BUILDING THE FUTURE

PROGRESS

COMPUTER SCIENCE AND ENGINEERING

A PIONEERING DEPARTMENT:

EXCELLENCE IN RESEARCH AND INNOVATION

Ever since the University at Buffalo became one of the first higher learning institutions to offer degree programs in the computing field more than 40 years ago, our Department of Computer Science and Engineering has succeeded in establishing itself as a leading research department, well known both nationally and internationally for its groundbreaking foresight and pioneering innovations.

For decades, our highly motivated and dedicated faculty have engaged in world-class research in every aspect of computer science and technology, and are recipients of numerous national and international awards. They have founded, and currently direct, major research centers devoted to biomedical computing, biometric systems, cognitive science, document analysis and recognition, information assurance, and high-performance computing. In addition, they have played key roles in many other major areas of research, including optical and wireless networks, computer security, computer vision, databases, algorithms, complexity theory, and software and hardware systems.

Among many of their cutting-edge achievements, our faculty have pioneered in the science and technology of automated handwriting recognition and developed software systems for machine reading of handwritten addresses, which has saved the U.S. Postal Service more than a billion dollars in just a few years. They also have been credited with an algorithm developed for crystal structure determination, which has been ranked as one of the top algorithms of the 20th century. Moreover, our faculty have helped establish UB as one of the leading academic supercomputing centers in the world.

Equally distinguished are the accomplishments of our alumni, many of whom are prize-winning researchers and CEOs of some of the fastest-growing companies of information technology worldwide.

Our department has led the way in advancing the science and technologies of information, computing, and communication technologies that are indispensable to our world today, and we will continue to lead the way into the future.

Aidong Zhang
Professor and Chair

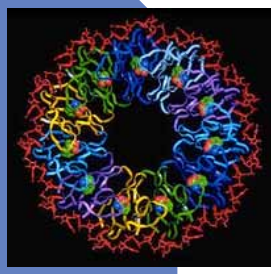
ON THE COVER

A VIEW OF THE NEW HOME FOR COMPUTER SCIENCE AND ENGINEERING, ALONG WITH ELECTRICAL ENGINEERING, TO OPEN IN 2011.

NEW CSE HOME TO OPEN IN 2011

UB DOWNTOWN CAMPUS

CSE RESEARCH CENTERS



BUFFALO CENTER FOR BIOMEDICAL COMPUTING

The Center's mission is to establish a multi-disciplinary program to address fundamental research issues in biocomputing while contributing to mid-to long-term research, development, and experimental deployment challenges of analyzing genomic data for diseases and treatment effects. The Center provides the expertise and infrastructure that merges the research activities of computational and biomedical scientists. The focus of the Center research is the study of common diseases, such as cancer, multiple sclerosis and coronary artery disease in which the underlying causes are multi-factorial. We use advanced computational techniques and approaches to convert raw genomic data into knowledge that will advance the understanding of these common diseases and potentially identify new modalities of treatment.

CENTER FOR UNIFIED BIOMETRICS AND SENSORS

The Center's mission is to establish a unified biometric framework, facilitating the development of next-generation biometric systems from proof-of-concept to product readiness. This includes radically different biometric technologies geared toward applications to improve comfort, convenience, and security for personal and commercial use.

CENTER FOR COGNITIVE SCIENCE

The Center's mission is to investigate the nature of cognition, i.e., of intellective processes as exhibited either by the human mind or by computer. Most centrally, cognitive science is the study of how the mind works, both in its conceptual organization and in its computational and neural infrastructure. Accordingly, cognitive science has brought together researchers from a number of traditionally separate disciplines -- primarily, computer science, psychology, linguistics, philosophy, anthropology , and neuroscience -- in order to build a new and unified understanding of cognition that is compounded from the different disciplinary perspectives and that moves beyond them. The Center organizes colloquia and conducts both an undergraduate major leading to a B.A. in Cognitive Science and a program of graduate tracks in cognitive science.

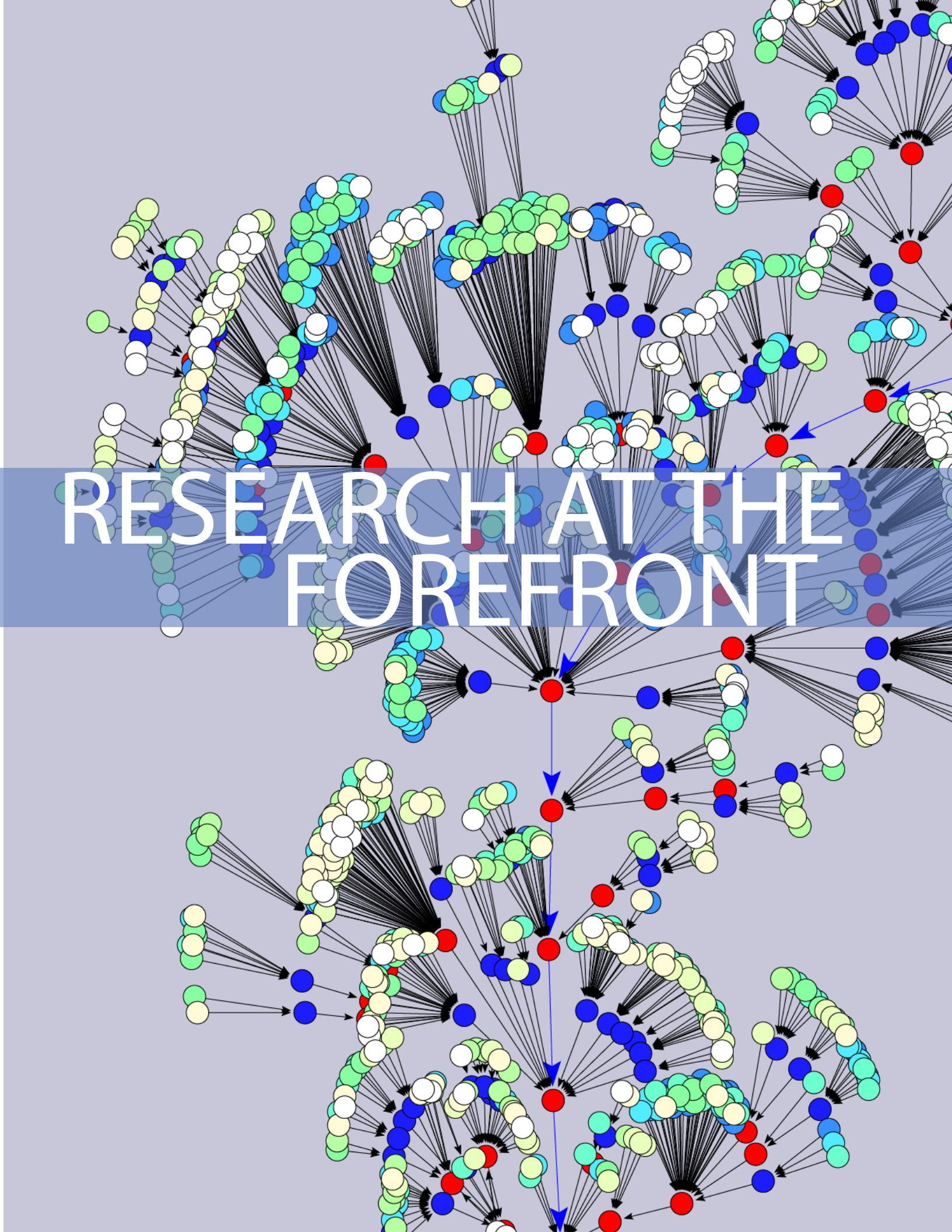
CENTER OF EXCELLENCE FOR DOCUMENT ANALYSIS AND RECOGNITION

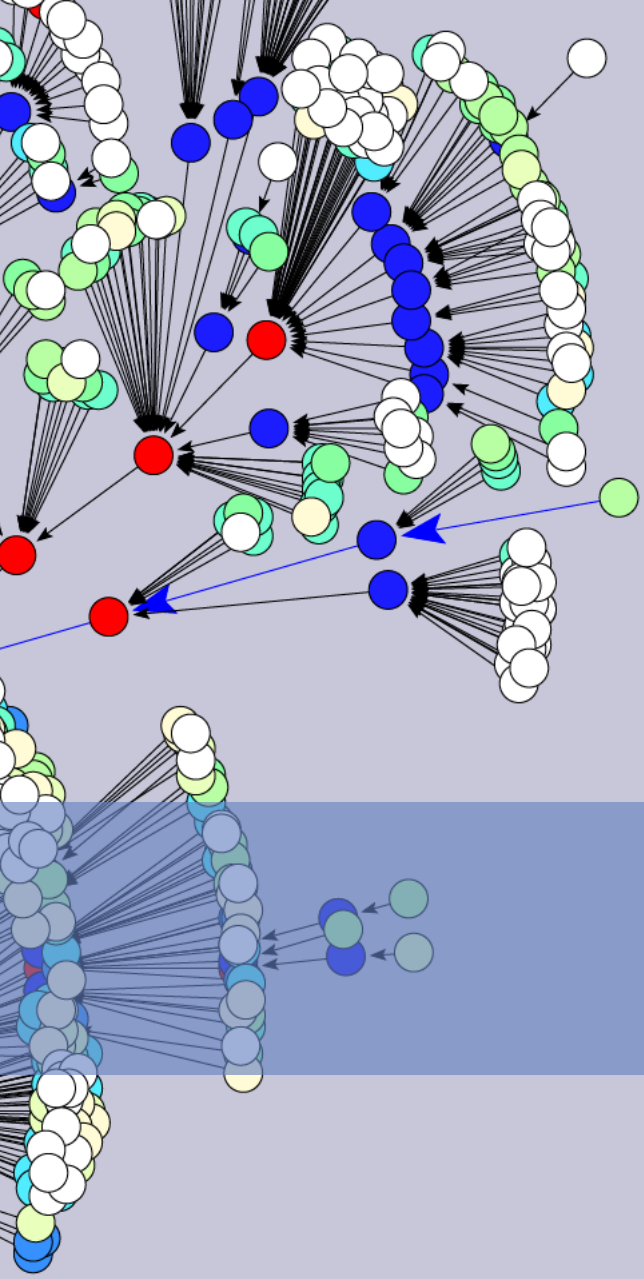
The Center's mission is to focus on the development of computational methods for the analysis of patterns in documents, text and two-dimensional images. While the application of such methods to the analysis of paper documents and handwriting recognition has been the Center's core strength since 1978, these applications has since been diversified to include computational forensics, e.g., fingerprints and shoe-prints. The methods of research are in the areas of pattern recognition, machine learning, information retrieval, data mining and text mining.

CENTER OF EXCELLENCE IN INFORMATION SYSTEMS ASSURANCE RESEARCH AND EDUCATION

The Center's mission is to promote Information Assurance (IA) in graduate education and coordinated research in computer security and information insurance by faculty members from several schools and departments at the University at Buffalo and promote collaborative relationships with companies engaged in security research and multidisciplinary research focus in IA.

Groundbreaking for a new $61-million, state-of-the-art classroom and laboratory building occurred on UB's North Campus. The new engineering building will be home to the Department of Computer Science and Engineering and the Department of Electrical Engineering, modernizing their programs and facilities. Designed by renowned architects Perkins & Will, the 130,000-square-foot structure will increase facility space of the School of Engineering and Applied Sciences by nearly one-third, accommodating significant new growth in the school's student enrollments, faculty hires, and research expenditures. The building will feature a cybertorium or smart auditorium, outfitted with the most sophisticated communications devices and smart technologies. Flexible research labs, classrooms, and meeting areas will foster interdisciplinary work. The building is expected to be completed in 2011.


RESEARCH AT THE
FOREFRONT



RESEARCH IN OUR DEPARTMENT HAS DETECTED LETHAL PROTEINS IN PROTEIN INTERACTION NETWORKS.

BIOINFORMATICS / BIOMEDICAL COMPUTING

Daniel Fischer | Aidong Zhang

Our faculty are active in development of novel algorithms and architectures for genomics, proteomics, and biomedical applications. The research areas include protein-protein interaction network analysis, microarray data analysis, high-dimensional biomedical data visualization, and a better understanding of life at the molecular level using "in silico" or computational tools to interpret the information encoded in biological macromolecules, from individual proteins to complete genomes.

Daniel Fischer's research focuses on protein structure prediction - from homology modeling to ab initio, the use of protein models in experimental structure determination, protein structure comparison and docking, computational genomics and evolution.

Aidong Zhang's research focus is on the areas of protein-protein interaction network analysis, microarray data analysis, and high-dimensional data visualization. To develop and ultimately predict the best treatment strategies for multiple sclerosis patients, she teamed up with pharmaceutics researchers at UB and Buffalo General Hospital to apply the technique of data mining to MS patient data generated by DNA microarray technology. She has worked on delineating genomic mechanisms in chronic complex diseases, pharmacodynamic analysis of drug-responsive gene expression changes, a central access data warehouse spanning multiple disease types, and a new technology for genome-wide detection of cancer-related genomic alterations.

CYBERINFRASTRUCTURE / GRID COMPUTING

Russ Miller | Vipin Chaudhary | Steve Ko

Cyberinfrastructure and grid computing sit at the core of modern stimulation and modeling, allowing for entirely new methods of investigation that allow scholars to address previously unsolvable problems.

Vipin Chaudhary's research focus is on the areas of high performance computing, data intensive computing, and computer aided diagnosis andinterventions. He is specifically interested in the areas of using accelerators like graphics processors for scientific computing and architectures and programming models for data intensive computations. He directs the Data Intensive Discovery Initiative, a multi-organization consortium that is targeting the use of data intensive computing for discovery and is funded by the NSF. He is also developing green resource allocation techniques for clouds and data centers.

Russ Miller's Cyberinfrastructure and Grid Computing Laboratory contains a 12,000+ processor machine that is one of the most advanced in New York State, as well as 60TB of storage. This laboratory is dedicated to the integration of research in disciplinary domains with research in enabling technologies and interfaces. The high availability of data and information processing tools will allow for revolutionary advances in all areas of science, engineering, and beyond. Dr. Miller's Cyberinfrastructure Laboratory and the Hauptman-Woodward Institute are responsible for the development of the world-class Shake-and-Bake algorithm and SnB program that has been used internationally for solving complex biomolecular structures. The IEEE recognized SnB on its poster "Top Algorithms of the 20th Century."

Steven Ko's research focuses on various aspects of cloud computing such as storage support and privacy for MapReduce as well as new networking architectures for data centers. In the past, he has worked on data center monitoring, Grid scheduling algorithms, and fault-tolerant peer-to-peer algorithms.

IMPROVING HEALTH, SECURITY, AND L

FAR-REACHING WIRELESS SENSOR NETWORKS ARE BEING DEVELOPED.

COMPUTER INTEGRATED SURGERY AND BIOMEDICAL IMAGING

Vipin Chaudhary | Jinhui Xu | Jason Corso

Our faculty are active in all aspects of biomedical imaging, including computer aided diagnosis, computer integrated and tele-surgery, medical image reconstruction, segmentation and registration, and architectures and parallelization of biomedical algorithms. Vipin Chaudhary's current foci are diagnosis of orthopedic problems, computer-assisted neurosurgeries, and high-performance bioinformatics. Jinhui Xu's current foci are the algorithmic underpinnings of computer aided tomography, reconstruction and segmentation, and analysis and understanding of the organization and dynamics of the cell nucleus. Jason Corso's current foci are tumor image analysis in brain and chest, and longitudinal modeling of tumor image appearance.

LIFE

CYBERSECURITY

Shambhu Upadhyaya | Sheng Zhong

Shambhu Upadhyaya's research focus is on various aspects of security and dependability that include user-level anomaly detection, insider threat modeling, event correlation and cyber-attack recognition, security in mobile ad hoc networks, emergency sensor networks, malware detection, human-centered security, and empirical cyber-security.

Sheng Zhong's research focuses on network systems, security, privacy, and applied cryptography. Dr. Zhong studies two types of problems: the incentive-compatibility problems with rational/selfish participants and the security and privacy problems with adversarial participants. Dr. Zhong has designed and implemented Sprite, a credit-based, cheat-proof system, which is the first purely software-based solution that provides provable incentive compatibility in wireless ad hoc networks.

SENSOR NETWORKS

Murat Demirbas

Murat Demirbas's research focus is on developing distributed robust and resilient wireless sensor network (WSN) services and applications. Sensor networks is a new and challenging research area that has received an enthusiastic reception in the science community as they enable precise and fine-grain monitoring of a large region in real-time. Dr. Demirbas's research aims to enable wide adoption of WSNs in long-lived maintenance-free urban-spaces monitoring applications, in providing physical-world spatial querying/search services (i.e., google-ing the physical spaces), and in achieving decentralized coordination and actuation for fulfilling the ubiquitous/pervasive computing vision.

SOCIAL RELEVANCE

Michael Buckley | Kris Schindler

Michael Buckley and Kris Schindler are employing computing technology to improve the quality of life of people with disabilities. Among the research projects and products under development are natural-voice talkers for the speech impaired, single-switch Internet surfing for quadriplegics, robotic wheelchairs, sensory systems to teach cause-and-effect to severely delayed children, Tablet PCs (in conjunction with Microsoft Corporation) that translate the uncharacteristic handwriting of people with spastic cerebral palsy, and a means to extend special-education classwork to home- and hospital-bound children.

THE SMART TALKER HELPS PEOPLE WITH SPEECH PROBLEMS

ALGORITHMS AND THEORY

Roger He | Russ Miller | Alan Selman | Hung Quang Ngo | Kenneth W. Regan | Jinhui Xu | Atri Rudra

Design of efficient algorithms is often a critical first step in solving problems in many areas. Research interests of faculty in this area include parallel algorithms, graph algorithms, approximation algorithms for intractable problems, and theory of error-correcting codes.

Complexity theory is a mathematical discipline that classifies computational problems by relative difficulty and measures the computational resources needed to solve them. It explains why certain problems have no practical solutions and helps researchers anticipate the difficulties involved in solving problems of certain types. In general, complexity theory deals with the quantitative laws of computation and reasoning. For this reason, complexity theory concerns issues and problems of direct interest to many other disciplines as well. Research in this area is concerned with properties of complexity classes, relationships between classes, identification of properties of problems that affect their computational complexity, and the obstacles to proving non-trivial lower bounds in complexity theory.

COMPUTER SCIENCE EDUCATION

Carl Alphonce | Michael Buckley | Adrienne Decker | Bina Ramamurthy | Kris Schindler

Computer science education is an area of research which focuses on curricular and pedagogic issues in the teaching of computer science, as well as related issues such as recruitment and retention of underrepresented groups in the discipline.

Research interests of faculty in this area include object-oriented pedagogy, the pedagogy of CS1-CS2 courses and rapidly emerging areas (such as grid computing and server-side programming), software tools which support course pedagogy, and student and community engagement through socially relevant projects.

A WORLD OF CSE RESEARCH

ARTIFICIAL INTELLIGENCE

Stuart Shapiro | William Rapaport | Rohini Srihari

Computational linguistics (or natural-language processing) and knowledge representation and reasoning are core areas of classical artificial intelligence (AI)—the computational understanding of human-level cognitive abilities. Knowledge representation and reasoning is the study of techniques for representing and reasoning about the information used by an AI program.

Research at CSE is concerned with the abilities that underlie natural-language use, reasoning, and rational acting. The objective is to build a computerized rational agent—a computer system that can converse in English about various everyday and specialized topics; be taught about such subjects by instruction carried out in English, possibly with the aid of gestures, drawings, and diagrams; and reason about those subjects, discuss them with humans, and perform as instructed.

SNePS is a fully intensional logic-, frame-, and graph-based knowledge representation, reasoning, and acting system that is being used in many sites around the world for studies in expert systems, knowledge representation, reasoning, natural-language understanding and generation, belief revision, planning and acting, and cognitive modeling.

DISTRIBUTED / NETWORK SYSTEMS

Chang Wen Chen | Chunming Qiao | Shambhu Upadhyaya | Vipin Chaudhary | Ramalingam Sridhar | Murat Demirbas | Yun (Raymond) Fu | Steven Ko | Sheng Zhong

Research in systems involves both hardware and software, and spans both user space and operating systems. Topics include wide-area networks and local-area networks, wired technology and wireless/mobile technology, data and telephony communications and integrated services, and applications and modem access. Networking includes enabling technologies for other systems in distance learning, multimedia systems, distributed supercomputing, telemedicine, collaborative research, electronic commerce, and online entertainment. Distributed systems studies communication and coordination patterns of components found in networked computers.

CSE laboratories and research groups conduct research on networking architectures, protocols, network control and management issues, and performance evaluation. They focus on switching networks (including multichannel networks), wireless networks, and interconnection networks. They study wireless sensor networks and distributed and dependable computing. Work is done on security, privacy, and economic

problems in wireless networks and mobile computing. Distributed systems research includes peer-to-peer alternatives to traditional client-server models and ubiquitous computing with location-based services at the application program level.

EMBEDDED SYSTEMS

Vipin Chaudhary | Ramalingam Sridhar | Bina Ramamurthy | Shambhu Upadhyaya

Hardware and software issues from the circuit to the system have three main foci: very large scale integration (VLSI) circuits and systems, computer architecture, and computer security. VLSI includes circuits and systems design, systems on chip,testing, computer-aided design, and synthesis. Computer architecture deals with the study and design of computer systems to meet functional, cost, and performance requirements of applications. CSE research focus is in the area of built-in self testing of circuits, scheduling for SOC testing, defect analysis, and fault model extensions in RF circuits and circuit diagnosis.

PATTERN RECOGNITION
MACHINE LEARNING
COMPUTER VISION

Venu Govindaraju | Sargur Srihari | Peter Scott | Jason Corso | Yun (Raymond) Fu

Pattern recognition is the study of methods and algorithms for putting data objects into categories. While classical pattern recognition techniques are rooted in statistics and decision theory, the machine learning paradigm is commonly used to design practical systems. Machine learning is a method of programming computers in which the machine is programmed to learn from an incomplete set of examples. Prominent work on automated systems for pattern recognition and machine learning has made an impact on statistical methods, information retrieval, the analysis and recognition of handwriting, and computational forensics.

The interdisciplinary field of computer vision draws on concepts from signal processing, artificial intelligence, neurophysiology, and perceptual psychology. The primary goal of computer vision research is to endow artificial systems with the capacity to see and understand visual imagery at a level rivaling or exceeding human vision. CSE research includes developing techniques for visualizing common data-structures such as graphs and multidimensional data sets, and visualizing molecular structures. Applied research includes visualizing data from practical applications, such as bioinformatics, software engineering, pharmacokinetics, engineering and design, bioimaging, and digital art.

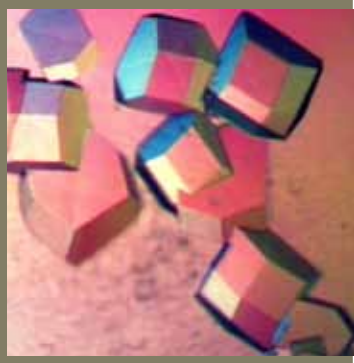
SOFTWARE AND INFORMATION SYSTEMS

Bharat Jayaraman | Aidong Zhang | Jan Chomicki | Rohini Srihari | Michalis Petropoulos | Sheng Zhong | Bina Ramamurthy

CSE database research involves designing, studying, implementing, and evaluating novel query interfaces and new query language constructs. Of special interest are the challenges of data integration, in which data coming from many autonomous and heterogeneous sources is combined and presented to the users in a unified way. Other topics include inconsistency resolution, queries with preferences, Web services, and query processing and optimization. The research projects combine engineering prototype systems with rigorous mathematical analyses.

The data mining research focuses on extracting valid, previously unknown, and ultimately comprehensible information from large databases and using it to make crucial decisions. Of special interest are cluster analysis of high dimensional data, outlier detection of unusual cases, feature extraction and analysis of data, and visualization tools for interactive pattern analysis.

The field of programming languages is concerned with concepts, notations, methodologies, tools, and environments for the construction of robust, efficient, maintainable, evolvable software. CSE focus is on languages that support high-level, declarative, and visual modeling of complex systems.



SOCIETY FELLOWS

PROFESSIONAL AND SCIENTIFIC SOCIETIES RECOGNIZE AN ELITE GROUP OF LEADERS AND INNOVATORS IN THEIR FIELDS AS FELLOWS. CSE FELLOWS ARE:

Chang Wen Chen: SPIE, 2007, for contributions in electronic imaging and visual communications; IEEE, 2005, for contributions to digital image and video processing, analysis and communications.

Venu Govindaraju: ACM, 2009, for contributions to handwritten document image analysis, recognition, and retrieval; IEEE, 2006, for contributions to handwriting recognition; IAPR, 2004, for contributions to advances in handwriting recognition; IETE, 2002, for professional competence and recognition demonstrated by academic qualifications and work experience.

Chunming Qiao: IEEE, 2010, for contributions to optical and wireless network architectures and protocols.

Alan Selman: ACM, 1998, for having been an influential contributor to computational complexity theory and a dedicated professional within the academic computer science community.

Stuart C. Shapiro: AAAI, 1994, for contributions to theory and practice of knowledge representation and reasoning, and service to the AI community.

Sargur Srihari: IAPR 1996, for contributions to Character Recognition and for Service to the International Association for Pattern Recognition; IEEE 1994, for contributions to Character Recognition and Document Understanding Systems; IETE, 1989, for his outstanding contribution to the discipline.

Satish Tripathi: AAAS, 1997, for meritorious efforts to advance science or its applications; IEEE, 1997, for advancing the state of the art in computer and network systems analysis and for excellence in technical and educational leadership.

Aidong Zhang: IEEE, 2009, for contributions to multimedia data indexing.

SOCIETIES:

AAAI: Association for the Advancement of Artificial Intelligence

AAAS: American Association for the Advancement of Science

ACM: Association for Computing Machinery

IAPR: International Association of Pattern Recognition

IEEE: Institute of Electrical and Electronics Engineers

IETE: Institute of Electronics and Telecommunication Engineers

SARGUR SRIHARI ILLUSTRATING A POINT

DISTINGUISHED PROFESSORS

Sargur Srihari holds the title of SUNY Distinguished Professor, the highest faculty rank in the SUNY system. Srihari, who teaches courses in pattern recognition, machine learning, and data mining, founded the Center of Excellence for Document Analysis and Recognition (CEDAR) in 1991. The handwriting-recognition technology developed by him and the Center served as the basis for the mail-sorting machines utilized today by the U.S. Postal Service, which has funded the work continuously for more than 20 years. Since 1991, Srihari has been funded by the National Institute of Justice to develop software tools for forensic science applications.

The following two CSE faculty members hold the title of UB Distinguished Professor for achieving distinction and leadership in their fields:

UB Distinguished Professor Venu Govindaraju has authored more than 300 scientific papers, including more than 60 journal papers. His seminal work in handwriting recognition was at the core of the first handwritten address interpretation system used by the U.S. Postal Service. He was also the prime technical lead responsible for technology transfer to Lockheed Martin and Siemens Corp. for deployment by the U.S. Postal Service, Australia Post, and UK Royal Mail. Govindaraju has been the principal or coprincipal investigator of projects funded by government and industry for about $50 million. The Center for Unified Biometrics and Sensors (CUBS) that he founded in 2003 has since received over $8 million in research funding.

UB Distinguished Professor Russ Miller founded the Center for Computational Research (CCR) at UB and was its director from 1998 to 2006. During his tenure, CCR was continuously ranked as one of the leading supercomputing centers worldwide, supporting nearly 25TF of computing, 300TB of data storage, and a wide variety of high-end visualization devices. Miller is a codeveloper of the Shake-and-Bake method of molecular structure determination, which was included in the poster "Top Ten Algorithms of the Century" in Computing in Science & Engineering, produced in cooperation with the IEEE and the Computer Museum History Center.

CAREER AWARD WINNERS

Seven members of the CSE faculty have received the prestigious Faculty Early Career Development (CAREER) Award from the National Science Foundation. The award is one of the NSF's highest recognitions of junior faculty who "exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the context of the mission of their organizations." The funding is typically in the range of $400,000-$500,000 for a period of five years. CSE awardees include:

Jason Corso is focusing on developing techniques for automatically learning hierarchical statistical models of complex phenomena and deriving robust efficient inference algorithms on these models.

Murat Demirbas is investigating the design and implementation of an in-network collaboration and coordination framework for wireless sensor networks, providing a platform for developing and deploying distributed control applications.

Hung Ngo aims to resolve the problem of switching speed in optical switching network infrastructures with a rigorous framework that bridges research and education on various areas of computer science and mathematics.

Atri Rudra is studying efficient techniques for computing approximate solutions to problems involving very large amounts of data, especially for handling the increasing number of errors that will occur as more data is packed into physical media.

Jinhui Xu is developing efficient geometric techniques for application in cardiovascular interventional procedures, improving the quality of projection imaging (such as angiogram and CT imaging) and the guiding of stent implant procedures.

Aidong Zhang was recipient of a CAREER Award for multimedia database systems research and education.

Sheng Zhong is studying the design of an enforceable economic mechanism for mobile ad hoc wireless networks that will provide sufficiently strong incentives for cooperative behavior and security protection against cheating.

SUNY CHANCELLOR'S AWARDS

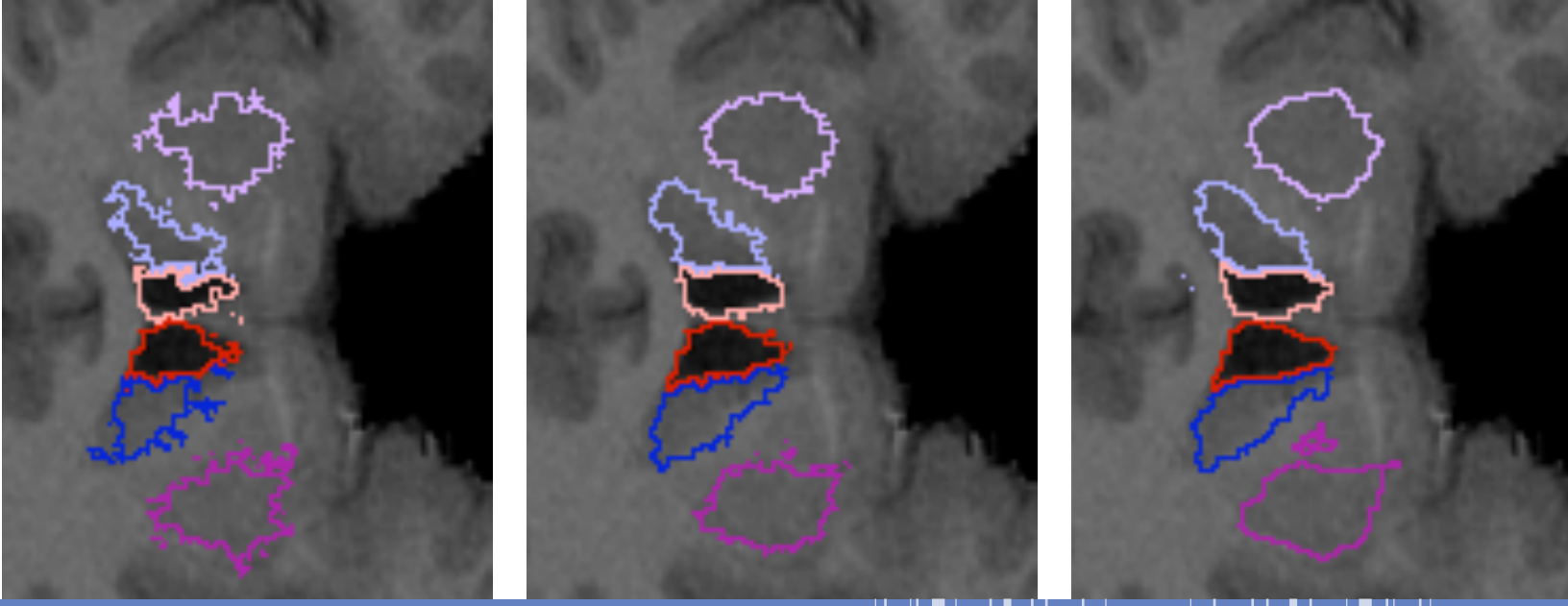
The Chancellor of the State University of New York recognizes outstanding faculty contributions to their respective professional fields, campuses, communities and the public at large. CSE faculty who have received such recognition are:

Venu Govindaraju, SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities

William J. Rapaport, SUNY Chancellor's Award for Excellence in Teaching

Alan L. Selman, SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities

Aidong Zhang, SUNY Chancellor's Research Recognition Award



GRANTS AND CONTRACTS

THE CSE FACULTY AVERAGES $4.5 MILLION ANNUALLY IN GRANTS FOR RESEARCH IN AREAS THAT RANGE FROM HIGH-PERFORMANCE COMPUTING TO DATA MINING. ACTIVE GRANTS IN RECENT YEARS HAVE INCLUDED:

Applied Media Analysis (AMA)

Arabic Optical Character Recognition, Venu Govindaraju, PI, 2008-2010, $100,000.

Army Research Office (ARO)

Unified Research on Network-Based Hard/Soft Information Fusion, Stuart C. Shapiro, Co-PI, 2009-2012, $3,020,833.

Defense Advanced Research Project Agency (DARPA)

PLATO: A System for Taming Multilingual Automatic Document Classification, Venu Govindaraju, PI, 2007-2012, $1,596,453.

Defense Threat Reduction Agency (DTRA)

A Robust and Resilient Network Design Paradigm for Region-based Faults inflicted by WMD Attack, Chunming Qiao, Co-PI, $758,134, 2009 - 2011

Hewlett Packard Company (HP)

Intelligent Processing of Handwritten Documents, Venu Govindaraju, PI, 2008-10, $129,969; *Multimodal Command and Control by Integrating Two-Handed Gestures and Speech,* Venu Govindaraju, PI, Jason Corso, Co-PI, 2008-2010, $109,969.

National Institutes of Health (NIH)

Integration of Clinical, Genomic and Proteomic Data using a Bioinformatic Approach, Aidong Zhang, Co-PI, 2009-2011, $779,970.

Office of Naval Research (ONR)

Efficient and resilient querying and tracking services for wireless sensor networks, Murat Demirbas, PI, 2009-2012, $510,000.

National Institute of Justice (NIJ)

Quantitative Assessment of the Discriminatory Power of Handwriting, Sargur Srihari, PI, 2004-2010, $891,458; *Analysis of Footwear Impression Evidence,* Sargur Srihari, PI, 2007-2010, $350,172; *Quantitative Measures in Support of Latent Print Comparison,* Sargur Srihari, PI, 2009-2011, $498,784.

National Science Foundation (NSF)

Advanced Approaches for Integration and Analysis of Genomic Data, Aidong Zhang, PI, 2003-2011, $1,628,001; *CAREER:Efficient Geometric Techniques for Problems Arising in Cardiovascular Intervention Procedures,* Jinhui Xu, PI, 2005-2010, $407,894; *Deceit Indication Through Person Specific Behavioral Dynamics,* Venu Govindaraju, PI, 2007-2010, $852,649; *III-CXT:Algorithmic Tools for Determining the Organization and Dynamics of the Cell Nucleus,* Jinhui Xu, PI, 2007-2010, $414,870; *International Digital Sanskrit Library Integration,* Venu Govindaraju, PI 2008-2010, $94,232; *Collaborative Research: NEXOS: Next Generation Embedded Operating Systems Course and an Innovative Support Environment,* Bina Ramamurthy, PI, 2008-2010, $74,997; *A Comprehensive Framework for Timely Introduction of Emerging Data-Intensive Computing to STEM Audiences,* Bina Ramamurthy, PI, Vipin Chaudhary, Co-PI, 2009-2012, $249,875; *Cooperation and Security for Opportunistic-Coding-based Wireless Networks,* Sheng Zhong, PI, 2009-2012, $304,179; *CAREER: Efficient Computation of Approximate Solutions,* Atri Rudra, PI, 2009-2014, $449,807; *Enforceable Economic Mechanisms for Cooperation in Wireless Networks,* Sheng Zhong, PI, 2009-2014, $450,000; *CAREER: Generalized Image Understanding with Probabilistic Ontologies and Dynamic Adaptive Graph Hierarchies,* Jason Corso, PI, 2009-2014, $539,086; *An In-network Collaboration and Coordination Framework for Wireless Sensor Actor Networks,* Murat Demirbas, PI ,2008-2013, $450,000; *Tool-Support for Producing High-Assurance and Reliable Software for Wireless Sensor Actor Networks,* Murat Demirbas, PI ,2009-2012, $500,000; *A Joint Layered Coding Scheme for Unified Reliable and Secure Media Transmission over Wireless Networks,* Chang Wen Chen, PI, 2009-2012, $329,069; *ITR: Unapparent Information Revelation - Creation, Visualization and Mining of Concept Chain Graphs,* Rohini Srihari, PI, 2003-2010, $675,998; *TC: Small: Online Privacy and Senior Citizens: A Socio-Technical Multi-Perspective Framework for Trustworthy Operations,* Shambhu Upadhyaya, Co-PI, 2009-2012, $454,771.

US Postal Service (USPS)

Distribution Quality Improvement Evaluation Support, Srirangaraj Setlur, PI, Venu Govindaraju and Sargur Srihari, Co-PIs, 2008-2009, $1,083,760; *Evlauation of PRIP, FRIP and FSS Recognition Programs,* Srirangaraj Setlur, PI, Venu Govindaraju and Sargur Srihari, Co-PIs, 2008-2009, $435,869.

AIDONG ZHANG CONSULTS

EDITORSHIP OF JOURNALS

CSE faculty serve on the editorial boards of over 30 prestigious journals, including:

Chang Wen Chen has been editor-in-chief of the IEEE Transactions on Circuits and Systems for Video Technology since 2006.

Jan Chomicki has been an associate editor of ACM Transactions on Database Systems since 2004.

Jason Corso has been an associate editor of Elsevier's Computer Methods and Programs in Biomedicine since 2009.

Yun (Raymond) Fu has been an associate editor of Journal of Multimedia, Academy Publisher, since 2009, an associate editor of Neurocomputing, Elsevier, since 2008, and an associate editor of International Journal of Image and Graphics, World Scientific Publishing, since 2008.

Venu Govindaraju has been an associate editor of IEEE Transaction on Systems, Man, and Cybernetics since 2002 and associate editor of International Journal of Document Analysis and Recognition, Springer, since 2003.

Chunming Qiao has been an editor for IEEE Transactions on Parallel and Distributed Systems since 2007.

Alan Selman has been editor-in-chief of Theory of Computing Systems since 2001, an associate editor of Journal of Computer and System Sciences since 1982 and of Chicago Journal of Theoretical Computer Science since 1995.

Aidong Zhang has been an associate editor of IEEE Transactions on Knowledge and Data Engineering since 2009, an associate editor of International Journal of Bioinformatics Research and Applications since 2004, an associate editor of International Journal of Distributed and Parallel Databases since 1998, and an associate editor of Internaltion Journal of Multimedia Tools and Applications since1998.

NORTH CAMPUS

NORTH CAMPUS STUDENT UNION

NORTH CAMPUS CENTER F

DOWNTOWN BUFFALO

THIS IS UB

The University at Buffalo is a premier research-intensive public university, a flagship institution in the State University of New York system and its largest and most comprehensive campus with three locations across Buffalo Niagara. UB's more than 28,000 students pursue their academic interests through more than 300 undergraduate, graduate, and professional degree programs. Founded in 1846, the University at Buffalo is a member of the Association of American Universities.

OR THE ARTS

SOUTH CAMPUS

DOWNTOWN CAMPUS

A GREAT PLACE TO LIVE AND WORK

THIS IS BUFFALO NIAGARA

The second-largest city in New York State, Buffalo is one of the most livable, lively, and comfortable places in which to live, work, and play. It's an easygoing, inviting mix, from great music and food to spirited professional sports teams, renowned architecture and cultural institutions, and top-notch entertainment. Situated at the eastern end of Lake Erie where the Great Lakes empty into the Niagara River, Buffalo is in easy reach of the Canadian lakeshore and Niagara Falls, the most accessible of the world's natural wonders.

The Buffalo Niagara region offers all of the amenities of a major urban area—without the headaches. The average workday commute is less than twenty minutes, which is the lowest out of fifty major U.S. cities.

Affordable housing is widely accessible throughout the region, and a reasonable cost of living makes the good life possible on any budget. Most neighborhoods offer easy access to shopping, recreation, dining, and excellent schools.

NIAGARA FALLS

University at Buffalo *The State University of New York* | **REACHING OTHERS**

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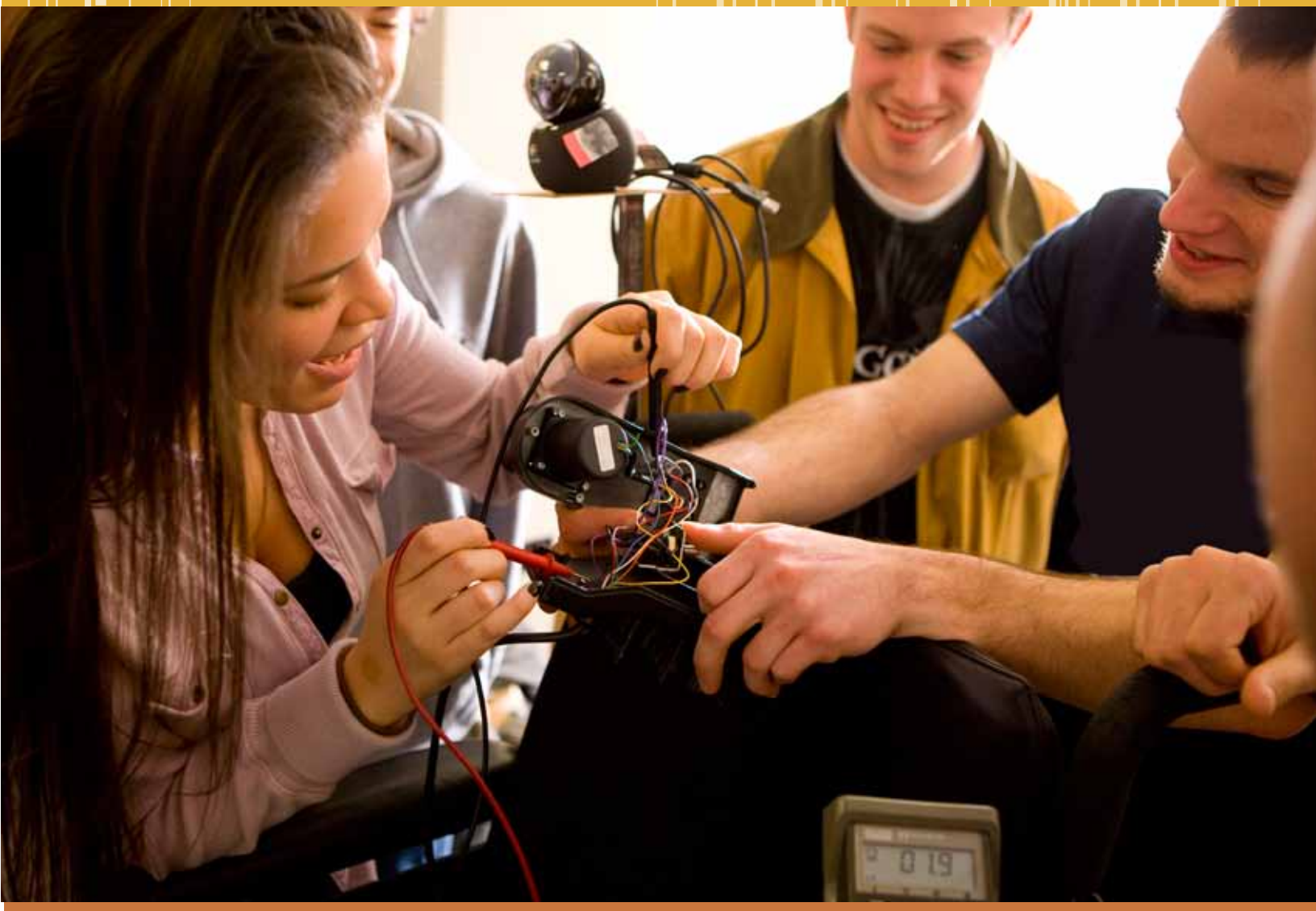

CSE STUDENTS AT WORK ON THE DEVELOPMENT OF A ROBOTIC WHEELCHAIR.