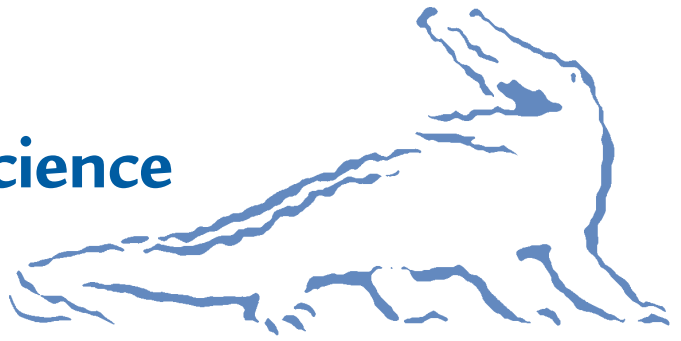


Computer & Information Science & Engineering

Spring 2007

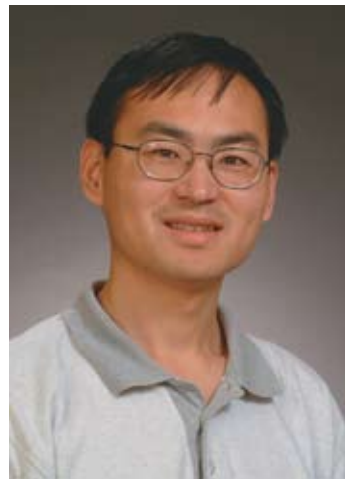
www.cise.ufl.edu



Two More CISE Faculty Win Prestigious NSF Career Awards

The National Science Foundation sponsored Faculty Early Career Development Program is one of the most prestigious awards for new faculty. The CAREER program recognizes and supports the early career-development activities of teacher-scholars who are most likely to become the academic leaders of the 21st century, according to the NSF Web site. The award provides more than \$400,000 over a five year period.

The Department's most recent recipients of the NSF CAREER award are Shigang Chen and Benjamin Lok. These two additional winners bring the Department total to eight. Past CISE winners of this award are professors Dobra, Helmy, Jermaine, Liu, Peir, and Schneider.



Shigang Chen



Benjamin Lok

Innovative Research for Next-Generation Wireless Networks

Wireless technologies have come a long way, from the radio technologies allowing data bits to be exchanged between two physically-disconnected devices, to the multiple access technologies allowing a group of devices to share a common wireless communication channel, and to the routing technologies that allow out-of-range devices to communicate via multihop wireless paths. In recent years we have witnessed the huge commercial success of WLAN, which bloomed into a multi-billion dollar market. Multihop wireless networks, including wireless-sensor networks, wireless-mesh networks, and mobile ad-hoc networks, are expected to lead the next wave of technical innovation.

However, the current technologies have limitations that serve as barriers to the widespread applicability of multihop-wireless networks. Shigang Chen, an assistant professor with the Department, recently showed some basic technologies such as MAC-layer fairness contribute to the WLAN success cause end-to-end performance problems in multihop networks. More importantly, from the user's perspective, the networks must provide a robust and efficient

communication infrastructure, but they should also provide the means to support diverse requirements at the application level. The network needs the ability to differentiate among various types of end-to-end traffic flows and ensure quality of service. This is an open problem for multihop-wireless networks.

Chen and his research group have been working on distributed algorithms and network protocols to solve several fundamental problems in multihop-wireless networks, including end-to-end weighted bandwidth allocation, bandwidth assurance, and performance/overhead tradeoff in traffic differentiation. The work covers a variety of network conditions, including single- and multi-commodity flows, single- and multi-path routing, and static or highly-dynamic wireless networks. The research focuses on two hop-by-hop, routing-independent, light-weight approaches based on aggregate state and packet labels, respectively. Without maintaining any per-flow state, these approaches are able to implement traffic differentiation under aggregate or weighted max-min models and have great flexibility in self-adaptation based on changing network/traffic conditions.

Traffic differentiation is a difficult problem in wireless networks because of resource constraints, dynamic link capacities, multipath routing, dynamic topology/flows, and lossy communication channels, which renders the solutions in wired networks inapplicable. But the reward of this research could

be enormous. It has many important practical applications. Consider a sensor network that collects data from some large geographical area. When an important event - such as the outbreak of fire, an earthquake, or enemy movement - triggers a surge of data traffic from hundreds or even thousands of sensors to a small number of base stations, the network can be severely congested, especially near the base stations. Traffic differentiation would allow sensors at the important locations to report data at higher rates and sensors at other locations to report at reduced rates. With this capability, the user can obtain an adjustable view of the monitored area with different resolutions at different locations.

Traffic differentiation could promote the adoption of wireless-mesh networks by home users. A user who carries a lot of others' traffic would demand - and deserve - a larger share of network bandwidth than a perimeter user who does not carry other's traffic. Multimedia applications with high bandwidth requirements should be given priority over applications with elastic bandwidth demands as long as the benefited users give up certain bandwidth at later times to keep their long-term averages.

Finally, consider a mobile ad-hoc network deployed in a battlefield. Data flows between commanders and their units are more important than flows between soldiers; reports about approaching enemy tanks are more important than reports about foot soldiers. In this environment, traffic differentiation could ensure the delivery of critical data amidst an overwhelming amount of less important information.

Wireless sensor networks, wireless mesh networks, and mobile ad-hoc networks will provide a pervasive communication infrastructure for modern society and dramatically change the way people interact with cyberspace and the physical environment. The proliferation of wireless networks in homes, workplaces, shops, cars, and highways will improve the quality, safety, and productivity of our lives. Multihop-wireless networking is also a major emerging market. Chen's research on traffic differentiation allows these types of networks to meet diverse application requirements, which will promote their entrance into the marketplace.

Traffic differentiation in multihop-wireless networks is drastically different from its counterpart in the wired networks forming today's Internet, yet the literature devoted to this subject is very limited. Chen's research team is working to fill this void through a systematic study of the problem and solution space. Its success will stimulate further research in this and related areas of computer networks.



Medical student interacts with virtual patient.

Professor Chen received his Ph.D. from the University of Illinois at Urbana-Champaign in 1999. He joined the CISE faculty in 2002.

Professor Explores Race and Ethnicity Issues with Immersive Virtual Humans

In a virtual world, would you cross a street to avoid a group of persons who belong to an ethnic or racial group different from your own?

Understanding if virtual humans can elicit such real-world biases in people is the foundation of a research project titled, "Studying Diversity Issues with Immersive Virtual Humans." This project applies virtual humans to simulating interpersonal scenarios. Through interacting with a diverse group of virtual humans, students can be educated on ethnic and racial issues.

Benjamin Lok, an assistant professor in the Department, is investigating fundamental questions about virtual humans. His research group - the Virtual Experiences Research Group - is working on mixed reality and virtual reality technologies to create compelling virtual experiences. Specifically, the group focuses on rendering, interacting, visualizing and studying highly immersive virtual humans. Their work has evolved into the Inter-Personal Simulator system. The virtual humans in IPS are similar to those in video games; however the IPS virtual humans are life-size and interact with speech, gestures, eye gaze and body language.

Lok is collaborating with faculty in the College of Medicine and College of Education to apply the IPS to simulate the interaction between a virtual patient and doctor. VPs provide medical students additional opportunities to practice communication skills.

It is within this framework that the group is using virtual humans to study diversity issues.

End-user studies are being conducted observing medical students interviewing VPs of differing ethnicities. In each medical student-VP interaction, the IPS system tracks many communication cues, including posture, speech, gaze and language. For each medical student, their interactions with VPs of different ethnicities or races are compared to identify systematic differences. These differences are later presented to the student using a visualization system that allows the student to replay and review the interaction. The IPS visualization system even allows the medical student to replay the conversation from the VP's eyes - in essence seeing what it was like to talk to yourself. Future virtual humans will also have varied ages, weight and levels of intelligence.

The goal is to have the VP system in teaching and practicing hospitals worldwide. The system uses only commodity-off-the-shelf components, and its total cost is less than \$8,000. The virtual patients system has been tested at three medical schools: the University of Florida, the Medical College of Georgia and Keele University (U.K.).

This project also has a strong education component. With hundreds of new medical students each year, the ability to provide additional training opportunities would directly impact health care. Further, the technologies developed will also be incorporated into CISE courses, including Human-Computer Interaction, Virtual Reality and Computer Graphics.

Professor Lok received his Ph.D. from the University of North Carolina at Chapel Hill in 2002. He joined the CISE faculty in 2003.

Combinatorial Optimization and Applications

Professor My Thai

There are many computationally hard problems leading to the design of approximation algorithms with near-optimal solutions. Along this direction, we focus on the design and analysis of approximation algorithms, providing solutions to many optimization problems, arising in two main application domains: computational biology and wireless networks.

Within the computational biology domain, we are tackling several problems, such as combinatorial group testing, non-unique probes selection, and community structure decomposition. For example, the combinatorial group testing has various applications in blood testing, chemical leakage testing, coding, and multi-access channel communication. In the context of biology, group testing is usually referred as pooling designs. As the technology for obtaining sequenced genome data matures, more sequenced genome data is available to the scientific research community. The study is supported by a high quality DNA library obtained through a large amount of testing and screening — efficient testing and screening is very important.

Pooling design is a tool to reduce the number of tests in DNA library screening as well as in DNA micro arrays. The construction of pooling design and its ability for decoding are very challenging, especially when inhibitors are present in the biological sample. Towards this end, we are tackling this problem in several layers, from distinguishing positive clones from negative clones to a more complicated model, called complex model. In addition, one of the recent research problems we are involved in is identifying the protein-protein interaction using our developed group-testing model based on bipartite graphs. Another application in this area is selecting the set of non-unique probes for micro arrays. Although we can use the concept of group testing to handle the non-unique probes selection problem, more sophisticated mathematical models and in depth analysis must be investigated in order to provide a good solution. Researchers in our group are studying the complexity of this problem and developing mathematical models and efficient algorithms for selecting a set of non-unique probes with minimum size.

In another project, we are developing mathematical models and efficient approximation algorithms to determine the community structure of a given network. Community structure is defined as a sub-graph such that there is a higher density of edges within the sub-graph than between them. This has applications in many domains, not only

in computational biology, but also in social research, life sciences and physics. Being able to identify these communities could help us to understand and exploit the networks more effectively. It also helps to reveal the hidden structure of a network. The problem becomes much more challenging when the size of a network is growing. We model this problem as clique decomposition where the cost function is highly related with the degree of vertices, and provide an efficient algorithm to successfully partition the network into communities using semi-definite programming tools.

Within the wireless networks domain, we are tackling several problems in order to optimize the use of wireless networks, including coverage problems, virtual backbone construction, and routing protocols. Our long term goal is to provide the mathematical models, algorithmic tools, and robust protocols for an integrated system as a whole. Wireless networks, especially wireless sensor networks, are recognized as a new frontier in communications, and in 2003, according to MIT's Technology Review, it was named one of "10 Emerging Technologies That Will Change The World". The networks are being used in a variety of military and civil applications, providing great benefits to businesses and individuals.

Therefore, it is important to provide algorithmic and theoretical foundations to optimize and analyze the use of WSNs. As an example, the class of connected dominating sets and set covers have been under extensive research over the past few decades. They have enriched other computer science and mathematical areas, such as graph theory and analysis techniques for non-submodular greedy functions.

The challenges of these studies are multi-fold. In WSNs, sensor nodes are battery powered and have limited resources. Thus energy efficiency becomes one of the most crucial problems. The energy efficient issue spans several areas in wireless networks, from the coverage problem (see Figure 1) to routing protocols. Most of these problems are NP-hard. Another unique characteristic of WSNs is there is no fixed or pre-defined infrastructure.

This characteristic heavily affects the communication method and network topology maintenances. This raises many issues on data transmission and data management, which require techniques not only pertaining to technology development in system, but also algorithm designs in theory. Along this direction, our group has made significant contributions in providing the best

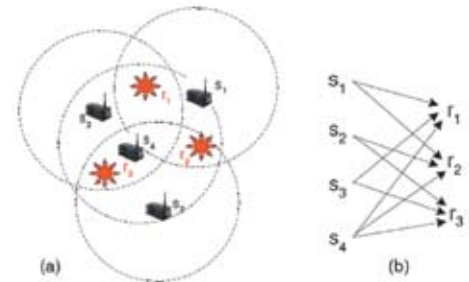


Figure 1(a): A network consists of 4 sensors and 3 targets

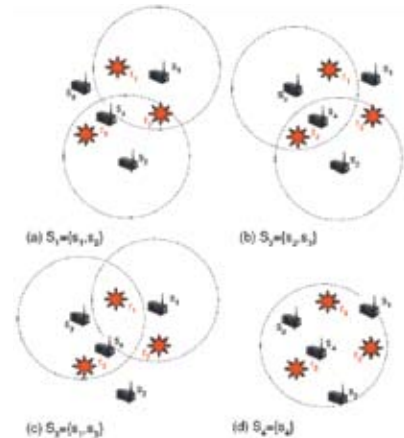


Figure 1(b): Organizing sensors into a maximum number of disjoint covers S_1, S_2, S_3, S_4 will double network lifetime

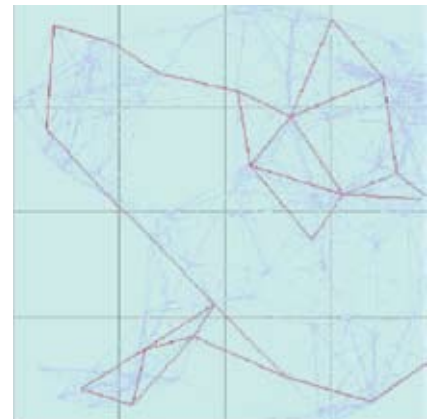


Figure 2: A contour of fault tolerant virtual backbone

approximation algorithms for the problems mentioned above. For example, in the work of virtual backbone (see Figure 2), also referred as connected dominating set we propose new approaches using a disk graph model to construct a minimum connected dominating set. This model allows us to investigate the heterogeneous networks, whereas the current model used in research literature is just for homogeneous networks. With the help of CDS, routing is easier and adapts quickly to network topology changes. In addition, we are considering the reliable and fault tolerant issues in providing the first general model to this problem.

Designing Future Networks for Mobile Societies

Professor Ahmed Helmy

With the popularity of mobile devices, a new generation of mobile societies is on the rise. Portable phones and Wi-Fi devices using 802.11 standards are becoming ubiquitous as more base stations and hot spots are installed. Wireless networks are being introduced, such as wireless ad hoc, mesh and sensor networks consist of groups of wireless devices that self-configure into networks without the need for infrastructure. The future Internet will integrate the above heterogeneous technologies in various capacities with the existing wired Internet.

Future devices will become personal and integrated in our everyday life more than ever before. Many aspects of user behavior will significantly affect the performance of the networked services and applications; including; mobility, calling pattern, on-line activity, grouping, friendship, trust and cooperation. Hence, deep understanding of user behavior in mobile environments becomes essential for the design, modeling, analysis and management of future efficient networks.

In ongoing work we aim to capture and model mobile user behavior by analyzing measurements from deployed wireless networks. To achieve this, we established a community-wide library of wireless networks traces, called MobiLib (nile.cise.ufl.edu/MobiLib) that incorporates millions of samples from more than 12 universities. The traces are collected from wireless networks on campus or during conferences, and from networks of vehicles and buses.

Analyzing these traces provides a challenging research problem due to the immense amount of data and user diversity. Such diversity, however, is needed to support generality of the findings, analyze commonalities and differences across various user groups and to provide meaningful models of user behavior.

Over the past several years our group made significant contributions in this field. We conducted several studies to investigate individual, pair-wise and group behaviors of mobile users. In the IMPACT study, measurements from four different campuses, including more than 12,000 users and 1,300 base stations, were analyzed. We identified very consistent qualitative trends across campuses, despite differences of deployment and user population. The usage patterns are heavily skewed amongst individuals, groups and locations, with clear repetitive behavior is strongest on a daily and weekly basis. Pair-wise relationships were studied using encounters, where users log into the network at the same

time and location. Our analysis of the encounter graph shows the formation of a small world with high clustering and low path length. This feature is utilized for efficient epidemic routing in mobile networks.

Efforts continue with studies using data mining techniques to identify significant features and characteristics of mobile user groups. We develop a systematic framework, called TRACE, as in Fig 1 to Trace, Represent, Analyze, Cluster and Extract behavioral trends among groups in mobile societies. Spatio-temporal user associations (times and locations of log-in) are represented using matrices, and similarity metrics are used to cluster users into behavioral groups using Eigen vector comparisons. Initial results indicate our ability to efficiently divide the population into distinct groups based on network-related activities. Such division may be explained by examining user communities, such as classes, buildings or departmental affiliations.

To provide a realistic model of user activity in mobile networks, we utilize our analysis of the underlying structure of mobile societies. In a recent study, we introduced a model of time-variant tiered-communities which users may associate. User activity is conducted with higher probability at the associated community. For example, a typical student may associate with a class in the morning, a nearby cafeteria during lunch and a related library in the afternoon. Such time-varying preference enables the recreation of the general statistics observed in the real traces. We are integrating this model with our mobility simulation tool, called IMPORTANT, that has been used widely in the networking community. This line of modeling work is essential for the analysis and simulation of classes of delay tolerant networks, where network connectivity is intermittent posing further research challenges in routing and data query and dissemination.

We are also working on the design of future network protocols and services in future mobile networks. Some target applications include information dissemination and retrieval in mobile networks. Our group has made major contributions to the field of location and geographic-based services, including geographic routing, geocast and geographic

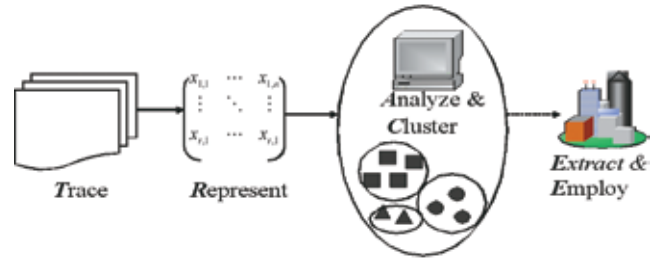


Fig 1. Conceptual paradigm of the TRACE framework

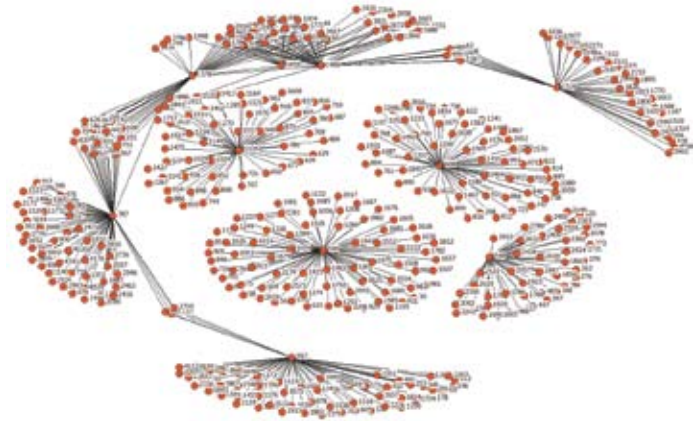


Figure 2.a. Clustered encounter-patterns among mobile users

storage/retrieval architectures. Ongoing work focuses on services for interest groups and social networking in mobile societies based on trace analyses.

In a related project, we are analyzing information and virus/worm propagation in future mobile networks. Worm propagation has been studied in the Internet, and found to be mainly influenced by its connectivity power-law distribution, where a small number of nodes act as hubs connecting much of the Internet and are considered a major vulnerability. Unlike the Internet, wireless networks have a spatial connectivity; where links are function of the inter-node distance, and we found no spatial hubs of connectivity. Hence, the nature of propagation of worms in such networks warrants further study. Initial findings in this area indicate in delay-tolerant encounter-based networks connectivity tends to be clustered between groups of users and are heavily skewed by location as in Fig. 2. This suggests that a potential defense mechanism in such environments includes vaccination of nodes in the most popular locations, as well as nodes moving between popular locations. This, among other defense mechanisms, is investigated in our VACCINE project.

Our approach to the above problems is multifaceted, where we use mathematical analysis as necessary with simulations and real systems test bed implementations and

Designing Future Networks for Mobile Societies continued from page 4

experiments. The design of future protocols takes into consideration energy-efficiency, mobility, lossy links and scalability.

Other active projects in our group include the design of efficient gradient-based routing in sensor networks, optimizing rate adaptation algorithms for 802.11 networks, and systematic testing of network protocols.

Our longer term target applications include mobile social networking, next generation classrooms that combine wireless, ad hoc and sensor networks in an integrated interactive educational environment, disaster-relief rapidly-deployable networks and vehicular networks.

Research in this article has been conducted in collaboration with Ahmed Helmy's Ph.D. students Wei-Jen Hsu, Sapon Tanachaiwiwat, Shao-Cheng Wang, Javed Faruque, former Ph.D. students Fan Bai (R&D GM), Karim Seada (Nokia research), Debojyoti Dutta (Cisco) and the STRESS project at the University of Southern California, among other collaborators. Partial funding is provided through grants from three NSF projects, Intel and NASA.

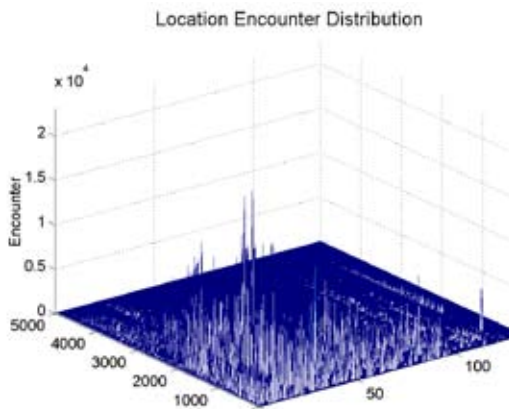


Fig 2. b. Skewed spatial distribution of encounters

Spring 2007 Barr Systems Distinguished Seminar Series

Through continued gifts from Barr Systems, Inc., CISE has been able to continue the annual Barr Systems Distinguished Seminar Series.

Joining the list of distinguished guest speakers, Guri Sohi presented his seminar *Single-Chip Multiprocessors: A New Landscape for Computer Architecture and Beyond*, Feb. 2.

Sohi is the John P. Morgridge Professor and Chair of the Computer Science Department at the University of Wisconsin-Madison. He has been a faculty member at Wisconsin-Madison since receiving his Ph.D. in Electrical and Computer Engineering from the University of Illinois in 1985.

Sohi's researches the design of high-performance microprocessors and computer systems. Results from his research can be found in almost every high-end microprocessor on the market today.

In 1999, Sohi received the 1999 ACM SIGARCH Maurice Wilkes award "for seminal contributions in the areas of high issue rate processors and instruction level parallelism". At the University of Wisconsin he was selected as a Vilas Associate in 1997 and won the WARF Kellett Mid-Career Faculty Researcher award in 2000. He is a Fellow of both the ACM and the IEEE.

On April 9 Pradeep Khosla presented his seminar, *CyberSecurity: Opportunities and Challenges*, to the faculty and students of CISE.

Khosla is currently the Dean of the College of Engineering and Founding Director of CyLab at Carnegie-Mellon University in Pittsburgh, Pennsylvania. CyLab is a university wide effort that involves 30 faculty and 100 Ph.D. students. The research portfolio in CyLab spans technology, policy and business issues.

Prior to his current position, Khosla served as the head of electrical and computer engineering and director of the Information Networking Institute. He is the recipient of several awards including the McDowell award from IEEE Computer Society, the George Westinghouse award for education from

ASEE, and the Cybersecurity education award from the Business Software Alliance. Khosla is a Fellow of IEEE, AAAI, and AAAS and was elected as member of the National Academy of Engineering for his contributions to research and education.

Khosla serves on the advisory boards of several universities, and venture capital funds. He is a member of the board of Directors of the Pittsburgh Technology Council, The Children's Institute and Quantapoint Inc.

Shree Nayar, the T.C. Chang Professor of Computer Science at Columbia University in New York, visited CISE on April 13. He presented a seminar entitled *Computational Cameras: Redefining the Image*.

Nayar received his Ph.D. in electrical and computer engineering from the Robotics Institute at Carnegie-Mellon University in 1990. He co-directs the Columbia Vision and Graphics Center, and heads the Columbia Computer Vision Laboratory, which is dedicated to the development of advanced computer visions systems. His research is focused on three areas: the creation of novel cameras, the design of physics based models for vision, and the development of algorithms for scene understanding. His work is motivated by applications in the fields of digital imaging, computer graphics and robotics.

Nayar received best paper awards at ICCV 1990, ICPR 1994, CVPR 1994, ICCV 1995, CVPR 2000 and CVPR 2004. He is the recipient of the David Marr prize (1990 and 1995), the David and Lucile Packard Fellowship (1992), the National Young Investigator Award (1993), the NTT Distinguished Scientific Achievement Award (1994), the Keck Foundation Award for Excellence in Teaching (1995) and the Columbia Great Teacher Award (2006). He has published more than 100 scientific papers and has been awarded several patents for inventions related to vision and robotics.

Industrial Advisory Board

The Industrial Advisory Board, a partnership between CISE and industry, provides a vital bridge between the Department and an innovation-driven computer science and engineering industry. The partnerships began in 1998, and since then board members have provided support to CISE through monetary, software, and equipment donations, and have also provided expert input on current industry trends. This input keeps the Department up-to-date on the latest trends, helps to focus its curriculum, and better prepares graduates for a constantly changing industry. Moreover, board members also benefit through networking with peers, cooperative research, and interaction with students who may become interns and future employees.

At the IAB's most recent meeting on March 22, Dean Pramod Khargonekar provided a status report on the College of Engineering and thanked IAB members for their significant assistance during this year's very successful ABET accreditation visit. Distinguished Professor and Chair Sartaj Sahni updated members on recent CISE activities, announcing two more CISE faculty had just received prestigious NSF CAREER awards. This brings the total number of such awards to eight, with more expected (see cover story.) A discussion followed regarding joint Department/IAB efforts related to recruiting and internship program development.

The March meeting also featured a presentation by graduate student Seema Degwekar, President of ASCIE. She described the increase in interaction among graduate students and faculty in the Department since the inception of ASCIE, and promoted the idea of instituting an industry-based mentorship program for grad students. The IAB response was very positive.

The meeting concluded with a presentation on Developing Reliable Wireless Mobility Networks by Ahmed Helmy, and by welcoming Jan Jackman and Rhonda Hold to their new co-vice chair positions, as well as former vice chair Gene Matter to his new chair position for the 2007-08 year.

IAB members who participated in the March meeting include:

Susan S Chong
Campus Relations Manager
Lockheed Martin

Kirk Haller
Director of Research
Solidworks

Rhonda Holt
VP of Infrastructure and Operations
Turner Broadcasting System, Inc

Jan Jackman
General Manager, Retail
On Demand, EBO & VP
IBM

Kurt Long
Founder
Epic Tide, Inc.

Gene Matter
Senior Principal Engineer
Intel Corp.

Christopher McLendon
Industry Technology Strategist
Microsoft

Victor S. Moore
Distinguished Engineer
IBM

Johnny Morgan
Sr. Systems Engineering Manager
Lockheed Martin

Douglas Opfer
ExxonMobil

Karel Rivadulla
Manager Systems Engineering
Raytheon

Randall Shiver
Software Engineer 4
Harris

More information on the IAB can be found at its Web site: www.cise.ufl.edu/iab

Gators at Lockheed Martin

By: Susan S. Chong, Lockheed Martin

Lockheed Martin is a highly diversified \$39.6 billion advanced technology company and the strategic leader in the aerospace industry. The company has major positions in information systems, software development, space launch vehicles, aeronautics, electronics, environmental services and energy programs. The vision of the corporation is to be the world's premier systems engineering and technology enterprise. To meet that vision, Lockheed Martin continues to build on its history of success in identifying and capitalizing on key information systems, electronic, aerospace and energy technologies. The corporation is organized into four core business areas: Aeronautical Systems, Space Systems, Electronic Systems and Information Systems & Global Services. Within these four businesses are 939 facilities in 457 cities and 45 states throughout the America. Internationally, the company holds business locations in 56 nations and territories. With more than 140,000 employees worldwide, at last count Lockheed Martin had 837 Gators among its ranks. As a top five employer of Gator Engineers in recent years, Lockheed Martin has benefited greatly from the excellent education and hands-on training that UF graduates receive.

Two of these exemplary Gator graduates are Johnny and Cathy Morgan, B.S., CISE, '80 and B.S., Environmental Engineering, '81, respectively. Meeting as undergraduate ROTC students, the Morgans graduated from UF and then served seven years on active duty in the U.S. Navy at various locations. After earning advanced degrees in Systems Management, they joined Lockheed Martin in 1987 and are senior manager and principle engineer, respectively, of major programs for customers in the intelligence community. Although they live in the Washington, DC area, Johnny Morgan visits UF regularly and represents Lockheed Martin on the CISE Industrial Advisory Board. The Morgans are active in recruiting efforts on campus and have attended numerous career fairs, information sessions, career workshops, resume reviews, etc. As Life Members of the UF Alumni Association, they encourage others to take advantage of corporate matching gifts programs to have the greatest impact possible on the future of UF. Johnny Morgan, who hails from tiny Frostproof, Fla. (pop. 3,500), where only five out of his 1985 graduating high school class went to college, is pursuing a Ph.D. in Systems Engineering with the intention of someday circling back to academia and perhaps



Johnny and Cathy Morgan

becoming a professor. He sums up his feelings on his time at UF with, "I'm very grateful that UF gave me the education and opportunities to go somewhere in the world. Go Gators!"

Shigang Chen, assistant professor, is serving as a symposium track co-chair for Wireless and Mobile Network Architecture of the 16th International Conference on Computer Communications and Networks in Honolulu, Hawaii, August 2007. Chen also served as a TPC co-chair for Computer and Network Security Symposium for the Institute of Electrical and Electronics Engineers International Wireless Communication and Mobile Computing Conference in Vancouver, Canada in July of 2006. Chen received a \$400,000 award from the National Science Foundation titled, "Traffic Differentiation in Multihop Wireless Networks" January 2007.

Douglas Dankel II, assistant professor, served as the general chair of the 20th International Florida Artificial Intelligence Research Society conference held May 7-9, 2007 in Key West, Florida.

Paul Fishwick, professor, will serve as the program co-chair of the International Workshop on Visual Languages and Computing, this coming September 2007 in San Francisco, California.

Ritter Gerhard, professor emeritus, was appointed to the Editorial Board of the International Journal of Forensic Computer Science December 2006. Ritter was also invited to be a member of the program committee of the Twelfth International Workshop on Combinatorial Image analysis which will be held in Buffalo, New York in April 2008.

Ahmed Helmy, associate professor, has received two grants from the National Science Foundation, part of the projects he started at the University of Southern California. For "Adaptive Architecture for Multicast Service Support in Large Scale Mobile Ad Hoc Networks: Design & Evaluation" Helmy was awarded \$91,509 March 2007, and "NeTS-NOSS: Data-Centric Active Querying in Sensor Networks" was awarded \$242,200. He was invited to be the local chair for the 16th Institute of Electrical and Electronics Engineers International Conference on Network Protocols, one of the leading conferences in computer networks, which is expected to be in November 2008 in Orlando, Florida. Helmy will also serve on the technical committee for ICNP in 2007 and 2008; this is a highly selective conference with an acceptance rate below 15 percent. He will serve on the Editorial Board of the Ad Hoc Networks Journal, Elsevier in 2007 and 2008.

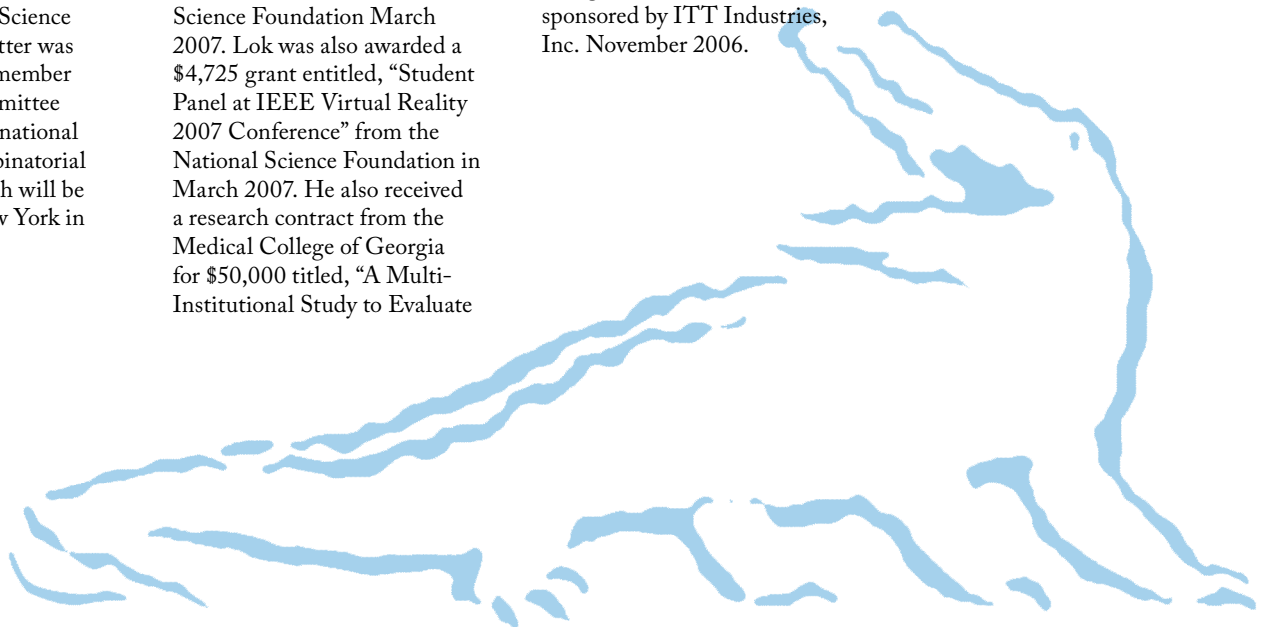
Benjamin Lok, assistant professor, has received numerous grants in order to continue supporting his research. Lok received a \$405,695 Faculty Early Career Development Award entitled, "Studying Diversity Issues with Immersive Virtual Humans" from the National Science Foundation March 2007. Lok was also awarded a \$4,725 grant entitled, "Student Panel at IEEE Virtual Reality 2007 Conference" from the National Science Foundation in March 2007. He also received a research contract from the Medical College of Georgia for \$50,000 titled, "A Multi-Institutional Study to Evaluate

the Use of Virtual Patients to Teach and Assess Clinical Skills." The work will be done with D. Scott Lind, Chief of Surgical Oncology at Medical College of Georgia. Lok also received a research contract from Keele University U.K., School of Pharmacy for \$56,000 titled "The Use of Virtual Patients to Teach Pharmacy Communication Skills." The work will be done with Steve Chapman, head of the School of Pharmacy at Keele University. Aside from all his grant awards, Lok was also appointed as adjunct assistant professor in the Department of Surgical Oncology at the Medical College of Georgia University. Lok served as Posters Chair for the Fifth IEEE International Symposium on Mixed and Augmented Reality in Santa Barbara, California in November 2006. He also served as Panels Chair for the IEEE Virtual Reality 2007 conference in Charlotte, North Carolina in March 2007. Lok chaired two panels including, "VR Support of Clinical Applications: Collaboration, Politics, & Ethics," and "Student Panel: Building the Future of - and a Career in - VR" March 2007.

Prabhat Mishra, assistant professor, has been awarded a \$40,000 grant, "Use of SystemC Transaction Level Modeling as a Golden Reference Model for Design & Validation of SoCs," sponsored by ITT Industries, Inc. November 2006.

Sartaj Sahni, distinguished professor & chair, was general chair of the International Conference on Information Systems, Technology and Management that was held in New Delhi, India March 12 - 13, 2007 and the International Association of Science and Technology for Development conference on Advances in Computer Science and Technology that was held in Phuket, Thailand, April 2 - 4. He gave the R. C. Bose Memorial Keynote Address at the International Conference on Interdisciplinary Mathematical and Statistical Techniques to be held in Shanghai, China May 20 - 23, 2007.

Baba Vemuri, professor, has been invited to be a colloquium speaker at the Johns Hopkins University on May 2007. He was also invited to speak at the Dagstuhl Workshop on Visualization and Processing of Tensor Fields from January 2007. Vemuri is a program committee member of the International Conference on Medical Image Computing and Computer Assisted Intervention to be held in Brisbane, Australia on October 2007, and serve as program chair of the International Conference on Computer Vision in Rio de Janeiro, Brazil the same month.



ASCIE

The Association of Graduate Students in Computer and Information Science and Engineering has had a great spring semester. Once again, ASCIE started the semester by hosting an informal and interactive orientation session for new graduate students. Students were advised on how to balance course and research workload as well as how to manage the stress of graduate studies. The orientation session was followed by a Q&A session in which graduate students answered specific queries of new students. Like last semester, each new student received a free CISE T-shirt from ASCIE.

In its biweekly meetings, ASCIE continued to address the issues and needs of graduate students. Just before the spring 2007 UF Career Fair, ASCIE held a special seminar about resume preparation and short interviews at the Career Fair. Although the Career Resource Center offers such services, ASCIE sessions were tailored specifically to Computer Science students applying for programming and other computer engineering related positions. ASCIE also assisted VMware, Inc., a software development firm, in holding an information session for CISE students. It

helped students to learn about the company and the career opportunities it offers. ASCIE also organized a seminar for new Ph.D. students to give them an idea about what to expect from the Ph.D. program. They were given advice on how to prepare for Ph.D. qualifiers, how to find a supervisor, and how important it is to be involved in research activities.

At the Industrial Advisory Board meeting, this semester, ASCIE briefed the board members about the activities and needs of graduate students. Consequently, the board has agreed to look into the possibility of establishing a mentorship program along with informal interactive sessions, possibly resume critiquing sessions, to coincide with the IAB meetings to help CISE graduate students better prepare to enter the industry.

ASCIE co-hosted the 2nd annual Department picnic with the CISE department.

This semester, ASCIE has proposed two significant amendments to its constitution. The first one is to make the position of Benton Engineering Council representative a part of the official body of ASCIE. If the amendment

is approved, the BEC representative will be elected by a general vote like the other officers of ASCIE. The second amendment is to elect the Graduate Student Council representative with the ASCIE elections. Elections for ASCIE will be held at the end of April 2007 and all the official positions will be open for election. The 2006/2007ASCIE administrative officers are:

President: **Seema Degwekar**

Vice President: **Raazia Mazhar**

Secretary: **Sameep Solanki**

Treasurer: **Andres Mendez-Vazquez**

Historian: **Alina Zare**

BEC Representative: **Pedro B. Morales**

Advisers: **Stephen Thebaut**

Amy Ladendorf

ASCIE has enjoyed a great first year. We hope CISE graduate students will continue this tradition of collaboration and helping each other out through the ASCIE platform in the years to come. For more information:

www.cise.ufl.edu/dept/ascie



Smita Singhaniya (in the back) and Archana Meka enjoy the day on Lake Wauburg.

Spring Picnic

On March 25, 2007, the CISE department held its 2nd annual Spring Picnic. More than 150 attendees including faculty, staff, graduate students and their families enjoyed a gorgeous spring day on the shores of Lake Wauburg. Following an opening address by Sartaj Sahni, distinguished professor and chair, the attendees enjoyed a variety of ethnic fare catered by Indian Cuisine, Napolitanos and Sonny's Real Pit Barbeque.

Picnickers had the opportunity to meet family members of the people they work with, and socialize through activities like sailing, playing volleyball, and frisbee. The picnic proved to be a great opportunity to socialize, relax, and have fun.

Planning for this year's event was a collaborative effort led by ASCIE – especially Seema Degwekar, ASCIE's president and Rachel Ngai, CISE staff member. The leftover food was donated to St. Francis House, a homeless shelter and soup kitchen, in downtown Gainesville. The Department would like to thank everyone involved in putting the picnic together, as well as everyone who attended.

Student Spotlights

CISE graduate students finishing this spring with the highest GPA's were: Amey Kulkarni, Xiao Chai (who are graduating with Master's Degrees), and Wencheng Lu (who is graduating with a PhD).



Amey Kulkarni

Amey Kulkarni started out at the University of Bombay but received his Bachelor of Science in Computer Science at Florida State University. The warm tropical weather agreed

with him. He applied and was accepted at the University of Florida to begin his master's degree.

While attending the UF, Kulkarni also worked as a math tutor at UF Teaching Center. There, Kulkarni became the math lab manager, and was responsible for the supervision of 20 to 25 math tutors. Kulkarni and his tutors helped roughly 5,000 students each semester. He even tutored some of UF's Gator football team players. While watching the 2006 national championship game, Amey recognized some of his students on the field, and felt "very proud" of the students.

After graduation, Kulkarni will be heading back to Seminole country to work at the Tallahassee based software development company Infinity Software. Infinity Software is no stranger to Kulkarni as he spent a summer interning there on their project maintenance program with the Florida Department of Financial Services. Kulkarni will be heading back as a full fledged employee to work in their Geographic Information Systems division on a joint project with the Florida Department of Agriculture.

Kulkarni is very excited about his future plans. Someday he would like to return to India and start his own GIS Company. He says that "everyone is developing software companies, but there are very few GIS companies". He hopes to return to academia and earn another degree in GIS, and combine his two fields of study for his possible future company.

Kulkarni knows that his success isn't just his and says, "I would like to thank my family for their unconditional support throughout every step in this degree."

In the meantime, Kulkarni is happy to stay in Florida even if it means trading The Swamp for Seminole country.



Xiao Chai

Xiao Chai is a regular Gator student. Decked out in her Gator t-shirt and a pair of camo pants- you'd never know that just a few years ago, Chai had arrived at the University of

Florida with the goal of earning her master's in computer science engineering and not knowing a single person in Gainesville. Chai hails from the Jiang Su Province in China, and earned her undergraduate degree at NanJing University of Posts and Telecommunications.

Like many International students already studying at UF, coming to Gainesville was Chai's first trip to the U.S. However, she wasn't as alone as she thought she would be. Chai said the local Chinese students had planned activities for her and even managed to arrange an apartment before her arrival. Some students were assigned to pick her up from the airport and escort her around town. Chai said although most Chinese students don't tend to branch out enough to get to know the students from other countries, it was comforting to have this home away from home. "It is like a big family," she said.

When asked how she felt about being a woman in a male dominated field, Chai said she didn't feel very different from her male counterparts. She said as long as she has the "interest and ability to learn" she feels comfortable in the world of computer science & engineering. Chai remarked that the male students were "more clever" than the female students in CISE but laughed and said the female students study harder and are "more patient and careful with details."

Chai's interest in the computer science field was encouraged by her family. Many of her family members in China are already involved with CIS. For her, the CIS field means job and financial security. She says that in China many women are already dedicated to the CIS field.

After graduation, Chai hopes to travel. She already has several interviews set up with companies in the U.S. She would like to move and work in New York City. She says New York City offers not only challenges, but also many opportunities in her field. Her future is wide open.



Wencheng Lu

Wencheng Lu is a native of China. He received his undergraduate '98 and master's '01 degrees in computer engineering at Zhejiang University, China. He says he was always

interested in mathematics and had a lot of fun playing with computers. After graduation from Zhejiang University, Lu worked for Philips Investment Co. (China) as a software engineer.

He chose the University of Florida CISE department because of the research programs and the scope of knowledge of the professors. That and Florida "is a good place to travel." Lu worked with Sahni, Department Chair of CISE, for his Ph.D. degree at the University of Florida, in the field of computer networks and communications. Lu describes the focus of his research as follows: "Today, gigabit fiber Internet links and router tables of several hundred thousand entries are commonplace. Hence, there is a need for high-end routers that can process packets faster and that are scalable. In particular, classifying packets based on header information is a major bottleneck in high-end routers. We developed efficient algorithms to construct fast and scalable packet classifiers."

During the five years Lu worked on his PhD at UF, he became a big fan of the Gator football team. He was very excited to be part of the university and watch as the Gators brought home three National Championships.

At the end of the Spring 2007 semester Wencheng Lu will be heading off to California in hopes to land a job with Google.

Congratulations 2006-2007 Graduates

Doctor of Philosophy in Computer Engineering

Hicham El-Zabadiani, Ph.D.
Dissertation Title: Self-Sensing Smart Plugs for Smart Environment
Advisor: Prof. Abdelsalam Helal

Seung Chul Han, Ph.D.
Dissertation title: Optimal Node Selection and Network Load-Aware Multimedia Streaming Distribution in Peer-to-Peer Networks
Advisor: Prof. Ye Xia

Jang Uk In, Ph.D.
Dissertation Title: Efficient Scheduling Techniques and Systems for Grid Computing
Advisor: Prof. Sanjay Ranka

Eunsam Kim, Ph.D.
Dissertation Title: Enhanced Distributed Multimedia Services Using Networked Storage Systems
Advisor: Prof. Jonathan Liu

Jeffrey Craig King, Ph.D.
Dissertation title: Atlas: A Service-Oriented Sensor and Actuator Network Platform to Enable Programmable Pervasive Computing Spaces
Advisor: Prof. Abdelsalam Helal

Wencheng Lu, Ph.D.
Dissertation title: Data Structures for Efficient Packet Classification
Advisor: Prof. Sartaj Sahni

Kevin M. McCullen, Ph.D.
Dissertation title: Layout Techniques for Phase Correct and Gridded Wiring
Advisor: Prof. Sartaj Sahni

Hailong Meng, Ph.D.
Dissertation title: A Novel Methodology for Identifying Conserved Regulatory Modules at Binding Site Level
Advisor: Prof. Arunava Banerjee

Alejandro Pauly, Ph.D.
Dissertation title: Design, Implementation, and Database Integration of a Data Model

for Vague Spatial Data as a Foundation of the Next Generation of Spatial Databases and Geographical Information Systems
Advisor: Prof. Markus Schneider

Hyunju Shim, Ph.D.
Dissertation title: An Integrative and Interactive Approach to Three-Dimensional Programming
Advisor: Prof. Paul Fishwick

Oguzhan Topsakal, Ph.D.
Dissertation title: Semantic Integration through Application Analysis
Advisor: Prof. Joachim Hammer

Fei Wang, Ph.D.
Dissertation title: Information Theoretic Measures and Their Applications to Image Registration and Segmentation
Advisor: Prof. Baba Vemuri

Brian E. Weinrich, Ph.D.
Dissertation title: A Formal Design for Three-Dimensional Spatial Data in Database Systems
Advisor: Prof. Markus Schneider

Zhan Zang, Ph.D.
Dissertation title: Overlay Infrastructure Support for Internet Applications
Advisor: Prof. Shigang Chen

Yong Zhou, Ph.D.
Dissertation title: Combinatorial Decomposition, Generic Independence and Algebraic Complexity of Geometric Constraints Systems: Applications in Biology and Engineering
Advisor: Prof. Meera Sitharam

Master of Engineering in Computer Engineering

Achareke, Ukachi Nkiruks Billingsley III, Max Turner Burns, Christopher Jonathan Horne, Anthony Campbell Pearson, Christopher David

Master of Science in Computer Engineering

Adams, Dain Drew Ansari, Aamir Apte, Ajit Premkumar Barbieri, Michael Gregory Batra, Tarundeep Singh Bhole, Akshay Blanchard, Jeremiah J. Boonchuay, Aungsuthorn Bose, Raja Briceno, Roque Julio Chai, Xiao Cheekoti, Venkata Ramana Chen, Kun Chinchuluun, Radnaabazar Cutrono, Joseph Thomas Dang, Nikhil Danso-Amoako, Mark O.*
**Also awarded Ph.D. in Design, Construction and Planning (FALL 2006)*

David, Prathiba Davis, Christina Marie Diaz, Rohini Patricia Dikshit, Anupam El Khoury, Georges Sami El-Kouche, Ahmad Hassan Gandhi, Kunal R. Ghosh, Moumita Gite, Mahim Hassan, Imran He, Ping Hegde, Sachin Suresh Ho, Tuananh Jobanputra, Varun Arvind Kaddoura, Youssef Omar Kapoor, Nishant Krishnappa, Meena Kulkarni, Amey Kulkarni, Archis Kulkarni, Saurabh Balkrishna Leko, Adam Joseph Liu, Xiang Lu, I-Hsuan Machin, Pedro Antonio Magis, Andrew Tyler Marimuthu, Suresh Babu Martinez, Alexandra Maru, Sumeetkumar Venkilar Mazlaghani, Mikel Mehta, Bhavyan Bhartkumar Mehta, Sanketi Jagdish Morales, Pedro Bernardo Neeli, Tulasi Kumar Nimmagadda, Krishna Chaitanya Nirakari, Somanath Shivanand Pan, Wei Pasupathi, Sundara Dinakar Peng, Chung-Ching Perchani, Dileep Peta, Subhani Basha Pol, Abhijit Ashok Rajendra Prasad, Rahul Rastogi, Pranav Ravikumar, Rakesh Kumar Sahi, Rupinderjeet Singh Shah, Tapan Dipakkumar Shahid, Omer

Sherburne, Hans Ebel Taube Shin, Incheol Shuma, James Jeffrey Thyagaraja, Karthik Vaidyanathan, Swetha Vaidyaraghavan, Nithya Wirth, Joshua George

Master of Science in Computer Science

Amiel, Randall L. Batabyal, Niladri Burra, Anjani Surya Teja Jones, James Chester Kim, Jaehoon Moturu, Tapasvi Reckard, Gary Sanap, Sachin Rambhau

Master of Science in Digital Arts and Sciences

Daher, Salam Gates, Andrew Lee Park, Yuna Angela

Bachelor of Science in Computer Engineering

Amrhein, Joseph Ayad, Abdunnasser Benjamin, Aaron Blackerby, Jason* Brown, Thomas* Brown, Thomas C Cabrera, Tessa* Casanova, Carlos* Castaneda, Michael* Caulfield, Lauren*** Chen, Wayne** Chin, Denzil Maulding Cui, Jia Cusick, David* Cusick, David R Damerow, Adam M Damerow, Eric* Dang, Kathy* Dastmalchi, Joshua Depree, Jeffrey* Dominguez, Jesus Edwards, Jeremy Eisenmenger, Kristofer Fadden, Lylas* Forman, Wade Galluzzo, Vincent** Garcia-Corkern, Monique* Gomez, Michael Greaves, Evol Jacobson, Mark G Jarrard, Jeffrey Jones, Malachi*** Jordan, Matthew* Kabadi, Chandan J Kasper, William Kim, Steven*** Larosa, Joel** Le, Thai T Leszczynski, Michael Luedtke, Stephen**

* Graduated (or on-track to graduate) Cum Laude

** Graduated (or on-track to graduate) Magna Cum Laude

*** Graduated (or on-track to graduate) Summa Cum Laude

Marod, Michael
 McNealy, Sean**
 Miller, Seth
 Mills, Ralph***
 Mitchell, Matthew H
 Moraes, Gabriel D
 Nofal, Christopher
 Noriega, Jose
 Nowak, Dennis
 Olion, Brice A
 Oliver, Matthew
 Perez, Ninsa A
 Petit-Bois, Merlande
 Pham, Daniel
 Pham, Daniel
 Pham, Daniel N
 Pledge, Shannon M
 Poon, Raymond
 Prakash, Asha
 Principe, Luis R
 Reddish, Garrett D
 Richard, Robert*
 Roberts, Adam
 Romero, Chris*
 Romero, Luis
 Sawries, Peter***
 Shaul, Etan
 Shepherd, David***
 Showalter, Eric*
 Showalter, Eric B
 Simons, Robert Sullivan
 Stitely, Daniel
 Sullivan, Mark Vincent
 Taylor, Christopher*
 Thomas, Jeffrey E
 Tomore, Adam
 Wonderly, Paul**
 Yazeji, Kastantin*
 Yazeji, Kastantin M
 Ybarra, JR, Luis R

Bachelor of Science in Digital Arts and Sciences

Campbell, Errol
 Cramer, Clifton
 Dang, Christopher
 Eisen, Ben**
 Gonzalez, Laura
 Guinta, Kyle
 Heipp, Benjamin
 Horton, Joshua***
 Manry, Cary
 Seifert, Michael***
 Shachar, Ron
 Shelestak, Molly*
 Stana, Lauren***
 Thompson, Alexander
 Vaughn, Kelsey
 Wheeler, Partrick**
 Zapata Bondurant, Simon

Bachelor of Science in Computer Information Sciences

Benkoski, Aric
 Hanna, David
 Small, Christopher



Wendi Decker-Miller-
Senior Secretary

Decker-Miller came to CISE from the School of Forest Resources and Conservation at UF in January. Her main responsibility is assisting Distinguished Professor & Chair Sartaj Sahni with his daily responsibilities. Other duties include helping to arrange Department colloquia, Industrial Advisory Board meetings, and faculty interview visits.

A Pennsylvania native, Decker-Miller feels more at home in the south since she grew up on a U.S. Army base in Alabama. She has two B.S. degrees in Fine Arts (Theater and Print Journalism) from Troy State University. During her free time, Decker-Miller says she enjoys photography, making jewelry, and shopping for unusual objects in antique, thrift and consignment stores with her husband, Mike.



Stacey Queller - Secretary

Queller joined the CISE staff in February – right after graduating from the UF with a B.A. in art history and Spanish. As secretary and receptionist for the CISE Student Services Center, she works closely with the advising staff and assists undergraduate and graduate students.

While pursuing her bachelor's degree, Queller interned at the Samuel P. Harn Museum of Art, worked at the UF Foundation and volunteered at Shands HealthCare. She has also worked as a secretary in a dental office and as a museum tour guide in Costa Rica.

In her spare time, Queller says she enjoys whitewater rafting and other adventure sports. While at home, she enjoys reading mystery novels, cooking, scrapbooking and watching the Lifetime Original Series Strong Medicine.



April Rollins- Senior Secretary

Rollins joined CISE in March as the receptionist in the Department's main office. She will assist with travel authorizations, expense reports and textbook adoptions. Before joining the Department, Rollins worked as a financial counselor at UF & Shands. She graduated from St. Leo University with a B.A. in criminal justice in 2005 and is pursuing an on-line master's degree in health care management. Rollins says her hobbies include reading and traveling as much as possible.

Sullivan Beck

Computer System Programmer, SR



Beck came to UF to pursue a Ph.D. in theoretical chemistry. In that program, most of the work was done with computers, and before long, he realized he enjoyed working with computers more

than he did studying theoretical chemistry. He began helping to manage the computers in the Quantum Theory Project where he studied. He then began working to create a joint software archive with UF's Department of Statistics.

The archive allowed the departments to legally share software and to reduce the time each had to spend managing their resources. Eventually, Beck left the Ph.D. program and became a full-time system administrator with CISE.

According to Beck, the most interesting thing about working in the Department is the wide variety of tasks the system administrators encounter. CISE provides almost every service that most large ISPs provide but is small enough that none of the system administrators have become pigeon-holed in a specialized area. Everyone is involved, at some level, in maintaining practically every computer supported in the Department.

Beck grew up in Logan, Utah and obtained his B.S. and M.S. in chemistry at Utah State University. He used to have several hobbies such as reading, caving, scuba diving, and watching movies, but for now, raising his 3-month old daughter, Elizabeth, seems to have pretty much taken over that part of his life. He spends most of his "spare time" these days trying to get enough sleep and counting the diapers he and his wife, Heather, have to change every day.

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