santa Barbara can be found at http://www.ucsb.edu/.

University of California, San Diego

Computers, Mathematical Sciences, Biotechnology

The University of California, San Diego seeks applications for a tenure-track position in Biotechnology. Applicants are expected to have a Ph.D. in computer science, computer engineering, or a closely related field, and demonstrate outstanding accomplishments in research and teaching.

Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Further details about the University of California, San Diego can be found at http://www.ucsd.edu/.

University of California, Santa Cruz (UCSC)

Computer Science & Engineering Department

Assistant Professor, Associate Professor, Full Professor

As part of the University of California, Santa Cruz (UCSC) Computer Science & Engineering Department (CSE), we seek candidates for faculty positions at the Assistant Professor, Associate Professor, and Full Professor levels. The positions advertised here are in addition to the new faculty openings at the junior and senior levels in fields related to robotics, computer systems, and bioinformatics. UCSC is the UC center for excellence in computer science, with a strong commitment to research with the computer industry. Researchers are expected to develop influential and successful careers in robotics, computer systems, artificial intelligence, and bioinformatics. UCSC is an active affiliate of the National Center for Research in Computing and Technology. Applicants are expected to develop innovative and influential research programs, demonstrate a commitment to excellence in research and teaching, and contribute to a diverse and inclusive academic community.

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Salary: Competitive salaries are available.

Deadline: Application materials will be accepted until December 15, 2003. Further details about the University of California, Santa Barbara can be found at http://www.ucsb.edu/.
The University of Cincinnati
Department of Electrical & Computer Engineering
Computing Research News
November 2002

Qualified minority group members and women reference shall be shared with departmental personnel.

To apply, please mail a letter of application, curriculum vitae, statement of research and career objectives, and three letters of recommendation to:

Dr. Donald Kelly—Chair
Department of Electrical & Computer Engineering
University of Cincinnati
Cincinnati, OH 45221-0014

The University of Cincinnati is an Affirmative Action/Equal Opportunity Employer.

University of Delaware Computer and Information Sciences
Faculty and Research Scientist Positions
Applications are invited for multiple tenure-track faculty positions to begin Fall 2003. Outstanding candidates for senior positions, with a Ph.D., are encouraged to apply. Of primary interest are candidates whose research is in networks, security, software engineering, software systems and languages, cloud computing, and distributed systems.

To apply, please mail a cover letter, curriculum vitae, statements of research and teaching interests, and three letters of recommendation to:

Dr. Charles Cochrane—Chair
Department of Computer and Information Sciences
University of Delaware
Newark, DE 19716

The University of Delaware is an equal opportunity/affirmative action employer.

The University of Iowa
Computer Science Department
Assistant/Associate Professor Positions
The University of Iowa Computer Science Department invites applications for tenure-track positions at the Assistant or Associate Professor level. We will consider strong candidates in all research areas, but we wish to recruit those who work closely with expertise in graphs, IR, networks and network science, database management, information extraction, biographical databases, and computational biology.

Applications will be considered immediately and will continue until the position is filled. The University of Iowa is an Affirmative Action/Equal Opportunity Employer.

UMBC—University of Maryland Baltimore County
Faculty and Research Scientist Positions
Applications are invited for tenure-track faculty positions at the Assistant or Associate Professor level. The University of Maryland Baltimore County is an Affirmative Action/Equal Opportunity Employer.

The University of Massachusetts
Department of Computer Science
Assistant/Associate Professor Positions
The University of Massachusetts at Amherst invites applications for tenure-track positions at the Assistant or Associate Professor level.

The University of Massachusetts is an Affirmative Action/Equal Opportunity Employer.

The University of North Carolina at Chapel Hill
Computer Science Department
Postdoctoral Research Associate
The University of North Carolina at Chapel Hill invites applications for a Postdoctoral Research Associate position in the Department of Computer Science, tenure-track faculty position or a visiting faculty position.

University of Virginia
Department of Computer Science
Research Assistant/Associate Professor
The University of Virginia, a public university, is seeking applications for a Research Assistant/Associate Professor position in the Department of Computer Science.

The University of Virginia is an Equal Opportunity/Affirmative Action Employer.

University of Wisconsin
Computer Science Department
Assistant/Associate Professor Positions
The University of Wisconsin Department of Computer Science invites applications for Assistant/Associate Professor positions.

The University of Wisconsin is an Affirmative Action/Equal Opportunity Employer.

University of Wisconsin—Madison
Computer Science Department
Assistant/Associate Professor Positions
The University of Wisconsin Department of Computer Science invites applications for Assistant/Associate Professor positions.

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University of Wisconsin-Madison
Computer Science Department
Assistant/Associate Professor Position
The University of Wisconsin Department of Computer Science invites applications for an Assistant/Associate Professor position.

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University of Wisconsin-Madison
Computer Science Department
Faculty Position
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University of Wisconsin-Madison
Computer Science Department
Assistant/Associate Professor Position
The University of Wisconsin Department of Computer Science invites applications for an Assistant/Associate Professor position.

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Faculty positions

The Department of Computer Science and Information Sciences invites applications for one or more tenure track faculty positions, effective October 1, 2003. Successful candidates will be considered for positions at the rank of either Assistant Professor, Associate Professor, or Professor, at the discretion of the search committee and the University. Select candidates will be invited to a campus interview. Pay is based on rank.

Candidates should have an earned doctorate in computer science or a closely related field. Experience in research that leads to publications in refereed conferences or journals is essential. The successful candidate will be expected to establish and maintain a strong research agenda, with potential for external funding, in areas such as software architecture and security, database systems, distributed computing, and programming languages. An interest in teaching, advising, and professional service activities is also required.

Successful candidates will be expected to interact effectively with both faculty and students in a multicultural teaching and research environment. The successful candidate will be expected to contribute to the interdepartmental M.S. degree program in Software Engineering and the Ph.D. degree programs in Computer Science and Information Sciences. The successful candidate will also be expected to contribute to the University’s interdisciplinary centers, such as the School of Public Health, the Center for Science and Space, and the Nuclear Science Center.

The Department of Computer Science and Information Sciences has a long tradition of developing outstanding graduate students, conducting cutting edge research, and providing leadership in both the computer science and information science communities. In addition to the Department of Computer Science and Information Sciences, the College of Computing also offers a Master of Science in Information Technology, a Master of Science in Information Systems, and a Master of Science in Management Information Systems. Undergraduate programs are offered in Computer Science, Information Systems, and Business Information Systems. The School of Computing also offers a Bachelor of Science in Computer Science with concentrations in Software Engineering, Information Security, and Computer Science.

The University of Georgia is an Equal Opportunity/Affirmative Action Employer and is a member of the Perl Foundation. The University of Georgia does not discriminate in the employment of faculty or staff for reasons of race, gender, age, relativity, or national origin. This position is subject to the provisions of Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination in Employment Act of 1967, and the Americans with Disabilities Act of 1990.

The University of Georgia is an Equal Opportunity/Affirmative Action Employer and consistently seeks diversity among its faculty and staff. Women and minorities are especially encouraged to apply. Applications are encouraged from all qualified candidates, with particular emphasis on candidates who will contribute to the diversity of the University community.

For a complete description of the Position, visit our web site: http://www.cs.uga.edu or contact: Chair, Computer Science Search Committee, Department of Computer Science and Information Sciences, University of Georgia, Athens, GA 30602-7207, telephone (706) 542-2726, fax (706) 542-4204, email: csc-search@uga.edu.
Professional Opportunities

The University of Texas at Arlington
Computer Science and Engineering Department

The University of Texas at Arlington invites applications for tenure-track faculty at all levels and across all areas of computer science. We are particularly interested in candidates who can contribute to one or more of the sub-disciplines of computer science (e.g., architecture, software engineering, theoretical computer science) who will complement current strengths in computer security, interaction, and collaboration. Applicants should have an earned doctorate in computer science, computer engineering, or closely related fields. The successful candidate will play a role in developing the Computer Science Department and Institute for Creative Technology.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@uta.edu. The University of Texas at Arlington is an Affirmative Action/Equal Opportunity Employer.

The University of Arkansas
Computer Science Department

The Department of Computer Science at the University of Arkansas (U of A) invites applications for tenure-track appointments at all ranks. U of A has a growing PhD program with over 100 students. U of A is a Research 1 University and a Land Grant Institution. U of A has actively sought to diversify its faculty and now has 10 faculty members from underrepresented groups. U of A is a highly competitive and diversified program with 20 research centers. Faculty members have won numerous awards, have been named a Distinguished Alumnus, and a Distinguished Alumni Professor. The department ranks among the top 50 of over 500 programs in the U.S.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cse@uark.edu. The University of Arkansas is an Equal Opportunity/Affirmative Action Institution.

The University of Utah
Computer Science Department

The University of Utah Department of Computer Science invites applications for multiple tenure-track faculty positions at all levels. All areas of computer science will be considered, including: software engineering, computer security, bioinformatics, pervasive computing, multimedia and video processing, computer networking and telecommunications, database and data mining, artificial intelligence, and computer vision. The successful candidate will play a role in developing the Computer Science Department. Faculty members have won numerous awards, including a Distinguished Alumni Award and a Distinguished Polytechnic Professor Award. The University of Utah Department of Computer Science has a strong record of excellence in research, teaching, and service. We are currently a top 20 research computer science research environment, and our mission is to continue our strong growth trajectory.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@cs.utah.edu. The University of Utah is an Equal Opportunity/Affirmative Action Institution.

The University of Southern California
Computer Science Department

The University of Southern California (USC) offers tenure-track appointments in computer science at all levels and across all areas of computer science. We are particularly interested in candidates who can contribute to one or more of the sub-disciplines of computer science, such as artificial intelligence, computer security, and computer vision. Applicants should have an earned doctorate in computer science, computer engineering, or closely related fields. Applicants should be able to develop and lead a successful research program.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@usc.edu. The University of Southern California is an Equal Opportunity/Affirmative Action Institution.

The University of Texas at Dallas
Computer Science Department

The University of Texas at Dallas invites applications for tenure-track appointments at all levels and across all areas of computer science. We are particularly interested in candidates who can contribute to one or more of the sub-disciplines of computer science, such as artificial intelligence, computer security, and computer vision. Applicants should have an earned doctorate in computer science, computer engineering, or closely related fields. Applicants should be able to develop and lead a successful research program.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@utdallas.edu. The University of Texas at Dallas is an Equal Opportunity/Affirmative Action Institution.

The University of Washington
Computer Science Department

The University of Washington Department of Computer Science and Engineering offers a strong and growing PhD program with over 150 students. Our program is one of the most sought after in the country, and we welcome applications from outstanding candidates. The Department of Computer Science and Engineering is located in the Pacific Northwest, a region known for its high quality of life and excellent academic institutions. The Department is committed to diversity and inclusion, and we strongly encourage applications from candidates who are committed to diversity and inclusion.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@cs.washington.edu. The University of Washington is an Equal Opportunity/Affirmative Action Employer.

The University of Virginia
Department of Computer Science

The University of Virginia Department of Computer Science invites applications for tenure-track positions at all ranks. All areas of computer science will be considered, including: software engineering, computer security, bioinformatics, pervasive computing, multimedia and video processing, computer networking and telecommunications, database and data mining, artificial intelligence, and computer vision. The successful candidate will play a role in developing the Computer Science Department. Faculty members have won numerous awards, including a Distinguished Alumni Award and a Distinguished Polytechnic Professor Award. The University of Virginia Department of Computer Science has a strong record of excellence in research, teaching, and service. We are currently a top 20 research computer science research environment, and our mission is to continue our strong growth trajectory.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@virginia.edu. The University of Virginia is an Equal Opportunity/Affirmative Action Institution.

The University of Wisconsin-Madison
Department of Computer Science

The Department of Computer Science at the University of Wisconsin-Madison invites applications for tenure-track faculty positions at all ranks. All areas of computer science will be considered, including: software engineering, computer security, bioinformatics, pervasive computing, multimedia and video processing, computer networking and telecommunications, database and data mining, artificial intelligence, and computer vision. The successful candidate will play a role in developing the Computer Science Department. Faculty members have won numerous awards, including a Distinguished Alumni Award and a Distinguished Polytechnic Professor Award. The University of Wisconsin Department of Computer Science has a strong record of excellence in research, teaching, and service. We are currently a top 20 research computer science research environment, and our mission is to continue our strong growth trajectory.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@cs.wisc.edu. The University of Wisconsin is an Equal Opportunity/Affirmative Action Institution.

The University of Wisconsin-Milwaukee
Computer Science Department

The Computer Science Department at the University of Wisconsin-Milwaukee invites applications for tenure-track faculty positions at all ranks. All areas of computer science will be considered, including: software engineering, computer security, bioinformatics, pervasive computing, multimedia and video processing, computer networking and telecommunications, database and data mining, artificial intelligence, and computer vision. The successful candidate will play a role in developing the Computer Science Department. Faculty members have won numerous awards, including a Distinguished Alumni Award and a Distinguished Polytechnic Professor Award. The University of Wisconsin Department of Computer Science has a strong record of excellence in research, teaching, and service. We are currently a top 20 research computer science research environment, and our mission is to continue our strong growth trajectory.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@cs.uwm.edu. The University of Wisconsin is an Equal Opportunity/Affirmative Action Institution.

The University of Wyoming
Computer Science and Computer Engineering

The University of Wyoming College of Engineering and Technology offers positions at all ranks. All areas of computer science will be considered, including: software engineering, computer security, bioinformatics, pervasive computing, multimedia and video processing, computer networking and telecommunications, database and data mining, artificial intelligence, and computer vision. The successful candidate will play a role in developing the Computer Science Department. Faculty members have won numerous awards, including a Distinguished Alumni Award and a Distinguished Polytechnic Professor Award. The University of Wyoming Department of Computer Science has a strong record of excellence in research, teaching, and service. We are currently a top 20 research computer science research environment, and our mission is to continue our strong growth trajectory.

Applicants should submit a letter of interest, curriculum vitae, a research statement, and names and addresses of at least four references. The application should be sent electronically to cssearch@uwyo.edu. The University of Wyoming is an Equal Opportunity/Affirmative Action Institution.