Computer Science and Artificial Intelligence Laboratory

As of July 1, 2003, the Laboratory for Computer Science (LCS) merged with the Artificial Intelligence Laboratory (AI Lab) to become the Computer Science and Artificial Intelligence Laboratory (CSAIL), the largest interdisciplinary research laboratory at MIT in terms of personnel and volume. CSAIL brings together faculty, researchers, and students in a wide program of study, research, and experimentation. The laboratory's membership is comprised of 782 members, including 159 faculty and research staff, 456 graduate students, 45 undergraduates, 88 visitors, affiliates and postdoctoral associates and fellows, and 34 support staff. The academic affiliation of the majority of the laboratory's faculty and students is with the Department of Electrical Engineering and Computer Science, but we also include faculty and students from Mathematics, Brain and Cognitive Sciences, Aeronautics and Astronautics, Ocean Engineering, the Biological Engineering Division, and the Harvard–MIT Division of Health Sciences and Technology.

Our research is sponsored by the US Government—primarily the Defense Advanced Research Projects Agency and the National Science Foundation—and by many industrial sources, the largest of which is the Oxygen Alliance. Since 1994, CSAIL has been the principal host of the World Wide Web Consortium (W3C) of nearly 400 organizations that helps set the standard of a continuously evolving World Wide Web. CSAIL participates in the Singapore–MIT Alliance and the Cambridge–MIT Institute.

CSAIL is organized into the following four broad research areas:

- *Architecture, Systems, and Networks* covers all aspects of the building of both hardware and software computational systems. Srini Devadas is the research director for ASN and sits on the CSAIL Executive Committee.

- *Theory* looks at the fundamental mathematical underpinnings of all aspects of computer science and artificial intelligence. David Karger is the research director for Theory and sits on the CSAIL Executive Committee.

- *Language, Learning, Vision, and Graphics* includes work on the sorts of things that all people manage to do effortlessly, both emulating those abilities and simulating their appearance. Leslie Kaelbling is the research director for LLVG and sits on the CSAIL Executive Committee.

- *Physical, Biological, and Social Systems* might also be called *complex adaptive systems.* It covers work from robotics to molecular biology and from semantic systems to computational models of politics. Randy Davis is the research director for PBSS and sits on the CSAIL Executive Committee.

The Executive Committee decides CSAIL policies, examines promotion cases, and discusses strategies designed to keep the laboratory at its peak. Members are drawn from each research area and include, in addition to those mentioned above, Rodney Brooks, Victor Zue, Chris Terman, Anant Agarwal, Tim Berners-Lee, Thomas Knight Jr., Agnes Chow, and Lissa Natkin.

Highlights

Facilities

CSAIL moved into the Stata Center during the month of March 2004. In the months leading up to the move, we designed and created a subnet with the sponsorship of CISCO and APC. The system has a 10-gigabit/second backbone and can send 1 gigabit/second to 1,000 desktops. This network also supports the Laboratory for Information and Decision Systems (LIDS) and the Department of Linguistics and Philosophy. CSAIL research space incorporates offices, four wet bio labs, rapid prototyping machines, a 1,000-sq ft holodeck for large-scale graphics experiments, a computer science reading room, four major machine rooms for file and web servers and specialized machines, and three different parallel processing clusters.

Stata Opening Events

Dedication of the Stata Center began officially on May 6, 2004, with Media Day, where Stata was presented to over 100 design and technology writers. The event began with a short welcome by Provost Robert A. Brown, followed bv opening remarks from Rodney Brooks. A series of architectural and research talks followed, presented by William J. Mitchell, John Guttag, Tim Berners-Lee, Alec Marantz, and Victor Zue. Frank Gehry then spoke about his vision for the building, followed by a Q&A session and guided architectural tours and technical demonstrations.

The formal dedication took place on May 7, 2004. It was hosted by President Charles Vest. The official presentations were made by Professor Morris Halle, Linguistics and Philosophy; Provost Robert Brown; Cambridge mayor Sullivan; Ray and Maria Stata; Alexander Dreyfoos; Professor Rodney Brooks, director of CSAIL; Professor Vincent Chan, director of LIDS; and Bill Gates via videotape.

The afternoon continued with the dedication of the Dertouzos Amphitheater and a program designed to showcase Michael Dertouzos' love of music. Performances included Senegalese drumming, Baroque dancing, and the MIT Chorallaries, followed by speeches from Professor Victor Zue, Cathy Liddell (widow of Michael L. Dertouzos), and Professor John Guttag.

The day concluded with a dinner for the donors and those special guests who made the Stata Center happen. Remarks were given by Dr. Vest, Frank Gehry, Nancy Joyce, Paul Hewins, and members of the trades who had worked on the Stata Center.

Project Oxygen

This year saw increased participation from the Project Oxygen partners. For the first time, all three workshops were hosted at partner locations: Acer in Taiwan, HP in California, and Nokia in Finland. In year four of the five-year agreement, 23 projects were researched. The major areas were sensors/networks/security, healthcare, perception, and software systems. In June, the Oxygen annual meeting was hosted at CSAIL and included two days of interactive demonstrations held in around CSAIL

research space. Victor Zue, Rodney Brooks, and Anant Agarwal comprise the committee that oversees this project.

CSAIL/Industrial Liaison Program Conference

In April, CSAIL and the Industrial Liaison Program hosted a conference in which senior executives representing telecommunications and network companies, electronic device and chip manufacturers, software developers for a broad range of applications including medical and biotech, and companies involved in the development of human-computer interfaces, as well as venture capitalists, listened to a variety of talks on the future of pervasive computing. These included the latest in device security, medical image analysis, biotech system modeling, secure distributed peer-to-peer networking, "lightweight" software design techniques, and multimodal speech, pen, and visual recognition technologies. The presentations were paired with live demonstrations in CSAIL's new home in the Stata Center.

In addition, there was a "spin-off bazaar," where 16 spin-offs from CSAIL (including the AI Lab and LCS in the past) set up booths and spoke with the attendees. This highlighted a hallmark of our lab: the creation of a large number of spin-off companies, some of them extremely successful.

Center for Information Security and Privacy The Center for Information Security and Privacy (CISP) was created in January 2004. Its mission is to conduct breakthrough, long-term research in information security and privacy. CISP addresses both fundamental problems that our society is presently facing such as Internet security as well as new security challenges in emerging computing environments, such as the millions of embedded networked devices that are coming online. CISP's goal is to develop both the theoretical foundation for secure systems as well as to engineer practical systems. CISP is headed by Professor Ron Rivest, and professors Hari Balakrishnan and Frans Kaashoek act as associate heads.

Like Project Oxygen, CISP is a series of research projects that cuts across the four major research areas in CSAIL. For more information, visit http://cisp.csail.mit.edu.

World Wide Web Consortium

The World Wide Web Consortium (W3C) is where the framework for today's web is developed (including HTML and XML) and is where the framework for tomorrow's web is being designed. This year, the W3C celebrates the 10th anniversary of its founding at MIT. The consortium is now cohosted by MIT, the European Research Consortium for Informatics and Mathematics, and Keio University; has 14 other offices around the world; and is driven by the support of close to 400 companies and organizations. W3C has issued 80 technical standards to date. During the past year, over 20 new web standards were completed, including the foundations for Web Services, the Semantic Web, and Voice Browsing. W3C's new Patent Policy provides the consortium with the most clear and comprehensive patent policy in the Internet standards industry and helps ensure that web technology can be implemented without the barrier of patent licensing fees. The application domain for web technologies

continues to expand well beyond the desktop browser. Efforts are underway to complete standards that support web access from anywhere (from fixed to mobile and from high to low bandwidth environments), any device (ranging from big computers with high-definition displays to palm devices to appliances), and via any mode of interaction (touch, pen, mouse, voice, assistive technologies, computer to computer). W3C's early leadership in Semantic Web technology has paid off with growing adoption in both research and production applications.

Distinguished Lecture Series

Three distinguished speakers gave presentations during this year's Dertouzos Lecturer Series. They were Anna Karlin, Professor of Computer Science, University of Washington; Scott Shenker, Professor of Computer Science, ICSI Berkeley; and, Dan Huttenlocher, Professor of Computer Science, Cornell University.

Awards/Honors

Our faculty and staff have won many awards this year. Some of the awardees included the following: Tim Berners-Lee was awarded the first Finnish Technology Award Foundation's Millennium Technology Prize and was knighted as knight commander of the British Empire; Erik Demaine received a MacArthur fellowship; Shafi Goldwasser and Ron Rivest were made members of the National Academy of Science; Bonnie Berger was made an ACM fellow; Eric Grimson was made IEEE fellow; Butler Lampson was awarded the Charles Stark Draper Prize; Barbara Liskov was awarded the IEEE John von Neumann Award; Silvio Micali was admitted to the American Academy of Arts and Sciences; Tommy Poggio was awarded the NOVOFER Foundation for Technical and Intellectual Creation Gabor Award; and Rodney Brooks, Tom Leighton, and Victor Zue were made members of the National Academy of Engineering.

Affirmative Action

CSAIL supports the affirmative action goals of the Institute.

Rodney Brooks
Director
Fujitsu Professor of Computer Science

More information on the Computer Science and Artificial Intelligence Laboratory can be found on the web at http://www.csail.mit.edu/.