Computer Science

As the first university to officially form a Computer Science department, Carnegie Mellon helped define and continually redefines the field. Here, it has always been more than software and code. It's robots exploring planetary terrain. It's enabling people speaking six different languages to communicate easily with each other by speaking into translating computers. It's elementary school students getting help in algebra from computer tutors.

Home to the largest terascale computer in the world dedicated to non-classified research and the world's premier computer incident response team, Carnegie Mellon and its School of Computer Science are sure to lead the world in computer science innovation for years to come. Detailed here are a number of the university's largest and most recent research initiatives.

Fruit Fly Nervous System Provides New Solution To Fundamental Computer Network Problem

The fruit fly has evolved a method for arranging the tiny, hair-like structures it uses to feel and hear the world that's so efficient a team of scientists in Israel and at Carnegie Mellon University says it could be used to more effectively deploy wireless sensor networks and other distributed computing applications. Having devised an algorithm based on the fly's nervous system, the researchers have concluded that it provides a fast solution to the MIS problem. Additionally, because the biological approach doesn't require so many assumptions the solution is applicable to many more applications.

Center for Automated Learning and Discovery: CALD's mission is to pursue basic science in automated learning methods, including data mining, statistical methodology and knowledge discovery driven by applications to problems of societal importance. New algorithms and theories developed here are being applied to areas like industrial process control, DNA sequencing, environmental assessments, information filtering and government statistical surveys. *www.cald.cs.cmu.edu*

Robotics Institute: Even when robotics technologies were relatively primitive, their potential role in boosting the productivity and competitiveness of the United States was foreseen in the evolving global marketplace. The Robotics Institute at Carnegie Mellon University was established in 1979 to conduct basic and applied research in robotics technologies relevant to industrial and societal tasks and is recognized worldwide as one of the premier organizations of its kind. *www.ri.cmu.edu*

Entertainment Technology Center: A joint computer science and fine arts research endeavor, this center strives to provide a new model for interactive multimedia entertainment by incorporating technologies like artificial intelligence, speech recognition, and advanced learning technologies with the fine arts. *www.etc.cmu.edu*

Human Computer Interaction Institute: The largest and most diverse group of HCII researchers anywhere in the world, research at the Institute is devoted to the design, implementation and evaluation of interactive computer-based technology. HCII researchers have developed more than 20 generations of wearable computers, systems that combine wireless with handheld technologies. *www.hcii.cs.cmu.edu*

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Organ Network Uses Carnegie Mellon Algorithm To Match Live Kidney Donors With Recipients

A computer algorithm developed at Carnegie Mellon University matched living kidney donors with medically compatible transplant candidates at the October 2010 national Organ Procurement and Transplantation Network (OPTN). The initial run of the computer matching process included just 43 kidney transplant candidates and 45 potential living donors, but a national kidney paired-donation (KPD) pool eventually could include as many as 10,000 donor-recipient pairs."A unified nationwide exchange can yield significantly better solutions than multiple separate exchanges, and it is extremely rewarding that after we have worked on this for six years, the nationwide program is now live," said Tuomas Sandholm, a Carnegie Mellon professor of computer science who has led the development of computer algorithms for optimizing match runs.

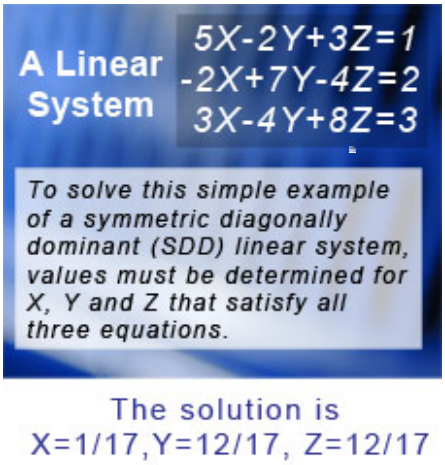
Institute for Software Research, International: ISRI creates innovative solutions to the problems of practical, large-scale, high-quality software-intensive systems for the new millennium. The primary focus is on systems that exploit the growing infrastructure for high performance, nearly ubiquitous computing and communication, especially systems the public depends on for services provided through the electronic marketplace. *www.isri.cs.cmu.edu*

Language Technologies Institute: This center draws on Carnegie Mellon's long-standing accomplishments in the natural language processing of written and spoken language and information management to make language barriers a thing of the past. Speech translation systems developed here have made it possible for multilingual communication over the Internet and have aided the military's need to translate foreign languages while in the field. *www.lti.cs.cmu.edu*

Pittsburgh Supercomputing Center: The PSC houses the most powerful computing system in the world dedicated to non-classified research. Funded by the National Science Foundation and available to scientists and engineers nationwide, its research capabilities bear on a wide range of important problems such as earthquake modeling, storm-scale weather forecasting, global climate change and protein genomics. *www.psc.edu*

Laboratory for International Data Privacy: By partnering with institutions, agencies and corporations facing real-world privacy concerns, the "Data Privacy Lab" is dedicated to creating technologies and related policies with provable guarantees of privacy protection while allowing society to collect and share private (or sensitive) information. Work involves developing ways to learn sensitive information from disparate and seemingly innocent information and constructing solutions; the Data Privacy Lab seeks balanced, integrated solutions that weave technology and policy together. *http://privacy.cs.cmu.edu*

Creative Technology Nights for Girls: A free weekly program focused on exposing middle and high school girls to creative technologies, Creative Technology Nights uses computer animation, Web design, programming, robotics and interactive media, taught by graduate students from the School of Computer Science, to engage a future generation of women in technology. In addition, students are encouraged to socialize through a variety of social events such as movie nights, open houses and Bring-Your-Mother-to-Work-Night to create an alternative social space for female students pursuing technology. *http://creativetechnights.com*



Carnegie Mellon Researchers Break Speed Barrier in Solving Linear Systems

Computer scientists at Carnegie Mellon have devised an innovative and elegantly concise algorithm that can efficiently solve systems of linear equations that are critical to such important computer applications as image processing, logistics and scheduling problems, and recommendation systems. Solving these linear systems can be time consuming on even the fastest computers. The new algorithm employs powerful new tools from graph theory, randomized algorithms and linear algebra that make stunning increases in speed possible. The algorithm, which applies to an important class of problems known as symmetric diagonally dominant (SDD) systems, is so efficient that it may soon be possible for a desktop workstation to solve systems with a billion variables in just a few seconds.