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MESSAGE FROM THE DIRECTOR
After five and a half very interesting years as Director it is time for a somewhat overdue sabbatical and to welcome Al Davis, the new Director of the School of Computing.

It is also time to say thank-you to all those staff, faculty and students who made my job such and interesting and often enjoyable one. Dean Rich Brown of the College of Engineering deserves particular thanks too.

Much has changed over the last few years, we have survived and even prospered under what once look like very severe budget cuts.

Since 2006 our undergraduate intake has grown by 25%. The graduate intake has doubled and research spending has nearly doubled to $17.1M.

Over the last 5 years our faculty population has increased, welcoming 12 new faculty members to the School of Computing. These new faculty members have helped strengthened many core areas including theory, algorithms, image analysis, compilers, security, animation and graphics. Two positions in image analysis are being funded through the State of Utah USTAR initiative.

The computing degree has added tracks in Robotics, Scientific Computing, Information Technology, Image Analysis, Computer Engineering and Graphics and Visualization. The computing degree encourages students to pursue area-specific coursework and to undertake research at an early stage of their graduate study in a way that fits with the range of educational possibilities available in a very broad School.

A new research center has grown in parallel computing, the aptly named CPU, led by Ganesh Gopalakrishnan, and others centers are planned.

In 2007 we introduced a new undergraduate program in Entertainment Arts and Engineering, an interdisciplinary program between the School of Computing and the Department of Film and Media Arts. This program has grown significantly over the years and in 2010 we announced a graduate level program called the Entertainment Arts and Engineering Master Games Studio. This interdisciplinary master’s program contains three tracks: game engineering, game arts, and game production. The level of student interest and excitement is such that the graduate level program went from planning, to an entering class of twenty or so students in not much more than a year.

The message is so clear, faculty, staff and students have all made tremendous efforts to move the School forward. There is no doubt that times still remain challenging and I am sure that the new directors job will be every bit as interesting as mine was.

Over to you Al!

*Martin Berzins*

*Professor*

*School of Computing*
Timeline

Department of Computer Science founded 1965
School of Computing created in 2000

Research Expenditures

2009 – $11M
2010 – $17.1M

Faculty

33 regular faculty
3 research faculty
16 adjunct faculty

Research Areas

• Algorithms
• Architecture & VLSI
• Computer Graphics
• Computer Systems
• Formal Verification
• Information Management
• Image Analysis
• Machine Learning
• Mobile and Embedded Systems
• Natural Language Processing
• Perception
• Programming Languages
• Robotics
• Scientific Computation
• Simulations & Electronic Animation
• Visualization

Undergraduate Population

396 enrolled in computer science major
110 enrolled in computer engineering major

Graduate Population

111 in master’s program
131 in Ph.D. program

Undergraduate Degrees

Bachelor of Science in Computer Science
Bachelor of Science in Computer Engineering
Bachelor’s/Master’s Entertainment Arts & Engineering Track

Graduate Degrees

Master’s in Computer Science
Non-Thesis Master’s in Computer Science
Master’s in Computing
• Computer Engineering
• Data Management & Analysis
• Entertainment Arts & Engineering: Master Games Studio
• Graphics and Visualization
• Image Analysis
• Information Technology
• Robotics
Ph.D. in Computer Science
Ph.D. in Computing
• Computer Engineering
• Data Management & Analysis
• Graphics and Visualization
• Robotics
• Scientific Computing
MEASURES OF EXCELLENCE

2009

- **Chris Johnson** awarded the Utah Cyber Pioneer Award
- **Chris Johnson** elected Fellow, Society for Industrial and Applied Mathematics (SIAM)
- **Elaine Cohen** presented with the Pierre Bezier Award
- **Mike Kirby** awarded Leverhulme Visiting Professorship
- **Rich Riesenfeld** presented with the Pierre Bezier Award

2010

- **Guido Gerig** elected Fellow of the American Institute for Medical and Biological Engineering
- **Mary Hall** recognized as ACM Distinguished Scientist
- **Chris Johnson** honored with the IEEE Visualization Career Award
- **Chris Johnson** awarded the Rosenblatt Prize for Excellence

**Best Paper Awards**

“Non-Uniform Power Access in Large Caches with Low-Swing Wires”
Aniruddha Udipi, Naveen Muralimanohar, Rajeev Balasubramonian
HiPC 2009

“Physically-based Interactive Schlieren Flow Visualization”
IEEE Pacific Vis 2010

“Uintah – A Scalable Framework for Hazard Analysis”
Justin Luitjens, Qingyu Meng and Martin Berzins, Todd Harman, Charles A. Wight, Joseph Peterson
Teragrid 2010

“Using VisTrails and Provenance for Teaching Scientific Visualization”
Claudio Silva, Erik Anderson, Emanuele Santos, Juliana Freire
Eurographics 2010 Educator Program

“Manifold modeling for brain population analysis,” In Medical Image Analysis,
Sam Gerber, Tolga Tasdizen, Tom Fletcher, Sarang Joshi, Ross Whitaker
MICCAI 2010

“Particle Systems for Adaptive, Isotropic Meshing of CAD Models”
Jonathan Bronson, Joshua Levine, Ross Whitaker
19th International Meshing Roundtable, 2010

“Handling the Problems and Opportunities Posed by Multiple On-Chip Memory Controllers”
Manu Awasthi, Dave Nellans, Kshitij Sudan, Rajeev Balasubramonian, Al Davis
PACT 2010

“Abstracting Abstract Machines”
David Van Horn and Matthew Might
ICFP 2010
* Northeastern University

“CHOP: Adaptive Filter-based DRAM Caching for CMP Server Platforms”
HPCA 2010
(to appear in IEEE Micro’s Special Issue on Top Picks from 2010 Computer Architecture Conferences, one of the eleven papers recognized as “the year’s most significant research publications in computer architecture based on novelty and industry relevance”)
* North Carolina State University. ** Intel Labs
The SCI research group was founded in 1994 by Drs. Chris Johnson and Rob MacLeod along with five graduate students. In 1996, we became the Center for Scientific Computing and Imaging and, in 2000, the SCI Institute. The SCI Institute is now one of eight permanent research institutes at the University of Utah and home to over 170 faculty, students, and staff. The 16 tenure-track faculty are drawn primarily from the School of Computing, Department of Bioengineering, and Department of Electrical and Computer Engineering and virtually all faculty have adjunct appointments in other, largely medical, departments. Recent growth in the SCI Institute has come in part from the award in 2007 from the state of Utah of a USTAR (Utah Science and Technology Advanced Research) cluster in Imaging Technology. This allowed the Institute to recruit four new faculty in image analysis: Professors Guido Gerig, Tom Fletcher, Tolga Tasdizen, and Orly Alter. During this same time period, we were also able to recruit Professor Valerio Pascucci in visualization. The SCI Institute’s overarching research objective is to conduct application-driven research in the creation of new scientific computing techniques, tools, and systems. An important application focus of the Institute continues to be biomedicine; however, SCI Institute researchers also address challenging computational problems in a variety of application domains such as manufacturing, defense, and energy. Within our overarching research objective, SCI Institute research interests generally fall within four core tracks. The first track involves research into new techniques for scientific visualization and the development of visual analysis tools to facilitate understanding of increasingly complex and rich scientific data. The second track focuses on technical research into computational and numerical methods requisite for scientific computing. The third track involves creating new image analysis techniques and tools. The final track emphasizes research and development of scientific software environments. SCI Institute researchers also apply many of the above computational techniques within their own particular specialties, including fluid dynamics, atmospheric dynamics,
biomechanics, electrocardiography, bioelectric fields, adaptive techniques, parallel computing, inverse problems, and medical imaging.

A particular hallmark of SCI Institute research is the development of innovative and robust software packages, including the SCIRun scientific problem solving environment, Seg3D, ImageVis3D, VisTrails, and map3d. All these packages are broadly available to the scientific community under open source licensing and supported by web pages, documentation, and users groups.

The SCI Institute either directs or is associated with several national research centers: the NIH Center for Integrative Biomedical Computing (CIBC), the DoE Visualization and Analytics Center for Enabling Technologies (VACET), the NIH National Alliance for Medical Image Computing (NA-MIC), the NIH Center for Computational Biology, the Center for Computational Earth Sciences and the DoE Center for the Simulation of Accidental Fires and Explosions (C-SAFE). In July, 2008, SCI was chosen as one of three NVIDIA Centers of Excellence in the U.S. (University of Illinois and Harvard University are the other two NVIDIA Centers).

The facilities at SCI are also outstanding with several large-scale computing facilities at the disposal of students and trainees, perhaps most exciting is the NVIDIA computing cluster and new Silicon Graphics UV system, which, along with a new graduate course in Parallel Programming for GPUs, provide opportunities for developing unique expertise in large-scale streaming architectures.

The combination of Mission, Faculty, Staff and Students, Academic Programs, and Facilities allows SCI to create a general atmosphere for its members where the whole of the institute is dedicated to some aspect of scientific computing. There is extensive expertise within the SCI Institute that covers all the topics required for simulation, modeling, and visualization including high performance computing, efficient numerical algorithms, large data management and storage, database management, and scientific visualization of all forms of scalar, vector, tensor, and volume data.

www.sci.utah.edu
Systems researchers work with the computing infrastructure that most people take for granted. This includes operating systems, virtual machines, compilers, and middleware. All this software must be reliable and secure because it is the foundation supporting all of a computer’s applications. However, building reliable systems software is an extremely challenging endeavor. It is challenging because systems software must deal with the complexity and hazards of the real world: complex hardware, limited resources, concurrent activities, real-time deadlines, machine and network failures, network attacks, and on and on. At the same time, systems software is expected to provide rich features to application programmers and users.

The School of Computing’s Flux Research Group is attacking the challenge head-on. Founded in the mid-1990s, the Flux Group invents and tests visionary ideas that make systems software more reliable, more flexible, easier to build, and easier to use. The group includes faculty, research staff, graduate students, and undergraduates who work together to tackle the problems of modern systems design and implementation. Their approach is to test new solutions in the context of the real world. This means working with large-scale and distributed systems, with legacy software and programming languages, and with real users. The result is that Flux research leads to real-world impact, both in delivered software and in proven ideas.

Languages, Components, System Structure, and Security

The Flux Group has a long history of advancing language and component technology, especially in the context of operating systems. Their advances include the OSKit component collection, the Knit composition language, and multiple contributions to operating systems based on safe languages. The Flux Group used Java to create the KaffeOS and Janos operating systems: this work directly shaped JSR-121, the Java Application Isolation API Specification. The STP system lets machines use untrusted mobile code, written in safe C, to remotely upgrade each other’s network protocols while protecting both the hosts and network. The Safe TinyOS system also uses a safe dialect of C, in conjunction with static program analysis, to increase the reliability of software that runs on embedded and networked sensors. Utah’s Safe TinyOS software has been incorporated into the primary TinyOS software distribution, which is used by hundreds of sensor-network projects worldwide.

The Flux Group also does “pure” OS work with impact. Well before virtual machines resurged in popularity, Flux pushed the limits of VM-based operating systems by developing a fully recursive OS called Fluke. Motivated by Fluke’s strong protections, the National Security Agency worked with Flux to refine a flexible security architecture and integrate it with Fluke. This architecture broke new ground in terms of policy flexibility. It is also the security architecture in today’s leading secure Linux, SELinux, now supported by the mainline Linux kernel. Today, as participants in the DARPA CRASH program, Flux is using VM technology to create “application containers” to improve security. Using selective replay and VM-based state partitioning, application containers seek to improve the robustness and trustworthiness of the computer systems that people use every day.

Compiler testing is another current effort with real-world impact. Using random program generation, members of Flux have found and reported literally hundreds of defects in production C compilers. This project is improving the correctness and trustworthiness of C compilers, which is essential for trustworthy systems overall: today’s popular operating systems are written mostly in C, and C is at the heart of countless, deployed mission-critical and safety-critical applications.

Network Testbeds and Experimental Environments

The Flux Group is well known for its work in pioneering advances in testbed technologies. Its flagship facility, Emulab,
ments a year. Emulab established the automated testbed as a new way to perform experimental research, addressing the resource allocation, virtualization, security, management, and performance challenges of such testbeds. The software that runs Emulab is a cutting-edge “operating system” for network and distributed-system experimentation, and it has been adopted by more than three dozen other universities and companies to run testbeds of their own. Emulab’s architecture supports over a dozen device types, ranging from PCs and network switches to software radios, from specialized network processors to wireless links—all integrated in a single framework and presented through common interfaces.

The software and technologies developed for Emulab are being used as the basis for other experimental environments as well. The NSF’s Global Environment for Network Innovation (GENI) is a large, collaborative effort between fifty universities and industrial partners to build a facility for research on the future of the Internet. The Flux Group is building ProtoGENI, one of GENI’s four “control frameworks.” ProtoGENI is based on Emulab and defines a set of protocols, APIs, and data structures that together comprise a platform on which the next generation of network innovations can be prototyped and evaluated. ProtoGENI ties together over twenty collaborative projects including substrate networks, tools to help researchers conduct their experiments, and measurement and monitoring frameworks. The ProtoGENI federation provides experimenters complete top-to-bottom control over a distributed network with PCs, programmable networking devices, wireless equipment, and sensor-network nodes. Many of these devices are connected by a layer-2 backbone being built in partnership with Internet2, giving researchers the ability to configure or replace most of the network stack. ProtoGENI has already been used by a number of early adopters, and its user community is growing rapidly.

PRObE, the Parallel Reconfigurable Observational Environment, is another new facility that will make use of Emulab at its core. Funded by the NSF and run by the New Mexico Consortium, Los Alamos National Laboratory, CMU, and the University of Utah, PRObE will offer researchers the ability to conduct experiments with raw access to high-performance computing hardware at a scale that has not previously been available. It is being built from a decommissioned supercomputer and will open for use in 2011.

Improving the Scientific Process
Finally, the Flux Group is looking at ways to improve the entire scientific process in experimental computer science research—and eventually, perhaps in other scientific domains. They are evolving Emulab into an experimentation workbench that helps users manage their activities and data, using concepts from scientific workflow. The idea is to change the way that researchers approach their work: to graduate from running isolated experiments and move toward the notion of managing entire courses of study. The ultimate goals of the project are to change how systems research is done and to advance science within the systems community. Emulab provides a unique environment in which this kind of scientific workflow management can succeed.

Testbeds like Emulab changed systems research by enabling realistic research at scale. Now, the workbench seeks to change the scope of activities that can be managed by testbeds and similar facilities. The Flux Group envisions that tomorrow’s Emulab-derived software could be central in managing all aspects of systems experimentation. It is another example of the Flux Group’s approach to performing leading-edge systems research: visionary goals for future computer systems, combined with the group’s deep and broad technical experience, and driven by a pragmatic, incremental, and user-focused philosophy.

In summary, the Flux Research Group catalyses the transition from today’s systems research to tomorrow’s systems practices. From languages to operating systems, from testbeds to scientific workflow, the Flux Group brings a wide range of new ideas to bear on real-world problems. It makes new solutions available to users through continual publications, software distributions, online services, and academic and industrial collaborations. In short, Flux has impact.
BACKGROUND

The story of scientific progress begins with a period of initial denial followed by a wholehearted embrace of the new that leaves the old in a wake of obsolescence. This is how we have moved on to embrace ink jet printers and electronic submission of conference papers, leaving behind their dot matrix counterparts and late night drives to the airport post office. In almost all cases, the new technology was full and complete, and there was no vital missing piece after its adoption.

The current transition from sequential to parallel and concurrent programming, however, follows a less than perfect storyline. For a very long time, it has been abundantly clear to computer system manufacturers that the steadily increasing clock frequencies and the corresponding increase in processor energy consumption cannot be sustained. As early as the 1990s, some early pioneers had foreseen various avenues forward: multi microprocessor solutions forecast by Patterson, the NESL functional algorithm design and programming approach by Blelloch; and work stealing runtimes by Leiserson, to name a few. Microprocessor manufacturers took another decade before shifting their roadmap toward parallel computing, meanwhile performing heroic acts of hardware design. For example, in 1993, the Pentium-2 was clocked at a “whopping” 67 MHz. The DEC Alpha that was introduced soon thereafter ran at over a gigahertz. It drew 10 amps of current—50 amps during clock switching— with its clock driver having an effective width of 20 inches! Clearly these trends, as well as many others such as deep pipelines and excessively speculative execution schemes burned more energy without commensurate performance gains.

Unfortunately, after this period of denial and rapid forward lurch toward parallelism, we have several crucial pieces missing. We have yet to develop good organizational principles for parallel computation; we have very weak methods to ensure their correctness; and we have a whole confused legacy of languages and libraries that must still be used because of their wide adoption, but they have many drawbacks with respect to their use in a parallel computing context. In this sense, the progress toward parallel programming has unfortunately emerged more as a belated admission, exposing the decades of neglect in languages, API and compiler design, and pedagogical methods that must now accelerate to catch up with the changing hardware realities. Addressing this acceleration is precisely the goal of the Center for Parallel Computing (CPU).

THE CENTER FOR PARALLEL COMPUTING AT UTAH

Given the inexorable increase in the demand for computing power and energy efficiency, all areas of computer application must now embrace parallel computing. This affects applications ranging from weather prediction done by powerful supercomputers, data storage on Cloud Computing facilities that are often larger than a dozen football fields, Science and Engineering research that is conducted on multi-million dollar supercomputers; all the way to desktop computers and even to personal communication devices (e.g., “phones”) that are being sold in counts of billions. The whole approach to programming these computers must change. We must invent new ways to develop the electronics underlying these computers. We must develop and teach new parallel programming approaches best suited for each problem type. Application scientists who ignore these trends will find that their existing codes will become slower with each generation of processors, unable to exploit the shared memory multicores and vector/accelerator hardware units that will be the norm in the coming years.

An important aspect of the aforementioned crises is that successfully addressing them not only requires Computer Scientists but also application developers. These researchers and engineers specialized in various branches of engineering and natural sciences must collaborate with the computer scientists. Together, they stand the only chance to meet the growing computational demands and various societal demands such as for communication and privacy. The Center for Parallel Computing (CPU) is directed toward fostering these collaborations.

Given that future innovations in parallel computing will
occur at the seams between areas, we fully expect collaborative projects to be launched between members of the CPU. The CPU will also launch seminar series as well as pilot classes experimenting with new curricular approaches. The recently concluded MSR/CPU Distinguished Lecture Series [*1] and the Practical Parallel and Concurrent Programming pilot course [*2] are indicative of more to come. CPU’s academic mission will include a strong emphasis on developing and disseminating new curricular material such as PPCP. There is an acute shortage of information on parallel programming techniques, verification techniques, and performance evaluation/tuning techniques. CPU will maintain a prominent web presence where educational resources in these areas will be maintained. It will also form an external advisory board comprised of members from various local and national/international industries.

We invite you to follow the activities of CPU at its website [*3] and become involved by attending meetings sponsored by CPU as well as suggesting avenues for further impact. The more we can push on this front, the more our students and fellow researchers will truly benefit from timely knowledge and derive benefits in selecting their future careers that are perfectly aligned with future academic and industrial needs. The research of the CPU members is supported by grants from NSF, DARPA, DOE, SRC, Microsoft, HP and Intel. Equipment grants from Nvidia, Oracle, and Xilinx.

[*1] www.cs.utah.edu/events/CPUDLS
[*2] research.microsoft.com/ppcp
[*3] www.parallel.utah.edu

MEMBERS

Ganesh Gopalakrishnan, Professor
Director, Center for Parallel Computing at Utah
School of Computing

Rajeev Balasubramonian, Associate Professor
School of Computing

Martin Berzins, Professor
School of Computing

Mary Hall, Associate Professor
School of Computing

Mike Kirby, Associate Professor
School of Computing

Matt Might, Assistant Professor
School of Computing

John Regehr, Associate Professor
School of Computing

Julio Facelli, Professor
Dept. of Biomedical Informatics

James C. Sutherland, Professor
Dept. of Chemical Engineering

AFFILIATED MEMBERS

Al Davis, Professor
School of Computing

Erik Brunvand, Associate Professor
School of Computing

Steve Corbato, Director of Cyberinfrastructure
Office of Information Technology

Matthew Flatt, Associate Professor
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Eric Eide, Project Engineering Manager
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Gianluca Lazzi, Professor
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Tim Ameel, Professor
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Dept. of Chemical Engineering
RESEARCH @ THE SCHOOL OF COMPUTING

- APPLIED COMPUTATION
- ARTIFICIAL INTELLIGENCE
- COMPUTER GRAPHICS
- COMPUTER SYSTEMS
- INFORMATION MANAGEMENT
- PROGRAM ANALYSIS & FORMAL METHODS
**IMAGE ANALYSIS**

Image analysis research addresses fundamental questions in 2D and 3D images and applications in a variety of fields including energy, defense, biology, and medicine. This research spans a wide range of areas including new methods for low-level image processing, such as filtering, segmentation, and surface reconstruction. Work on image analysis also focuses on statistical methods for analyzing shapes and applications of these methods to problems in medicine and biology. The work in image processing also includes applications of advanced computing to 3D images, which has resulted in new parallel algorithms and real-time implementations on graphics processing units (GPUs). A particularly important application area is neuroimage analysis, and collaborations with the University of Utah Brain Institute focus on disorders and diseases such as autism and Alzheimers. Examples are the analysis of diffusion-weighted MRI images for quantifying brain connectivity, the analysis of longitudinal pediatric images to understand brain development, and analysis of functional data for understanding brain function and the affects of disease. These applications drive the development of new methods for image processing, shape representation and analysis, and computational statistics.

**SCIENTIFIC COMPUTING**

The Scientific Computing faculty within the School of Computing perform cutting edge research in all of the aspects of the scientific computing pipeline: mathematical and geometric modeling; advanced methods in simulation such as high-performance computing and parallelization; numerical algorithm development; scientific visualization; and error quantification and evaluation. The School of Computing has scientific computing research efforts in a wide variety of areas, including adaptive methods, inverse and imaging problems, numerical analysis, uncertainty and error quantification, distributed and parallel computing, problem solving environments, integral methods, Monte Carlo algorithms, computational complexity and computational science applications. Students at both the undergraduate and graduate level working under faculty guidance are able to apply this knowledge to real-world problems in important scientific disciplines, including combustion, mechanics, geophysics, fluid dynamics, biology, and medicine. A collaborative base provides students with tremendous flexibility to seek out science which interests them, and strong mentoring from scientific computing track faculty.

**VISUALIZATION**

Scientific visualization, sometimes referred to as visual data analysis, is the graphical representation of data as a means of gaining understanding and insight into the data. Scientific visualization research at Utah has focused on applications spanning computational fluid dynamics, medical imaging and analysis, and fire simulations. Research involves novel algorithm development to building tools and systems that assist in the comprehension of massive amounts of scientific data. To comprehend spatial and temporal relationships between data, interactive techniques provide better cues and therefore, much of the scientific visualization research focuses on better methods for visualization and rendering at interactive rates.
ARTIFICIAL INTELLIGENCE

ROBOTICS

The robotics group conducts research on a wide variety of topics, particularly mobile robots, haptic interfaces, novel sensor and actuator systems, and intelligent sensor networks. A variety of novel mobility platforms are being developed for traversing varied terrain. For rough terrain, approaches include bipedal and quadrupedal legged robots, compliant-framed wheeled robots, and hybrid robots with legs that tuck into a ball for rolling downhill. Climbing robots include insect-like robots that utilize claws and spines to adhere to small features even in nearly smooth walls, and robot snakes that can crawl through pipes. Ornathopters (flying robots) are also being developed that use flapping wings for lift. Haptic interfaces are robot devices that physically interact with humans, and include both manual interfaces and locomotion interfaces. The virtual prototyping project seeks to add a sense of touch to the mechanical design process. Aside from feeling the force of contact, the tactile feel of contact is also being provided by pressing on the fingertip with a moving indenter that simulates the point of contact. A method of measuring human grasp force is being developed, that utilizes imaging coloration changes in a fingernail with a camera. The Sarcos Treadport Locomotion Interface seeks to provide a multi-sensory experience of walking, including visual, mechanical, auditory, and wind displays. Wet robots are being developed that embed Shape Memory Alloy "muscles" within a network of biologically inspired "robotic blood vessels" that fluidically distributes thermal energy to and from any actuators in the array using only a small number of valves. Smart sensor networks are being developed that are capable of computation, communication and sensing for many distributed sensors.

MACHINE LEARNING

Machine learning technology aims to solve problems of inference and prediction. Based on past data, we desire algorithms that can reliably forecast the future. Machine learning techniques have led to significant advances in the fields of natural language processing, computational biology, robotics and medicine. The machine learning group at Utah works in several areas, ranging from basic technology building to application development and from mathematical modeling to algorithmic implementation. These areas include structured prediction, domain adaptation, semi-supervised learning, bootstrapping and Bayesian statistics. Structured prediction aims at developing algorithms that can predict complex outputs, such as those found in natural language or biology. Domain adaptation, semi-supervised learning and bootstrapping address the frequently occurring problems of mismatches between past data and anticipated future data.

NATURAL LANGUAGE PROCESSING

The goal of natural language processing (NLP) research is to create computational models for understanding natural (human) languages, such as English. The natural language processing group at the University of Utah works on a variety of problems in human language technology, including event extraction, semantic analysis, and coreference resolution. Event extraction technology reads texts such as news articles and identifies important facts associated with events, such as the perpetrators and targets of a terrorist attack or the diseases and victims associated with infectious disease outbreaks. To understand text, our research group develops new techniques to determine the semantic meaning of words and phrases in context and through the automatic creation of semantic dictionaries. We also conduct research on coreference resolution to recognize when different words and phrases are referring to the same real-world entity or concept. The NLP group at Utah specializes in weakly supervised learning techniques that use bootstrapping to automatically acquire knowledge for natural language processing using unannotated text collections with minimal human supervision.
COMPUTER GRAPHICS
GEOMETRIC DESIGN & COMPUTATION // PERCEPTION // SIMULATION & ANIMATION

GEOMETRIC DESIGN & COMPUTATION

The Geometric Design and Computation group has engaged in both fundamental and applied research in developing methods for representing, specifying, manipulating, and visualizing geometric models. The group has projects ranging from early conceptual design methods to innovative manufacturing processes and from detail modeling applications to large-scale assembly systems. Supporting these applications is fundamental work on surface and model representation, computational geometry, topology, differential geometry, and numerical methods.

PERCEPTION

Perception research focuses on two complimentary goals. One aims to increase the effectiveness of computer graphics in conveying information about the three-dimensional world. We are interested in better understanding the spatial information potentially available in CG imagery, determining what spatial cues are actually used when CG imagery is viewed, and using this information to inform the development of improved rendering algorithms. A major thrust of this work has been directed at improving the accuracy of spatial actions conducted within virtual environments. The other goal uses the tools of computer graphics and visually immersive environments to probe basic questions about human perception. We are exploring fundamental issues concerning the processes used to scale distance judgments and the interaction between visual perception and locomotion. This is an interdisciplinary effort involving computer graphics, perceptual psychology, and computational vision.

SIMULATION & ANIMATION

While exploding trucks and collapsing buildings are rare occurrences in everyday life, they are frequently depicted in films, video games, and training simulations. Filming such effects in the real world can be dangerous and obtaining a specific outcome is often difficult. Consequently, such effects are increasingly generated through physical simulations where initial conditions and parameters can be tuned to produce the desired effect. Research in the Simulation and Electronic Animation Lab is focused in developing tools that allow artists to create high-quality, realistic, visually-detailed animations of complex materials for applications in computer graphics.
ARCHITECTURE & VLSI

Computer architecture and VLSI design are inexorably intertwined. At Utah, Architecture and VLSI researchers are tackling issues related to the synergy of these fields, including multiple efforts to understand and reduce the architectural impact of interprocessor communication and a project designing custom hardware for interactive ray tracing.

On modern multi-core chips, it is critical that on-chip interconnects and coherence protocols enable fast and power-efficient data transfers between parallel threads. Professor Balasubramonian's research focuses on architectural mechanisms, such as heterogeneous wire technology, that improve the efficiency of on-chip communication.

Professors Brunvand and Davis, in conjunction with computer graphics colleagues, are designing special-purpose hardware for ray tracing, a form of computer graphics that generates much higher quality and more realistic images than commodity graphics chips. The resulting processor employs multiple ray tracing pipelines and is based on previous work designing domain specific processors that support run-time configuration of the datapath. This allows it to operate at very close to the speed and power efficiency of a fully custom pipeline, but with enough programmability so that a variety of ray trace algorithms can be supported.

PARALLEL COMPUTING

We are entering the multi-core era where every computer, whether embedded, laptop, desktop, server or supercomputer, is a parallel computer. As parallel computing is reaching the masses, faculty at Utah are developing new courses and expanding their research to embrace the changes in programming tools and systems software that naturally must arise in response to this paradigm shift, in collaboration with the previously-described architecture and VLSI research in this area. In particular, the newly formed Center for Parallel Computing at Utah (CPU) fosters collaborations between the School of Computing faculty and faculty across campus on a variety of correctness and performance challenges being faced by the parallel computing community. We now describe some specific efforts. Professor Hall is developing performance tuning tools, called autotuners, designed to ease the programming burden in the face of the growing complexity and diversity of modern computer architectures. Autotuners experiment with a set of alternative strategies for mapping application code to hardware to automatically select the mapping that yields the best performance. Such programming tools increase programmer productivity by reducing the effort of porting to new architectures, and empowering the programmer to maintain code that is simpler, and architecture independent.

Advances in parallel computing are ultimately tied to delivering correct and efficient systems. The Gauss group lead by Professors Gopalakrishnan and Kirby is engaged in researching and developing formal analysis tools that can analyze and help debug parallel and concurrent programs. One of their tools ISP (In-Situ Partial Order Analysis) has the ability to analyze large-scale message passing programs written using the MPI library. A framework called GEM (Graphical Explorer of MPI programs) enhances one's ability to use ISP on complex programs, and has been officially released as part of the Eclipse Parallel Tools Platform. The Gauss group also has built tools for debugging GPU kernels through symbolic analysis, and a host of other tools to debug multi-core communication, thread libraries, and cache coherency protocols. Professor Gopalakrishnan, director of the CPU center, is also active in Concurrency Education, and collaborates with Microsoft Research in helping develop a Practical Parallel and Concurrent Programming curriculum called PPCP.
MOBILE & EMBEDDED SYSTEMS

Mobile and embedded computer systems have become pervasive in all aspects of human life: transportation, entertainment, communication, etc. This trend will continue. Professor Kessler’s group is working on context-aware web search systems where context can include physical location and activity type. Professor Regehr’s efforts address problems in creating dependable embedded software, particularly for highly constrained platforms. His group has created tools that take existing sensor network applications and enforce type-safe execution, detect the possibility of stack overflow, and reduce RAM usage using data compression techniques. Professor Davis’ group is designing high performance, low-power, flexible domain-specific architectures which do things like speech and visual feature recognition. They are also designing tools to automate the design process.

PROGRAMMING LANGUAGES

Professor Flatt’s group is investigating how multiple programming languages can be made to interoperate without forcing all interactions to be defined in terms of a single shared language (such as JVM bytecode). They are also exploring how individual programming languages can be made more extensible. Professor Kessler’s research group is developing a new requirements specification technique that incorporates use cases, class diagrams and simple state machines to automatically generate concrete scenarios for the various stakeholders. They are also working on an investigation into techniques to improve meta-modeling in UML. Professor Hall’s research group is developing compiler optimization technology that exploits performance-enhancing features of modern architectures, including multi-core microprocessors, SIMD compute engines, accelerators, complex memory hierarchies, and software-controlled storage. Professor Might’s research team investigates software analysis technology that optimizes performance, detects security vulnerabilities, improves parallelism and eliminates bugs.

NETWORKING & OS

Computer systems research at Utah spans operating systems, distributed systems, networking, and security. Much of this work is done in collaboration with researchers in programming languages and compilers, mobile and embedded systems, software engineering, and formal methods. The Flux Research Group, led by several systems faculty and senior technical staff, develops the internationally acclaimed Emulab network emulation testbed. Technologies and ideas from Emulab are being used to build NSF’s new GENI and PRObE experimental environments. Current Flux projects also include software containers to protect applications, and securing testbed systems. Past projects include operating systems like Fluke and Janos, which pushed the envelope in terms of OS design and features. Professor Kasera’s networking research encompasses mobile systems and wireless networks, network security, new network architectures, and networks measurements. Ongoing research includes developing novel methods for enhancing wireless network security using unique device fingerprints and link signatures, developing distributed medium access protocols for next generation wireless communication technologies, building social networking platforms to facilitate collective decision making, and building robust overload control. Professor Kasera’s group is also building mobile ad hoc network routing and security using accurate network performance characterizations and cross layer approaches.
PROGRAM ANALYSIS & FORMAL METHODS

ALGORITHMS

Algorithms research at the School of Computing explores problems in numerous areas, including topics in massive data sets, data mining, computational geometry, shape analysis and data visualization. One strand of current research being developed by Prof. Venkatasubramanian deals with the computational challenges of doing statistics on large data sets, and how information-theoretic methods can be brought to bear on a variety of problems in data management, with application in general data cleaning scenarios, as well as bioinformatics. Another research effort involves understanding algorithms in non-Euclidean spaces: a particular application of this effort is in the analysis of shape, particularly the shapes extracting from medical imaging modalities like MRI scanning and diffusion tensor imaging. Prof. Venkatasubramanian, together with Profs. Fletcher (CS) and Joshi (Bioengineering), is developing scalable, accurate algorithms for data analysis in non-Euclidean domains.

VERIFICATION

Research on formal methods in the School of Computing is unique in its tight integration with systems research activities at Utah and elsewhere. In one research thrust, Profs. Gopalakrishnan and Kirby are collaborating to verify the correctness of communication structures in large-scale aggressively optimized parallel simulations written using the Message Passing Interface (MPI). Another effort led by Prof. Gopalakrishnan is aimed at improving the reliability of hardware cache coherence protocols through formal verification. Prof. Regehr’s group builds tools that use lightweight formal methods to verify novel properties of embedded software. For example one tool uses abstract interpretation to bound the stack memory consumption of a compiled sensor network application. This is difficult because real embedded software uses many idioms that are hard to analyze, such as interrupts, recursion, and function pointers.
MANAGING SCIENTIFIC DISCOVERY PROCESS

The Information Management group has been working on building new cyberinfrastructure that streamlines the creation, execution and sharing of complex visualizations, data mining and other large-scale data analysis applications. We developed VisTrails (http://www.vistrails.org), a new open-source, scientific workflow and provenance management system that was designed to manage rapidly evolving workflows common in exploratory applications. VisTrails provides novel mechanisms for capturing and interacting with provenance that greatly simplify the data exploration process. VisTrails has been adopted as part of the cyberinfrastructure in large scientific projects, as well as a teaching and learning tool in graduate and undergraduate courses, both in the U.S. and abroad.

LARGE-SCALE WEB INFORMATION INTEGRATION

There has been an explosive growth in the volume of structured information on the Web. This information often resides in the hidden (or deep) Web, stored in databases and exposed only through queries over Web forms. A recent study by Google estimates that there are several millions of such form interfaces. However, the high quality information in online databases can be hard to find: it is out of reach for traditional search engines, whose index include only content in the surface Web. Our group is combining techniques from machine learning, information retrieval and databases to build infrastructure that automates, to a large extent, the process of discovering and organizing hidden-Web data sources, a necessary step to large-scale retrieval and integration of Web information. This infrastructure will enable people and applications to more easily find the right databases and consequently, the hidden information they are seeking on the Web. We have used our hidden-Web infrastructure to build DeepPeep (http://www.deeppeep.org), a new search engine for Web forms.
EDUCATION @ THE SCHOOL OF COMPUTING

• COURSE LIST
• UNDERGRADUATE PROGRAM
• GRADUATE PROGRAM
• COMPUTING TRACKS
• EAE : MGS
• M.S. & PH.D. GRADUATES
Course List

CS 1000 Engineering Computing
CS 1001 Engineering Computing using MATLAB
CS 1010 Introduction to UNIX
CS 1020 Introduction to Programming in C++
CS 1021 Introduction to Programming in Java
CS 1040 Creating Interactive Web Content
CS 1050 Computers in Society
CS 1060 Explorations in Computer Science
CS 1400 Introduction to Computer Science
CS 1410 Introduction to Computer Science I
CS 2000 Introduction to Programming in C
CS 2100 Discrete Structures
CS 2420 Introduction to Computer Science II
CS 2960 Apple Certification
CS 2961 Cisco CCNA Level 1
CS 2962 Cisco CCNA Level 1
CS 2963 LPI level 1
CS 2964 LPI level 2
CS 3010 Industry Forum
CS 3100 Model of Computation
CS 3130 Engineering Probability and Statistics
CS 3200 Scientific Computation
CS 3500 Software Practice I
CS 3505 Software Practice II
CS 3650 3D Modeling for Video Games and Machinima
CS 3660 Interactive Machinima
CS 3700 Fundamentals of Digital System Design
CS 3710 Computer Design Laboratory
CS 3810 Computer Organization
CS 3991 Computer Engineering Junior Seminar
CS 3992 Computer Engineering Pre-Thesis/Pre-Project
CS 4005 Honors Research Practice
CS 4150 Algorithms
CS 4400 Computer Systems
CS 4500 Software Engineering Laboratory
CS 4510 EAE Senior Project I
CS 4515 EAE Senior Project II
CS 4540 Web Software Architecture
CS 4550 Software Practice I
CS 4560 Software Practice II
CS 4570 Advanced Algorithms
CS 4610 Introduction to Computer Graphics
CS 4650 Advanced Computer Graphics I
CS 4660 Advanced Computer Graphics II
CS 4670 Advanced Computer Graphics II
CS 4680 Advanced Computer Graphics II
CS 4690 Image Processing
CS 4710 Computer Engineering Senior Project
CS 5010 Software Practice I
CS 5020 Software Practice II
CS 5040 Teaching Introductory Computer Science
CS 5060 Legal Protection of Digital Information
CS 5100 Foundations of Computer Science
CS 5150 Advanced Algorithms
CS 5160 Computational Geometry
CS 5200 Artificial Intelligence
CS 5300 Artificial Intelligence
CS 5310 Robotics
CS 5320 Computer Vision
CS 5340 Natural Language Processing
CS 5350 Machine Learning
CS 5460 Operating Systems
CS 5470 Compiler Principles and Techniques
CS 5480 Computer Networks
CS 5510 Programming Language Concepts
CS 5520 Anatomy of a Modern Programming Language
CS 5530 Database Systems
CS 5540 Human/Computer Interaction
CS 5560 Introduction to Computer Graphics
CS 5605 Honors Introduction to Computer Graphics
CS 5610 Interactive Computer Graphics
CS 5630 Scientific Visualization
CS 5650 Perception for Graphics
CS 5710 Digital VLSI Design
CS 5720 Analog Integrated Circuit Design
CS 5740 Computer-Aided Design of Digital Circuits
CS 5745 Testing and Verification of Digital Circuits
CS 5750 Synthesis and Verification of Asynchronous VLSI Systems
CS 5780 Embedded System Design
CS 5785 Advanced Embedded Systems
CS 5830 VLSI Architecture
CS 5960 VLSI Architecture
CS 6020 Conducting, Publishing and Presenting Early-Career Research
CS 6100 Foundations of Computer Science
CS 6110 Formal Methods for System Design
CS 6150 Advanced Algorithms
CS 6160 Computational Geometry
CS 6210 Advanced Scientific Computing I
CS 6220 Advanced Scientific Computing II
CS 6230 High Performance Parallel Computing
CS 6300 Artificial Intelligence
CS 6310 Robotics
CS 6320 Computer Vision
CS 6340 Natural Language Processing
CS 6350 Machine Learning
CS 6360 Virtual Reality
CS 6370 Geometric Computation for Motion Planning
CS 6380 Multi-agent Systems
CS 6470 Advanced Topics in Compilation
CS 6480 Advanced Computer Networks
CS 6490 Network Security
CS 6510 Functional Programming
CS 6530 Database Systems
CS 6540 Human/Computer Interaction
CS 6610 Advanced Computer Graphics I
CS 6620 Advanced Computer Graphics II
CS 6630 Scientific Visualization
CS 6640 Image Processing
CS 6650 Perception for Graphics
CS 6670 Computer-Aided Geometric Design I
CS 6680 Computer-Aided Geometric Design II
CS 6710 Digital VLSI Design
CS 6712 Digital IC Project Testing
CS 6720 Advanced Integrated Circuit Design
CS 6750 Synthesis and Verification of Asynchronous VLSI Systems
CS 6760 Modeling and Analysis of Biological Networks
CS 6770 Advanced Digital VLSI Systems Design
CS 6780 Embedded Systems Design
CS 6785 Advanced Embedded Systems
CS 6810 Computer Architecture
CS 6830 VLSI Architecture
CS 6840 VLSI Architecture
CS 7010 Writing Research Proposals
CS 7120 Information-Based Complexity
CS 7240 Sinc Methods
CS 7250 Advanced Topics in Scientific Computing
CS 7310 Advanced Manipulation and Locomotion
CS 7320 System Identification for Robotics
CS 7480 Distributed Operating Systems
CS 7520 Programming Language Semantics
CS 7640 Image Processing
CS 7650 Realistic Image Synthesis
CS 7810 Advanced Computer Architecture
CS 7820 Parallel Computer Architecture
Undergraduate Program

COMPUTER SCIENCE

The School of Computing offers the only nationally ranked B.S. computer science degree program in Utah and is consistently rated in the top 50 computer science departments in the country. The undergraduate program provides a firm grounding in programming skills, followed by a study of more advanced topics such as algorithm analysis, software engineering, computer architecture, and systems programming. Beyond this level, students have complete flexibility in selecting from a wide selection of elective classes in areas of interest to them. Popular options are graphics, scientific visualization, operating systems, networks, compilers, artificial intelligence, programming languages, databases, robotics, natural language processing, and many others. The program culminates in a capstone experience, in which students work in groups to produce a significant software product of their choice.

COMPUTER ENGINEERING

The primary technical objective of the Computer Engineering program at the University of Utah is to provide an in-depth study of hardware for both information-processing systems and digital control systems. To help meet this objective, we bring problems of current relevance in industry and research into the classroom. Virtually every faculty member is involved in research or other scholarly activity, and most spend part of their time consulting in the private sector. Faculty members teach classes in the areas of their research and consulting activities, thereby bringing to the students an up-to-date knowledge of the material.

B.S. / M.S. PROGRAM

The School of Computing’s B.S./M.S. program was created to allow students the opportunity to earn both a bachelor and a master’s degree in five years. Students typically apply for admission in their junior year and begin to take graduate-level courses during their senior year. The B.S./M.S. program primarily benefits local students who otherwise would have been unlikely to pursue an advanced degree.

ENTERTAINMENT ARTS & ENGINEERING

The School of Computing provides a specialty track through the Computer Science (CS) program with an emphasis on Entertainment Arts and Engineering (EAE). The EAE track is a joint program between the School of Computing and the College of Fine Arts (currently the fine arts side is housed in the Division of Film Studies). The purpose of this program is to provide an undergraduate, interdisciplinary academic path for those students who wish to have careers in the digital entertainment industry (video games, digital animation, computer generated special effects, etc.). There are currently two specified tracks: video games and animation, differing by the junior year Game/Animation series of classes. The key feature of this program is its interdisciplinary nature. Students from both CS and Fine Arts will take common classes throughout their undergraduate years, culminating in a yearlong senior project in which students build a video game or animation from the ground up. Students in the program can choose either a bachelor’s degree in Film Studies or Computer Science.
Graduate Program

MASTER’S IN COMPUTER SCIENCE

The School of Computing’s M.S. program offers a spectrum of curriculum options ranging from a research oriented option culminating in a written M.S. thesis, to a coursework only option emphasizing flexibility and breadth in material studied. In between these two extremes is a project option, where a taste of research can be obtained on a one semester basis, while continuing to focus on coursework.

PH.D. IN COMPUTER SCIENCE

The Ph.D. program is a traditional research-centered doctoral program emphasizing an in-depth, innovative scientific investigation leading to results publishable in respected professional journals and conferences. Sustained, close interaction with a faculty advisor and supervisory committee is a central aspect of a student’s dissertation experience. All regular faculty and selected auxiliary faculty supervise Ph.D. research, often in the context of ongoing funded research projects.

The School of Computing offers 8 master’s degree options

- Master of Computer Science
- Computing Degrees
- Computer Engineering
- Data Management and Analysis
- EAE: Master Games Studio
- Graphics and Visualization
- Image Analysis
- Information Technology
- Robotics

The School of Computing offers 7 Ph.D. degree options

- Ph.D. of Computer Science
- Computing Degrees
- Computer Engineering
- Data Management and Analysis
- Graphics and Visualization
- Image Analysis
- Robotics
- Scientific Computing
Computing Degree Program

Computer Engineering Track

Computer Engineering is a discipline that combines elements of both Electrical Engineering and Computer Science. Computer engineers design and study computer systems at many levels from the circuits that make up computers, to the architecture of processors and subsystems, to the programming interfaces of those processors. This usually involves an interesting mix of software and hardware skills and the integration of both skills. The Computer Engineering graduate track allows students to pursue a graduate degree with a focus on these sorts of issues. The track offers M.S. (course-based, project, and thesis) and Ph.D. degrees. The Computer Engineering graduate track is offered with essentially the same requirements in both the School of Computing and the Department of Electrical and Computer Engineering. Students may choose to apply to either department depending on their background and interests within computer engineering. There is also a B.S. computer engineering track that is jointly administered by the two departments and involves courses from both.

Graphics & Visualization Track

As part of the Computing Degree Program, the School of Computing offers a specialized graduate track in Computer Graphics and Visualization. This track in the degree program encourages students to pursue area specific coursework and advanced research at an early stage of their graduate study. Aimed at maximizing a student’s learning opportunities and research experiences, this track engages students in research activities as soon as possible. The Computer Graphics and Visualization degree track draws heavily on the many faculty and excellent facilities that have contributed to making Utah one of the nation’s top-ranked graphics programs. The graphics program at the School of Computing is quite comprehensive, with research efforts in most areas of computer graphics, including geometric modeling, CAD/CAM, scientific visualization, biomedical visualization, computer vision, terrain modeling and rendering, haptics (force-feedback), realistic rendering, digital geometry processing, point-based graphics, immersive environments, and non-photorealistic rendering.

Image Analysis Track

The Image Analysis track provides students with training and research opportunities in image processing, image analysis and computer vision. Students study a wide range of topics, including mathematical principles, numerical implementations, software engineering, applications to real image data, scientific visualization of results, computational statistics and machine learning. Students have the opportunity to apply this knowledge to 2D and 3D imaging problems driven by challenging applications from a variety of fields including medicine, biology, energy, defense and more – in principle from every field that uses cameras or scanners as sensors. Image processing by definition is multidisciplinary, covering aspects from mathematics, physics, numerical analysis, scientific computing, programming, and from the disciplines providing the driving applications such as clinical research, biology, geosciences, robotics, industrial inspection and surveillance. Students therefore have the chance to be exposed to concepts and cutting-edge research in all those disciplines and to actively interact with researchers who are part of these collaborative projects.
DATA MANAGEMENT & ANALYSIS TRACK

The rate at which scientists and businesses are producing data is increasing at an unstoppable rate. Being able to efficiently process and make sense of such data has become a key scientific challenge in computer science. Not only must one be able to store such information compactly, but one must be able to develop algorithms to process it efficiently and produce intelligent systems that can interpret this data to find interesting patterns or make decisions. These topics form the core of the Data Management and Analysis track. Students in this track may pursue a M.S. degree (course-based, project, and thesis) and Ph.D. degrees.

INFORMATION TECHNOLOGY TRACK

The goal of the M.S. Computing Degree in Information Technology (MSIT) is to train a new generation of technologists. It offers a mix of technology and management courses to provide students with a solid background in both areas. This unique combination of skills is currently in high demand in the IT industry. The MSIT degree is a good investment for both information technologists and business professionals who want to deepen their technical knowledge and develop their management skills. The curriculum for this degree draws from internationally recognized faculty in the School of Computing and David Eccles School of Business.

ROBOTICS TRACK

The Robotics Track is a program of study for the M.S. or Ph.D., with virtually identical course requirements for students in either department. Prospective students will choose one or the other of the departments to apply to, guided primarily by undergraduate preparation and by which department the student wishes the graduate degree to be in. The field of robotics has expanded tremendously since its early focus on industrial robots, and now includes very diverse topics such as autonomous vehicles, medical robots, smart sensor networks, micro robots, robot vacuum cleaners, sentry robots, and pet robots. Robotics technology is embedded in many devices, which are not usually thought of as robots. Knowledge of how to model motion and an emphasis on real-time computation finds application in graphics, animation, and computer games. Utah is world-famous for the robotics systems it has produced, including manipulators such as the Utah/MIT Dextorous Hand and the Sarcos Dextorous Arm, humanoid robots such as DB2, entertainment robots such as Disney figures and Jurassic Park the Ride dinosaurs, and virtual reality systems such as the Sarcos Treadport and Biport. Faculty expertise encompasses the entire theory-to-market stream, including ties to a U of U spin-off, Sarcos, piloted by a participating faculty member and a CAD/CAM system prototyping device for Ford Motor Co. and the oil exploration industry.

SCIENTIFIC COMPUTING TRACK

The Scientific Computing track trains students to perform cutting-edge research in all of the aspects of the scientific computing pipeline: mathematical and geometric modeling; advanced methods in simulation such as high-performance computing and parallelization; numerical algorithm development; scientific visualization; and evaluation with respect to basic science and engineering. Students apply this knowledge to real-world problems in important scientific disciplines, including combustion, mechanics, geophysics, fluid dynamics, biology, and medicine. Students integrate all aspects of computational science, yielding a new generation of simulation scientists who are performing fundamental research in scientific computing, as well as being interdisciplinary `bridge-builders" that facilitate interconnections between disciplines that normally do not interact. Our mission is to provide advanced graduate training in scientific computing and to foster the synergistic combination of computer and computational sciences with domain disciplines. The School of Computing has scientific computing research efforts in a wide variety of areas, including adaptive and high-order methods, inverse and imaging problems, numerical analysis, distributed and parallel computing, problem solving environments, validation and verification, uncertainty quantification, computational complexity and computational science applications.
Entertainment Arts & Engineering: Master Games Studio

In the fall of 2010, we admitted our first cohort of students (23) in the Entertainment Arts and Engineering Master Games Studio (EAE: MGS), an interdisciplinary master’s program with three tracks: game engineering, game arts, and game production. Students in the game engineering track are awarded the M.S. in Computing degree from the School of Computing, while students in the game arts and production tracks are awarded the MFA degree from the Department of Film and Media Arts. The EAE: MGS program operates during fall and spring semesters over two consecutive years in a cohort model in which the students remain together throughout the entire program.

All students in each of the three tracks have a series of common classes including game design, rapid prototyping, pre-production, and final project. The students also have courses that will focus on the specialty of each of the tracks. These classes are exclusive to the students enrolled in the Entertainment Arts and Engineering Master Games Studio. Also each track will have a concentrated set of explicit electives to choose from the School of Computing, Film and Media Arts, and other departments on campus. The last semester will require a professional level internship, an internal internship, or an individual research project. Completion of the program requires 48 credits for each of the three tracks.
Entertainment Arts and Engineering (EAE) is an interdisciplinary program between the School of Computing and the Department of Film and Media Arts. The focus is on where computers and art meet in areas such as video games, computer animation, and special effects. EAE began back in 2007 as an undergraduate emphasis (EAE: Emphasis). Students from Computer Science and Film take classes together every semester from their freshman through senior years, collaborating and working on interdisciplinary projects. EAE: Emphasis culminates in a year long senior project where large teams of students construct a video game from inception through commercial release.

“As the digital entertainment industry continues to grow, employers are focusing more on students who understand both sides of the industry, whether it is a computer science students with additional fine arts skills or fine arts students with computing skills.”

- Bob Kessler, Professor
OUTREACH @ THE SCHOOL OF COMPUTING

- GREAT SUMMER CAMP
- EAE SUMMER PROGRAM
The School of Computing debuted the new Entertainment Arts and Engineering Summer Program Summer (EAESP) in June 2008. The two-week long camp was created for high school students and designed to introduce the students to the concepts of 3D modeling, texturing, rigging, animation, and rendering, using some of the most advanced software in the industry such as Autodesk Maya and Adobe Photoshop.

The curriculum was based on a final project where the students chose a character and then produced them in MAYA. During the two weeks the students worked on abstract designs for their characters by producing clay sculptures, drawings, and verbal descriptions as preliminary steps to creating a 3D version in MAYA. The students learned engineering principles and art concepts and applied both to the production of their character. The camp also involved visits to research laboratories in the School and fieldtrips to local game and modeling studios.

The camp was taught by Mark van Langeveld, a clinical assistant professor in the School of Computing. Mark pioneered this same summer program at the University of Pennsylvania in 2004 and has been offering it every year since then.

David Johnson, who directed the camp, said, “We were delighted to have almost 200 children attend the camps this year. The fun and intensive curriculum really pays off with students making games and animations in just a short period of time.” Erin Parker was also instrumental in teaching and guiding the camps as were six very capable student teachers.

Contributions from Novell, Microsoft and NDEP/Hill AFB were instrumental in funding the program and making it both affordable and of high quality.
RESEARCH AWARDS

RESEARCH EXPENDITURES

2009 - $11.8M
2010 - $17.1M
Disclaimer:
The following information provided only includes the PI's and Co-PI's within the School of Computing. Many of the grants reported are multi-University/lab grants, the amounts shown are the research dollars that have come to Utah.

Rajeev Balasubramonian
“CAREER: Exploring Heterogeneity Within Chip Multiprocessors” (PI), NSF CAREER Award, $300,000 (5/2006 – 4/2011)

“Reconfiguration within Large Cache Hierarchies” (PI), Intel Corporation, $50,000 per year (renewable up to three years), (10/2007 – 9/2010)


“SHF: Small: Hardware/Software Management of Large Multi-Core Memory Hierarchies” (PI), Mary Hall NSF, $372,000 (9/2009 – 8/2012)

“Meeting Datacenter Demands with Novel DRAM Architectures” (PI), HP Labs Innovation Research Program award, $75,000 per year, (8/2010)

Adam Bargteil
“EAGER (G&V): Exploring Morse Theoretic Tools for Automatic Mesh Generation and Simulation on Surfaces” (co-PI), NSF, $100,000 (9/1/2010)

“II-NEW: The Utah Acquisition and Rapid Prototyping Laboratory” (PI), NSF, $391,200 (8/1/2009)

Martin Berzins
Peta-apps (PI), NSF, $999,280 (2009-2013)
SDCI-HPC (PI), NSF, $703,916 (2007-2010)

“Center for Simulation of Fires and Explosions” (co-PI), DOE-LLNL, $2,982,650 (2002-2010)

Richard Brown
“An Engineering Research Center in Wireless Integrated Microsystems” (sub-contract with University of Michigan), NSF, $90,300 (9/08-8/10)

“Student Travel Assistance for the Symposium of 35 Years of Chemical Sensors in 215th ECS” NSF, $6,000 (5/09-8/09)

“Detection and Mitigation of Hazardous Releases in Infrastructure” (sub-contract with University of Michigan), NSF, $70,114 (8/09-7/12)

“Glucose Management Food Tray,” Joel Ehrenkranz, MD, $10,000 (5/10-12/10)

Erik Brunvand
“Hardware Support for Real Time Ray Tracing” (PI), NSF, $499,382 (2006-2010)

“Hardware Support for Real Time Ray Tracing REU” (PI), $6,000 (2006-2010)


“Embedded Systems and Kinetic Art” (PI) University Teaching Committee, $4,300, 2009

Elaine Cohen
“Curvature Reparameterization” (PI), MIT, $40,040 (2008-2009)

REU Supplement (PI), NSF, $6,000 (2006-2010)

“Solving of Symbolic Problems” (PI), NSF, $375,000 (2006-2010)

Al Davis
“Biologically Motivated Scaling” (PI), NSF $160K (2006-2010)


Matthew Flatt
Extensible Gradual Type System (PI), NSF, $419,565 (2009-2012)

Thomas Fletcher
Language Development in Autism (PI), UU Research Foundation, $22,400 (2009-2010)


“ADNI Atlases” (co-PI), NIH, $327,263 (7/2008-3/2012)

Juliana Freire
“Supplement for CAREER: Storing, Querying and Re-Using Provenance of Computational Tasks” (PI), NSF, 60,000 (2010-2013)

III:EAGER:Collaborative Research: A Community Experiment Platform for Reproducibility and Generalizability” (PI), NSF, 190,000 (2010-2012)

“SBIR Phase I and Phase II: Provenance-Enabling DOE Visualization Applications” (co-PI) DOE, $850,000 (2008-2011)

“Supporting Pipelines of Retrieval, Analysis and Visualization of Web Data” (PI), SNL-DOE, $103,430 (2009-2010)

“Provenance Analytics Tools to Improve the Measurement of Usability and Insight in Visualization Applications” (co-PI), SNL-DOE, $100,000 (2009-2010)
“NCRR ARRA Administrative Supplement – Translational” (co-PI), NIH, $998,137 (2009-2011)


“Center for Management of Provenance and Exploratory Workflows” (co-PI), State of Utah, Centers of Excellence, $200,000 (2008–2010)


“III-COR: Discovering and Organizing Hidden-Web Sources” (PI), NSF, $27,212; REU Supplement $15,000. (2007–2011)

“SBIR Phase I and II: Provenance-Enabling DOE Visualization Applications” (co-PI), DOE, $850,000 (2008–2011)

“Science and Technology Center for Coastal Margin Observation and Prediction” (co-PI for Utah subcontract), NSF, $478,563 – Utah portion (2006–11)

“CT-T: A Laboratory Workbench for Security Research” (PI), NSF, $1,466,000. (2005–2010)

Guido Gerig

“A Longitudinal MRI Study of Infants at Risk for Autism” (PI), UNC, $147,723 (06/01/07-05/30/12)

“Characterization of Normal Brain Development Using Parallel MRI” (co-PI), NIH NIBIB, $74,714 (07/01/07-06/30/12)

“Prospective Studies of the Pathogenesis of Schizophrenia, Silvio O. Conte Center for the Neuroscience of Mental Disorders” (PI Imaging Core), NIH NIMH, $82,359 (08/01/07-07/31/12)

“Neurobiological and Behavioral Consequences of Cocaine Use in Mother-Infant Dyads” (PI Imaging Core), NIH NIDA, $117,625 (06/01/08-05/31/13)

“NA-MIC: National Alliance for Medical Image Computing” (co-PI), NIH NIBI, $196,530 (09/30/2010 – 08/31/2014)

“Prospective studies of Early Brain Development in Twins, Role” (PI UofU), NIH, $57,938 (05/01/10 – 11/30/14)


“Development of a web-based Infrastructure for Comparison and Validation of Image Computing methods (COVALIC)” (PI), NIH, $100K (07/01/10 – 06/30/11)

Ganesh Gopalakrishnan

“CPS: Medium: Safety-Oriented Hybrid Verification for Medical Robotics” (co-PI), CNS, $500,000 (2010–2012)


“Formal Analysis of Multicore Communication APIs and Applications” (PI), SRC, $45,000 (2009–2012)

“Formal specification, verification, and test generation of Multi-core CPUs” (PI), SRC, $180,000 (2008-2011)

REU Supplements, NSF, $32K (2010-2011)

8-core server (equipment grant) (PI), SUN

Mary Hall


“Intelligent Optimization of Parallel and Distributed Applications” (PI), NSF-CSR, $885K (8/2006-1/2010)

“Petascale Hierarchical Simulations of Biopolymer Translocation through Silicon Nitride and Silica Nanopores and Nanofluidic Channels” (co-PI), NSF, $160K (9/2007-9/2012)

“SHF:SMALL: Hardware/Software Management of Large Multi-Core Memory Hierarchies” (co-PI), NSF, $350K (9/2009-8/2012)

“Compiler-Based Autotuning” (PI), DOE, $510K to Utah (2/1/2010-1/31/2012)

“Performance Engineering Research Institute” (Utah PI), DOE, $290K to Utah (12/15/2008-01/31/2012)

“SHF Small: A Compiler-Based Auto-Tuning Framework for Many-Core Code Generation” (PI) $481K (7/1/2010-6/30/2013)


“Echelon: Extreme scale Compute Hierarchies with Efficient Locality Optimized Nodes,” Mary Hall (Utah PI), Nvidia Corporation (Lead) DARPA, ($1.256M to Utah) (8/15/10-05/31/14)

“CRI: CRD: Raising the Standard of Scientific Publishing Through an Experiment Archive”, PI, co-PI Eric Eide, original PI Jay Lepreau, $40K (10/01/07-09/30/10)

Chuck Hansen

“Enabling Transformational Science and Engineering Through Integrated Collaborative Visualization and Data Analysis for the National User Community” (co-PI), NSF, $848K (8/2009-8/2012)
"Image Processing of Large Data Sets" (co-PI), Exxon Mobil, $1,895,855 (12/2004-12/2011)

"Institute for Applied Mathematics and Computational Science" (co-PI), KAUST (subcontract from TAMU), $1.67M (6/2008-6/2013)


"Center for Simulation of Fires and Explosions" (Senior Investigator) DOE LLNL, $2,982,650 (10/2002-9/2010)


"Visualization Research for Multicore Processors" (co-PI), Sandia, $250K (6/2009-6/2010)

**Tom Henderson**

"Innate Theories in Cognitive Robotics" NSF, $36,000 (2010-2011)

"IPA Agreement," NSF, $203,000 (2010-1011)

**John Hollerbach**

"CPS: Medium: Safety-Oriented Hybrid Verification for Medical Robotics" (co-PI), NSF, $500K (1/2010-9/2013)


"Measuring Finger Forces by Imaging the Fingernail" (PI), NIH, $392,677 (7/2006-6/2010)

**Chris Johnson**

"Center for Integrated Biomedical Computing" (PI), NIH/NCRR, $11,205,029 (09/29/05-07/31/15)

"Visualization and Analytics Center for Enabling Technologies" (PI), DOE, $2,628,230 (09/15/06-09/14/11)

"CRI: A Hierarchical Data Storage System for Large Data Simulation, Comparison, and Visualization" (co-PI), NSF, $506,243 (03/16/06-02/28/11)

"Institute for Mathematics and Computational Science" (Visualization Subcontract) (PI), KAUST, $1,675,830 (06/01/08-05/31/12)

"Open Wildland Fire Modeling" (PI), NSF CDI, $564,158 (11/01/08-10/31/12)

"End to End High Performance Visualization and Data Analysis" (PI), DOE, $7,500,000 (03/08/10 – 02/28/13)

**Sneha Kasera**

"CPS: Medium: Collaborative Research: Enabling and Advancing Human and Probabilistic Awareness for Smart Facilities and Elder Care" (co-PI), NSF, $749,998 (9/15/2010-9/14/2013)

"An Infrastructure for Robust Authentication Systems Research" (PI), DURIP, $150K (9/2010-9/2011)


"II-NEW: An Infrastructure for Researching Wireless Link Signatures" (PI), NSF, $224,326 (8/1/2009-7/31/2012)

"CT-ISG: Opportunistic Secret Key Exchange Using Wireless Link Characteristics and Device Mobility" (PI), NSF, $349,995 (9/1/2008-8/31/2011)


"Utah’s Engineers: A Statewide Initiative for Growth" (Computer Science Lead), NSF, $1,998,013 (9/1/2007-8/31/2011)


"CT-CISG: Opportunistic Secret Key Exchange Using Wireless Link Characteristics and Device Mobility" (PI), NSF, $349,995 (9/1/2008-8/31/2011)


"Robust Location Distinction Using Temporal Link Signatures" (co-PI), University of Utah, $70K (8/1/2007-7/31/2009)

**Mike Kirby**

"High-Finite Order Element" (PI), ARO, $154,284 (9/2008-9/2011)

"Vascular Assess" (co-PI), NIH, $27,241 (9/2008-8/2009)


"Message Passing Software" (co-PI), NSF, $199,998 (7/2005-6/2010)

"Computational Inverse Problems" (PI), NSF, $406,262 (1/2004-12/2009)

"REU Supplement (PI), NSF, $24K (10/2003-12/2009)

**Matthew Might**

"Safety-Oriented Hybrid Verification for Medical Robotics" (PI), NSF, $500K (10/2010-10/2013)
Valerio Pascucci

“ARRA: Enabling Transform Science” (PI), UT Austin, $278,481 (8/2009-7/2012)

“Visualization of Noisy Data” (PI), UC Davis, $112,793 (3/2010-9/2011)


SCI-DAC VIS (PI), DOE, $657,634 (9/2006-3/2011)


Sandia: 3 month project (PI), DOE-SNL, $75,624 (6/2010-12/2010)


“EAGER” (PI), NSF, $100K (9/2010-8/2011)

“Image Process of Large Data Sets” (co-PI), Exxon Mobil, $1,895,855 (12/2004-12/2011)

“End to End High Performance” (co-PI), DOE-LLNL, $2,485,111 (3/2010-2/2013)

UV-CDAT (co-PI), DOE, $800K (9/2010-8/2012)

John Regehr

“Containers for Advanced Adaptive Applications” (PI), DARPA, $1.4M (9/2010-8/2014)


“MRI: Evolutionary Development of an Advanced Distributed Testbed” (PI), NSF, $1,704,000 (9/01/07 – 08/31/11)


Robert Ricci

“End-To-End ProtoGENI” (PI), GENI Project Office, $759,662, (11/01/08 - 11/01/11)

“Experiment Workflow Tools and Services for GENI” (PI), GENI Project Office, $592,994, (10/01/09 - 09/30/12)

“Integrating New Projects into the ProtoGENI Control Framework” (PI), GENI Project Office, $448,665, (10/01/09 - 09/30/12)

“MRI: Evolutionary Development of an Advanced Distributed Testbed” (co-PI), NSF, $1,704,000 (9/01/07 – 08/31/11)

“NeTS-ProWin: Software Radio Testbeds: One Large, Many Small”, (co-PI), NSF, $1,000,000, (09/01/05 - 08/31/11)

“NeTS-ProWin: An Open, Low Cost, High Quality Software Radio Platform and Testbed”, (co-PI), $1,199,998, (09/01/04 - 08/31/10)

Rich Riesenfeld

“Legacy Engineering Modeling” (PI), Hampton University, $75K (5/2008-7/2009)

Ellen Riloff

“RACR: Reader and Contextual Reasoner”, Key Personnel, subcontract to IBM, DARPA, $769,550 (8/1/09-5/30/14)

“Text Mining Infrastructure for the Entire Biological Literature” Key Personnel, subcontract to USC/ISI, NSF, $119,917 (10/1/09-9/30/2012)

“POET: Consolidated, Comprehensive Clinical Text Preprocessing” , Key Personnel, NIH, $335,903 (9/15/08-8/31/10)

“Information Extraction of Events and Beliefs from Text” (co-PI), Department of Homeland Security, $498,200 (10/16/06-5/31/10)

“Coreference Resolution Research” (PI), LLNL, $109,992 (10/1/07-10/31/09)

Claudio Silva

“STC For Coastal Margin” (PI), OHSU, $329,176 (7/2006-6-2011)


“Integrating Visit and VisTrails” (PI), DOR-ONL, $53,209 (12/2008-12/2009)


“EAGER” (PI), NSF, $100K (9/2010-8/2011)

“Image Process of Large Data Sets” (co-PI), Exxon Mobil, $1,895,855 (12/2004-12/2011)

“End to End High Performance” (co-PI), DOE-LLNL, $2,485,111 (3/2010-2/2013)

UV-CDAT (co-PI), DOE, $800K (9/2010-8/2012)

John Regehr

“Containers for Advanced Adaptive Applications” (PI), DARPA, $1.4M (9/2010-8/2014)


“MRI: Evolutionary Development of an Advanced Distributed Testbed” (PI), NSF, $1,704,000 (9/01/07 – 08/31/11)


Robert Ricci

“End-To-End ProtoGENI” (PI), GENI Project Office, $759,662, (11/01/08 - 11/01/11)

“Experiment Workflow Tools and Services for GENI” (PI), GENI Project Office, $592,994, (10/01/09 - 09/30/12)

“Integrating New Projects into the ProtoGENI Control Framework” (PI), GENI Project Office, $448,665, (10/01/09 - 09/30/12)

“MRI: Evolutionary Development of an Advanced Distributed Testbed” (co-PI), NSF, $1,704,000 (9/01/07 – 08/31/11)
“End to End High Performance” (co-PI), DOE-LLNL, $2,485,111 (3/2010-2/2013)


William Thompson

“A New Method for Evaluating Perceptual Fidelity” (PI), NSF, $498,893 (08/01/2009-07/31/2012)

“Designing Visually Accessible Spaces” (PI-Utah portion), NIH, $1,192,000 (03/01/2007-02/28/2012)

“Increasing Student Motivation Without Compromising Student Performance on Online Classes” (co-PI), NSF, $499,370 (09/15/2008-08/31/2011)


Suresh Venkatasubramanian


“Scalable Shape Analysis” (PI), NSF, $49,868 (1/2009-8/2010)

“Scalable, Accurate and Efficient Data Analysis for Medical Imaging” (PI), University of Utah Research Foundation, $34,952 (1/2009-6/2010)

“CAREER: Geometric Algorithms For Data Analysis In Spaces Of Distributions” (PI), NSF, $489K (2/2010-1/2015)

“CPS: Medium: Collaborative Research: Enabling and Advancing Human and Probabilistic Context Awareness for Smart Facilities and Elder Care” (co-PI), NSF, 249,000, (9/2010-8-2013)

Ross Whitaker

“Image Processing of Large Data Sets” (PI), Exxon Mobil, $1,895,855 (12/2004-12/2011)


“Noise and Dose Reduction” (PI), GE, $211,379 (8/2010-7/2011)

“NAMIC” (PI), Brigham and Womens Hospital, $1,228,997 (9/2004-8/2014)

“Center for Integrated Biomedical Computing” (co-PI), NIH/NCRR, $11,205,029 (09/29/05–07/31/15)
FACULTY @ THE
SCHOOL OF COMPUTING
Professor Balasubramanian's research focuses on many aspects of computer architecture. He is particularly interested in studying how future technology trends influence the design of high-performance microprocessors. In recent years, much of his research group's focus has been on the design of efficient memory hierarchies. His students have examined data placement in large caches (two papers each at HPCA'10 and HPCA'09) and novel organizations for DRAM main memory (papers at ISCA'10, ASPLOS'10, PACT'10). In the past five years, Prof. Balasubramanian has also worked on the design of efficient on-chip networks (papers at HPCA'10, HPCA'09, MICRO'07, ISCA'07, ISCA'06, HPCA'05).

Publications

Refereed Journals


Refereed Conference and Workshops


Invited Talks & Presentations

Invited talk, Harvard University, February 2010

Professional Participation

• Program Chair, ISPASS 2011
• Workshop Co-Chair, CMP-MSI 2009, CMP-MSI 2010
• Registration Chair, ISPASS 2009, HPCA 2010

Honors & Awards

• Best Paper Award at PACT-19, paper on Multiple On-Chip Memory Controllers
• Best Paper Award at HiPC-16, paper on Non-Uniform Power Access in Large Caches
• HPCA’10 paper by Jiang et al. selected as one of the eleven best architecture papers of 2010 by IEEE Micro magazine’s annual Top Picks issue
Adam W. Bargteil is an assistant professor at the University of Utah. He earned his Ph.D. in computer science from the University of California, Berkeley and spent two years as a post-doctoral fellow in the School of Computer Science at Carnegie Mellon University. He received dual BS degrees in computer science and mathematics (magna cum laude) from the University of Maryland in 2000. Adam was a U.C. Microelectronics Fellow in 2000 and a Siebel Scholar in 2006. From 2005 to 2007, he was a consultant at PDI/DreamWorks, developing fluid simulation tools that were used in “Shrek the Third” and “Bee Movie.”

Professor Bargteil’s research interests are in computer graphics and animation, especially physics-based animation. In essence, this subfield develops mathematical models of the real world and uses numerical methods to compute motion. For computer graphics applications, physical fidelity and standard notions of accuracy are less important than visual fidelity and plausibility. These unique requirements for computer graphics allow the use of new approximations to the real world, but also present challenges, such as temporally coherent tracking of liquid surfaces. With collaborators, Prof. Bargteil has explored techniques for animating liquids, deformable solids, and materials that demonstrate behavior of both fluids and solids, such as clay, slime, and goop. The interdisciplinary nature of his work leads to overlaps with scientific computing, numerical methods, computational physics, and computational geometry.

Publications

Refereed Conference and Workshops


Invited Talks & Presentations

DreamWorks Animation SKG. Animation with a Point: New Approaches to Point-based Animation, May 2010

University of California at Berkeley. Animation with a Point: New Approaches to Point-based Animation, May 2010

Pixar Animation Studios. Animation with a Point: New Approaches to Point-based Animation, May 2010

Columbia University. Animation with a Point: New Approaches to Point-based Animation, May 2010

Bellairs Workshop on Computer Animation: Reduced Physics, Simulation, and Control. Bezier Tetrahedra for Computer Animation, February 2010

Technical University of Denmark. Animation with a Point: New Approaches to Point-based Animation, December 2010

Professional Participation

- Associate Editor, Graphics Models, Spring 2010 - present
- Program Committee Member, SIGGRAPH Asia 2010
- Posters Chair, ACM/Eurographics Symposium on Computer Animation 2010
- Program Committee Member, ACM/Eurographics Symposium on Computer Animation 2010
- Program Committee Member, Pacific Graphics 2010
- General Jury Member, SIGGRAPH 2010
- NSF Panelist, 2010
- Program Committee Member, SIGGRAPH 2009
- Program Committee Member, ACM/Eurographics Symposium on Computer Animation 2009
- Program Committee Member, Pacific Graphics 2009
Martin Berzins received his Ph.D. from the University of Leeds in 1981. Martin’s research area is the study of serial and parallel novel computational algorithms for the numerical solution of partial differential equations (p.d.e.s), a part of the discipline of Scientific Computing. The physical problems that are modeled by p.d.e.s are of great importance to a wide range of both industrial and academic research groups. Examples range from being able to design better harbors to understanding environmental pollution, modeling the behavior of lubricants in a car engine or modeling fires and explosions.

The approach taken in this research has been to derive numerical methods with adaptive error control and develop software on both serial and parallel computers for a broad, mathematically-defined problem class. This has made it possible for users from different physical applications areas to solve their problems by creating a mathematical model which fits inside the general problem class.

A focus of recent research has been to develop parallel asynchronous adaptive approaches inside the Uintah software.

Martin’s current research areas are:

• Parallel adaptive mesh algorithms for tera-scale and peta-scale computers
• Adjoint based error estimation and error control algorithms
• Positivity preserving high-order methods
• Analysis of methods used in modeling fires and explosions
• Asynchronous adaptive parallel software

Publications

Refereed Journals


Refereed Conference and Workshops


Invited Talks & Presentations

2009

• Fields Institute Workshop on Hyperbolic Equations, Waterloo Canada, Invited Talk, April
• US Computational Mechanics Congress Ohio, invited Mini symposium talk, July
• IMACS World Congress Invited talk August
• DFWA09 Italy Contributed talk, September
• Supercomputing 09 Invited talk at TACC booth, November
• Visiting Professor Seminar, University of Leeds, December
• Seminar at CWI, Amsterdam, December

2010

• SIAM Parallel Processing for Scientific Computing Conference Seattle, Organizing Committee and Minisymposium organizer
• NAG Technical Policy Meeting Oxford, UK, June Invited Talk
• WCCM Invited Mini Symposium talk Sidney Australia, July
• TG10 Conference. Best Science Track paper for contributed paper and talk
• CnC Workshop Houston October paper presented
• MASCOT10 Workshop Las Palmas invited paper presented
• SC10 Conference. Invited talk at BOF session on multidisciplinary Science, talk at NICS Booth

Professional Participation

• Institute on Mathematics and its Application Fellow (UK)
• Visiting Professor University of Leeds, UK
• Member of NAG (software non-profit) member of NAG Inc Board of Directors
• NSF Reviewer on seven panels (2009-2010) for NSF Office of CyberInfrastructure NSF Review on Teragrid Allocations Committee (Six panels)
Richard B. Brown received B.S. and M.S. degrees in electrical engineering (computer emphasis) from Brigham Young University in 1976, and then worked in industry for five years before returning to school at the University of Utah, where he earned his Ph.D. in Electrical Engineering in 1981. He joined the Electrical & Computer Engineering (EECS) faculty at the University of Michigan, where he served as associate chair for EE and as interim chair of EECS. In July 2004, Professor Brown was appointed the 11th Dean of the College of Engineering at the University of Utah. He is Professor in the departments of Electrical & Computer Engineering and School of Computing and Adjunct Professor in Bioengineering. He also has an appointment at the University of Michigan as Adjunct Professor in Electrical Engineering & Computer Science.

Prof. Brown conducts research in two general areas, solid-state sensors and integrated circuits. Related sub-areas are Chemical Sensors; Neural Interfaces; Electronic Circuit Clocking; Circuit Design; High Performance Microprocessors; Mixed Signal Microprocessors. In the sensor work, he has enjoyed fruitful collaborative relationships with researchers in chemistry and medicine. He has been active in technology transfer and is a founder of Sensicore, i-sens, and Mobius Microsystems.

Publications

("*" indicates that the person was his postdoctoral student when the published work was done.)

Full Articles in Refereed Journals


Refereed Conferences (* Indicates archival proceedings)


**Other Presentations and Publications**

Richard B. Brown, “Interfacing to the Brain with Electrochemical Sensors”, Lecture Series for the College of Technology and Computing, Utah Valley University, Orem, UT, April 2, 2009


Richard B. Brown, panel member, “Managing Up — Partnering with your Dean” at the Computing Research Association Conference at Snowbird, Utah, July 18-20, 2010


**Government Reports**


**Honors & Awards**

Distinguished Alumnus of the Department of Electrical and Computer Engineering, Brigham Young University, October 2010.

**Professional Participation**

University of Washington, College of Engineering Visiting Committee, November 2010 (Committee provides advice and support to the College of Engineering)
Erik Brunvand received a B.S. in Computer Science and a B.S. in Mathematics at the University of Utah in 1982, his M.S. in Computer Science at the University of Utah in 1984, and his Ph.D. in Computer Science at Carnegie Mellon University in 1991.

Professor Brunvand joined the Department of Computer Science in 1990. He has interests in computer architecture and VLSI systems in general, and self-timed and asynchronous systems in particular. One aspect of his research involves compiling concurrent communicating programs into asynchronous VLSI circuits. The current system allows programs written in a subset of occam, a concurrent message-passing programming language based on CSP, to be automatically compiled into a set of self-timed circuit modules suitable for manufacture as an integrated circuit. His most recent research project is involved with designing custom hardware to accelerate ray tracing graphics. The end goal of this research is to develop technology to enable commodity ray-tracing-based graphics chips that can replace or augment today’s GPUs and enable higher quality and more realistic graphics capabilities for future computers.

Publications

Refereed Journals


Refereed Conference and Workshops


Books


Invited Talks & Presentations


Professional Participation

- Technical Program co-Chair of the Great Lakes Symposium on VLSI (GLSVLSI) 2010
- NSF Research Funding Panels (2009(2), 2010)

Program committees

- ACM Great Lakes Conference on VLSI (2009)
Elaine Cohen received her B.A. in Mathematics from Vassar College in 1968, her M.S. and Ph.D. in Mathematics from Syracuse University in 1970 & 1974.

Prof. Cohen has focused her research in computer graphics, geometric modeling, virtual prototyping, haptics, and manufacturing, with emphasis on complex sculptured models represented using NURBS (Non-Uniform Rational B-splines) and NURBS-features. Also, Prof. Cohen has been working on issues related to design collaborations and reverse engineering in immersive environments. Results in manufacturing research have been focused on automating process planning, automatic toolpath generation for models having many surfaces, optimizing both within and across manufacturing stages and fixture automation. Recent research has produced algorithms for determining both visibility and accessibility of one object by another. Computation of such information is necessary for manufacturing, assembly planning, graphics, and virtual environments. Research in haptics has been focused on developing new approaches to solving geometric computations such as fast and accurate contact and tracking algorithms for sculptured models.

Publications

Refereed Journals


Refereed Conference and Workshops


Invited Talks & Presentations


“Isogeometric Analysis” at the 2009 SIAM/ACM Joint Conference on Geometric & Physical Modeling

“Isogeometric Methods” at the 2009 ASME International Mechanical Engineering Congress & Exposition Symposium

Honors & Awards

SIAM/ACM Siggraph/Solid Modeling Foundation Best Paper Award 2009

Bezier Prize, Solid Modeling Association (co-recipient) 2009
Al Davis received his B.S. in Electrical Engineering at MIT in 1969, and his Ph.D. in Electrical Engineering, Computer Science Division at the University of Utah in 1972. Traditionally Professor Davis has worked in the areas of high performance computer architecture, asynchronous circuits and systems, VLSI, parallel computation, and domain specific embedded systems. His current focus areas are silicon nanophotonics and main memory micro-architecture. Modern multi-core processor performance is increasing rapidly but system performance improvement is increasingly constrained by main memory bandwidth starvation and by power and thermal limits. In collaboration with Professor Rajeev Balasubramonian and a number of graduate students, Professor Davis has created new DRAM micro-architectures and interfaces, developed more error resilient main memory architectures, and novel memory controller techniques. In collaboration with colleagues at HP Laboratories, Professor Davis is working on replacing long wires, which are increasingly problematic in terms of power consumption, with photonic signaling. The advantage of photonics is that it promises to provide much higher bandwidth at significantly lower power than the electrical alternative.

Publications

Refereed Journals


Refereed Conference and Workshops


M. Awasthi, D. Nellans, K. Sudan, R. Balasubramonian, A. Davis. “Handling the Problems and Opportunities Posed by Multiple On-Chip Memory Controllers,” PACT 2010, Vienna. (Received the “Best Paper” award.) pp. 319-330.


Book Chapter


Patents


M. McLaren, R. G. Beausoleil, N. Jouppi, M. Fiorentino, N. Binkert, A. Davis. “Use of multiple ring resonator modes to minimize thermal tuning requirements” (disclosure filed April 2010)

A. Udipi, N. Muralimanohar, R. Balasubramonian, N. Jouppi, A. Davis. “A Slot-Based Memory Interface with Single-Point Arbitration and Simplified Memory Controllers” (disclosure filed March 2010).


N. Binkert, M. McLaren, M. Tan, A. Davis “All Optically Interconnected Data Center Switches” (patent filed Mar. 2010).


M. McLaren, A. Davis “Scalable mechanism for ensuring correct order of delivery in

Professor Flatt’s research interests include practical and theoretical aspects of programming languages and programming environments. He is especially interested in programming environments and tools for extensible and interoperating programming languages.

Publications

Refereed Conference and Workshops


M. Flatt and E. Barzilay, “Keyword and Optional Arguments in PLT Scheme” Workshop on Scheme and Functional Programming (Scheme Workshop) 2009


Invited Talks and Other Presentations

“Future Memory Architectures”, invited presentation at LANL workshop, Santa Fe, NM, Oct. 2010

“Photonics and Future Data Centers”, tutorial presentation at Hot Chips, Aug. 2010.


Professional Participation

ISCA 2010 – Program Committee
CASES - Program Committee

Graduation

Matthew Flatt
Associate Professor
www.cs.utah.edu/~mflatt
mflatt@cs.utah.edu

Matthew Flatt continued on next page
University of Utah Campus

Matthew Flatt continued

Books


Invited Talks & Presentations

Colloquium, Brigham Young University, Provo, UT 2009

Professional Participation

• Member-at-large, ACM SIGPLAN Executive Committee 2009-2012
• Chair, ACM SIGPLAN Outstanding Doctoral Dissertation Award Committee 2009-2010
• Program committee member, ACM Conf. on Principles of Programming Languages (POPL) 2009
• Program committee member, Sym. on Implementation and Application of Functional Languages (IFL) 2009
• Program committee member, Workshop on Dynamic Languages and Applications (Dyla) 2010
• Editorial board member, Journal of Functional Programming 2009-2011

Publications

Refereed Journals


Tom Fletcher received his B.A. degree in Mathematics at the University of Virginia in 1999. He received an M.S. in Computer Science in 2002 followed by a Ph.D. in Computer Science in 2004 from the University of North Carolina at Chapel Hill.

Dr. Fletcher’s research is focused on creating novel methods at the intersection of statistics, mathematics, and computer science to solve problems in medical image analysis. He is currently collaborating with researchers in Autism and Alzheimer’s disease at the University of Utah on the statistical analysis of combined imaging modalities, including structural MRI, DTI, fMRI and PET in longitudinal studies.

Books


Refereed Conference and Workshops


Book Chapters


Invited Talks & Presentations

Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Laboratory, Invited Talk on “Robust Statistics on Riemannian Manifolds”

Summer School on Manifold Learning in Image and Signal Analysis, Ven, Sweden, Invited lecture on “Statistics on Manifolds”

Professional Participation

- Organized MICCAI 2010 Workshop on “Spatio-Temporal Image Analysis for Longitudinal and Time-Series Image Data”
- Organized ISBI 2009 Tutorial on “Statistical Shape Analysis: Theory, Software, and Applications”
- Program Committees, MICCAI Workshop on Probabilistic Models for Medical Image Analysis (PMMIA) 2009

Honors & Awards

Medical Image Analysis / MICCAI Best Paper Award, 2010
Juliana Freire is an Associate Professor at the School of Computing at the University of Utah. Before, she was member of technical staff at the Database Systems Research Department at Bell Laboratories (Lucent Technologies) and an Assistant Professor at OGI/OHSU. An important theme in Professor Freire’s work is the development of data management technology to address new problems introduced by emerging applications, including the Web and scientific applications. Her recent research has focused on two main topics: Provenance management for computational tasks and Web mining. Professor Freire is an active member of the database community, having co-authored over 80 technical papers and holding 4 U.S. patents. She is a recipient of an NSF CAREER and an IBM Faculty award. She has chaired or co-chaired several workshops and conferences, and she has participated as a program committee member in over 50 events. Her research has been funded by grants from the National Science Foundation, Department of Energy, the University of Utah and the State of Utah, and gifts from IBM, Yahoo! and Microsoft.

Publications

Refereed Journals


L. Barbosa and J. Freire. “Siphoning Hidden-Web Data through Keyword-Based Interfaces,” Journal of Information and Data Management (JIDM) special issue including the most cited papers of the Brazilian Database Symposium, 1(1), pp. 133-144, 2010.


Refereed Conference and Workshops


Book Chapters


Invited Talks & Presentations

“Provenance in Science: Challenges and Opportunities” International Workshop on The Next Generation of Quantum Simulations, Moorea, French Polynesia, May 6, 2009

“Provenance Management: Challenges and Opportunities” (Keynote) Technologie und Web (BTW), Munster, Germany, March 4, 2009

“Provenance in Science: Challenges and Opportunities” University of Utah Campus CyberInfrastructure Day, Salt Lake City, UT, March 13, 2009


The WebDB Group: Research Overview. Federal University of Amazonas, Manaus, Brazil, June 29th, 2010

“Provenance-Rich Science” (Keynote) DB/IR Day, AT&T Shannon Labs, Florham Park, NJ, October 22, 2010

“Provenance Management for Data Exploration” (Keynote) International Conference on Data Integration in the Life Sciences (DILS), Sweden, August 2010

Professional Participation

• Program Chair: International World Wide Web Conference (WWW), 2010
• Chair: The Second International Workshop on Role of Semantic Web in Provenance Management (SWPM 2010) — Shanghai, China. November 2010
• Co-Chair: First International Workshop on Traceability and Compliance of Semi-Structured Processes (TC4SP10) — Hoboken, New Jersey, Sept. 2010
• Panelist for NIH, 2010
• Co-Chair: International Workshop on Role of Semantic Web in Provenance Management (SWPM) Washington D.C., USA, October 2009
• Workshops Co-Chair: International Conference on Very Large Databases (VLDB) — Lyon, France, August 2009
Guido Gerig began research in the area of medical image analysis in 1985 at ETH Zurich, Switzerland. Since then, he has led a large number of national and international projects with close multidisciplinary collaboration between medicine, engineering, statistics, industry, and computer science. He is the director of the UTAH Center for Neuroimage Analysis (UCNIA) and supports a number of clinical neuroimaging projects with new methodology for image processing, registration, atlas building, segmentation, shape analysis, and statistical analysis. Current key research topics are analysis and modeling of the early developing brain, longitudinal analysis of multi-shape complexes, and new methodologies for statistical analysis of white matter using diffusion tensor imaging. Method developments are driven by challenging clinical applications that include research in schizophrenia, autism, multiple sclerosis, infants at risk for mental illness and aging. New tools and methods are open source and are made available to public.

Publications

Refereed Journals


Refereed Conference and Workshops


Invited Talks & Presentations

March 2009, Invited presentation “Image Analysis In Neuroimaging: Recent Progress”, Penn State University-Milton S. Hershey Medical Center, PA


June 2009, Invited presentation “Advanced methodology for quantitative analysis of white matter tracts from MR Diffusion Weighted Imaging”, EPFL Lausanne, Switzerland, Advanced Clinical Imaging Technology CIBM

Sept 2009, Presentation “DTI Fiber Cup Challenge” Workshop, titled: “Fiber Challenge, SCI Utah Solution”


Nov 2009, Invited presentation “Growth trajectory of the early developing brain derived from longitudinal MRI/DTI data”, MIND Institute, Albuquerque, NM (invited by Vince Calhoun).

Jan 2010, “Computational Tools for Longitudinal Neuroimaging Infant Study”, Advisory Board Meeting Silvio Conte Project, UNC Chapel Hill, NC

Sept 2010, Introduction STIA’10, Spatio-temporal Image Analysis, Workshop Organizer MICCAI 2010, Beijing, China

Sept 2010, “Atlas-Based Classification ABC”, Workshop MICCAI’10 “The NAMIC Platform”, Beijing, China

Sept 2010, “Infant Imaging Core: Structural MRI and DTI Processing of Neonates”, UNC Chapel Hill, NC

Sept 1010, Progress update USTAR Imaging Cluster, USTAR governing board meeting, Salt Lake City, Utah

Oct 2010, “Fiber tract analysis in infants at risk for autism”, ACE-IBIS Meeting, Chicago, USA

Oct 2010, Plenary Talk, Analysis of early brain growth trajectory from longitudinal neuroimaging data, NEUROSPIN, Paris, France (invitation J-F Mangin)


Guido Gerig continued on page 48
Ganesh L. Gopalakrishnan earned his PhD in Computer Science from Stony Brook University in 1986, joining Utah the same year. He spent a year each at the University of Calgary (1988), visiting Stanford University (1995), and at Intel, Santa Clara (2002). During his 2009 sabbatical, he helped establish the Center for Parallel Computing at Utah and serves as its Director. He facilitated a pilot offering of Microsoft’s Practical Parallel and Concurrent Programming course at Utah during Fall 2010. His currently active projects are in scalable dynamic verification methods for message passing interface (MPI) programs, symbolic verification methods for GPU kernels, building verification tool integration frameworks, and prototyping formal analysis methods for multicore communication APIs, and also building FPGA based multicore systems including these APIs. He advises many PhD, MS, BS/MS, and BS students on a variety of topics - all described at http://www.cs.utah.edu/fv.

Publications

Refereed Journals


Refereed Conference and Workshops


Honors & Awards

Fellow of the American Institute for Medical and Biological Engineering (AIMBE) 2010

Ganesh Gopalakrishnan
Professor
www.cs.utah.edu/~ganesh
ganesh@cs.utah.edu

Students present projects during Computer Engineering Demo Day


Invited Talks & Presentations


Professional Participation


2009

• Tutorials Committee, Supercomputing Conference (SC), Portland, OR, 2009
• General Chair, Workshop on Parallel and Distributed Systems: Testing, Analysis, and Debugging (PADTAD), Chicago, 2009
• One Day Invited Tutorial, The 16th EuroMPI Conference, Turku 2009
• Organizing Committee, Exploiting Concurrency Efficiently and Correctly (EC2), Edinburgh, UK 2010

PC Member

• The 16th EuroMPI Conference, Turku 2009
• 8th International Workshop on Parallel and Distributed Methods in Verification (PDMC) 2009
• Formal Methods in Computer-Aided Design (FMCAD), 2009
• Methods and Models for Co-Design (MEMOCODE) 2009

2010

PC Member

• Workshop on Parallel and Distributed Systems: Testing, Analysis, and Debugging, Trento, 2010
• Computer Aided Verification 2010, Edinburgh, UK
• Exploiting Concurrency Efficiently and Correctly, Edinburgh, UK 2010
• MEMOCODE 2010, Methods and Models for Co-Design, Grenoble 2010
• The 17th EuroMPI Conference, Stuttgart 2010
• Parallel Software Tools and Tool Infrastructures 2010
• 9th International Workshop on Parallel and Distributed Methods in Verification, 2010
• 17th Spin Workshop, Twente University, 2010
• Formal Methods in Computer Aided Design, Lugano 2010

• Director, Center for Parallel Computing at Utah (CPU), formed in 2010
Mary Hall is an associate professor. Her research focuses on compiler technology for exploiting performance-enhancing features of a variety of computer architectures, with a recent emphasis on many-core graphics processors and multi-core nodes in supercomputers. Prior to joining University of Utah, Professor Hall held positions at University of Southern California, Caltech, Stanford and Rice University.

Professor Hall’s current research involves developing compiler-based autotuning technology, and applying it to application domains that include molecular dynamics, biomedical imaging, signal processing and social networks. Autotuners experiment with a set of alternative application mapping strategies to select the mapping that best exploits architectural features such as deep memory hierarchies, specialized compute engines and multiple cores.

Professor Hall is an ACM Distinguished Scientist. She has published over 70 refereed articles and given more than 50 invited presentations. She has led a total of 30 projects funded by NSF, DARPA, DOE, NSA and Intel Corporation. She has served on over 45 program committees in compilers and their interaction with architecture, parallel computing, and embedded and reconfigurable computing, including 2009 program chair of the Code Generation and Optimization Conference, and 2010 program chair of the ACM Symposium on Principles and Practice of Parallel Programming. She serves as chair of the ACM History Committee, and as a member of the IEEE Computer Society Awards Committee. She also participates in outreach programs to encourage the participation of women in computer science.

**Publications**

**Refereed Journals**


**Refereed Conference and Workshops**


Book Chapters


Invited Talks & Presentations

“Autotuning Compiler Technology to Support Architectural Diversity,” Dept. of Electrical and Computer Engineering, Brigham Young University, Provo, UT, January, 2009


“Collaborative Autotuning of Scientific Applications,” SIAM Parallel Processing Symposium, Feb. 2010

“Paving the Way for Programming Extreme Scale Systems,” DOE Institute for Computing in Science, Future of the Field Workshop, Jul. 2010


“A Programming Language Interface to Describe Transformations and Code Generation for Auto-Tuning,” ASPLOS Program Committee Symposium, CMU, October 2010

Professional Participation

National Technical Leadership

• Participant, DOE Extreme Architecture and Technology Workshop, Dec. 2009
• Report co-author, “Seven Years of Computer Science Breakthroughs,”
• DOE Office of Science, 2010 (report to appear)
• Participant, “The NSF Workshop on Future Directions of Computer System Research in 2010” Mar. 2010

Leadership in ACM and IEEE

• Chair, ACM History Committee, 2009 to present
• Member IEEE Computer Society Cray, Fernbach and Kennedy Awards Committee, 2009, 2010
• Chair, ACM and IEEE-CS Ken Kennedy Awards Committee, 2010
• Steering Committee, ACM SIGPLAN Programming Language Design and Implementation, 2010

Conference Organization

• Program Chair, CGO 2009
• Program Committee, International Workshop on Application Performance Tuning, 2009
• Program Committee, ACM/IEEE Parallel Architecture and Compilation Techniques, 2009
• Awards Chair, SC09
• Program Chair, ACM PPOPP 2010
• External Review Committee, ACM SIGPLAN Programming Language Design and Implementation, 2010

Honors & Awards

ACM Distinguished Scientist 2010
Charles (Chuck) Hansen is a Professor of Computer Science and an Associate Director of the Scientific Computing and Imaging Institute at the University of Utah.

He received a B.S. in computer science from Memphis State University in 1981 and a Ph.D. in computer science from the University of Utah in 1987. He was a visiting scientist at INRIA-Rhone Alpes in the GRAVIR group in 2004-2005. From 1997 to 1999, he was a research associate professor in Computer Science at Utah. From 1989 to 1997, he was a Technical Staff Member in the Advanced Computing Laboratory (ACL) located at Los Alamos National Laboratory, where he formed and directed the visualization efforts in the ACL. He was a Bourse de Chateaubriand PostDoc Fellow at INRIA, Rocquencourt France, in 1987 and 1988.

Chuck Hansen has published over 100 peer reviewed journal and conference papers and has been a co-author on three papers recognized with “Best Paper Awards” at the IEEE Visualization Conference (1998, 2001, 2002). He was co-author on the Best Paper at IEEE Pacific Visualization 2010. He was awarded the IEEE Technical Committee on Visualization and Graphics “Technical Achievement Award” in 2005 in recognition of seminal work on tools for understanding large-scale scientific data sets.

He has been Associate Editor in Chief of IEEE Transactions on Visualization and Computer Graphics. His research has made contributions to the fields of scientific visualization, computer graphics, parallel computation and computer vision.

Publications

Refereed Journals


Refereed Conference and Workshops


Books


Invited Talks & Presentations


“Biomedical Computing and Visualization at SCI”, University of Kaiserslautern, May 2010

Introduction to Scientific Visualization, KAUST Winter Enrichment Program, 2010

“VACET: Visualization and Analytics Center for Enabling Technologies”, International Supercomputing Conference, Hamburg, June 2009

“Interactive Texture-based Flow Visualization”, University of Kaiserslautern, June 2009

“Multi-Field Volume Visualization”, IAMCS Spring Symposium, May 2009

“Large-scale Scientific Visualization”, IAMCS Colloquium, TAMU, May 2009

**Professional Participation**

- Conferenc Co-Chair: Eurographics and IEEE-CS, Symposium on Volume Graphics 2010
- Program Committee: Eurographics 2011
- Program Committee: Pacific Vis 2010
- Program Committee: VMV 2010
- Program Committee: Pacific Vis 2009
- Program Committee: VMV 2009
- Program Committee: Pacific Vis, 2009
- Program Committee: ACM Super Computing, 2009
- Program Committee: TopoVis: Topological Methods for Visualization, 2009
- Program Committee: ACM I3D, 2009
- Scientific Advisory Board: RIVIC, Wales 2009, 2010
- External Advisory Board: Computer Integrated Systems for Microscopy and Manipulation, UNC 2009, 2010
- Advisory Board, RENCI 2009
- Advisory Board, LLNL Computation Division, 2009
- DOE Panel Review 2009
- NSF Panel Review 2009

**Honors & Awards**

Best Paper Award “Physically-Based Interactive Schlieren Flow Visualization,” IEEE Pacific Visualization 2010, March 2010
Thomas C. Henderson received his B.S. in Math from Louisiana State University in 1973 and his Ph.D. in Computer Science from the University of Texas at Austin in 1979. He is currently a full Professor in the School of Computing at the University of Utah. He has been at Utah since 1982, and was a visiting professor at DLR in Germany in 1980, and at INRIA in France in 1981 and 1987, and at the University of Karlsruhe, Germany in 2003. Prof. Henderson was chairman of the Department of Computer Science at Utah from 1991-1997, and was the founding Director of the School of Computing from 2000-2003.

Prof. Henderson is the author of Discrete Relaxation Techniques (University of Oxford Press), and editor of Traditional and Non-Traditional Robotic Sensors (Springer-Verlag); he serves as Co-Editor-in-Chief of the Journal of Robotics and Autonomous Systems and was an Associate Editor for the IEEE Transactions on Pattern Analysis and Machine Intelligence. His research interests include autonomous agents, robotics and computer vision, and his ultimate goal is to help realize functional androids. He has produced over 200 scholarly publications, and has been principal investigator on over $8M in research funding. Prof. Henderson is a Fellow of the IEEE, and received the Governor’s Medal for Science and Technology in 2000. He enjoys good dinners with friends, reading, playing basketball and hiking.

Professor Henderson’s primary areas of research are autonomous intelligent systems, smart sensor networks, parallel programming, and digital image/map analysis.

Publications

Refereed Journals


Refereed Conference and Workshops


Book


Book Chapter


Invited Talks & Presentations


“Innate Theories as a Basis for Autonomous Mental Development,” IEEE Workshop on Autonomous Mental Development, October 2009

“Plato Vindicated: Learning is Remembering,” Humanoids at Home Symposium, Karlsruhe, Germany, October 2009


“Cloud Robotics,” Schloss Dagstuhl, 4-8 October, Wadern, Germany, 2010


Professional Participation

- Regional Program Chair, IEEE Conference on Intelligent Robots and Systems, Taipei, Taiwan, 18-22 October 2010

- General Chair, IEEE Conference on Multisensor Fusion and Integration for Intelligent Systems, Salt Lake City, UT, 5-7 September 2010
Lee A. Hollaar received his B.S. Electrical Engineering from Illinois Institute of Technology in 1969, his M.S. and Ph.D. in Computer Science at the University of Illinois in 1974 & 1975 and was a Non-matriculated student at the University of Utah College of Law, 1989-1993. During his 1996-97 sabbatical, he was a Committee Fellow at the Senate Judiciary Committee, where he worked on patent reform legislation, database protection, and what eventually became the Digital Millennium Copyright Act. He was also a visiting scholar with Circuit Judge Randall R. Rader at the Court of Appeals for the Federal Circuit.

His past research was on hardware and software tradeoffs in system design, particularly as they apply to systems handling large text databases. He is the co-inventor of a new method of rapidly searching text stored and was the primary architect for perhaps the first distributed, workstation-based information retrieval system. He also worked on avionics and navigation systems.

He was Director of Campus Networking during the development of the University’s campus-wide data communications network, and remains interested in distributed systems and telephony. Prior to coming to Utah, he designed and supervised the construction of the first campus-wide data network at the University of Illinois at Urbana-Champaign.

Professor Hollaar’s current research interests center on intellectual property and computer law. He is the author of “Legal Protection of Digital Information,” which covers copyrights and patents for computer software and other digital works, published in 2002 by BNA Books and available on the Internet at no cost.

Publications

Brief of Professor Lee A. Hollaar and IEEE-USA as amici curiae to the Supreme Court of the United States in Bilski v. Kappos, September 1, 2009. (Lee wrote the brief, and IEEE-USA joined it.)

John M. Hollerbach received his B.S. in Chemistry from the University of Michigan in 1968, his M.S. in Mathematics from the University of Michigan in 1969, his S.M. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology in 1975, and his Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology in 1978.

Publications

Refereed Journals, Conference and Workshops


Invited Talks & Presentations

September 10-11, 2010: “The Year(s) of the Robot,” invited lecture, Mike Brady Symposium, University of Oxford, UK

June 18, 2010: “Finger force measurement by imaging the fingernail,” keynote lecture, 7th International Conference in Control, Automation and Robotics (ICINCO 2010), Madeira, Portugal

October 4-6, 2009: “Medical robotics,” invited presentation, Science and Technology for Society Forum, Kyoto, Japan

Professional Participation

- Editor-in-Chief, International Journal of Robotics Research, 2000-present
- Vice President for Technical Activities, IEEE Robotics and Automation Society, 2010-2011
- International Foundation of Robotics Research, USA Regional Officer, 2002–present
Chris Johnson directs the Scientific Computing and Imaging (SCI) Institute at the University of Utah where he is a Distinguished Professor of Computer Science and holds faculty appointments in the Departments of Physics and Bioengineering. His research interests are in the areas of scientific computing and scientific visualization. Dr. Johnson founded the SCI research group in 1992, which has since grown to become the SCI Institute employing over 175 faculty, staff and students. Professor Johnson serves on several international journal editorial boards, as well as on advisory boards to several national and international research centers. Professor Johnson has received several awards, including the NSF Presidential Faculty Fellow (PFF) award from President Clinton in 1995 and the Governor’s Medal for Science and Technology in 1999. He is a Fellow of the American Institute for Medical and Biological Engineering and a Fellow of the American Association for the Advancement of Science, and in 2009 he was elected a Fellow of the Society for Industrial and Applied Mathematics (SIAM) and received the Utah Cyber Pioneer Award. In 2010 Professor Johnson received the Rosenblatt Award from the University of Utah and the IEEE Visualization Career Award.

Publications

Refereed Journals


Refereed Conference and Workshops


Book Chapters


Invited Talks & Presentation

Biomedical Visualization, Oxford University, December 2010

Visualizing Uncertainty, Future Directions in Uncertainty Quantification, Santa Fe, November 2010

Visual Computing: Making Sense of a Complex World, Bucknell University, Lewisburg, October 2010 (Emerging Minds Series)

Image-Based Biomedical Modeling, Simulation, and Visualization, IEEE Cluster 2010, Crete, Greece, September 2010 (Keynote Speaker)

Extreme-Scale Biomedical Visualization, ICIS Workshop: Future of the Field,
Snowbird, July 2010

Image-Based Biomedical Modeling, Simulation, and Visualization, Wright State University, Dayton, May 2010 (2010 Mazumdar Lecture in Applied Mathematics)

Image-Based Biomedical Modeling, Simulation, and Visualization, Mathematical Biosciences Institute, Ohio State University, May 2010


Image-Based Biomedical Modeling, Simulation, and Visualization, NIH NCIBI Annual Meeting, Ann Arbor, April 2010 (Keynote Speaker)

Image-Based Biomedical Modeling, Simulation, and Visualization, IEEE Pacific Visualization 2010, Taipei, Taiwan, March 2010 (Keynote Speaker)

Biomedical Applications Confront Large Data in the 21st Century, 2010 AAAS Annual Meeting, San Diego, February 2010

Image-Based Biomedical Modeling and Simulation), Salt Lake City, September 2009 International Meshing Roundtable (Plenary Speaker)

Large-Scale Visual Data Analysis), Pacific Northwest National Laboratory, July 2009 (Frontiers in Computational and Information Sciences Lecture Series)

Computing the Future of Biomedicine), University of Chicago, April 2009 (Distinguished Lecture)

Finite-Element Discretization Strategies for the Electrocardiographic (ECG) Inverse Problem, Inverse Days, Luosto, Finland, December 2009

Biomedical Visualization, Computers in Cardiology, Park City, September 2009

Biomedical Visualization, World Congress on Medical Physics and Biomedical Engineering, Munich, September 2009

Image-Based Biological Computing, DOE Workshop on Biological Computing at Extreme Scale, Chicago, August 2009


Professional Participation

- Journal of Uncertainty, Editorial Board
- Journal of Computational Science, Editorial Board
- DOE Office of Advanced Scientific Computing Research Communications Project Editorial Board
- Visualization and Mathematics, Book Series, Springer-Verlag
- Computing and Visualization in Science, Editorial Board

Advisory Board and National Committees

- NSF Office of Cyberinfrastructure Task Force on Software Infrastructure
- NSF Office of Cyberinfrastructure Task Force on Grand Challenge Communities
- NSF-CRA Computing Community Consortium (CCC)
- Computing Research Association Education Committee
- European Union Virtual Physiological Human Network of Excellence
- Fundamental and Computational Science Directorate Review Committee, Pacific Northwest National Laboratory
- Mathematics Awareness Advisory Committee. Joint Policy Board for Mathematics (SIAM, AMS, ASA, MAA)
- NIH National Center for Biomedical Computation, Stanford University, Scientific Advisory Board
- Finnish Centre of Excellence in Inverse Problems, Scientific Advisory Board
- Bavarian Graduate School of Computational Engineering International Advisory Board
- NIH National Alliance for Medical Image Computing, Chair, Advisory Board
- NCMI: National Center for Microscopy and Imaging Research, External Advisory Board

Program Committees

- Selection Committee, SIAM/ACM Prize in Computational Science, 2010
- Program Committee, Parallel Processing for Imaging Applications, 2010
- Program Committee, Workshop on Novel Computing for Life Sciences, 2010
- Working Group Co-Chair, DOE Workshop on Scientific Opportunities in Modeling and Simulation at the Extreme Scale for Biological Sciences, 2009

Honors & Awards

2009 Utah Cyber Pioneer Award
2009 Elected Fellow, Society for Industrial and Applied Mathematics (SIAM)
2010 IEEE Visualization Career Award
2010 Rosenblatt Award - The University of Utah
Sneha Kumar Kasera heads the Advanced Networked Systems Research (ANSR) Group at the University of Utah. His research interests include networks and systems—technologies, protocols and applications encompassing mobile and pervasive systems and wireless networks, network security and reliability, overload and congestion control, multicast communication, Internet pricing, Internet measurements and inferencing.

Publications

**Refereed Journals**


**Refereed Conference and Workshops**


**Patents**


**Invited Talks & Presentations**


**Professional Participation**

- IEEE/ACM Transactions on Networking (2009 -- present)
- ACM/Springer Wireless Networks Journal (2007 -- present)
- ACM Mobile Computing and Communications Review (MC2R), Associate Editor-in-Chief (2008 – 2009)
Conference / Workshop Organization
- Technical Program Committee Co-Chair – IEEE International Conference on Networks Protocols (ICNP), 2011.
- Technical Program Committee Co-Chair – IEEE Conference on Sensor, Mesh, and Ad Hoc Communications, and Networks (SECON), 2011
- Technical Program Committee Area Chair – IEEE International Conference on Network Protocols, 2010
- Student Poster Co-Chair - IEEE International Conference on Network Protocols, 2010

Technical Program Committee Member
- IEEE Conference on Sensor, Mesh, and Ad Hoc Communications, and Networks (SECON), 2010
- IEEE Conference on Computer Communications (INFOCOM), 2010
- ACM Sigmobile International Conference on Mobile Computing and Networking (MOBICOM), 2010
- IEEE International Conference on Network Protocols (ICNP), 2010
- Second International Conference on Communication Systems and Networks (COMSNETS), 2010
- ACM Sigmobile International Conference on Mobile Computing and Networking (MOBICOM), 2009
- IEEE International Conference on Network Protocols (ICNP), 2009
- IEEE Conference on Sensor, Mesh, and Ad Hoc Communications, and Networks (SECON), 2009
- IEEE Conference on Computer Communications (INFOCOM), 2009
- IEEE International Conference on Pervasive Computing and Communications (PERCOM), 2009
- First International Conference on Communication Systems and Networks (COMSNETS), 2009.

Review Panels
- National Science Foundation Review Panel, November 2009.
- National Science Foundation Review Panel, October 2009.
- National Science Foundation Review Panel, February 2009.

Honors & Awards
Robert (Bob) R. Kessler has been on the faculty of the University of Utah since 1983 and is currently a professor and associate director of the School of Computing. He earned his B.S., M.S., and Ph.D. in 1974, 1977, and 1981 respectively, all from the University of Utah. His early work was centered on the portable implementation of the Lisp programming language and then distributed and parallel implementations of Lisp. In the early 90’s, he founded the Center for Software Science, a state of Utah Center of Excellence, which was a research group working in nearly all aspects of system software for sequential and parallel/distributed computers. In the late 90’s Professor Kessler served as chairman of the Department of Computer Science. At about that same time, his research interests expanded into software engineering and he also dabbled in agent technologies. His most recent interests are in undergraduate education and tackling the challenges of declining computer science enrollment by the introduction of computer gaming into early CS classes. He has authored two books and over fifty journal and conference publications. Professor Kessler has received over $6.5M in external research funding from government and industrial sources and $10M in equipment grants. He has founded two startup companies and has been on the board of directors of several others. Professionally, he served several years as an officer of the ACM SIGPLAN organization and was the co-editor-in-chief of the International Journal of Lisp and Symbolic Computation for seven years. He is an award-winning teacher having received the College of Engineering Outstanding Teaching Award in 2000 and the University of Utah’s highest teaching honor, the Distinguished Teaching Award in 2001. In 2007, he lead the founding of the undergraduate Entertainment Arts and Engineering emphasis and in 2010 the Entertainment Arts and Engineering: Master Games Studio master’s program.

Publications


Professor Kirby’s research focus is on large-scale scientific computing and visualization, with an emphasis on the scientific cycle of mathematical modeling, computation, visualization, evaluation, and understanding. His primary research interests are: Computational Science and Engineering, High-Order Methods: Algorithm Development and Applications, Scientific Visualization, Concurrent Programming: Verification and Applications, and High Performance Computing.

Publications

Refereed Journals


J. D. Frazier, P. K. Jimack and R. M. Kirby, “On the Use of Adjoint-Based Sensitivity


Refereed Conference and Workshops


Professional Participation

• Associate Editor of Mathematics and Computers in Simulation, 2007 - 2009

Have reviewed for the following journals:

• Computer Methods in Applied Mechanics and Engineering
• IEEE Transactions on Visualization and Computer Graphics
• IEEE Transactions on Parallel and Distributed Systems
• Journal of Applied Numerical Mathematics
• Journal of Computational Physics
• Journal of Fluids Engineering
• Journal of Scientific Computing
• SIAM Journal on Scientific Computing

Honors & Awards

Dr. Might joined the school as an assistant professor in the fall of 2008. Before joining the School of Computing, he received his Ph.D. from Georgia Tech and then worked for two start-ups, Diagis and yaplet.com. Dr. Might’s research in the field of programming languages and compilers is focused on tackling the key challenges in modern software development: improving security and harnessing parallelism. Driven by the escalation of information security crisis, he is actively investigating and constructing software tools for programmers to use that can prove the absence of security flaws and find bugs in software systems; his work with Diagis involved commercializing such tools. In response to hardware manufacturers recent insistence on doubling cores instead of clock-speeds, he is also investigating software analyses and tools that can automatically parallelize sequential software across multiple processors and detect flaws in explicitly parallel software.

Publications

Refereed Conference and Workshops


Invited Talks & Presentation


Professional Participation

- SAS 2010. PC Member. 14-16 September 2010. Perpignan, France
- PADTAD 2010. PC member. 13 July 2010
- Oregon Ph.D. Summer School 2009. Lecturer. 23-31 July 2009
- Scheme Workshop 2009. PC member. 22 August 2009
- PADTAD 2009. PC member. 19-20 July 2009
- ICFP 2009. PC member. 31 Aug - 2 Sep 2009
Valerio Pascucci is an Associate Professor of Computer Science at the Scientific Computing Institute and School of Computing at the University of Utah. Previously, Valerio was a Group Leader and Project Leader in the Center for Applied Scientific Computing at the Lawrence Livermore National Laboratory, and Adjunct Professor Computer Science at the University of California Davis. Prior to his CASC tenure, he was a senior research associate at the University of Texas at Austin, Center for Computational Visualization, CS and TICAM Departments. Valerio earned a Ph.D. in computer science at Purdue University in May 2000, and a EE Laurea (Master), at the University “La Sapienza” in Roma, Italy, in December 1993, as a member of the Geometric Computing Group.

Publications

Refereed Journals


Refereed Conference and Workshops


Books Chapters


Books


Invited Talks & Presentations

IX Congress of the Peruvian Society of Computing, October 14, 2010

23rd SIBGRAPI Conference on Graphics, Patterns and Images, August 31, 2010

CSRI workshop on workshop on combinatorial algebraic topology, August 30, 2009 in Santa Fe, NM

CScADS 2009, July 20, 2009 in Lake Tahoe, CA

University of Utah Campus Cyberinfrastructure Day, March 11, 2009

Joint AMS-MAA Mathematics Meetings Tuesday January 6, 2009

University of San Paulo, August 27, 2010, San Paulo, Brazil

American-Chinese Cyberinfrastructure and E-Science workShop (ACCESS) 2010, National Center of Supercomputing Applications (NCSA) at the University of Illinois at Urbana-Champaign (UIUC), August 9, 2010

SciDAC conference, July 14, 2010, Chattanooga, TN

Pacific Northwest National Laboratory, March 12, 2010, Richland, WA

Professional Participation

Conference Chair:
- Co-Chair of the ACM Symposium on Computational Geometry 2010
- Program Co-Chair and Organizer of TopoInVis 2009, International Workshop on Topological Methods in Data Analysis and Visualization
- SciDAC 2009 Organizing Committee and Co-Chair of Visualization Competition

Program Committee Member:
- 2011 ACM/IEEE conference on Supercomputing (SC2011)
- 2011 SIAM/ACM Joint Conference on Geometric and Physical Modeling (GD/SPM11)
- 2011 Workshop on Emerging Computational Methods for the Life Sciences (at HPDC 2011)
- Eurographics 2011
- 2011 SIBGRAPI Conference on Graphics, Patterns and Images
- IEEE Visualization 2010 Conference (Vis 2010)
- 2010 ACM/IEEE conference on Supercomputing (SC2010)
- 2010 SIBGRAPI Conference on Graphics, Patterns and Images
- 6th International Symposium on Visual Computing ISVC10
- 2010 Workshop on Emerging Computational Methods for the Life Sciences (at HPDC 2010)
- IASTED International Conference on Computer Graphics and Imaging (CGIM 2010)
- SIBGRAPHI 2009
- SciDAC 2009 Program Committee
- Eurographics 2009
- Eurovis 2009
- 5th International Symposium on Visual Computing ISVC09

Honors & Awards

Supercomputing 2009, finalist for the Bandwidth Challenge, November 2009
John Regehr received his B.S. in Mathematics and Computer Science from Kansas State University in 1995, his Master of Computer Science from the University of Virginia in 1997, and his Ph.D. in Computer Science from the University of Virginia in 2001.

Publications

Refereed Conference and Workshops


Invited Talks & Presentations


“Safe TinyOS.” Part of a three-hour tutorial on TinyOS given at IPSN 2009 with other members of the TinyOS Core Working Group. April 16 2009.


Professional Participation

Program Committee Chair

- Associate editor, ACM Transactions on Sensor Networks, October 2010–present

Program Committee Member

- IEEE 2010 Real-Time Systems Symposium (RTSS), track on sensor networks
Having previously served as a two term Chair of Computer Science, Riesenfeld has sustained a large, multi-disciplinary research effort for more than three decades in Geometric Modeling, Manufacturing, and Design. He has published extensively and headed many large funding contracts from various sources like NSF, DARPA, ONR, ARO, in addition to private industrial supporters. From 1998 until it ended in July 2002, he served as Director of the NSF Science and Technology Center for Computer Graphics and Scientific Visualization, a research consortium including Brown University, California Institute of Technology, Cornell University, the University of North Carolina, and University of Utah. He has held faculty appointments in five different academic areas including mechanical engineering, electrical engineering, mathematics, and civil engineering in addition to computer science. The B-spline methods of design, proposed in his doctoral thesis, is now used as a worldwide standard for computer aided design of freeform curves and surfaces. Since then he has co-authored several seminal papers, including those on the well known “Oslo Algorithms,” on surface subdivision methods, and presenting exact formulations for radiosity calculations. In addition, his co-authored papers in approximation theory include widely referenced work on discrete box splines and cone splines.

In 2001 he co-authored a reference and advanced textbook entitled “Geometric Modeling with Splines,” that closely ties spline theory and geometric algorithms. The multidisciplinary Geometric Design and Computation Research Group which he co-heads has been investigating a broad spectrum of research problems in computer graphics, geometric modeling, remote collaborative design, and manufacturing within an integrated experimental testbed environment. He heads both the Computer Graphics Laboratory and the Advanced Manufacturing Laboratory at the University of Utah. In 2005 Riesenfeld received the International Gregory Award for lifetime contributions to Computer Aided Geometric Design.

Publications

Refereed Journals


Refereed Conference and Workshops


Honors & Awards

2009 Bezier Award for Solid, Geometric and Physical Modeling and Applications, from the Solid Modeling Association
Professor Riloff’s primary research area is natural language processing (NLP), although she also has interests in information retrieval, machine learning, and artificial intelligence in general. Recent research projects have tackled the problems of information extraction, semantic tagging and lexicon induction, coreference resolution, and subjectivity analysis. A major emphasis of Prof. Riloff’s research involves automatically acquiring the knowledge needed for conceptual natural language processing, and the development of bootstrapping methods that can learn from unannotated text with minimal human supervision.

Publications

Refereed Conference and Workshops


Book Chapter


Professional Participation

- Area Chair: Association for Computational Linguistics (ACL), 2009

Program Committee Member:
- Association for Computational Linguistics (ACL) 2010
- Empirical Methods in Natural Language Processing (EMNLP) 2010
- Computational Natural Language Learning Conference (CoNLL) 2010
- International Conference on Semantic Computing (ICSC) 2010
- NAACL-HLT
- 2010 Workshop on Formalisms and Methodology for Learning by Reading
- NAACL-HLT 2010 Workshop on Semantic Search
- NAACL-HLT 2009 Student Research Workshop

Reviewer:
- Computational Linguistics (2010)
- Journal of Natural Language Engineering (2009),
- National Science Foundation External Reviewer (2009)
- National Science Foundation Panel Reviewer (2010).
Professor Sikorski received his MS from the Department of Mathematics, Computer Science and Mechanics at the University of Warsaw, and his Ph.D. from the Department of Mathematics at the University of Utah.

Professor Sikorski's research interests are in the areas of scientific computation, computational complexity and numerical analysis, with special emphasis on Information Based Complexity. Of special interest are optimal algorithms for fixed points and nonlinear equations, optimal algorithms for signal reconstruction, forward and inverse problems in geophysics, combustion engineering, computational sensor networks, numerical verification and validation of nonlinear solvers as well as nonlinear optimization for inverse problems in urban modeling. Professor Sikorski was awarded First Degree Prize of the Secretary of Education of Poland (jointly with M. Kowalski and F. Stenger) for research leading to the publication of the monograph: Selected Topics in Approximation and Computation (1996). In 2001-2010 he received 7 Dean's letters for excellence in teaching as well as best paper award in 2008. He published 2 research monographs with Oxford Press, 1 textbook and numerous papers in wide spread areas from theory of scientific computation and numerical analysis, algorithmic design, through software and hardware design. He is the founding Director (2001) of the Master of Science program in Computational Engineering and Science (www.ces.utah.edu) at the University of Utah. He currently directs the MS CES program.

He held positions at universities in USA, Poland, Germany, and Italy. He chairs WG1.1 Research Group on Continuous Algorithms and Complexity/Foundations of Computer Science of the International Federation for Information Processing. He supervised 13 Ph.D. and 28 MS students. His students hold top positions in academia and industry.

Publications

Journals


Vol 35, 2009, pp. 375-392


Refereed Conference and Workshops


Book Chapter


Invited Talks & Presentations

“Computational Complexity of Fixed Points” University of Warsaw, Poland, 9/2009

“Optimal Algorithms for Fixed Points” UKSW University, Warsaw, Poland, 9/2009


“Uncertainty quantification and verification: the MGS Method” University of Utah, Department of Chemical Engineering, 3/2010.

“Tools to Characterize the source of hazardous releases” National Conference on Advancing Tools and Solutions for Nuclear Material Detection, Salt Lake City, 2/2010

“Inverse source problems with QMC/MC methods” Dept. of Applied Mathematics and Statistics, University of Notre Dame, 5/2010


Professional Participation

Chair: WG1.1 Group on Continuous Algorithms and Complexity/Foundations of Computer Science of the International Federation for Information Processing

Discussion Session Chair: IFIP Group WG1.1, Dagstuhl, Germany 9/2009

Member: Scientific Program Committee, International Multiconference on Computer Science and Information Technology (IMCST) organized by the Polish Information Processing Society in cooperation with the IEEE Computer Society (Poland Chapter), Council of European Professional Informatics Societies (CEPIS), the Systems Research Institute Polish Academy of Sciences, and the Institute of Computer Science Polish Academy of Sciences, Wsia, Poland, Oct. 2010 (www.imcst.org).
Claudio Silva received the B.S. degree in mathematics from the Federal University of Ceara, Brazil, in 1990, and the Ph.D. degree in computer science from the State University of New York at Stony Brook in 1996. He is a full professor of computer science and a faculty member of the Scientific Computing and Imaging (SCI) Institute at the University of Utah. Before joining Utah in 2003, he worked in industry (IBM and AT&T), government (Sandia and LLNL), and academia (Stony Brook and OGI). He coauthored more than 150 technical papers and eight U.S. patents, primarily in visualization, geometric computing, scientific data management, and related areas. He is an active member of the visualization, graphics, and geometric computing research communities, having served on more than 80 program committees. He is co-editor of the Visualization Corner of the IEEE Computing in Science and Engineering, and on the editorial board of Graphical Models and Computer Graphics. Previously, he was on the editorial board of the IEEE Transactions on Visualization and Computer Graphics. He was papers co-chair for IEEE Visualization conference in 2005 and 2006, and general co-chair of IEEE Visualization 2010. He received IBM Faculty Awards in 2005, 2006, and 2007, and best paper awards at IEEE Visualization 2007 and IEEE Shape Modeling International 2008. He is a member of the ACM, Eurographics, and IEEE. His work is primarily funded by grants from the NSF, NIH, DOE, IBM, and ExxonMobil.

Publications

Refereed Journals


Invited Talks & Presentations

- “VisTrails: Provenance and Data Exploration”
  - 7th Workshop on Parallel and Interactive Computing (PPoPP’09), March 2009
  - EuroVis 2009 - Brazilian Symposium on Computer Graphics and Image Processing (SIBGRAPI), June 2009
  - Conference on Computer Graphics and Interactive Techniques (SIGGRAPH’09), August 2009
  - CAI 2010 - Brazilian Symposium on Computer Graphics and Image Processing (SIBGRAPI), June 2010
- “High-Quality IsoSurfaces and Surface Re(Meshing)”
  - Washington University, December 4th, 2009
  - Brown University, April 7th, 2009
  - Linkoping University, January 20th, 2009

Honors & Awards

- Best paper award, EUROGRAPHICS 2010 Educator Program.

Best poster award, 24th Brazilian Symposium On Databases (SBBD 2009).

“Computing and Rendering Point Set Surfaces” (article published in 2003) is the 2nd most cited paper in the 15-year history of the IEEE Transactions on Visualization and Computer Graphics with over 700 citations.

2009 Utah Innovation Awards, VisTrails Provenance Plugin for Autodesk Maya.
William Thompson received his ScB., Physics, Brown University in Providence, RI in 1970, his M.S. in Computer Science at the University of Southern California in Los Angeles, California in 1972, and his Ph.D. in Computer Science at the University of Southern California in Los Angeles, California in 1975.

Prof. Thompson's current research lies at the intersection of computer graphics and visual perception, with the dual aims of making computer graphics more effective at conveying information and using computer graphics as an aid in investigating human perception. This is an intrinsically multi-disciplinary effort involving aspects of computer science, perceptual psychology, and computational vision. Prof. Thompson has also made contributions in the areas of visual motion perception and in the integration of vision and maps for navigation.

Publications

Refereed Journals


Refereed Conference and Workshops


Book Chapters


Professional Participation

- Associate Editor, ACM Transactions on Applied Perception, 2003 – current
Suresh Venkatasubramanian is interested in algorithms of all shapes and sizes. His current interests lie in computational geometry, massive data sets and statistics, and he enjoys working on problems on the boundary between theory and applications. He comes to the School from AT&T Labs -- Research, where he spent seven years working on a variety of problems in geometry, graphics and databases. He also learned that if your “massive data set” isn’t at least a gigabyte, people in the Labs will laugh at you.

Suresh got his Ph.D at Stanford in 1999, working with Rajeev Motwani and Jean-Claude Latombe. At Stanford, he worked on geometric problems arising in the design of pharmaceutical drugs, which allowed him to get up close and personal with cocaine, albeit only on a computer screen. Prior to that, he inhabited the hallowed halls of the Indian Institute of Technology, Kanpur.

In the alternate universe where he has time for hobbies, he enjoys playing classical guitar, skiing, and compulsively redesigning his website. His personal credo is, ‘Make the world safe for theory', and to this end writes The Geomblog (http://geomblog.blogspot.com), a blog about algorithms, geometry, and technology.

Publications

Refereed Conference and Workshops


Invited Talks & Presentations

NSF Workshop on Electronic Design Automation: Past, Present and Future

Tutorial: Information Theory for Data Management. 35th International Conference on Very Large Databases (VLDB) (with Divesh Srivastava)

Professional Participation

Editorial Boards

• International Journal of Computational Geometry and Applications (Associate Editor)

Program Committees

• Workshop on Massive Data Algorithmics, 2009.
• IEEE International Conference on Data Mining, 2009.
Ross T. Whitaker received his B.S. in Electrical Engineering and Computer Science/Engineering Physics at Princeton University in 1986 and his M.S. and PhD in Computer Science at the University of North Carolina in 1991 and 1993.

Professor Whitaker works in the Scientific Imaging and Computing Institute, and he runs the Image Processing Laboratory. He conducts research in image processing, computer vision, pattern recognition, and visualization. His approach to problems in these domains is usually based upon my background in differential geometry, differential equations, and signal processing.

Publications

Referred Journals


Referred Conference and Workshops


Invited Talks & Presentations

Janelia Farms workshop on Computer Vision in Neuroscience (Nov. 14 – 17, 2010)

Banff International Research Station (BIRS) workshop on Sampling and Reconstruction (Nov. 28 – Dec. 3, 2010)

Professional Participation

- Workshops Chair, IEEE Int. Symposium on Biomedical Imaging, 2009, Boston.
- General coChair of IEEE VisWeek 2010
- Associate Editor of IEEE Transactions on Visualization and Graphics
- IEEE EuroVis 2009.

Honors & Awards

Medical Image Analysis / MICCAI Best Paper Award, 2010

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Samuel Drake received his B.S. in Physics at Massachusetts Institute of Technology in 1965, and his M.S. and PhD in Mechanical Engineering at Massachusetts Institute of Technology in 1970 and 1977.

Professor Drake holds appointments as a research associate professor in Mechanical Engineering and at the School of Computing. His research interests include integrated process planning, computer aided manufacturing, design for manufacturing, design for assemblies and industrial robotics. Professor Drake is also in charge of running the Advanced Manufacturing Laboratory (AML), a lab which allows departmental research into computer vision, computer-aided geometric design, and geometric modeling to produce not only pictures, but solid objects as well.

Marcel Prastawa received his B.S. in Computer Science and Mathematics from Purdue University in 2001, his M.S. in Computer Science from University of North Carolina at Chapel Hill in 2004, and his Doctor of Philosophy in Computer Science from University of North Carolina at Chapel Hill in 2007.

Marcel Prastawa’s research focus is on the analysis of medical images that somehow differ from the norm, particularly those related to pathology or aging. His main research interest is in the application of statistical and physical models for analyzing and modeling normal growth processes or pathological processes. His general research areas are: image processing and analysis, computer vision, machine learning, and biological modeling.

Publications

Refereed Journals, Conference and Workshops


Robert Ricci received his B.S. in Computer science from the University of Utah in 2001, and his PhD in 2010. Prior to joining the faculty of the School of Computing as a Research Assistant Professor, he was a research staff member in the SoC for nine years. He is one of the leaders of the Flux Research Group, which has approximately two dozen faculty, staff, and students. Dr. Ricci’s research is in the area of systems and networking, including testbeds for conducting experiments in those fields. He and the Flux Group have produced two testbeds, Emulab and ProtoGENI, that are heavily used by researchers and educators worldwide.

Publications


2009 & 2010 REPORT
H. James de St. Germain received his B.S. degree from New Mexico State University in 1991 and his PhD in Computer Science at the University of Utah in 2002. His doctoral work was on constraint hypothesis and optimization in the field of Reverse Engineering of mechanical parts. He has conducted further research into CAD/CAM user interface methods and modeling systems, including work toward a 3D stereo wall for virtual design of mechanical CAD models. In 2005, he joined the faculty at Utah and began extensive teaching of university undergraduates. His current interests include exploring more effective tools and techniques for teaching problem solving and programming skills. Dr. de St. Germain is the current Director of Undergraduate Studies for the School of Computing.

Peter A. Jensen received his B.S. and Ph.D. degrees from the University of Utah in 1995 and 2007 respectively. Dr. Jensen began teaching at Utah in 1998 and he received the School of Computing outstanding teaching award in 2007. His research interests include automated fault localization for tutoring systems, efficiency in teaching, and Boolean techniques for factoring large integers. Dr. Jensen has been professionally involved in education and computer science since 1986. His professional background includes development of educational software and hardware for elementary schools, interactive kiosks, data compression techniques, and high-volume financial transaction processing. Most recently, he helped create an educational display for Clark Planetarium in Salt Lake City. Dr. Jensen is currently a clinical assistant professor in the School of Computing.

Erin Parker received B.S. degrees in Computer Science and Mathematics at the College of William and Mary in 1999. She received an M.S. in Computer Science in 2001 followed by a Ph.D. in Computer Science in 2004 from the University of North Carolina at Chapel Hill. After moving to Utah in late 2004, Erin became an Adjunct Assistant Professor in the School of Computing, teaching a variety of courses in systems and introductory computer science. Erin recently became a Clinical Assistant Professor and is excited to continue teaching, as well as, working on undergraduate and diversity issues.

Joe Zachary is a graduate of the Massachusetts Institute of Technology, where he earned a B.S. in Computer Science and Engineering in 1979, an M.S in Computer Science in 1983, and a Ph.D. in Computer Science in 1987. He has been on the faculty of the School of Computing since 1987.

Prof. Zachary specializes in teaching undergraduates, and has been recognized for outstanding teaching throughout his career. He received the IEEE Computer Society Computer Science and Engineering Undergraduate Teaching Award in 1999, the University of Utah Distinguished Teaching Award in 1997, the Department of Energy Undergraduate Computational Science Education Award in 1996, the University of Presidential Teaching Scholar Award in 1995, and the College of Engineering Outstanding Teaching Award in 1990.

Prof. Zachary’s research interests center on the applications of computers to computer science education. He is the author of two versions of the textbook Introduction to Scientific Programming, the creator of five innovative online courses over the last fifteen years, and the author of a variety of computer-based educational tools for teaching introductory programming.
Mark Christensen van Langeveld received his B.S. degree from Brigham Young University in 1985, his M.A. in Design at the University of California Los Angeles in 1990, his M.B.A from Northwestern University in 1999, his M.S.E in Computer Graphics and Game Technology at the University of Pennsylvania in 2005, and his Ph.D. in Computing at the University of Utah in 2009. His dissertation was on “The Educational Impact of Digital Visualization Tools on Digital Character Production Computer Science Courses” and his doctoral work was on Entertainment Arts and Engineering Interdisciplinary Education. His industry experience included designing and directing interactive music videos for Sting and Peter Gabriel, working on several AAA video games in varied rolls, and designing and directing the first major interactive TV (I-TV) show at Microsoft that was called Vine Street. He has been teaching at the University of Utah since 2007. He is currently the director of the Entertainment Arts and Engineering Master Games Studio program.
The University of Utah is located in Salt Lake City, situated at the foot of the Wasatch Mountains. Salt Lake City is the hub of a large metropolitan area including a major international airport and a population of approximately a million people. The local high technology base is growing steadily. Salt Lake City offers a wide variety of athletics, cultural events and popular entertainment. Fine dining is abundant, along with many affordable eating and drinking establishments frequented by students. Excellent cultural facilities are available in the city and throughout the rest of the state, including The Utah Symphony, Ballet West, and a large number of theater companies. The Sundance Film Festival takes place annual in Park City, a half hour’s drive from campus.

The canyon country of southern Utah is unique. The area includes five National Parks and the largest contiguous area of wilderness in the U.S. outside of Alaska. National Forests and Wilderness Areas are scattered throughout the state. The state of Utah has unsurpassed opportunities for outdoor recreation, many only a few minutes away from the campus. It has the world’s best skiing only thirty minutes from campus, along with excellent biking camping and mountain and desert hiking.

National Parks
- Arches National Park
- Bryce Canyon National Park
- Canyonlands National Park
- Capitol Reef National Park
- Zion National Park

Skiing // Snowboarding

Salt Lake Resorts
- Alta
- Brighton
- Snowbird
- Solitude

Park City Resorts
- Deer Valley
- Park City
- The Canyons
- Sundance

Northern Resorts
- Beaver Mountain
- Powder Mountain
- Snowbasin
- Wolf Mountain

Southern Resorts
- Brian Head
- Eagle Point

1 - Salt Lake City (photo courtesy Utah Office of Tourism) 2 - Skiing Wasatch Mountains (photo courtesy Howie Garber) 3 - Bryce Canyon (photo courtesy Utah Office of Tourism) 4 - Deer Valley Music Festival (photo courtesy Utah Office of Tourism) 5 - Wasatch Mountain (photo courtesy Utah Office of Tourism)