

InterConnections

A Report on Interdisciplinary Computing at the
University of Maryland Institute for Advanced Computer Studies

UMIACS Center for Bioinformatics and Computational Biology Becomes a Reality

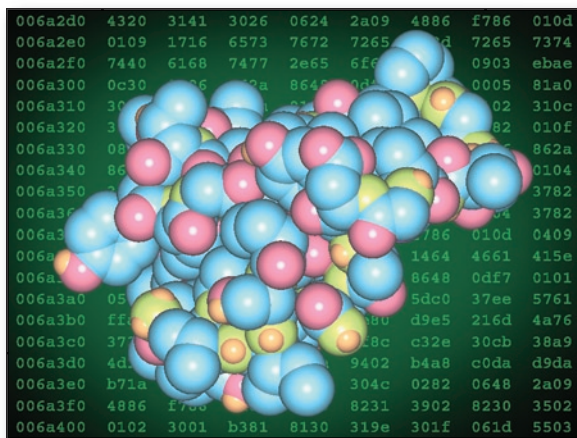
The UMIACS Center for Bioinformatics and Computational Biology (CBCB) has finally moved from concept to reality. Starting this August, the Center will have a physical presence in the Surge Building that already houses the Center for Biomolecular Structure and Organization, and will have access to over 10,000 square feet of office and lab space there. During the past two years, the Center's affiliate faculty members have been active in developing research programs in computational biology, running distinguished lecture series, organizing workshops, and working to recruit new faculty to the Center. These activities have already led to the development of a synergistic environment for collaborations among the researchers in biological and computational sciences on campus. Furthermore, and in spite of the extremely competitive national recruiting environment in the bioinformatics area, the Center was able to attract two new researchers this year: Drs. Michael Cummings and Yehuda Koren. Dr. Cummings will be joining the University of Maryland this fall as an Associate Professor in a joint appointment between the Center and the Department of Biology. Dr. Cummings is internationally known for his work in the area of molecular evolution and genetics, including examination of patterns and processes of sequence evolution to understand molecular evolutionary mechanisms that bring about biological change. His research program uses methods from molecular biology, population genetics, statistics, and computer science. Dr. Koren will be also joining the Center this fall as a Postdoctoral Research Scientist, supported in part by a Fulbright Foundation award. He completed his Ph.D. work in the Department

of Computer Science and Applied Mathematics at the Weizmann Institute of Science. His thesis research, which has already attracted significant attention, covered exciting results in the areas of graph drawing, information visualization, and clustering methods. At the Center, he will be focusing on the analysis and clustering of microarray data in collaboration with Ben Shneiderman and other faculty affiliated with the Center. In addition to recruiting these two new researchers, the Center is expected to attract an exceptional senior researcher in the next few months, the details of which will be reported in the next issue of *InterConnections*.

The Center was funded two years ago through the campus enhancement initiative in biosciences after considerable deliberations involving faculty from many colleges on the College

Park campus. The main goal of the Center is to advance research and education in computational biology through the establishment and enhancement of nationally visible programs that are at the interface between biology and computer science. The initial focus of the Center will be on computational genomics and proteomics. Current departments affiliated with the Center include Biology, Computer Science, Mathematics, Chemistry and Biochemistry, Cell Biology and Molecular Genetics, and Entomology. The Center will be actively pursuing possible collaborations with some of the many outstanding research groups around the Washington area, including groups at the National Institutes of Health (NIH), Celera, The Institute for Genomic Research (TIGR), University of Maryland Biotechnology Institute (UMBI), Children's Hospital,

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Welcome to the Spring/Summer 2003 issue of *InterConnections*

Three events took place during the past five months, each of which will have a significant long-term impact on UMIACS. The first was the holding of the UMIACS retreat that addressed topics ranging from the UMIACS mission and possible future research directions to an examination of the Institute's overall infrastructure and the quality of support provided to the faculty and researchers. The second event is the official inauguration of the UMIACS Center for Bioinformatics and Computational Biology, including the acquisition of the new space for the Center. The third event is the establishment of the first-ever University Affiliated Research Center (UARC) on the campus of the University of Maryland, which will focus on the study of languages. The computational linguistics group in UMIACS played a critical role in the planning and the development of the proposal that led to winning the major award that established the UARC. In this issue of *InterConnections*, you will find separate articles covering these events as well as other exciting news about the Institute. I would like to focus the remainder of my message on a few issues discussed during the UMIACS retreat.



The UMIACS retreat held on January 24, 2003 gave the faculty an opportunity to take a close look at the mission of the Institute and its relationship to other units on campus, focusing particularly on the relationship between UMIACS and the Department of Computer Science. The notion of a broad-based Institute, all of whose tenure-track faculty hold joint appointments in academic departments across the campus, is relatively unique to the University of Maryland. Each of the Institutes on the College Park campus was established under unique circumstances, following relatively different paths. As I explained during the retreat, the few documents that led to the establishment of UMIACS were fairly vague as to the precise mission of the Institute, and contained in fact some significant differences. The initial impetus for the creation of UMIACS in 1984 was the establishment of a system-wide research unit (and hence the name University of Maryland Institute for Advanced Computer Studies, similar say to the University of Maryland Biotechnology Institute, which is a separate campus of the University System of Maryland), focusing on "advanced computer studies," that is, at the time, research related to the architecture, programming, and applications of supercomputers. The final memo that established UMIACS in 1985 stated that the Institute would be a College Park campus unit with close ties to the Department of Computer Science and whose mission is to "serve as a focal point for interdisciplinary research in computer related studies." It is this latter mission that we have focused on since the inception of UMIACS. The retreat confirmed the crucial importance to sustain and push forward this mission by developing national research programs

at the interface between computer science and other disciplines, drawing on the extensive strengths of the College Park campus. Clearly such a mission cannot be carried out successfully without the substantial core strengths within the Department of Computer Science, and hence the continuing close relationship and close coordination between the two units.

While the overall consensus of the retreat was that UMIACS has been very successful in pursuing its mission, I would like to highlight three significant challenges that have to be tackled to continue the vigorous upward momentum of the Institute. The first is the critical importance of the Institute's ability to move quickly into new areas. UMIACS should play a leading role in defining and pursuing new emerging directions as compared to the role of academic departments with typically well-defined core research areas and core educational programs, thereby requiring relatively more time to move into new areas. The second challenge facing UMIACS is the lack of adequate space to support the growth of its research programs. The campus is planning to provide space for UMIACS in a new building on the College Park campus set aside for computer science and engineering, but such a building will take at least five years before it even gets started. The third challenge is the establishment of high-quality graduate educational programs in interdisciplinary computing, which can draw on our substantial research strengths in related areas. Based on the ideas exchanged and the enthusiasm shown during the retreat, I am confident that the Institute will be able to effectively address these challenges and move to an even higher level of excellence.

I hope you will enjoy reading this issue of *InterConnections* and I look forward to hearing from you.

Joseph Jaja

Wired Covers Language Exercise

An exercise to develop a program that translates between English and a randomly chosen language within a month was the focus of a June 7 article in *Wired* magazine. The project, sponsored by DARPA, is meant to mimic circumstances when a language becomes important to translate quickly. Prof. Doug Oard (Information Studies/UMIACS) is interviewed in the article, which mentions research done at the University of Maryland along with the University of Southern California and Johns Hopkins University.

The language selected for this exercise was Hindi. In March, a smaller group of researchers participated in a "practice run" for this exercise using Cebuano, a language spoken in the Philippines. ☺



ICDL Project Receives Broad Coverage Around the Globe

The International Children's Digital Library, a joint project of the Human-Computer Interaction Lab and the Internet Archive, continues to receive a great deal of attention from the media. News about the project, which aims to create an extensive library of international children's literature and make it available worldwide, has been featured in media from South Africa to Singapore. A comprehensive list of the more than 70 features is available at <http://www.umiacs.umd.edu/ICDLpress.htm>. 📄

Burtonsville Gazette Covers Dorr's Visit to Local Middle School

The *Burtonsville Gazette* was on hand when Prof. Bonnie Dorr (Computer Science/UMIACS) visited a class of seventh-graders at Briggs Chaney Middle School to discuss how UMIACS researchers are developing technology to increase the accessibility of an archive of videotaped Holocaust survivor testimony. The Multilingual Access to Large spoken ArCHives or MALACH project is a joint effort of the University of Maryland, Johns Hopkins University, IBM, and the Shoah Visual History Foundation and is the recipient of a five-year, \$7.5 million award from the National Science Foundation. Prof. Dorr explained to the students what current technology exists to search an archive of this size and what tools the team are attempting to develop to improve accessibility. Prof. Doug Oard (Information Studies/UMIACS) is the University of Maryland PI on this project. 📄

BusinessWeek Looks at Shneiderman's Information Visualization Research

January 20 *BusinessWeek* column praises the results of the research of Prof. Ben Shneiderman (Computer Science/UMIACS) into information visualization. He developed the underlying technology used in the "Map of the Market" on smartmoney.com. The tool allows users to see the "big picture" of the stock market by representing companies as various colored blocks, with each company's market capitalization indicated by its size. Users can click on the blocks for more detailed information about the company. By allowing for a richer visual picture, "Information visualization answers questions you didn't know you had" Shneiderman notes in the piece.

The columnist points out that this new way of looking at information may take some getting used to for users, especially since most data management tools for computers have mimicked paper reports, but also urges readers to try out these visualization tools. As he says, "their visual nature proves a picture is worth at least 1,000 words." 📄

Davis Featured in InfoWorld Story on Surveillance Tools

An article in the December 18, 2002 *InfoWorld* about the wide variety of tools used for surveillance featured the perspective of Prof. Larry Davis (Computer Science/UMIACS). The story discussed the state of the art in technology such as digital video cameras and facial recognition software. Though many advances have been made in this area, there are still limitations. Prof. Davis pointed out, "Over the next ten years or so, you're not going to be able to build a system that would be able to identify every person who walks by a camera in a natural environment." 📄

Mercury News Covers DateLens

An April 9 column in the San Jose Mercury News about the latest trends in human-computer interaction mentions DateLens, a research project of Prof. Ben Bederson (Computer Science/UMIACS). The project, a collaboration with Microsoft, aims to develop a zooming interface for calendars on handheld devices. Dubbed "a calendar-on-steroids for the Pocket PC" by the article, DateLens gives users an overview of their calendar and allows them to zoom in on specific tasks. 📄

Media Briefs

- Professors Bill Arbaugh (Computer Science/UMIACS) and James Hendler (Computer Science/UMIACS) appeared on the "Mark Steiner Show" on WYPR on April 16. The two took part in a roundtable discussion on cybersecurity.
- Prof. Ben Shneiderman (Computer Science/UMIACS) was featured in an April 26 *Baltimore Sun* article about adding "personality" to automated teller machines. Shneiderman noted that people want machines to be efficient, not necessarily friendly.
- National Public Radio's "The Kojo Nnamdi Show" featured two UMIACS professors as part of its Tech Tuesday feature. On January 14, Prof. Ashok Agrawala (Computer Science/UMIACS) took part in a roundtable discussion on the future of wireless. The following week, Prof. Ben Shneiderman (Computer Science/UMIACS) was Nnamdi's guest for a show about human-computer interaction.
- In February, New Zealand's *Computerworld* reported on the research of Prof. Ben Shneiderman (Computer Science/UMIACS) and his new book, *Leonardo's Laptop: Human Needs and the New Computing Technologies*.
- The MIND Lab and its partner Koolspan were featured in the February 14 *Business Gazette* and the March 31 *Washington Business Journal* for awards related to wireless technology. For more information, see the related article on page 11.



New Center for Advanced Study of Language Draws on Talents of UMIACS Researchers

The University of Maryland is teaming with the federal government to create a new and unprecedented research facility that will support the nation's critical need for increased language capabilities. The Center for Advanced Study of Language (CASL) will conduct groundbreaking research that focuses on less commonly taught languages, language acquisition, contextual analysis of language, and human-computer interaction and machine translation. CASL is the first University Affiliated Research Center (UARC) ever established at the University of Maryland. Other UARCs include the Johns Hopkins University Applied Physics Laboratory, the Applied Research Laboratory at Pennsylvania State University, and the Applied Research Laboratories at the University of Texas at Austin.

Prof. Amy Weinberg (Linguistics/Computer Science/UMIACS) was a driving force behind the proposal to bring CASL to College Park. The new center will bring together researchers from across the university, the federal government, other institutions of higher education, and industry. As the center fosters direct access to professionals in the field, researchers will collaborate closely with the people who will use the tools they develop. Areas of research in the center will be defined in concert with the government, and UMIACS researchers will be critical to the success of CASL's efforts in many of these areas.

Based on the success of past UMIACS research, one likely area of interest will be developing multi-lingual applications,

which include tools for message routing and information retrieval. An example would be tools that allow documents in a foreign language to be categorized, screening documents of interest to be forwarded to human translators. Researchers will also develop tools for rapid ramp-up, increasing the abilities for machine translation with low-contact, low-density languages. Often, a foreign language becomes strategic quicker than tools for working with it can be developed, and this research will be critical for filling that gap.

UMIACS researchers will also be involved in developing computerized solutions for training language professionals. These tools will allow users to learn and maintain foreign language skills, with an emphasis on advanced skills and adults working in agencies and offices concerned with national security. UMIACS researchers' expertise in human-computer interaction will be essential in developing and testing applications to meet these needs.

The new center will also organize a wide range of conferences, seminars, and workshops in 2006 and 2007. A series of summer workshops to conduct research on specific topics is also planned.

Federal support for CASL will be provided through the Department of Defense. The center will be part of the university's new 130-acre research park located in College Park. ☺

MIND Lab Research Group at Work on the Semantic Web

A research group in the Maryland Information and Network Dynamics (MIND) Lab is hard at work developing the Semantic Web, an evolution of the current Web that will give information more structured meaning and will enhance the ability of machines to share and process data. The Semantic Web Agent Project (MINDSWAP), led by Prof. James Hendler (Computer Science/UMIACS), has had a number of achievements recently, including major input into a newly emerging web standard related to Semantic Web technologies, a major demonstration at the recent World Wide Web (WWW2003) Conference, joint work with the National Cancer Institute (NCI) on an ontology to enhance cancer research, and developing the first web site completely based on Semantic Web Technology.

Prof. Hendler is one of the originators of the Semantic Web. He is now co-chair of the World Wide Web Consortium's Web-Ontology (WebOnt) Working Group. This group is developing the Web Ontology Language OWL, a semantic markup language for publishing and sharing ontologies on the World Wide Web. OWL is being developed as a vocabulary extension

of RDF (Resource Description Framework) and is derived from the DAML+OIL Web Ontology Language. This new standard is being designed for use by applications that need to process the content of information instead of just presenting information to humans.

An example of this can be seen in a new version of the NCI Metathesaurus, which researchers at the MIND Lab have created an OWL version of—with close to a half million OWL statements, this is the largest OWL ontology developed to date. The Web has revolutionized access to information for many disciplines. However, as Prof. Hendler points to in a January 24 *Science* magazine article, the Semantic Web offers new ways for scientists to make connections within an ever-expanding amount of data from a variety of disciplines. The group's work with the NCI on the Thesaurus allows rich semantic interrelationships between the nodes of its taxonomies. By parsing this information in a common structure that machines are able to process, it becomes possible for computers to help people to see relationships across broad tracts of information where previous links were unknown.

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UMIACS Retreat Focuses on the Future

On January 24, 2003, more than 75 UMIACS faculty and staff members met to review the current status of the Institute and discuss strategies to continue its momentum towards higher levels of achievement. Participants in the UMIACS retreat discussed a number of major issues including: the Institute's overall mission and how it is being addressed; possible new research directions over the next five years; UMIACS involvement in promoting interdisciplinary educational programs; enhancements to the Institute's infrastructure; enhancements for outreach efforts to government and industry; and ways to measure the progress made by UMIACS.

Prior to the retreat, five committees were formed to create discussion points in the areas mentioned. Prof. V.S. Subrahmanian (Computer Science/UMIACS) coordinated discussions related to the research mission of UMIACS and future directions. Prof. Louiqa Raschid (Business/UMIACS) led the committee investigating benchmarking. Prof. Ben Bederson (Computer Science/UMIACS) led the discussions on a possible educational agenda of UMIACS. Prof. Bonnie Dorr headed the group addressing outreach efforts. Prof. Larry Davis (Computer Science/UMIACS) focused on the UMIACS organizational structure. Dr. David Doermann (UMIACS) and Director of Administration Johanna Weinstein led the team focusing on staff issues.

The participants at the retreat discussed the issues raised by the different committees as a group as well as in breakout sessions in the afternoon. Based on these discussions, the committee chairs revised their pre-retreat reports and also came up with recommendations for enhancing the future activities of UMIACS. Following are the recommendations each of the groups came to as a result of these discussions

The committee focusing on future directions for research named several new interdisciplinary related core computer science areas. Examples of these include, but are not limited to, knowledge management and integration, biocomputing, massively scalable wide area services, information security, the semantic web and web services, embedded systems, and cognitive and neural modeling. While UMIACS cannot hope to initiate and sustain strong research programs in all of these areas, the committee felt mechanisms should be put in place to identify the most appropriate areas to focus on and adequate resources should be found to fund seedling efforts in chosen areas, which should lead to nationally visible research programs supported by extramural funding resources.

In the education arena, retreat attendees recommended that graduate programs leading to Ph.D. degrees in targeted areas should be explored. These programs would be similar in

scope to the Robotics and HCI programs at Carnegie Mellon University and would be offered in collaboration with related academic departments. Human-computer interaction, computer visions, computational linguistics, and computational biology were among areas tentatively suggested. It was also recommended that UMIACS not consider offering professional M.S. program, as it may not be consistent with the research focus of the Institute. Committee members also felt UMIACS should not pursue a broad graduate degree program in interdisciplinary computing with one of the specializations as options as it may dilute the program.

Recommendations for enhancing outreach efforts included hosting research lab or group-based workshops and conferences to promote awareness among government organizations and industry. The group also felt that mechanisms for engaging top executives from companies should be put in place for attracting research support for laboratories, internship programs and potential

collaborative proposals and that the Institute's industrial affiliates program should be revamped. Successful transitions of technology should be documented and widely disseminated. The committee also suggested that methods for interacting with small and large businesses, which will lead to funding under the Maryland Industrial Partnerships (MIPS) program, be explored.

The main recommendation from the group tasked with assessing the Institute's organizational structure was to find ways to recognize the contributions of research faculty. Suggestions included membership on key committees within UMIACS.

Several recommendations were made for enhancing and streamlining the infrastructure, including the designation of a point of contact who can handle inquiries related to problems with facilities; establishment of an open lab for visitors to access the internet and their emails and make phone calls; improving open facilities for copying, scanning and printing. The group also proposed that online methods for reserving facilities such as conference or meeting rooms be implemented.

The committee in charge of coming up with benchmarks for comparing UMIACS with other peer institutes discussed at length the difficulties involved in coming up with a single measure, largely due to the unique nature of the institute. They recommended a combination of metrics that take into account: awards and honors received; best paper awards; total journal counts and quality of the journals; publication rate/faculty; citations; publications in new areas; books and general articles; multidisciplinary publications; technology leadership; contributions to education (placement of graduate students; new educational initiatives); and other activities including collaborations with other campus groups and peer institutions. ☺



PHOTO BY BEN SHNEIDERMAN

Faculty and staff discuss ways to improve UMIACS.



New NSF-Funded HCIL Project to Assess Voting Technology and Ballot Design

A new National Science Foundation-funded project involving UMIACS faculty will assess voting technology and ballot design. Paul Herrnson, Professor of Government and Politics and Director of the Center for American Politics and Citizenship at the University of Maryland is the PI for the project whose team includes Prof. Ben Bederson (Computer Science/UMIACS) and researchers from the University of Michigan and the University of Rochester.

Voting technology and ballot design received a great deal of attention following the 2000 presidential election. The events surrounding that election showed how these factors can influence the outcomes of elections. Other areas of concern raised by these events include outdated technology used in most polling places in the United States, inadequate training in election administration, minorities and the poor are more likely to cast their ballots on outdated systems; and that voting procedures affect how voters feel about their ability to exercise their right to vote and their willingness to accept the results of an election as legitimate.

Since 2000, states have commissioned studies, revamped election administration, redesigned ballots, and begun to invest in new voting equipment. Little research has been done, however, to help in understand current technology and the interface between voters and various voting systems and ballots. Thus, there is little solid information on which to base massive reforms, significant expenditures, or even the redesign of individual local ballots. The problems associated with the September 2002 primary election in Florida illustrate this.

This project will bring together social and computer scientists from a number of disciplines to study voting technology and ballot design. The research team will first assess the impact of existing technology and ballot designs on a variety of factors: the ability of voters to cast their ballots accurately and efficiently, voter ease in casting complete ballots (if so desired), voter comfort

using different technology and ballot interfaces, voter confidence that their ballots will be accurately and confidentially recorded, and the level of voter turnout. They will also assess the effects of alternative voting systems and ballot formats on the frequency of incomplete ballots and split-ticket voting.

The researchers will use a variety of research designs, data collection methodologies, and analysis techniques, including: laboratory experiments, expert review, close-up observation, field tests, and natural experiments that occur as local jurisdictions change their voting technology and procedures. The project will also subject the research team's own prototype ("zoomable") voting interface design to the same rigorous evaluation applied to existing systems. Finally, the research team will create a generalized protocol for testing voting technology and ballot formats that will be disseminated for nationwide use.

The public benefits of this approach will be substantial: a considerable improvement in the totality of the election process, including reduced voter frustration, increased voter confidence in elections, the casting of more completed ballots, and, possibly, an increase in voter turnout. Scholarly benefits include improved understanding of human-computer interaction as it relates to voting behavior and commencement of a new approach to data collection and analysis in the study of voting technology, ballots, and voting behavior.

The project will be guided by regular interaction with practitioners and policy makers who have responsibility for the effective administration of the electoral system in the United States. Regular interaction will allow these individuals and agencies to disseminate information about the project, encourage potential beneficiaries to review the findings and use the testing protocol, communicate project findings and recommendations to companies that manufacture voting machines, and collect and analyze data from those who use the protocol. ☺

Center for Bioinformatics and Computational Biology Established

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Georgetown University Medical Center, the Johns Hopkins School of Medicine, and the Smithsonian.

The Center's interim director is Prof. Joseph JaJa and its current affiliate faculty, their department affiliations, and their research areas are:

- Eric Baehrecke (Center for Biosystems Research, UMBI) *Cell Death and Development*;
- Charles Delwiche (Cell Biology & Molecular Genetics) *Plant Evolution*;
- Doug Julin (Chemistry & Biochemistry) *Enzymology of Genetic Recombination and DNA Repair*;
- Ben Kedem (Mathematics) *Statistical Techniques and Analysis of Time-Series Data*;

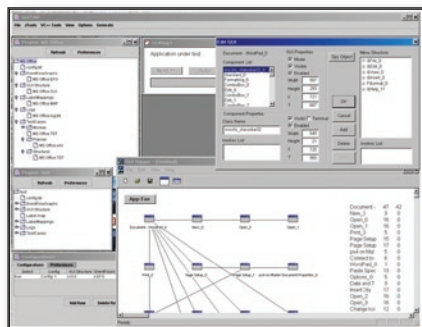
- Charles Mitter (Entomology) *Phylogeny and insect-plant interactions*;
- Steve Mount (Cell Biology & Molecular Genetics) *Splice Site Selection*;
- Dianne O'Leary (Computer Science) *Scientific Computing*;
- Louiqa Raschid (Smith School of Business) *Scientific Discovery from Biomolecular Data Sources*;
- Ben Shneiderman (Computer Science) *Information Visualization for the Exploration of Genetic and Microarray Data*;
- Sarah Tishkoff (Biology) *Human Evolutionary Genetics*;
- Amitabh Varshney (Computer Science) *3D Graphics and Scientific Visualization*; and
- Gerald Wilkinson (Biology) *Social Behavior and Evolutionary Genetics*. ☺



GUITAR Project Fine Tunes Software Testing

A critical component of the software development process, testing ensures the safety, robustness, and usability of computer programs. With labor-intensive software testing comprising approximately two-thirds of the expense of developing new software, however, automation of the testing process can lead to significant savings in development costs. While researchers have achieved much success with automation of these processes, many issues remain unresolved, especially with testing software that have a graphical user interface (GUI).

Prof. Atif Memon (Computer Science/UMIACS) is leading research that aims at advancing the state of the art in automated testing of GUIs, which constitute an increasingly large portion of software systems (almost half of the total software code). “The currently available inadequate GUI testing tools are partly responsible for the ‘fragile’ and ‘unreliable’ software that we have grown accustomed to using,” he notes. “As GUIs become more and more popular, they become increasingly complex, and the gap between the evolution of these interfaces and the effectiveness of the techniques to test them continues to widen. Now is the right time to address the problem of testing GUIs before defects in GUIs reduce our ability to routinely and cost-effectively produce high-confidence software.” Recent news on CNN.com says that the US already loses close to \$60 billion annually because of defective software.



With GUITAR software testers can create integrations trees and event-flow graphs automatically to speed the testing process.

Memon, along with graduate and undergraduate students, has developed GUITAR, a GUI Testing frAmewoRk, to present a unified solution to the GUI testing problem. The team’s emphasis has been on the development of new event-based tools and techniques for various phases of GUI testing.

Freely available to practitioners and researchers via the project’s Web site, the software includes the GUITAR Recorder & Player, which allows test designers to create, execute, and manage test suites, and the GUI Ripper, a tool that allows users to automatically extract a GUI’s architecture and create new structures called integration trees and event-flow graphs that allow test automation.

“We have already had more than 100 downloads of GUITAR. Software testers are excited by the fact that GUITAR allows them to automatically generate thousands of test cases in a matter of minutes, and execute them on their software. In a recent experiment, we executed 990,000 test cases on four programs without any human intervention and detected plenty of faults,” says Memon.

In addition to allowing users to download the software, the GUITAR Web site also serves as a forum for GUI testing researchers to collaborate and share results and ideas to develop better solutions. For more information on this research, see <http://guitar.cs.umd.edu>.

MINDSWAP Group Developing the Semantic Web

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Another use of the Semantic Web is to provide a way for intelligent agents to interact on the Web. In an influential article published in *Scientific American* (May 2001), Tim Berners-Lee (inventor of the Web) and Prof. Hendler outlined an ambitious scenario in which agents coordinated the medical treatment for the elderly mother of two working siblings. In response to several recent articles that said building such a system would be impossible, the MINDSWAP group decided to prove otherwise by implementing the entire thing using a combination of Maryland’s Semantic Web technology, Web services, and a planning system developed by Prof. Dana Nau (Computer Science/UMIACS). The demonstration was presented at the recent World Wide Web Conference in Hungary (WWW2003), attracting enough attention that it had to be shown twice to standing room only audiences.

Another achievement of the research group is the development of what has become known as “the first site on the Semantic

Web.” Currently available at <http://owl.mindswap.org>, the site is the first OWL-compliant site developed to date. Prior to the W3C’s development of OWL, however, earlier versions of the site were in existence using a toolkit based on a web ontology language called SHOE, developed at the University of Maryland—the first web ontology language ever developed and a major inspiration to the OWL language. The MINDSWAP research group, though, views the site as a place to explore a variety of technologies that can enhance the Semantic Web including many Web technologies (HTML, XHTML, XML, PHP, CSS, etc.), Semantic Web languages (RDF, RDFS, DAML+OIL, OWL), and Web Service languages (SOAP, WSDL). The site also has a number of tools related to Semantic Web research available for download.

For more information on Semantic Web research in the MIND Lab, see <http://owl.mindswap.org>.



Vic Basili

- IEEE Computer Society's 2003 Harlan D. Mills Award.
- Keynote Talk: "Distilled Experiences from Several COTS Project," the 2nd International Conference on COTS-Based Software Systems Conference, Ottawa, Canada, February 2003.

Ben Bederson

- Published Book: *The Craft of Information Visualization: Readings and Reflections* (edited with Ben Shneiderman). San Francisco: Morgan Kaufmann (2003).
- Invited Talk: "Visualizations for Archivists," (with Allison Druin) National Archives and Records Administration, College Park, MD, March 2003.
- Invited to join the Microsoft Research University Relations Advisory Board.

Rama Chellappa

- Selected as a 2003-2004 Distinguished Scholar-Teacher.

Bonnie Dorr

- Invited to serve as an Advisory Committee Member at the Center for Drug Evaluation and Research for the Food and Drug Administration.

Allison Druin

- Invited Talk: "Visualizations for Archivists," (with Ben Bederson) National Archives and Records Administration, College Park, MD, March 2003.

Lise Getoor

- Invited Talk: "Selectivity Estimation using Probabilistic Models," New England Database Society, Waltham, MA, March, 2003.

James Hendler

- Appointed a member of the NASA Earth Science and Applications Advisory Committee's Technology Subcommittee.

Michael Hicks

- SIGPLAN Doctoral Dissertation Award 2002 from the Association for Computing Machinery.

Jeff Hollingsworth

- Hosted the Dyninst/Paradyn Meeting at the University of Maryland in April 2003.

Samir Khuller

- Invited Talk, "Algorithms for Data Migration with Cloning," Workshop on Integrated Logistics, Carnegie Mellon University, March 2003.
- Best Newcomer Paper Award at the Symposium on Principles of Database Design (PODS '03).

Doug Oard

- Invited Talk: "Multilingual Access to Large Spoken Archives," European Conference of the Association for Computational Linguistics; Budapest, Hungary; April 2003.

Dianne O'Leary

- Invited Talk: "8 Rules for Career Success," ALL-WIE Symposium, IEEE Women in Engineering Washington Area Affinity Group; Lanham, Md.; May 2003.
- Invited Talk: "Blind Deconvolution Algorithms," IPAM/SIAM/EMS Conference on Applied Inverse Problems; Lake Arrowhead, Calif; May 2003.

Gang Qu

- Published Book: *Intellectual Property Protection in VLSI Designs: Theory and Practice* (with Miodrag Potkonjak). Kluwer Academic Publishers: Boston (2003).

Ben Shneiderman

- Erskine Fellowship at University of Canterbury, Christchurch, New Zealand
- Invited Talk: The New Zealand Royal Society, March 2003.
- Keynote Talk: "Leonardo's Laptop: Human Needs and the New Computing Technologies," The 12th International World Wide Web Conference; Budapest, Hungary; May 2003.
- Keynote Talk: "Leonardo's Laptop: Human Needs and the New Computing Technologies," The Human-Computer Interaction International Conference; Crete, Greece; June 2003.
- Published Book: *The Craft of Information Visualization: Readings and Reflections* (edited with Ben Bederson). San Francisco: Morgan Kaufmann (2003).

Aravind Srinivasan

- Invited Speaker: Workshop on Network Management and Design, the Institute for Mathematics and its Applications, University of Minnesota, April 2003.

New UMIACS Faculty Member: Jeff Foster

Jeff Foster comes to the University of Maryland with joint appointments in UMIACS and the Department of Computer Science.

Foster's research focuses on programming languages with applications to software engineering. His Ph.D. thesis proposes type qualifiers as a lightweight, specification-based mechanism for improving the quality of software. As part of this research, type qualifiers have been used to find security vulnerabilities in C programs and to find deadlocks in the Linux kernel. In earlier research he worked on the BANE



project, co-developing a scalable constraint-based alias analysis. Foster has also studied the trade-offs between different styles of polymorphism in the context of aliasing.

Foster received his Ph.D. in Computer Science at the University of California, Berkeley, and he received B.S. and M.Eng. degrees from Cornell University, also in Computer Science.

More information on Foster and his research is available at <http://www.cs.umd.edu/~jfoster/>.



High School Student Wins Awards for Research UMIACS Professor

In early 2002, Montgomery Blair High School student Jeremy Hoffman contacted Prof. V.S. Subrahmanian (Computer Science/UMIACS) to look into the possibility of doing research in Subrahmanian's lab during the summer. Hoffman spent the summer of 2002 working in the lab on querying heterogeneous databases with associated ontologies so that the answers returned are semantically correct. Hoffman continued his work with Subrahmanian throughout fall 2002 and spring 2003, to the extent his schoolwork permitted.

Hoffman's work resulted in numerous awards for high school research in 2003. These include: Intel Science Talent Search (Semifinalist), Montgomery Area Science Fair (First Place Award in the category of Computer Science), U.S. Nuclear Regulatory Commission (Special Science Fair Award), Central Intelligence Agency (High School Science & Engineering Fair Award), and the Intel Corporation's Excellence in Computer Science Award. ☺

Habash Wins Grad Student Distinguished Service Award



Computer Science graduate student Nizar Habash was selected as the 2003 recipient of the University of Maryland Graduate Student Distinguished Service Award. This competitive award honors graduate students who have made outstanding contributions to the university community in the areas of scholarship, leadership, involvement, and service. Prof. Bonnie Dorr (Computer Science/UMIACS) was the lead nominator. Habash is completing his Ph.D. dissertation through the Computational Linguistics and Information Processing (CLIP) Laboratory under the supervision of Prof. Dorr. His thesis research is on natural language generation and machine translation. ☺

Paraguayan Forests Benefit Features GLCF Products

The Global Land Cover Facility (GLCF), led by Professors John Townshend (Geography/UMIACS) and Joseph JaJa (Electrical & Computer Engineering/UMIACS), participated in the Paraguayan Forests benefit, hosted by the World Wildlife Fund and the Nature Conservancy at the Mexican Cultural Institute in Washington, DC, on May 14. The primary focus of the evening was support for the conservation of Paraguay's Atlantic Forest. The Deforestation Mapping Group (DMG) project at the GLCF has produced a deforestation product for Paraguay, based on Landsat imagery. At the event, the Paraguayan Ambassador, Her Excellency Leila Rachid de Cowles, visited the GLCF display and engaged DMG Leader Alice Altstatt, in a discussion about the DMG products and what they reflect about the Paraguayan environment. ☺



Alice Altstatt and the Paraguayan Ambassador discussing deforestation.

MIND Lab Hosts Workshop on Homeland Security Technologies

The Maryland Information and Network Dynamics (MIND) Laboratory hosted a Workshop on Homeland Security Technologies on April 28 at the University of Maryland. The workshop's purpose was to understand the breadth of the challenges and foster collaboration between interested parties to explore the synergistic use of these technologies. A specific goal of this workshop was to identify opportunities for practical deployable systems and to reveal a possible road map as to the nature of future deployments.

The event featured presentations from the MIND Lab and a number of its partners including Koolspan, Fujitsu, Cisco Systems, and AeroSense. Topics covered included wireless network security, pervasive computing, intelligent information networks and network centric communications, reflective situation awareness management, and the Semantic Web.

More information about the workshop, including online versions of the presentations given, is available at <http://www.mindlab.umd.edu/>. ☺



Hundreds Attend Annual Research Review Day

On March 21, 2003, more than 400 people attended the eighth annual Research Review Day in the Stamp Student Union at the University of Maryland. Sponsored by UMIACS, the Department of Computer Science, the Institute for Systems Research, and the Department of Electrical and Computer Engineering, the event showcases cutting-edge technology research at the university to guests from industry, government, and other institutions of higher education.

The morning session consisted of four high-tech presentations and a keynote address from Dr. Robert E. Kahn, CEO and president of the Corporation for National Research Initiatives. UMIACS faculty members delivered three of the four morning presentations: “Discovering Patterns in Linked Heterogeneous Data” from Prof. Lise Getoor (Computer Science/UMIACS), “Interactive Scientific Visualization for Large Data” from Prof.



PHOTO BY JORDAN LANDES

Attendees look over some of the 185 research posters and demonstrations.

Many of the posters from Research Review Day currently are available online at <http://www.rrd.umd.edu>. ☺

UM Hosts 2nd Annual Workshop on Economics and Information Security

On May 29 and 30, the University of Maryland hosted the second annual Workshop on Economics and Information Security at the Robert H. Smith School of Business. Sponsored in part by UMIACS, the event focuses on questions related to the efficient allocation of funds to information security activities. Topics discussed during the sessions included: Trusted Computing and DRM, Security Intrusion, Privacy Policies, Options and Security, Alternative Approaches to Security Processes, Asymmetric Information Aspects of Information Security, and Practical Cases and Problems. Prof. Martin Loeb (Business/UMIACS) served as general chair for the event, which featured John Manfredelli of Microsoft as its guest speaker in addition to many of leading researchers in the field. More information about the workshop, including a complete agenda, can be found at <http://www.cpppe.umd.edu/rhsmith3/>. ☺

HCIL Celebrates 20th Annual Symposium and Open House

The Human-Computer Interaction Laboratory (HCIL) hosted its 20th Annual Symposium and Open House on May 29 and 30. The event was attended by more than 230 people from industry, government, and other institutions of higher education.

The first day was comprised of Pre-Symposium Tutorials and Workshops. Tutorials introduced participants to subjects including Human-Computer Interaction, Usability Testing, and Web Design. Workshops covered the areas of Interfaces for Mobile Devices and Information Visualization Evaluation. The event’s second day consisted of a variety of sessions on topics such as Digital Libraries, Devices Big and Small, and Information Understanding. Demonstrations of cutting-edge research in HCI followed the morning sessions and offered attendees an opportunity to see the fruits of this research up close.



PHOTO BY ALLISON FARBER

A guest is given a demonstration of Treemap 4.0 from HCIL students Kristine Holland and Gouthami Chintalapani.

A highlight of the event was the unveiling of the new, basic version of the interface for the International Children’s Digital Library (ICDL) project. The ICDL is a joint effort by the HCIL and Internet Archive to create an extensive library of international children’s literature. The new HTML-based interface software increases the ICDL’s accessibility and complements the Java-based version launched in November 2002. ☺

UMIACS Organizes SDUIT’03

The 2003 Symposium on Document Image Understanding Technology was held April 9 to 11 in Greenbelt, Maryland. Sponsored by UMIACS and the Department of Defense, the event brought together leading researchers from industry and academia, as well as all government agencies involved in document understanding. Funding agencies were on hand to describe present and future document understanding programs, and principal investigators reported on current efforts in the field. Session topics included Page Structure, Multilingual Documents, Handwriting, Degraded Documents, OCR and OCR Correction, and Multimedia.

Gabriel Watts of the Federal Bureau of Investigation gave a keynote talk entitled “Overview of the Questioned Document Unit.” The second keynote talk, “Document Processing, and Understanding: An Integrated Approach,” was delivered by Patrice Simard of Microsoft Research. ☺



UMIACS and CS Unveil New Industrial Affiliates Program

In order to develop closer relationships with information and computing technology companies and promote common interests, UMIACS and the Department of Computer Science (CS) have launched a new Industrial Affiliates Program.

The Industrial Affiliates Program (IAP) is aimed to foster relationships between UMIACS/CS and companies interested in research and development in software systems and computing technologies, and to facilitate collaborative activities between member companies and UMIACS laboratories and research groups. Benefits to member companies include active faculty involvement on joint projects, exchange of technical information, interactions between corporate technical representatives and faculty, and recruitment programs.

In collaboration with a faculty member, Industrial Affiliates design and carry out research projects in areas of mutual interest. The member company may send its own representative to conduct research in a UMIACS lab in collaboration with the lab's research staff, or may interact regularly with a faculty member in carrying out the joint research.

UMIACS/CS will provide office space, computing resources, and network access for technical staff from IAP members who will be working in a UMIACS lab. During their stay, these researchers can attend classes, have access to the university libraries, and participate in a variety of research-related events. Companies may elect to send one person for a year or two people for a six-month period each. The four types of memberships currently offered under the IAP are explained to the right.

For more information about the Industrial Affiliates Program, contact Joseph JaJa at joseph@umiacs.umd.edu or Chris McCarthy at mccarthy@umiacs.umd.edu. ☺

Affiliate

- Annual research seminar conducted by our faculty, focusing on technical issues of interest to members.
- Complimentary invitation for one participant to participate in UMIACS-sponsored workshops and symposia.
- One-day consultation with faculty members on matters of technical interest, which includes visits to the labs and demonstrations of latest technologies developed by the UMIACS/CS faculty.
- Recruiting information and recruiting seminars
- Recognition of support on the UMIACS web site and in all appropriate UMIACS/CS publications
- Membership in Partners in Computing, a joint CS/UMIACS program, which in particular provides special opportunities for recruiting Computer Science students
- \$20,000 per year.

Collaborator

- On a single project or with one faculty member
- Includes benefits of an Affiliate
- Can send a Resident Scientist for one semester
- \$50,000 per year plus the resident scientist costs

Partner with a UMIACS Lab or Center

- Can involve several projects
- Includes benefits of an Affiliate
- Can send a Resident Scientist for a year
- Partnership agreement arranged with the lab or center

Resident Scientist Program

- A company may send a scientist to be resident at the University and work in a lab or with a faculty member.
- The basic cost will be \$ 25,000 per semester.

UM Hosts IBM SUR Technical Review

The University of Maryland hosted representatives from IBM on February 4 for a Shared University Research (SUR) Technical Review. Since 1994, the University of Maryland and IBM have had a strong relationship built around collaborative research projects. The Technical Review allows researchers to share information about projects supported by the campus and SUR awards from IBM.

UMIACS faculty participating in the event included Professors Jeff Hollingsworth (Computer Science/UMIACS), Doug Oard (Information Studies/UMIACS), Ben Bederson (Computer Science/UMIACS), François Guimbretière (Computer Science/UMIACS), Ben Shneiderman (Computer Science/UMIACS), and Dr. David Doermann (UMIACS). IBM representatives included David Hawks, Steve Mills, Dennis Shea, and Lori Southworth.

For more information about the IBM-UM partnership, see <http://www.umiacs.umd.edu/partnerships/ibm.htm>. ☺

MIND Lab and Koolspan Team Up for MIPS Grant

In February, the Maryland Information and Network Dynamics (MIND) Laboratory and its partner Koolspan received a grant from the Maryland Industrial Partnerships (MIPS) program. The grant will support further development of solutions to security and user authentication concerns of users of Wi-Fi networks. MIPS provides matching grants for research to help Maryland companies develop new products or processes.

Koolspan also was awarded an award from Maryland TEDCO in March to commercialize technology developed at the MIND Lab. The technology can securely connect a computing device to a wireless network.

The Bethesda-based company has been a partner in the MIND Lab since September 2002. For more information, see <http://www.koolspan.com>. ☺

Awards (December 2002-June 2003)

- Classroom of the Future (NSF)
A. Druin
- Customizable Audio User Interfaces for the Visually Impaired and the Sighted (NSF)
R. Duraiswami, L. Davis
- Customized Audio User Interface (ONR)
R. Duraiswami
- Data Collection Infrastructure for Digital Government Applications (NSF)
H. Samet, L. Golubchik, S. Khuller
- Decision Making in the Context of Commitments to Team Activity (NSF)
S. Kraus
- Development of a Formal Theory of Agent-Based Computing for System Evaluation and System-Design Guidance (DARPA)
J. Horty
- Enhancing Human Understanding of NCHS Statistics (HHS)
C. Plaisant, B. Shneiderman
- Enhanced Metadata Extraction (NASA)
J. Jaja
- Evaluation and Improvement of Machine Translation Using Parallel Corpora (DARPA)
D. Doermann, B. Dorr
- Fast Multipole Translation Algorithms for Solution of the 3D Helmholtz Equation (NSF)
N. Gumerov, R. Duraiswami, H. Elman, I. Mayergoyz, D. O'Leary
- Federated Persistent Archive (NARA)
J. Jaja
- Handling Contradictory Data with Metareasoning (Air Force)
D. Perlis
- Human Computer Interface Design (Census)
K. Norman, C. Plaisant, B. Shneiderman
- Human Tracking and Verification in Video (ONR)
R. Chellappa
- Improved Algorithms (NASA Goddard)
J. Townshend
- Information Acquisition as a Factor in Improving Agent Performance in Negotiation and Decision Making (NSF)
S. Kraus, J. Wilkenfeld
- Infrastructure to Develop a Large Scale Experiment Testbed of Multi-modal Resources (NSF)
L. Raschid, D. Doermann, B. Dorr, D. Oard, A. Weinberg
- Integration of Data and Interfaces to Enhance Human Understanding of Government Statistics (NSF)
C. Plaisant, B. Shneiderman
- International Children's Digital Library (NSF)
A. Druin, B. Bederson, A. Weeks
- LAMP Lab (DoD)
D. Doermann, A. Weinberg
- A Landcover Earth Science Information Partnership (NASA)
J. Townshend, J. Jaja
- Multilingual Access to Large spoken ArCHives - MALACH (NSF)
D. Oard, D. Doermann, B. Dorr, P. Resnik
- MURI-Bootstrapping out of the Multilingual Resource Bottleneck (JHU/ARO)
P. Resnik, A. Weinberg, B. Dorr
- NPACI - San Diego (UCSD/NSF)
J. Jaja, A. Sussman
- Real-Time Capture, Management and Reconstruction of Spatio-Temporal Events (NSF)
H. Samet
- Scalable Intelligent Agent Architecture for the 21st Century Battlefield (ARL)
V. Subrahmanian, D. Nau
- Search Interfaces for Biodiversity Informatics (NSF)
B. Bederson
- Secure Wireless Infrastructure Test Bed (NIST)
W. Arbaugh, A. Agrawala
- Sustainability of NASA EOS Products (NASA)
J. Townshend
- System Support for Enterprise Application Servers (NSF)
P. Keleher, J. Hollingsworth, B. Pugh
- Textual Information Access for the Visually Impaired (NSF)
L. Davis, R. Duraiswami
- Translingual Information Access (Navy)
D. Oard, B. Dorr, P. Resnik
- Uncovering and Exploiting Memory Parallelism in Pointer-Chasing Applications (NSF)
D. Yeung, C. Tseng
- University Partnership with Laboratory for Telecommunication Sciences (DoD)
J. Jaja
- Using the Web as a Corpus for Empirical Linguistic Research (NSF)
P. Resnik
- Zoomable User Interfaces for the Semantic Web (Air Force)
B. Bederson
- 3D Description and Recognition of Human Activities Using Distributed Cameras (NSF)
R. Chellappa

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For additional information, visit UMIACS on the web at <http://www.umiacs.umd.edu> or contact

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