University of Massachusetts Amherst

Fall 2003

Significant BITS

Newsletter of the
Department of Computer Science

Major new collaborative research efforts funded

The Department obtained major new funding for collaborative research this year. As part of a team with the UMass Electrical and Computer Engineering Department, computer science faculty led by Jim Kurose have been awarded funding for a National Science Foundation (NSF) Engineering Research Center (ERC). In addition, the faculty are involved in four new NSF medium Information Technology Research (ITR) grants.

Both types of funding are very competitive and proposals have low success rates. The newly funded NSF ERC Center, Collaborative Adaptive Sensing of the Atmosphere (CASA), is one of only four new centers created in a year in which more than 100 teams competed for the prestigious designation. The NSF ITR Program reviewed 1,475 proposals this year for the medium level award and funded approximately ten percent of the proposed projects. "Our success with both the ERC and the ITR awards is a clear demonstration of the quality of our faculty and the computer science program at UMass Amherst," says computer science chair Bruce Croft.

CASA Engineering Research Center

In the CASA Engineering Research Center, computer science faculty will collaborate on research and development of next-generation atmospheric sensing capabilities. Revolutionary sensing technology that will enable earlier and more accurate forecasts of weather emergencies will be at the heart of the $40 million center. Funded in part by the NSF, CASA is expected to increase the warning time for tornadoes, flash floods, and other severe weather disturbances, and to have far greater accuracy than existing systems.

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Harald Richter photo

The analytic web

The Internet has irrevocably changed the way scientific research is undertaken. Huge volumes of data, stored on computers all over the world, are now available to scientists everywhere. As a result, observations taken around the globe can be accessed quickly by scientists, raising the prospect of accelerated formulation and validation of scientific hypotheses. Extensive computing power, mass storage, and fast Internet access seem poised to foster rapid expansion of scientific knowledge.

But there are risks associated with this attractive scenario. The ways in which scientists acquire and process data must be understood by those who use these methods. Failure to take this information into account can lead to misuses that, in turn, can lead to misleading or incorrect results.

To address these issues, the Analytic Web

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NEWS

Major new research .....

(from page 1)

A student from U. Puerto Rico uses UMass equipment to do remote sensing in Oklahoma

"This new Engineering Research Center is another example of how UMass Amherst's academic and scientific expertise has a profound, positive impact on our society," said John V. Lombardi, UMass Amherst chancellor. "As a result, this center has the ability to save millions of dollars and protect many lives by identifying severe weather systems much sooner than any system currently in use."

UMass Amherst will lead a multidisciplinary team of engineers and computer scientists from UMass as well as engineers, meteorologists, atmospheric scientists, and sociologists from partner institutions, including the University of Oklahoma, Colorado State University, and the University of Puerto Rico, Mayaguez. CASA's industry partners include Raytheon, IBM, MA/COM, Vaisala, Vieux and Associates, Telephonics, and The Weather Channel. Government partners include NOAA's National Severe Storms Laboratory and Oak Ridge National Labs. The UMass Principal Investigators are CASA Director David McLaughlin (Armstrong Professor in Electrical and Computer Engineering), and Computer Science Professor Jim Kurose. Computer Science professors Victor Lesser, Prashant Shenoy, and Don Towsley are leading research efforts in computational and networking aspects of CASA.

"From the radar endpoints to in-network processing, to control points, to storage -- computing is everywhere in this system. This is a terrific example of a new, emerging class sensor-driven application in computer science," says Kurose. "We're all thrilled to be teaming with our colleagues in ECE, at other academic institutions, and in industry."

Echoing that sentiment, McLaughlin noted, "This is an essential partnership. We're tackling a problem that just can't be solved without this essential mix of multidisciplinary collaborators."

Today's forecasting systems employ high-power, long-range radars that are blocked from observing the lower part of the atmosphere by the earth's curvature. This means, for example, that today's sensors cannot be used to observe tornadoes that begin close to the ground. CASA can overcome the blockage effects of the earth's curvature by arranging low-cost, dense networks of radars operating at short range. A new generation of meteorological software will use this radar data to support organizations that need weather data for decision making: government, emergency managers, and private industry. These new sensor systems will be used for more than severe weather detection – for example, they could track low-level winds that transport pollutants throughout the atmosphere.

UMass and its partners will operate CASA and will be aided by $40 million in funding over a five year period. This includes a $17 million grant from the NSF ERC program, $5 million from the Commonwealth of Massachusetts, contributions from academic partners, plus nearly $6 million from corporations and in-kind donations.

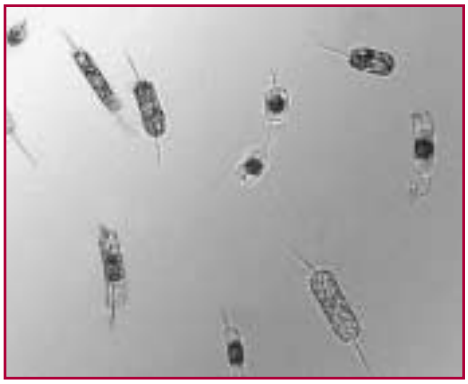
The first field test of CASA will be conducted in mid-2005 in Oklahoma and will cover roughly 20 percent of the state – a region that experiences approximately 22 tornadoes per year. The second test will be in Houston, where CASA will deploy a system to predict floods more accurately. A third test, in Puerto Rico, will improve monitoring of hurricanes as they approach land.

The NSF currently funds 24 engineering research centers nationwide. The centers are designed to partner university researchers with industry and government practitioners, in order to tackle issues too complex and expensive for one sector alone. All engineering research centers must also have a large educational component. CASA has plans to introduce schoolchildren to engineering using the appeal of weather. University students will work in teams alongside industrial practitioners and academic researchers, to design and test sensors in the field, and will work with end-users to interpret sensor data.

NSF ITR grants announced

Among this year's NSF ITR recipients, the Computer Vision Lab has been awarded a grant for collaborative research in marine science with Bigelow Laboratory, a leading ocean science lab located in Boothbay Harbor, Maine. The 5-year project is focused on the development of environmental monitoring tools for marine scientists that, among other things, would allow early detection of harmful algal blooms along the coast. This grant, "Interactive Software Systems for Expert-Assisted Image Analysis and Classification of Aquatic Particles," is under the direction of Professor Edward Riseman (PI), Professor Allen Hanson, Associate Professor Paul Utgoff (co-PI) and Senior Research Scientist Howard Schultz (co-PI). The research involves determination of species of aquatic organisms using vision, classification, and learning methodologies applied to several different underwater microscopy imaging systems. The research team intends to produce common software tools that can effectively address the specific challenges unique to the varying imaging instruments and classification needs of marine science applications.

underwater cell microscopy images



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FACULTY

Department welcomes new faculty

Mark Corner

Mark Corner joined the Department as an Assistant Professor this fall. "The collegial, collaborative atmosphere was a big factor in my decision to come here. I am extremely excited to start teaching and working with students," says Corner.

Corner's research focuses on the performance, security, and usability of mobile computing systems. He has also made contributions in the areas of adaptive multimedia systems and broadband networking. "I am interested in applying experimental computer science to problems such as performance, reliability, energy consumption, and usability," says Professor Corner.

One area of Corner's research addresses the problem of authentication in mobile systems. "Currently, systems assume that the user typing now is the same person who supplied a password days ago," says Corner. "Such persistent authentication is inappropriate for mobile and ubiquitous systems because associations between people and devices are fleeting."

His solution to this problem is Transient Authentication. In Transient Authentication, a user wears a small hardware token that authenticates the user to other devices over a short-range, wireless link. Because the token is worn, it is unlikely to be set down, lost, or stolen. Corner's work presents three protection mechanisms to protect the device from physical attacks, one for file systems and two for applications. The first protection mechanism is a cryptographic file system named ZIA which uses encryption to secure files on the disk using keys available only from the token. The second mechanism transparently encrypts the memory of the user processes when the user walks away. The third provides an Application Programming Interface (API) for processes to utilize token services.

As Corner continues working on solutions to problems in software systems and mobile computing, one of his goals is to design projects that provide him with opportunities for collaboration with other researchers. "There is such a broad range of research in the Department; plenty of opportunities are starting to present themselves," says Corner. He is also looking forward to teaching at UMass, and says, "The opportunity to teach undergraduate and graduate students is one of the primary reasons that I am pursuing an academic career."

Corner received his Ph.D. in Electrical Engineering Systems from the University of Michigan. He received the Best Student Paper award at the Eighth ACM Conference on Mobile Computing and Networking (Mobicom '02) for "Zero-Interaction Authentication," and Corner was an Intel Foundation Graduate Fellow 2001-2002.

"My door is always open to students and faculty. Anyone interested in experimenting with cutting edge mobile systems should come by for a chat," says Corner.

Andrew McCallum

After a national search for new faculty, the Department recruited a professor from within its own ranks. Andrew McCallum, who has been a Research Associate Professor in the Department since 2002, begins this fall as a tenure-track Associate Professor.

"I've had a wonderful first year advising students and doing research at UMass, but I also love to teach. I'm now looking forward to deeper involvement in teaching here as well," says McCallum.

His particular interests include natural language processing, information extraction, Web mining, and finite-state models, all explored with the tools of statistical machine learning. Since arriving, McCallum has taught seminars in "Statistical Information Extraction" and "Computational Social Network Analysis." In the future he will also be teaching courses in natural language processing at the undergraduate and graduate level.

During the past year, McCallum was affiliated with the Department's Center for Intelligent Information Retrieval (CIIR) and the Knowledge Discovery Laboratory (KDL). He also collaborated with faculty in a number of other areas. He has expanded from advising only one student when first at UMass; McCallum now leads a research team of seven graduate students, one undergraduate, and a senior researcher.

McCallum has been focusing on a number of new initiatives while at UMass. He is part of an SRI International research team developing a "Cognitive Agent that Learns and Organizes" (CALO), funded through DARPA's IPTO. He is also working with Aptima, Inc. on a DARPA STTR-funded project to automate the diagnosis of usability reports. As PI with Research Assistant Professor David Jensen, McCallum was recently awarded an NSF Medium ITR to explore unified statistical models of information extraction and data mining. Their new research will be demonstrated in the construction of a public Web portal of scientific research and the social network of researchers. This past year McCallum and his students have also created MALLET, a Java toolkit for machine learning applied to natural language, which is now in use at CMU, MIT, UPenn, and several other universities.

Before joining UMass in 2002, McCallum was Vice President of Research and Development at WhizBang Labs and directed the company's 30-person research lab in Pittsburgh, PA. He also held an adjunct faculty position at Carnegie Mellon University, where he co-advised several Ph.D. students and helped teach courses. Prior to WhizBang, he was a Research Scientist and Coordinator at Just Research (Justsystem Pittsburgh Research Center), where he spearheaded the development of methods for statistical text processing. McCallum was a post-doctoral fellow at Carnegie Mellon after receiving his Ph.D. in computer science from University of Rochester in 1995. His Ph.D. work, which was nominated for the ACM Best Thesis Award, did not focus on text, but rather on models of short-term memory and selective perception for reinforcement learning agents and humans.

The Department: then and now

by Rick Adrion

"Welcome back, your dreams were your ticket out. Welcome back, to that same old place that you laughed about. Well, the names have all changed since you hung around, but those dreams have remained and they've turned around …" Welcome Back Kotter *theme song.*

For the last four years, I have spent much of my time at the National Science Foundation. I served part-time for the first few months and the last year, and I returned each week for one day plus the weekend while I was full time. Still, it seems like a homecoming from a long absence.

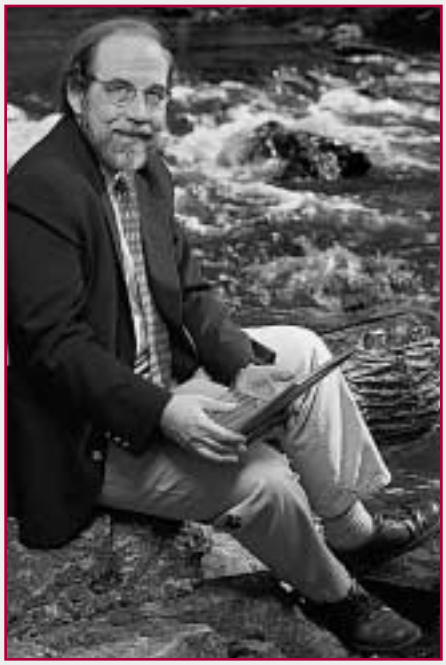
Of course I followed the news about UMass in the *Washington Post,* and tried to catch up with colleagues when I had a chance. There was substantial coverage of our System President, William Bulger, and some coverage of the budget cuts that higher education has suffered in Massachusetts (as has occurred in most states and for many public and private institutions). What I discovered on my return was that for the Amherst campus and for the Computer Science Department, in particular, the truth has been quite a contrast.

We have a new Chancellor, John Lombardi, who came to the campus in 2001 from the University of Florida where he had served as president for 10 years. We have a new Dean of Natural Sciences and Mathematics, Leon Osterweil, who is a member of the Computer Science Department. We have a new chair, Bruce Croft, who is continuing the excellent leadership of our previous chair, Jim Kurose.

I had very active and prominent colleagues before I left (19 fellows of the ACM, IEEE, AAAI and/or AAAS; 12 colleagues who had won outstanding teaching awards; 3 who hold the University's highest rank, Distinguished University Professor; the faculty hold 50 journal editor and editorial board positions; etc.), but now the Department has grown, adding six assistant professors (with a seventh to join in January) and three associate professors in the last few years. We now have 37 faculty members active in research and teaching. We expect to add several more new faculty members for AY 2004-5. In the last five years, enrollments have increased dramatically with a 68% increase in graduate students and a 79% increase in undergraduate majors. Administrative and technical staff support has grown from 78 to 93, with over a 40% increase in technical staff support. Our research funding continues to increase, reaching $12.4M in FY2001. Our success in the NSF CAREER program, the NSF ITR program and our key role in the recently announced $40M NSF Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere (CASA) will cause our research revenues to continue to grow.

At the campus level the cuts were severe, however, under Chancellor Lombardi's leadership, we emerged leaner but stronger. Chancellor Lombardi is a person with substantial charisma, but more importantly he completely understands the qualities that make a university great and he knows how to set priorities. In his words "through this incredibly difficult and painful process, I have been heartened by the strength and effectiveness of the people of UMass Amherst [who] have found the creativity and commitment to carry us through this period with the minimum damage to our core academic strength." What he has done is run an open process to deal with our budget struggles and made the hard decisions. All of the indicators are up: increased research funding, increased revenues from distance education and intellectual property, and substantial increases in gifts and donations. We are embarking on the largest building program in some years, aggressive faculty and staff recruiting to replace those lost to early retirement programs, and the first growth in student enrollments since the 1960s.

Ben Barnhart photo



Rick Adrion

The biggest adjustment for me is the change in the faculty. **Prashant Shenoy** (Ph.D. 1998 from Texas-Austin, interests in multimedia systems, operating systems, computer networks, and distributed systems) joined in 1998 just as I was leaving (as *officially* did **James Allan** and **Raghavan Manmatha**, but both had been in the Department earlier). Among the new additions to the faculty are: **Micah Adler** (joined in 1999 from Toronto, Ph.D. 1996 from Berkeley, interests in algorithms, communication networks, parallel and distributed systems, and theoretical computer science); **Emery Berger** (joined in 2002, Ph.D. 2002 from Texas-Austin, interest in operating systems, memory management, programming languages and compilers, and application of theory to systems work for robustness); **Oliver Brock** (joined in 2002 from Stanford where he received his Ph.D. in 1999 having spent some time at Rice, interests in robotics, mobile dexterous manipulation, motion planning, computer vision, and structural biology); **Mark Corner** (joined in 2003, Ph.D. 2003 from Michigan, interests in mobile and pervasive computing, security, file systems, and distributed systems); and **Brian Levine** (joined in 1999, Ph.D. 1999 from Santa Cruz, interests in computer networks, network security, and group communication). **David Kulp** (Ph.D. 2003 Santa Cruz) will join us in January 2004 from Affymetrix where he heads the bioinformatics program. The three new associate professors include: **Sridhar Mahadevan** (joined in 2001 from Michigan State where he was associate professor of

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RESEARCH

The analytic web

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project, funded by the NSF ITR program, is investigating computer support for web-based scientific processes. This project brings together researchers from the UMass Computer Science Department and from Harvard Forest to explore automated support for defining, analyzing, and automating scientific processes. Professors Lee Osterweil and Lori Clarke are leading the software engineering effort; Research Assistant Professor David Jensen is providing statistical analysis expertise; and Vision Lab researchers, Professor Ed Riseman, Professor Al Hanson, and Senior Research Scientist Howard Schultz, are working closely with the Harvard Forest researchers on collecting data and carefully defining ecological processes. The ecologists from Harvard Forest (Emery Boose, Aaron Ellison, David Foster, and Julian Hadley), are concerned with measuring and predicting forest carbon dioxide sequestration.

The ecologists gather data from a flux tower, a 10-meter structure located in Petersham, MA, in the midst of Harvard Forest. The flux tower takes in ambient air and measures the percentage of carbon dioxide in the air five times per second. These measurements are affected by various natural phenomena such as temperature, wind speed, and tree species (identified by aerial photographs that are evaluated by the Vision Lab). The ecologists apply and evaluate a number of cleansing, estimation, and statistical processes with the aim of determining a model of forest carbon dioxide sequestration. It is clear that such findings can have a substantial impact on policies aimed at addressing the control of greenhouse gases, which lead to global warming. These processes also serve as excellent case studies for the researchers' investigation into support for the Analytic Web.

Central to this investigation is a careful study of the models needed to represent scientific processes effectively. This aspect of the work builds upon Osterweil's ongoing research that is aimed at developing languages for the specification of processes. Originally focused on languages for defining software development processes, this work has recently widened its focus to address processes in such diverse areas as medical procedures, government functions, and electronic commerce. It has led to the development of Little-JIL, a graphical language that incorporates representations of such semantic issues as exception management, resource utilization, timing constraints, and concurrency control. "These are all essential to the articulate definition of processes, but most are absent from current process definition languages," says Osterweil. "Thus our intention is to use Little-JIL as a starting point in our efforts to model scientific processes, expecting that experience will point the way towards modifications and enhancements needed to support working scientists."

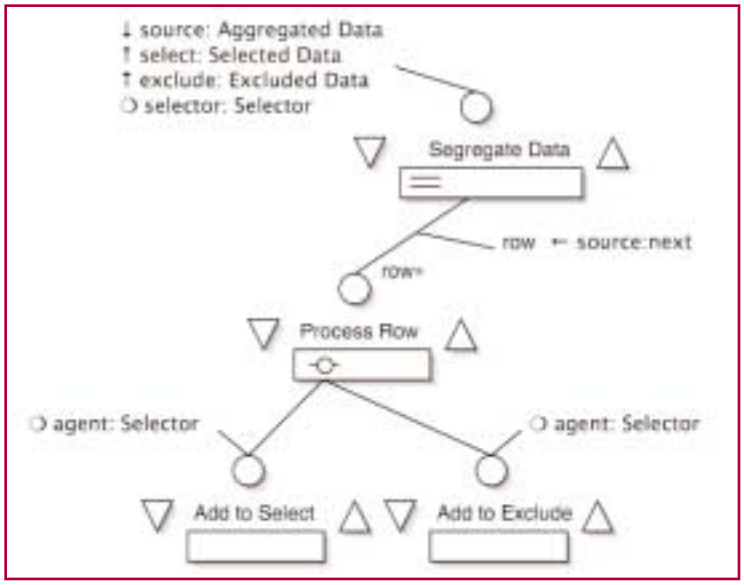

Figure 1: Little-JIL Process for Cleansing Data

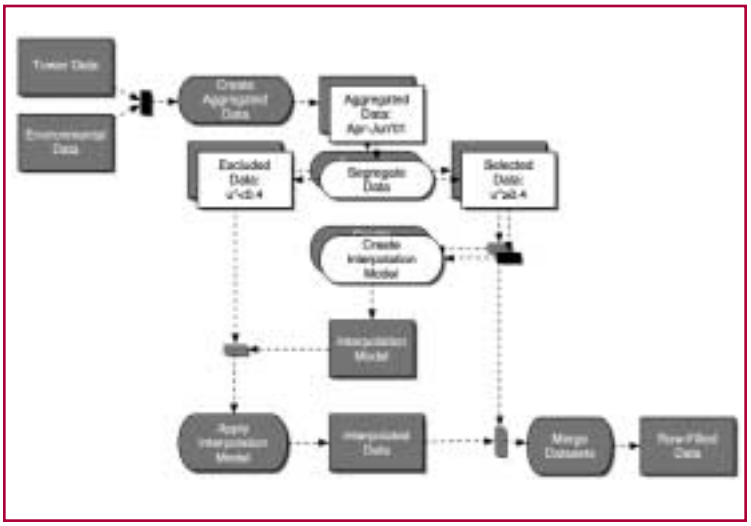

Figure 2. Derivation Model for Carbon Dioxide Sequestration Evaluation

Figure 1 shows a small part of a Little-JIL process for cleansing the carbon dioxide data collected from a flux tower. One of the team's first findings has been the need to complement the process model with a derivation model. A derivation model is similar to a data-flow model or state diagram, in that it shows how types of data are processed, but it must also distinguish data instances, as Figure 2 illustrates.

The derivation model and process model together carefully document the processing applied to various instances of the dataset. The description is adequate to be used as the basis for execution. Thus, in documenting their processes, scientists are provided with an execution framework. Although there is considerable work to be done on the models and the user interface for such a framework, the ecologists have already found it preferable to their current programming environment (don't ask!). "In the future, we plan to investigate using such models to support automatic rederivation and configuration management," remarks Osterweil.

Another central theme in this project is analyzing the soundness of scientific processes. Clarke is leading this effort, building upon her previous research in finite-state verification. In this research, Clarke and her colleagues are developing an analyzer, called FLAVERS, capable of determining whether or not user-specified properties, describing desirable (or undesirable) sequences of events, can occur on

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Major new research

(from page 2)

Associate Professor Andrew McCallum (PI) and Research Assistant Professor David Jensen (co-PI) have teamed up on a five-year NSF ITR project on Unified Graphical Models of Information Extraction and Data Mining with Application to Social Network Analysis. This project aims to improve the ability to data mine information previously locked in unstructured natural language text. The research focuses on developing novel statistical models for information extraction and data mining that have such tight integration that the boundaries between them disappear, resulting in a powerful unified framework for extraction and mining. The new algorithms will be applied to the creation of two large-scale databases with useful, publicly-available website front-ends: one concerning scientific research, the other government information. Mining these databases will enable insight into government efficiency and the flow of scientific ideas.

In another five-year ITR project, "Peer-to-Peer Networking Theory," Assistant Professor Micah Adler (PI) will collaborate with researchers at Columbia University, including Columbia co-PI and CS alumnus Dan Rubenstein (Ph.D. 2000), and Polytechnic University of New York to combine expertise in computer networking, the Internet, and distributed systems along with modeling, stochastic networks, optimization and distributed algorithms. It is expected that Peer-to-Peer (P2P) networking will revolutionize the Internet and computing over the next ten years. Adler's ITR project is motivated by two fundamental challenges in studying P2P networks: (i) P2P systems are enormously complex and create a networking environment that is significantly different from the traditional client/server model, and (ii) it is difficult to evaluate new design proposals through online experimentation and simulation. Thus, there is a significant need for theoretical evaluation, design and analysis of P2P systems.

Computer Science Professors Jim Kurose (PI), Brian Levine, Prashant Shenoy (co-PI), and Don Towsley (co-PI) are teaming with UMass Engineering Professors Lixin Gao (co-PI), Weibo Gong, and Tilman Wolf (co-PI) on the five-year project "Hyperion - next generation measurement infrastructure and application use." This fundamental, cross-disciplinary research project is aimed at the design, development, and application-use of a next generation of distributed, high-performance passive network measurement infrastructure. The project will be divided into four efforts: (i) the design, development, and prototype implementation of a new network measurement node architecture based on the use of next-generation network processor (NP) chips; (ii) the use of multiple Hyperion nodes to enable a much richer set of network-management and traffic-profiling capabilities; (iii) the exploration of a number of application-level uses of Hyperion nodes, including fault-detection, overlay support, and traffic characterization; and (iv) working with network providers to understand network-management needs, and to demonstrate Hyperion capabilities. The UMass team will involve collaborations with the UMass Office of Information Technologies (OIT), the staff of the Massachusetts Information Turnpike Initiative (MITI), and Sprint. In commenting on the award, Professor Kurose noted, "We're excited to have won this award. The five-year timeline, and the collaborations between departments and with network providers will give us a great opportunity to make fundamental advances here."

The ITR program encourages and stimulates innovative, high-risk yet high-return multidisciplinary research that extends the frontiers of information technology, improves our understanding of its impacts on society, helps prepare Americans for the Information Age, and reduces the vulnerabilities of society to catastrophic events, natural and man-made. In addition to augmenting the nation's information technology knowledge base and strengthening the information technology workforce, the ITR program fosters visionary work that could lead to major advances, new and unanticipated technologies, revolutionary applications or new ways to perform important activities.

Then and now

(from page 4)

computer science, Ph.D. 1990 from Rutgers, interests in artificial intelligence, cognitive science, machine learning, reinforcement learning, robot learning, and sequential decision-making); **Andrew McCallum** (joined in 2002 from WhizBang Labs where he was director of R&D, Ph.D. 1995 from Rochester, interests in information extraction, text data mining, statistical natural language processing, and machine learning) and **Hava Siegelmann** (joined in 2001 from the Technion where she was head of the information systems department, Ph.D. 1993 from Rutgers, interests in biological and physical computation, neural computation, adaptive information systems, machine learning and knowledge discovery, theory of analog and adaptive systems, and bioinformatics).

We have experienced some losses to faculty departures and retirements, but many of these remain active collaborators or participants in the Department. I was sad that Kathryn McKinley, one of my last hires as department chair, had left for Texas, but I was pleased to discover at the first faculty meeting that another of my last hires, **Ramesh Sitaraman,** has been lured back from Akamai (The other two of my last hires in 1994 are **Shlomo Zilberstein**, and our new dean, **Lee Osterweil**). Kathryn and Krithivasan Ramamritham both left for family reasons, but Kathryn continues her close collaboration with Chip Weems and Eliot Moss on the DaCapo Project and Krithi remains an adjunct professor in the Department and directs Ph.D. students. I have to be happy for research faculty members, Jamie Callan, Susan Landau, and Barb Lerner, who left for CMU, Sun Microsystems, and Williams College respectively. Jamie still works with the CIIR group and Barb participates in the LASER laboratory. Susan lives in Amherst and we see her often. I do feel older with several colleagues taking early or regular retirement: B**ob Graham, Robin Popplestone, Dave Stemple,** and just this Fall, **Ed Riseman,** have joined the ranks of faculty emeriti. Bob is still teaching. Ed is still directing the Vision Lab. Robin and Dave spend much of their time in the British Isles, but Dave still has his home in nearby Hatfield.

So the names have all changed … but [the] dreams have remained and they've turned around … It's great to be back. UMass is as an exciting place to be now as it has been in my 17+ years in (and out) of Amherst.

AWARDS

Croft receives major research award

Alistair Moffat photo

Susan Dumais presents Bruce Croft with Salton Award

Distinguished Professor and Computer Science Chair W. Bruce Croft recently accepted the Gerard Salton Award during the ACM Special Interest Group in Information Retrieval (SIGIR) Conference in Toronto. The prestigious Salton award is presented every three years to an individual who has made and continues to make significant and sustained contributions to research in information retrieval.

Croft was honored for his contributions to the theoretical development and practical use of Bayesian inference networks and language modeling for retrieval, and to their evaluation through extensive experiment and application. In addition, the UMass Center for Intelligent Information Retrieval (CIIR), which he founded, illustrates the strong synergies between fundamental research and its application to a wide range of practical information management problems.

In accepting this award, Croft joins a small and distinguished group of recipients: Gerard Salton, Karen Sparck-Jones, Cyril Cleverdon, William Cooper, Tefko Saracevic, and Stephen Robertson. Established in 1983 as the SIGIR Award, this award was renamed the Salton Award in 1997 for Gerard Salton, Professor of Computer Science at Cornell University and preeminent figure in the field of information retrieval, who died in August 1995.

Towsley accepts NSM faculty research award

At the UMass College of Natural Science and Mathematics (NSM) fall convocation, Distinguished Professor Don Towsley received the outstanding faculty award for research, which has been presented since 2001 to honor faculty members for their research contributions. Departments make nominations for the faculty awards and the selections are made by a college-wide committee appointed by the NSM Dean.

Towsley was nominated and selected for his sustained record of truly outstanding research achievements in the areas of networking and computer systems. He has established himself as a pioneer and a leading scholar over a career spanning nearly three decades. His research efforts have resulted in the development of foundational modeling and analysis techniques that have been used by researchers worldwide to model, predict, and analyze the performance of computer and communication systems. Towsley has also developed important new network protocols and mechanisms, built upon the broad, principled, and rigorous foundations that are the hallmarks of his research.

He has held editorial board positions in the top journals in his field, including the *Journal of the ACM, IEEE Transactions on Communications, IEEE/ACM Transactions on Networking, Performance Evaluation,* and *Networks*. He has held major conference positions in addition to a number of Program Committee positions. Towsley also served as Technical Program co-chair of ACM Signmetrics. He currently is chair of the IFIP working group in performance modeling.

Beyond leadership within technical societies, Towsley is recognized as a leader in his field – one who not only works on, but who also defines the cutting edge of research. He has been elected a Fellow of both the Association of Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE), the two major technical societies in the field of computer science and engineering. He has received two Best Paper awards from the most prestigious conference in his field. Several of his students have been nominated for, and in one case has won, an ACM Dissertation Award.

To learn about news and upcoming events, click "Department Calendar" at www.cs.umass.edu

University of Massachusetts Amherst

Alum Matters

Vol. 4, No. 4 • Fall 2003

A newsletter for alumni of the Department of Computer Science

Tic-tac-toe with DNA

"Playing to win at DNA computation" is how a recent issue of *Nature Biotechnology* described the work of Darko Stefanovic (Ph.D. '99). He and his collaborators developed a molecular automaton that can play tic-tac-toe. The report about the automaton was picked up by media around the world.

"It was quite surprising to see our experiment reported as far away as the *Sunday Times* of Sri Lanka," says Stefanovic. All the team set out to do was to show that they could combine many molecular logic gates to work in parallel, and tic-tac-toe was a challenging example for the researchers. "The hard part was developing a comprehensive set of gates in the first place," notes Stefanovic. "Rendering a game strategy in a single layer of logic was a curious combinatorial exercise in its own right, though."

Stefanovic has been an Assistant Professor in the Computer Science Department at the University of New Mexico since 2000. Before that, he held a postdoctoral position at Princeton University. His dissertation was in the area of memory management, with advisor Associate Professor Eliot Moss.

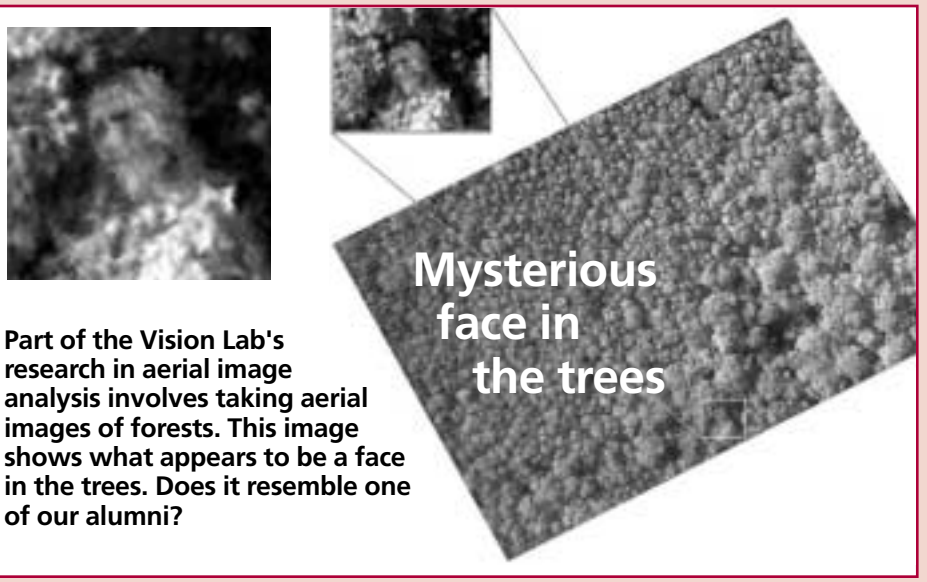
"I continue to work closely with Eliot and with [former Associate Professor] Kathryn McKinley on programming language research, but I could not resist the lure of working in a nascent field. In software systems, everything is possible; here nothing can be taken for granted. It took us a while to build a simple half-adder!" adds Stefanovic. "We have, for the first time, computational elements whose operation parallels that of silicon circuits, built of biochemical molecules. In fact, they are compatible with living cells. We can combine the decision-making gates with sensor elements to detect cell disease markers, and with actuators to release drug molecules."

The automaton uses deoxyribozymes (nucleic acid enzymes) for logic gates. High concentrations of particular oligonucleotides (short single-stranded pieces of DNA) indicate the presence of the signal, or logical 1. Oligonucleotides that serve as gate inputs bond with deoxyribozymes allosterically, and can thus activate them or in some cases inhibit them. Active deoxyribozymes produce gate output molecules, which are also oligonucleotides. Multiple gates can be connected in a variety of ways. The specificity of DNA base-pair matching ensures that each signal oligonucletide acts only upon its own gate. In principle, thousands of signals (corresponding to wires in silicon logic) can be present simultaneously in the solution.

Stefanovic's work is supported by the National Science Foundation, through the ITR, CAREER, and QuBIC (Quantum and Biologically Inspired Computation) programs.

Alumni and friends reception

We're planning a reception for Alumni and Industrial Affiliates on Friday, June 4, 2004. This coincides with the UMass Amherst Alumni Reunion Weekend of June 4 - 6. Details can be found on our web pages at **www.cs.umass.edu/reception**. We hope that you'll be able to join us.



Part of the Vision Lab's research in aerial image analysis involves taking aerial images of forests. This image shows what appears to be a face in the trees. Does it resemble one of our alumni?

Where have they gone?

The Department is proud to have graduated ten students with Ph.D.s over the past year. They include:

- Zihui Ge: "Interest-Based Content Retrieval and Dissemination in Distributed Environments" (Jim Kurose and Don Towsley, Advisors); Senior Postdoctoral Research Associate, Computer Science Department, UMass Amherst
- Bill Hesse: "Dynamic Computational Complexity" (Neil Immerman, Advisor); Assistant Professor, Department of Math and Computer Science, Clarkson University
- Ping Ji: "Design, Analysis and Signaling for Advanced Distributed Network Services" (Jim Kurose and Don Towsley, Advisors); Assistant Professor, Mathematics Department, John Jay College of Criminal Justice, City College of New York, City University of New York
- Dawn Lawrie: "Language Models for Hierarchical Summarization" (Bruce Croft, Advisor); Assistant Professor, Department of Computer Science, Loyola College
- Benyuan Liu: "Design and Performance Modeling of Wireless Networks" (Don Towsley, Advisor); Assistant Professor, Department of Computer Science, City College of New York, City University of New York
- Anita Raja: "Meta-Level Control in Multi-Agent Systems" (Victor Lesser, Advisor); Assistant Professor, Department of Software and Information Systems, University of North Carolina, Charlotte
- Srinivas S. Ravela: "On Multi-Scale Differential Features and their Representations for Image Retrieval and Recognition" (Allen Hanson, Advisor); Postdoctoral Research Associate, Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology
- Michael T. Rosenstein: "Learning to Exploit Dynamics For Robot Motor Coordination" (Andy Barto, Advisor); Senior Postdoctoral Research Associate, Computer Science Department, UMass Amherst
- Jonathan K. Shapiro: "Directions in Optimization-Based Congestion Control" (Don Towsley, Advisor); Assistant Professor, Department of Computer Science and Engineering, Michigan State University
- Hariharasubrahmanian Shrikumar: "Dynamic composability- Building Flexible Complex Real-time Systems" (Krithi Ramamritham, Advisor); CTO of Ipsil, Inc.

Alumni Connections

Jamie Callan (Ph.D. '93) became a tenured Associate Professor in the School of Computer Science at Carnegie Mellon University. Prior to joining CMU, Callan was a UMass Computer Science Department Research Assistant Professor and the Assistant Director of the Center for Intelligent Information Retrieval (CIIR). Professor Bruce Croft advised Callan while he was a student at UMass.

Columbia University Associate Professor **Henning Schulzrinne** (ECE Ph.D. '93), advised by Professor Jim Kurose while a graduate student at UMass, was honored with the 2003 New York City Mayor's Medal for Excellence in Science and Technology. The award recognizes outstanding achievements in science and technology by individuals who live or work in New York City. Mayor Michael Bloomberg presented the medal to Schulzrinne at the Brooklyn Botanical Garden in October.

Ping Xuan (Ph.D. '02), advised by Professor Victor Lesser, has taken an Assistant Professor position in the Department of Math and Computer Science at Clark University in Worcester, MA.

Daniel J. Barrett (Ph.D. '98) just published his fourth computer book, *Linux Security Cookbook*, with O'Reilly & Associates. Co-authored with Richard Silverman and Robert Byrnes, the book presents targeted solutions to computer security problems on Linux systems. Barrett and his family live in Boston, where he is a senior technology manager at VistaPrint (**www.vistaprint.com**). He can be reached at dbarrett@blazemonger.com.

Advised by Victor Lesser while a student at UMass, **Frank Klassner** (Ph.D. '96) became a tenured Associate Professor at Villanova University this fall. In addition, Klassner has been awarded an Education Innovation grant from the CISE Directorate at the National Science Foundation. In this project, Klassner will develop software and laboratory modules to use LEGO® MindStorms™ robotics to enhance undergraduate Computer Science curricula across the United States. This past year, Villanova began a co-op program with the Vatican's Web Development Office. Klassner is looking forward to both training students for work at the Vatican office and to working there himself as a scholar.

Alumni updates needed!

What have you been up to lately? Keep in touch with other alumni. Tell us where you are living and working and we'll include your information in **Alumni Connections**.

Email us at: alumni@cs.umass.edu. Thanks!

CENTERS

Crossing the language barrier – in less than a month

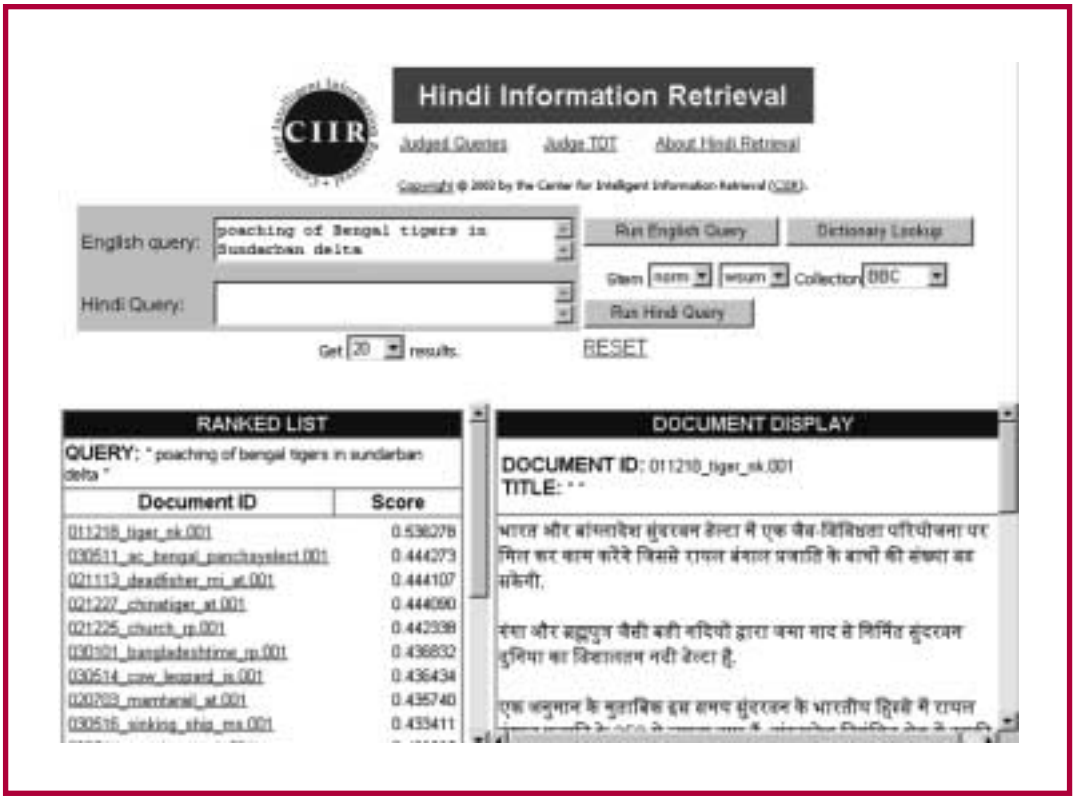
How difficult is it to modify search engine or information extraction technology so that it works in a new language? And how rapidly can necessary changes be made? To explore those questions, the Center for Intelligent Information Retrieval (CIIR) participated in a DARPA sponsored "surprise language" exercise this past June. The specific task was to modify existing technology to support document retrieval, news event tracking, and name finding in a "surprise" language, but starting from English. In other words, the system would accept queries in English and return a ranked list of documents in another language.

The CIIR was among the first research groups working on cross-language information retrieval techniques in the mid 1990s, and was the first to carry out a substantial evaluation of the technology. State-of-the-art systems are able to retrieve documents across languages almost as well as (and occasionally even better than) within a single language. However, those systems have benefited from months or even years of development. The linguistic resources needed to cross the language barrier effectively – e.g., dictionaries, parallel translated text, etc. – are expensive to create and are sometimes difficult to find. People asked the obvious question: can retrieval capability in a new language be developed rapidly without a large investment of time and money?

On June 2, 2003, a DARPA program manager started the "surprise language" exercise by announcing a language – in this case, Hindi. Starting immediately after that, the 11 participating sites began working independently and collaboratively to develop needed technology and to find useful multilingual resources. On the weekend of June 28, 2003, sites were evaluated. For document retrieval, sites were given English queries and a collection of Hindi documents to be searched. For new event tracking, sites were given several English news stories and required to scan a Hindi news collection to find stories on the same topic. For name finding, systems had to find names of people, places, and organizations within a collection of Hindi documents. On June 30, 2003, all work stopped and system outputs were scored.

"When Hindi was chosen, it seemed a surprising choice because it is so widely spoken and it appeared evident that on-line resources would be incredibly easy to find," says Associate Professor James Allan. "It turned out that although that was largely true, an unanticipated engineering problem created a huge bottleneck. Although there is substantial on-line text in Hindi, there are dozens of encoding standards for storing the text, many proprietary." As a result, the participating groups spent more time than anticipated reverse-engineering coding standards so that sufficient "usable" text was available.

Beyond that problem, there were few major difficulties: although Hindi is sufficiently different from English to make it "interesting" to process, most standard techniques were adapted to the new language within a few days to a week. Work was distributed across numerous sites, resulting in rapid progress overall. The end result was a generally successful adaptation of numerous language technologies to Hindi. The evaluation corpora were small (given time and resource constraints), so results are more suggestive than definitive, but they indicate that useful (but not highest quality) tools can be created in a new language in just a few weeks.



NEWS

KDL wins data mining competition

Knowledge Discovery Laboratory (KDL) researchers won first place in the prestigious KDD Cup data mining competition. The competition, which allows researchers from around the world to compete on a set of knowledge discovery and data mining tasks, was held in conjunction with the Ninth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD-2003) which convened in Washington, D.C. this August. The conference, attended this year by over 700 computer scientists, provides an educational forum for academic researchers and computer industry practitioners from business and government to share their most recent findings. It is the premier venue to learn the trends in knowledge discovery and data mining.

The winning UMass team consisted of Amy McGovern, Lisa Friedland, Michael Hay, Brian Gallagher, Andrew Fast, Jennifer Neville and David Jensen. All are engaged in research in the Knowledge Discovery Laboratory (KDL), directed by Research Assistant Professor Jensen. KDL investigates how to find useful patterns in large and complex databases, focusing on the underlying principles of data mining algorithms and on developing innovative techniques for knowledge discovery. KDL's research is sponsored by Federal, State, and commercial organizations, including the National Science Foundation, the U.S. Defense Advanced Research Projects Agency, the U.S. Army, and the University of Massachusetts Amherst.

"The competition was a huge motivator for us," said McGovern, a senior postdoctoral research associate in KDL and CS alumnus (Ph.D. '02). "Using our methods to identify trends in a different scientific field was exciting. It showed us how our research applies to fields outside of computer science."

This year's competition focused on analyzing a large database of scientific articles from the field of high-energy physics. The data provided by the competition included the textual content of 29,555 articles in high-energy physics, as well as references among these papers. The significance of this stiff, open competition, which included entries from 15 countries, is the ability to understand what data and patterns are important in the face of almost overwhelming amounts of information. This question is of critical importance to most businesses and organizations in today's data rich environment. The goal is to use such data in the most meaningful, efficient, and responsible way.

The title of the UMass entry was "Exploiting Relational Structure to Understand Publication Patterns in High Energy Physics." The entry discovered a number of interesting trends in the data including:

- A small set of scientists write the majority of the influential papers in physics.
- Papers with a single author are much less likely to be accepted by physics journals than papers with multiple authors.
- Authors tend to prefer particular journals for their publications.
- Scientists tend to pick a particular focus of research and not to publish much in multiple topics.
- Influential authors tend to co-author with other influential authors more frequently than with less influential authors.
- The number of citations that a scientist receives from other scientists is a good predictor of the world-class research prizes that these scientists will win.

The UMass team competed in the "open task," one of four parts of this year's KDD Cup competition. This task required participants to identify interesting questions about the data and then formulate the answer using data mining techniques. Other parts of the competition included tasks such as predicting a new paper's popularity by predicting the number of other papers that will cite the new paper and by predicting the number of times that the new paper will be downloaded in its first 60 days online.

The competition provided benefits in the areas of both education and research. "Some of the students joked that the competition was a type of 'boot camp' for their research," said Jensen. "We got to see how our algorithms and techniques applied when we were handed a new data set and asked to analyze it quickly."

Corporate gifts benefit faculty research

Attracted by the Department's research and the quality of its faculty and students, Sprint, Intel, IBM, Microsoft, and Honeywell have again provided generous gifts in support of research in the Department of Computer Science.

The Sprint gift is intended to support networking research by Professors Jim Kurose and Don Towsley on the development of a new measurement and analysis methodology that can be used to characterize end-to-end performance measures (such as reordering, loss, and delay along a path) as well as internal network characteristics (such as loss experienced along distant path segments) from measurements taken at a single point within the network. The Intel gift supports research on the use of so-called network processors in network measurement and analysis, a joint research effort by Computer Science Professors Kurose, Towsley, and Prashant Shenoy and ECE Professor Tilman Wolf.

IBM provided a gift, as part of its Faculty Partnership Award Program, to Assistant Professor Prashant Shenoy for his research on self-managing storage systems. Shenoy also received a gift from Microsoft Corporation for his project on the use of mobile devices in peer-to-peer data dissemination. Microsoft also provided gifts to Associate Professor Andrew McCallum in support of his information extraction efforts and to Associate Professor Robert Moll to investigate extending work on the CS-OWL project to other languages, particularly Visual Basic. The Honeywell gift will support Professor Victor Lesser's work in multi-agent systems.

The Department is committed to working with industry on a number of fronts to further our research and teaching goals, and to provide opportunities for our students. Company representatives interested in learning more about the Department should contact Jean Joyce (jean@cs.umass.edu).

RESEARCH

Robotics team explores uses of Segway platform

The Laboratory for Perceptual Robotics is developing control software for producing an autonomous version of the Segway Human Transporter (HT) called the Segway RMP (for Robotic Mobility Platform). Most people are now familiar with the the Segway HT, a two wheeled "inverted pendulum" on which a human driver stands and moves at up to 12 miles per hour by simply shifting his or her weight. The manufacturer of the HT has collaborated with the Defense Advanced Research Projects Agency to create a special "autonomous" platform that can be driven using computer (rather than human) inputs. Instead of handlebars there is a platform where sensors and computers take the place of the passenger. The Segway RMP automatically balances the sensor package using gyroscopes (much like people can balance an inverted broomstick on their hands), and can be remotely controlled using a common joystick.

A Segway RMP was loaned to the Robotics Lab for one year to determine whether their advanced control software could be transferred to new applications for which traditional mobile platforms are unsuited. The UMass team is one of a dozen across the country working with the modified Segway RMPs. The goal is to develop a high-performance, human scale mobile platform that can collaborate with human partners to reduce their exposure to hazardous environments, to follow them and carry heavy loads, or to carry sensors that augment a human's perceptual ability. The UMass platform currently has a camera and laser range finder mounted on the Segway to follow a human leader while avoiding obstacles. They have demonstrated outdoor "follow-the-leader tasks" at previously unattainable speeds with commercially available mobile robots.

Ultimately, the UMass team hopes to mount arms and hands on the platform to allow the robot to perform manipulation tasks shoulder-to-shoulder with other robots and humans. On Mars, this configuration of the controller might help explorers pull cables and build habitats; in disasters the RMP might pull stretchers to transport wounded people to medical facilities. With collaborators at NASA's Johnson Space Center, the Robotics Lab is helping to build similar controllers that enable NASA's "Robonaut" to live outside the International Space Station and to perform maintenance tasks both autonomously and with astronauts. To see the Segway in action, visit **www-robotics.cs.umass.edu/segway/.**

EKSL spans the country

Although Professor Paul Cohen has taken a leave of absence from the Department to join the Intelligent Systems Division of the University of Southern California's Information Sciences Institute (ISI) as Deputy Division Director, the research undertaken by the UMass Experimental Knowledge Systems Lab (EKSL) continues.

"The Experimental Knowledge Systems Lab is bigger than Starbucks is in France," says Cohen. "We have two sites, one on each coast. EKSL East focuses on simulation, agent technology, and wargaming, while EKSL West is the locus of our cognitive science and homeland security work." EKSL Senior Research Fellow Clayton Morrison has joined Cohen at ISI. While Cohen focuses on EKSL West's research, Senior Research Fellow Gary King is managing EKSL East.

The two groups will be combining expertise on research projects in AI such as multi-agent simulation and information fusion in dynamic, uncertain, and adversarial environments and applications such as military course of action analysis. For example, the Capture the Flag project develops tools for commanders to sketch courses of action, simulate them in Monte Carlo trials against intelligent agent adversaries, and summarize the results. Based on its extensive experience in these research areas, EKSL was recently commissioned to run an exploratory study for DARPA on intelligent assistants for commanders, and another study of how human assistants learn their jobs.

New techniques to aid geneticists' research

A research geneticist focuses on trying to understand how a small number of genes (typically two) interact. The study of a pair of genes can take one to two years of laboratory time, so choosing which pair to study is a critically important decision for the geneticist. As a result of recent rapid advances in sequencing genomes, geneticists are faced with daunting amounts of information when attempting to make such decisions. This past spring, Professor Jack Wileden worked with Biology Professor Randall Phillis and two undergraduates, Leo Voloshin from Computer Science and Clayton Wood from Biology, to apply some computer science techniques and tools to help research geneticists decide which genes to study.

The research team developed a prototype system to determine how frequently a given pair of genes has been discussed together in research literature. The frequency results may help to influence the geneticist's decision about where to focus laboratory effort. The prototype system combined publicly available literature databases with new querying and user interface software developed by Voloshin under Wileden's guidance. Preliminary experiments suggest that such a system could indeed facilitate the research activities of research geneticists.

Edward Riseman retires

After 34 years of service with UMass, Ed Riseman retired this fall. Riseman joined the Computer Science Department (then COINS) as Assistant Professor in 1969, and became a full professor in 1978.

Riseman's research reflects a broad interest in computer vision and artificial intelligence, including knowledge-based image understanding, stereo and motion analysis, autonomous vehicle navigation, learning, three-dimensional reconstruction, image databases, content-based image retrieval and parallel processing, and architectures for computer vision. Emphasis on practical systems is supported by applications of photo-interpretation of aerial images including 3-D building and terrain reconstruction, biomedical image analysis, automated robotic manufacturing and assembly, real-time control of intelligent vehicles, terrain classification and fly-through visualization, and development environments for vision research. He is the author of more than 150 publications in these areas. Riseman's newest ventures are research in oceanography and new anti-terrorism initiatives.

When Riseman arrived at UMass in 1969, Computer Science was a program in the graduate school. Then-Graduate Dean Ed Moore was fully supportive of the plan to create a Computer Science Department, so he approved the hiring of a junior faculty position. Riseman filled that position. "We could not have made a better choice," says Professor Emeritus Conrad Wogrin, who was the Acting Chair at the time of Riseman's hiring. "He came to UMass running and has not stopped for thirty four years."

Riseman immediately started his research in character recognition upon arrival at UMass. He was willing to define his problem in its most difficult form, the recognition of hand written characters. "When we [the Department and Engineering] bought a new computer, the PDP 15, for the wrong reason, Ed quickly and skillfully used it to build his first lab. What might have been a financial blunder was transformed into a good move," says Wogrin.

Riseman was instrumental in the establishment and success of the Department's Computer Vision Laboratory, which he co-directed with Professor Allen Hanson. Riseman and Hanson also founded Amerinex Artificial Intelligence Corporation and Dataviews Corporation (formerly VI Corporation), both visual technology oriented companies located in the Amherst, Massachusetts area. Riseman and Hanson had successful collaborations with nearly every faculty member in the Department over the years, as well as with industry partners such as Martin Marietta, Lockheed, and most recently, Bigelow Laboratory in Maine.

Hanson and Riseman have been a team since they were undergraduate students. The two met while undergrads at Clarkson College and went on to graduate school together at Cornell University. While Hanson and Riseman started their careers at different universities, Riseman at UMass and Hanson at the University of Minnesota, they still collaborated on research, and the two eventually joined forces at UMass. Hanson attributes the Vision Lab's success to the close working relationship that he and Riseman have had over the past forty years. "We complemented each other extremely well," says Hanson.

Some of Riseman and Hanson's research accomplishments include pioneering work on vision understanding systems. Riseman, Hanson, and then- student Tom Williams (Ph.D. '81) designed one of the first knowledge-based image understanding systems that handled very complex natural images. A landmark book edited by Hanson and Riseman, *Computer Vision Systems* (Academic Press, New York, 1978), set the tone for much of the area's research over the following ten years. The Vision Lab participated in the DARPA Unmanned Ground Vehicle Program, in which UMass was one of only two universities to have a military humvee on site for testing. As part of the DARPA RADIUS APGD program, UMass produced the only working aerial imaging system that was utilized at government installations. "The highlights of Ed's career span both research and university service," says Hanson. The Vision group was one of the first in the Department to build a lab, so the group's computers became resources for the entire Department. "Ed tried to do what was best for the Department," says Hanson. "He was always looking for ways to move the Department forward."

Riseman was Chair of the Department from 1981 to 1985. "Ed as the Department head was a dynamo," says Wogrin. "At the time, the Department had a number of very good people, a broad spectrum of research, and was moderately well funded. What Ed did was to inject a sense of optimism." During his tenure as Chair, Riseman changed the culture of the Department to become very cooperative, where faculty worked together and respected one another's views. Riseman recognized that it was key for the Department's growth to increase presence in the area of systems and theory, and he was able to obtain support from the University to build in those areas. Riseman was also instrumental in encouraging faculty to go after large grants that were key to creating a first-class research environment in the Department. "He made faculty at all levels feel that they had a voice in the directions of the Department," says Professor Victor Lesser. "It is this spirit that lives on in our Department, and which makes it special."

An accomplished researcher and leader, Riseman is also a dedicated teacher. During his tenure at UMass, Riseman was the advisor to 38 Ph.D. graduates (many co-supervised with Hanson). "His greatest legacy is in the students that have been members of the Visions group," says Hanson.

Riseman is a Fellow of the American Association for Artificial Intelligence (AAAI), a senior member of the Institute of Electrical and Electronics Engineers (IEEE), a member of AAAI, the Association of Computing Machinery (ACM), and of the Pattern Recognition Society. He received his Ph.D. in Electrical Engineering from Cornell University in 1969.

NEWS

Undergraduate research on network forensics

COMPUTER SCIENCE UNDERGRADUATE student Amos Wetherbee spent the summer doing research in network forensics at Polytechnic University in Brooklyn, NY. Funded by the National Science Foundation's Research Experience for Undergraduates (REU) program, Wetherbee helped develop a prototype for ForNet, a distributed network-wide logging mechanism.

"Networks have become ubiquitous and an integral part of the nation's critical infrastructure," says Wetherbee. With the explosive growth of LAN/WAN technologies and the Internet, the process of mitigating threats to networks has become one of the key tasks of several government and private entities. However, existing defensive mechanisms, such as firewalls and Intrusion Detection Systems (IDSs), have proven insufficient and slow to adapt to new network vulnerabilities and threats. ForNet is designed to both store network traffic efficiently and to provide a querying mechanism that assists in network forensics and attack attribution. Research in these areas is relatively new and is being actively pursued. "The challenge is to design a system that can store as much information about network traffic as possible, while at the same time minimizing the storage overhead of this data," says Wetherbee. "I'm happy to report that we were able to get a fully working prototype up and running."

Polytechnic University's summer REU program is a paid internship designed for students of computer science, electrical engineering, and computer engineering. Wetherbee, a junior at UMass, spent his REU internship working with students from Carnegie Mellon, Harvard, Lehigh, SUNY, and Wellesley College. Polytechnic's REU program receives approximately 80 applications each year for 10 internships.

UMass hosts programming languages symposium

UMASS HOSTED THE NINTH NEW ENGLAND Programming Languages and Systems Symposium (NEPLS) in June. NEPLS is a regional venue to discuss current research in programming languages and systems.

Organized by Professor Jack Wileden, the Symposium brought together 30 people from the New England area. Associate Professor Eliot Moss and Assistant Professor Emery Berger gave a well-received invited talk, "I Didn't Want My Java DECAF!," that described how the JAVA programming language was expected to run as fast as FORTRAN by now, but that vision has not yet been realized. Moss and Berger pointed out what they believe to be some of the barriers and some of the research opportunities in addressing the problem. MIT and Harvard researchers also gave presentations at the Symposium.

On a related note, Professor Wileden introduced a new course, "Programming Languages for the Web," during the spring semester. The course provides students with an introduction to concepts, techniques, and tools used for building web applications. Course tools were drawn from the Java 2 Enterprise Edition (J2EE) and Microsoft .NET frameworks.

CCC 2004 coming to UMass

The 19th IEEE (Institute of Electrical and Electronics Engineers) Conference on Computational Complexity (CCC 2004) will be held June 21- 24, 2004 at UMass Amherst. Computer Science Professors Dave Barrington and Neil Immerman are the local arrangements chairs for the conference.

CCC is an annual conference that deals with computational complexity broadly defined. Among the topics considered in the scope of the conference are: complexity classes, algebraic complexity, proof complexity, interactive proof systems, circuits and other concrete computational models, Kolmogorov complexity, reducibility, communication complexity, complexity and logic, non-approximability, cryptographic complexity, complexity and learning, and quantum computation.

This conference is sponsored by the IEEE Computer Society through its Technical Committee on Mathematical Foundations of Computing.

The analytic web *(from page 5)*

any execution of a concurrent system. In this project, the team is investigating how such analysis techniques can be applied to Little-JIL process models. Eventually they would like to build upon the work of Jensen and Tim Oates (Ph.D. '00) to specify and detect unreliable statistical processes. They also are exploring the consistency relationships between the process and derivation models.

"Although we are still in the early stages of this project, we have successfully defined and automated a few of the carbon dioxide sequestration measurement processes," says Clarke. Visualization, execution, and easy modification of these processes have been demonstrated at an ecological conference. Work on improving the model representations and the associated analyses is underway. Eventually the researchers want to make the Analytic Web framework available to the general scientific community. Through this framework, they hope to provide support for defining, executing, and analyzing scientific processes that should foster safe reuse of data and processes and facilitate scientific discovery. "Ultimately we hope to see these scientific processes made available to students in universities, colleges, and high schools, in order to bring the challenges and excitement of scientific discovery into laboratories and classrooms around the country and the world," says Clarke.

Faculty News

James Allan, co-Director of the Center for Intelligent Information Retrieval, has been awarded tenure and was promoted to Associate Professor. ■ Professor **Victor Lesser** gave the plenary speech, "Experiences Building a Distributed Sensor Network," at the 16th Canadian Conference on Artificial Intelligence (AI'2003), held in Halifax, Nova Scotia, in June. In addition, Lesser is co-editor (with Charles Ortiz and Milind Tambe) of a new book entitled *Distributed Sensor Networks: A Multiagent Perspective,* published by Kluwer Academic Publishers. He also graduated his 25th Ph.D. student, Anita Raja, this fall. ■ With his 18th book in production this fall, Associate Professor **Chip Weems** will release the 4th edition of *Programming and Problem Solving in* C++ in January. ■ Associate Professor **Andrew McCallum** gave an invited tutorial on Information Extraction from the World Wide Web at the Ninth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. He was also appointed Action Editor for the *Journal of Machine Learning Research*. ■ Research Associate Professor **Beverly Woolf**'s paper "Tracking Student Propositions in an Inquiry System" won the Best Paper Award at the 11th International Conference on Artificial Intelligence in Education in Sydney, Australia. Co-authors include David Marshall, Matthew Mattingly, Joshua Lewis, Sean Wright, Michael Jellison, and Tom Murray. ■ Professor **Jim Kurose** chaired an NSF workshop on network research testbeds, gave a Plenary address at ACM Federated Computing Research Conference in San Diego, and was the featured Speaker at the UMass Phi Beta Kappa Induction ceremony. In addition, Kurose recently completed a term as Chair of the IEEE/ACM Transaction on Networking Steering Committee. ■ Assistant Professor **Oliver Brock** was awarded a UMass Faculty Grant for Teaching for "Mobil Robots in the Classroom as an Incentive for Interdisciplinary Studies in Computer Science and Engineering." The grant program provides individual awards to encourage new and improved approaches to undergraduate education. ■ An invited speaker at the Florida Artificial Intelligence Research Society (FLAIRS) meeting in May, Professor **Paul Cohen** was also the invited speaker at the Second International Conference on Knowledge Capture this fall. ■ A multi-site NSF project, "Dynamic Cooperative Performance Optimization (DeCapo)," led by Associate Professor **Eliot Moss** was chosen by the National Science Foundation for display within the Foundation. The project's research summary will be displayed to visitors entering NSF.

Visitor News

Kyu-Won Lee is a Visiting Professor with the Visions Lab. Lee is a Professor at Daejeon University, Korea, in the Division of Computer and Communications Engineering. ■ Working with the Center for Intelligent Information Retrieval (CIIR) as Visiting Researchers, **Joon Ho Lee, Sun Ho Kim,** and **Joon Hyock Moon** are from NHN Corporation, Korea. ■ Visiting Professor **Mikkel Thorup**, from AT&T Research, has joined the Theoretical Aspects of Parallel and Distributed Systems (TAPADS) group.

Research News

Ivon Arroyo has joined the Center for Knowledge Communications (CKC) as a Senior Postdoctoral Research Associate. ■ **Al Hough** has joined the Knowledge Discovery Lab as a Senior Research Fellow. ■ Joining the Networks group as a Senior Postdoctoral Research Associate, **Zihui Ge** (Ph.D. '03) is working with Professors Jim Kurose and Don Towsley. ■ **Michael Rosenstein** (Ph.D. '03) joined the Robotics Lab as a Senior Postdoctoral Research Associate.

Ramamritham joins IIT Bombay

After a two-year leave from the Department, Professor Krithi Ramamritham has resigned from UMass to pursue a career on the faculty at the Indian Institute of Technology Bombay. He is currently the Vijay and Sita Vashee Chair Professor in the Department of Computer Science and Engineering, and head of the Kanwal Rekhi School of Information Technology. Ramamritham will hold an adjunct faculty position at UMass.

"Krithi and I have had a very fruitful collaboration for five years on content distribution networks," says Assistant Professor Prashant Shenoy. "While we continue to collaborate remotely, I am sad to see that he will no longer be a faculty member here. I wish him success as the new chair of the School of IT at IIT Bombay."

Ramamritham's interests span the areas of real-time systems, transaction processing in database systems, and real-time database systems. He is applying concepts from these areas to solve problems in mobile computing, e-commerce, intelligent Internet applications, and the Web.

Ramamritham received his Ph.D. in Computer Science from the University of Utah and joined UMass in 1980. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and a Fellow of the Association of Computing Machinery (ACM).

Student News

Multi-Agent Systems Lab graduate student **Raphen Becker** along with co-authors **Shlomo Zilberstein, Victor Lesser** and **Claudia Goldman** received the Best Paper Award for their paper "Transition-Independent Decentralized Markov Decision Processes" at the Second International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS-2003) held in Melbourne, Australia. ■ **Gary Holness,** a graduate student in the Laboratory for Perceptual Robotics, received an award from the Southern Regional Education Board (SREB) to participate in the Institute for Teaching and Mentoring. ■ A graduate student in the Multi-Agent Systems Lab, **Bryan Horling** and his wife, Maura Fennelly, welcomed the birth of their first child this spring, Megan Elizabeth Horling. ■ Undergraduates **Christopher Barrieau, Bobby Berlet,** and **Charles Jordan** received the 2003-2004 Microsoft Research Fellowships.

Staff News

Emily Horrell has joined the Robotics Laboratory as their Lab Manager. ■ CSCF Software Specialist **Victor Danilchenko** (MS '02) and his wife Martha are the proud parents of their fourth son, Julian, who was born in November.

Significant Bits

NEWSLETTER of the
DEPARTMENT OF COMPUTER SCIENCE
at the UNIVERSITY OF MASSACHUSETTS, AMHERST

140 Governors Drive
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"Significant Bits" is published twice a year by the Department of Computer Science, University of Massachusetts Amherst **(www.cs.umass.edu)**. Your news, suggestions, comments, and contributions are welcome. Please mail them to the address above or send them electronically to **bits@cs.umass.edu.**

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