



2010-2011



## UT ECE Welcomes Our New Chairman: Dr. Ahmed Tewfik

Dr. Ahmed Tewfik has been named the new chair of the Cockrell School of Engineering Electrical and Computer Engineering department at The University of Texas at Austin.

Dr. Ahmed Tewfik, E. F. Johnson professor of Electronic Communications, University of Minnesota, and Vice President for Technical Directions of the Institute of Electrical and Electronics Engineers (IEEE) Signal Processing Society, has been named the new chair of the Cockrell School of Engineering Electrical and Computer Engineering department at The University of Texas at Austin.

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*“Ahmed Tewfik’s unique blend of research expertise, entrepreneurial experience and global leadership is exactly what we need to help guide the growth of our Electrical and Computer Engineering department,” said Gregory L. Fenves, dean, Cockrell School of Engineering.*

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Tewfik brings to the Cockrell School an impressive research record, entrepreneurial insight as the founder and CEO of a software company and leadership gained through various positions with IEEE, the world’s largest professional association for the advancement of technology.

Dr. Tewfik’s current areas of research interests include: medical imaging for minimally invasive surgery, programmable wireless networks, genomics and proteomics, neural prosthetics and audio signal separation. He has made seminal contributions in the past to food inspection, watermarking, multimedia signal processing and content based retrieval, wavelet signal processing and fractals.

His education includes a B.S.E.E. from Cairo University, Cairo Egypt, in 1982, an M.S.E.E. in 1984 and Sc.D. in 1987, both from the Massachusetts Institute of Technology. Dr. Tewfik is a Fellow of the IEEE, and was a distinguished lecturer of the IEEE Signal Processing Society from 1997 to 1999.

He received the IEEE Third Millennium Award in 2000. Dr. Tewfik was awarded the E. F. Johnson professorship of Electronic Communications in 1993, the Taylor Faculty Development Award from the Taylor Foundation in 1992 and an NSF Research Initiation Award in 1990.

Dr. Tewfik has delivered plenary lectures at several IEEE and non-IEEE meetings and taught tutorials on bioinformatics, cognitive radio, ultrawideband communications, watermarking and wavelets at major IEEE conferences. He served as the founding Editor-in-Chief of the IEEE Signal Processing Letters from 1993 to 1999.

In addition to his many years as a professor, lecturer and mentor to students at the University of Minnesota and M.I.T., Dr. Tewfik has worked at Alphatech, Inc., in Burlington, MA, and served as a consultant to several companies. He has enjoyed long standing collaborations with Texas Instruments and Computing Devices International. From August 1997 to August 2001, he was the President and CEO of Cognicity, Inc., an entertainment marketing software tools publisher that he cofounded.

## Sparking the Future of Engineering

Professors Andrea Alù, Seth Bank, Mattan Erez, and Sujay Sanghavi were all recognized for their outstanding research with 4 new highly competitive CAREER awards from the National Science Foundation.



**Professor Andrea Alù** has received an NSF CAREER Award for his research on “Sensing, Imaging and Energy Applications of Metamaterial Cloaks.” Dr. Alù’s research focuses on the fundamental theoretical and experimental study of metamaterial covers, operating as cloaks to suppress the otherwise inevitable disturbance that near-field sensors, imagers and absorbers produce on their surroundings. These findings will be aimed at advancing near-field measurements and imaging techniques, and increasing the efficiency of green-energy devices. Furthermore, these research concepts will be combined with a number of outreach and educational activities, aimed at integrating metamaterial research and education, with special emphasis on diversity and minorities.



**Professor Seth Bank** was awarded an NSF CAREER award for his research on “High-Efficiency Mid-Infrared Diode Lasers Incorporating Novel Metallic Nanoparticle-Enhanced Tunnel Junctions.” The objective of his research is to address a fundamental issue that pervades modern optoelectronic and photovoltaic devices: power conversion efficiency. The approach of this research is to combine photonics with nanotechnology to dramatically enhance the performance of lasers that emit in the mid-infrared portion of the electromagnetic spectrum. Such laser sources will find applications in medicine, emissions monitoring, communications, etc.



**Professor Mattan Erez** received an NSF CAREER Award for his research on “Architectural Mechanisms for Cooperative Reliability.” Dr. Erez’s research focuses on hardware and software techniques, as well as programming model considerations, for enabling flexible and dynamic soft error protection. The goal of the research is to enable cooperative protection schemes and maximize efficiency by blurring the lines between the hardware and software control of soft error protection.



**Professor Sujay Sanghavi** received an NSF CAREER Award for his research on “Networks and Statistical Inference: New Connections and Algorithms.” According to Dr. Sanghavi, “This research will significantly impact both how we control large-scale networks and interpret the high-dimensional data they generate. By providing a common algorithmic language, it will facilitate the easy migration of techniques across fields.”

### Bank and Belkin Receive Young Investigator Awards



Bank



Belkin

Prof. **Seth Bank** and **Mikhail Belkin** were announced among the winners of the Air Force’s Young Investigator Research Program. The program awards approximately \$14.6 million in grants to 38 scientists and engineers who submitted winning research proposals. Dr. Seth R. Bank received his award for “work on manipulating the interfacial electrical and optical properties of dissimilar materials with metallic nanostructures.” Dr. Mikhail A. Belkin won his award for investigating “tunable quantum electronic metamaterials for mid-infrared range.”

## Sparking the Future of Engineering

### Andrews Publishes New 4G Cellular Book



**Professor Jeffrey Andrews** and his former student **Dr. Jun Zhang**, whose dissertation research was on multiuser and networked MIMO techniques and their application LTE, have published *Fundamentals of LTE*, the most accessible and complete tutorial on the LTE standard for 4G cellular. This book is the result of a long-standing collaboration with Dr. Arunabha Ghosh and Rias Muhamed of AT&T Labs, and was supported by AT&T Labs. Andrews, Ghosh, and Muhamed previously co-authored *Fundamentals of WiMAX*, which was published in 2007 also by Prentice-Hall, and became the definitive WiMAX text and one of the best-selling wireless textbooks of the last decade.

### Rappaport Receives Joe J. King Achievement Award



Rappaport

**Professor Ted Rappaport** has been awarded the 2010 Joe J. King Professional Engineering Achievement Award by the Cockrell School of Engineering. This college-wide award was created in 1976 to recognize significant contributions in furthering the engineering profession.

### Andrews Honored by IEEE Comm. Society



Andrews

**Professor Jeffrey Andrews** has been awarded the 2010 Best Tutorial Paper Award from the IEEE Communications Society, for his paper “Stochastic Geometry and Random Graphs for the Analysis and Design of Wireless Networks” in the IEEE Journal on Selected Areas in Communications, which appeared in September 2009. This paper was the first tutorial of its kind in the literature and was co-authored with four other international leaders on the theory and applications of stochastic geometry to wireless networks.

### Dr. Nan Sun to Join UT ECE Faculty



Sun

**Dr. Nan Sun** will join the faculty of UT ECE in Spring 2011 as an Assistant Professor. Prof. Sun received the B.S. degree in electrical engineering from Tsinghua University, Beijing, China, in 2006 and the Ph. D. degree in electrical engineering at Harvard University in 2010. Prof. Sun received the Harvard Teaching Award three times, from 2008-2010. Prof. Sun’s major research interests lie in RF, analog, and mixed-signal integrated circuit design, and developing EE tools to solve fundamental problems in neurobiology.

### Orshansky Speaks at On-Line Testing Symposium



Orshansky

**Professor Michael Orshansky** was the keynote speaker at the 16th International On-Line Testing Symposium in Corfu, Greece. The title of his talk was “Statistical Design of Digital Circuits: the First Ten Years.” In the talk, Prof. Orshansky discussed the status of statistical design of digital circuits after a decade of intense work in the area. Specifically, he focused on evaluating evidence for the practical adoption of the new techniques and on assessing the limitations of some of the assumptions made in the early years of the discipline.

### Abraham and Students Win Best Paper at ICCD



Abraham

**Professor Jacob Abraham** along with UT ECE students **Joonsoo Kim** and **Joonsoo Lee** have won the Best Paper Award in the Computer Systems Design and Applications Track at the 28th IEEE International Conference on Computer Design (ICCD) for their paper entitled “Toward Reliable SRAM-based Device Identification.” ICCD is the premiere conference covering the research, design, and implementation of computer systems and their components.

### Garg and Students Win Best Paper Award at SSS



Garg

**Professor Vijay Garg** along with former UT ECE students **Anurag Agarwal** and **Vinit Ogale**, received the best paper award at the 12th International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS 2010). The award is for the paper titled “Modeling and Analyzing Periodic Distributed Computations.” The SSS symposium is one of the most respected international forums in the area of fault-tolerance in distributed systems.

### Kim and Students Win Best Paper Award at ASE



Kim

**Professor Miryung Kim** along with former UT ECE students, **Adam Duley** and **Chris Spandikow**, have received the Best Paper Award at the 25th IEEE/ACM International Conference on Automated Software Engineering for their paper “A Program Differencing Algorithm for Verilog HDL.” The ASE conference has become one of the world’s premier Software Engineering venues. Adam Duley and Chris Spandikow are UT ECE graduates who are now hardware engineers at ARM and IBM.

### Gharpurey Receives IEEE JSCC Best Paper Award



Gharpurey

**Professor Ranjit Gharpurey** and UT ECE alumnus **Junghwan Han** (Ph.D. 2007) have received the IEEE Journal of Solid State Circuits Best Paper Award for their paper “Recursive Receiver Down-Converters With Multiband Feedback and Gain-Reuse,” published in the May 2008 issue. This award recognizes the best paper published each year in the IEEE Journal of Solid-State Circuits on the basis of outstanding achievement, significance, clarity of presentation, and timeliness.

### Patt and Students Win Best Paper Award at ASPLOS



Patt

**Professor Yale Patt** along with UT ECE students **Eiman Ebrahimi** and **Chang Joo Lee**, and UT ECE alumnus and Carnegie-Mellon professor **Onur Mutlu**, received one of three Best Paper Awards at ASPLOS XV for their paper entitled “Fairness via Source Throttling: A Configurable and High-Performance Fairness Substrate for Multi-Core Memory Systems.”

### Andrews Receives Best Paper at IEEE Globecom



Andrews

**Professor Jeffrey Andrews**, along with his former PhD student **Vikram Chandrasekhar** (now at Texas Instruments) and post-doc **Marios Kountouris** (now on the faculty at the Supelec, Paris), won the Best Paper award in Communication Theory at IEEE Globecom, the IEEE Communication Society’s annual flagship conference.

### David Pan and Students Win Two Best Paper Awards



Pan

**Professor David Pan** and students have been recognized for their work in VLSI/CAD with two Best Paper Awards including one at ASPDAC 2010 and one at DATE 2010. These are two premier conferences in the VLSI/CAD field.

### Lizy John and Students Win Best Paper Award



John

**Professor Lizy John** and UT ECE students **Dimitris Kaseridis** and **Jeff Stuecheli** from the Laboratory for Computer Architecture (LCA) won the Best Paper Award at the 38th International Conference on Parallel Processing (ICPP), 2009, for their paper entitled “Bank-aware Dynamic Cache Partitioning for Multicore Architectures.”

## The Pharos Project: Testing Complex Cyber-Physical Systems

Professors Christine Julien and Sriram Vishwanath head The Pharos Project. The Pharos Project is creating a pervasive computing testbed to support the study of complex cyber-physical systems.



Cyber-physical systems are those that require the combination and coordination of many different computational elements to interact with the physical world. These systems are not only complicated but also complex and unpredictable. Examples of cyber-physical systems include autonomous automotive systems (real-time traffic monitoring, collision avoidance, intersection management), medical monitoring (elderly, Alzheimer's, and Parkinson's patients), process control systems, distributed robotics, and wireless sensor networks.

The centerpiece of the Pharos Project is the Proteus mobile node. Each node is afforded autonomous behavior by both a Linux server and a microcontroller. Each node's mobility is provided by one of three different platforms: a Roomba robotics platform, a modified remote controlled car, or a Segway robotic mobility platform. Finally, nodes are provided with a wide variety of sensors and actuators that the nodes can use to interact with the environment and each other. These Proteus nodes have been specifically designed to be inexpensive, easy to manufacture, and simple to control. These individually controlled mobile platforms simulate the

complex, distributed, and heterogeneous environment that characterizes cyber-physical systems.

Since the challenges encountered in these environments are inherently interdisciplinary, the Pharos Project also takes an interdisciplinary approach to the study of cyber-physical systems. The testbed supports research in sensor management, network coding, wireless protocols, localization, multi-agent coordination, fault-tolerant systems, and software simulation validation.

Eventually, the Pharos Project will also support research in distributed teams, project management, and maintenance of software and hardware artifacts. The Pharos testbed has already provided support for a wealth of both undergraduate and graduate research projects in control and communications. The broad range of topics available to the Pharos Project research allows for advancement in a host of different fields, each highly visible and well funded.



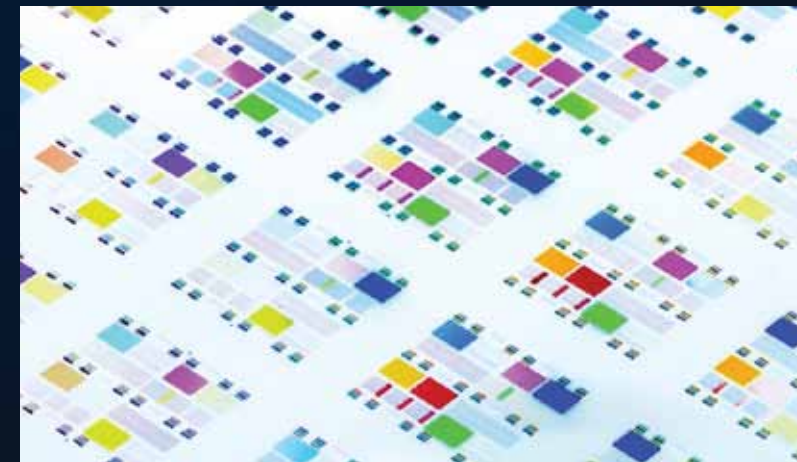
**Dr. Christine Julien** is an Associate Professor at UT ECE where she is part of the Software Engineering Group. Dr. Julien's research interests lie in the realm of software engineering, specifically for mobile computing.



**Dr. Sriram Vishwanath** is an Assistant Professor at UT ECE. His research interests include information theory, wireless communications and coding theory. His industry experience includes work at the National Semiconductor Corporation and at the Lucent Bell labs.

## Metallic Nanostructures in Semiconductor Photonic Devices

Professors Seth Bank and Ed Yu, are part of a research group investigating new materials to solve long-standing challenges that may enable fundamentally new photonic devices with diverse applications.



The integration of metals and semiconductors offers incredible possibilities for new electronic and (nano)photonic devices for these applications, particularly with recent advances in plasmonics and related fields. Unfortunately, metals are typically relegated to the periphery of semiconductor devices, due to materials challenges associated with their integration with semiconductors.

Prof. Bank is working on these challenges in collaboration with Prof. Matthew Gilbert at the University of Illinois Urbana-Champaign to better understand these materials at a fundamental level, using rigorous theory. He is collaborating with Prof. Ed Yu, also a member of the UT ECE faculty, as well as Profs. Xiuling Li and James Coleman at the University of Illinois at Urbana-Champaign on materials characterization and semiconductor device applications.

ErAs and the other semimetallic rare-earth monpnictides provide a potential pathway to integration, as they may be epitaxially embedded as nanoparticles into high-quality III-V semiconductors (e.g. GaAs),

with thermodynamically stable interfaces. They have recently demonstrated that these materials can be integrated with semiconductor nanostructures, without degrading the optical properties of the semiconductor. They have also dramatically reduced the resistance of tunnel junctions that are used to connect the junctions of multijunction solar cells, by controlling the morphology of ErAs nanoparticles (e.g. size and shape) placed at the p-n junction.

There are several key challenges that remain, however. Solving these challenges requires the exploration of novel methods in order to realize the full potential of metals in semiconductor photonic devices, potentially enabling fundamentally new photonic device functionality with diverse applications such as solar power generation, chemical/gas sensing, and optical communications.



**Dr. Seth Bank** is an Assistant Professor at UT ECE. His current research interests are centered on the molecular beam epitaxy growth of dilute-nitride semiconductors, metal/semiconductor

nanocomposites, carbon nanostructures and their application to silicon-based lasers, mid-IR lasers, THz generation and sensing, and high-speed transistors.

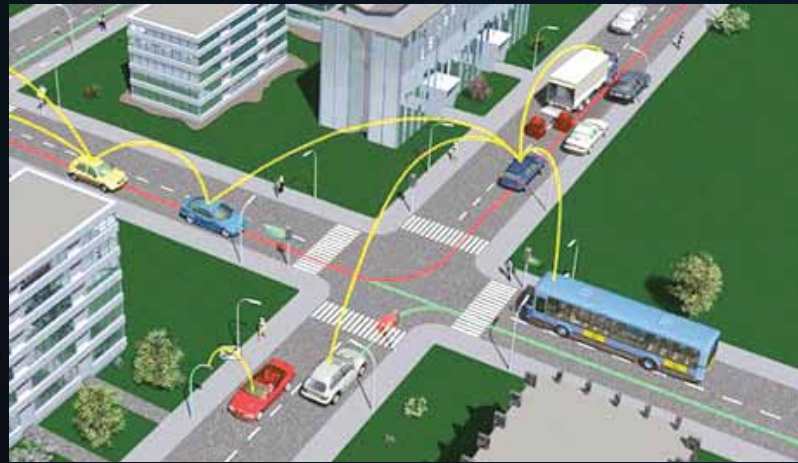


**Dr. Ed Yu** holds the Judson S. Swearingen Regents Chair in Engineering at the University of Texas at Austin. The results of his research have been reported in over 130 archival journal publications and over

200 conference and seminar presentations.

## A Vision of Wireless Possibilities

Professors Derek Chiou, Robert Heath, and Andreas Gerstlauer are tackling a big-picture wireless initiative combining communication and computation in never-before-imagined ways.



Imagine you're driving home from work, the GPS system in your car collecting data from sensors and choosing a route that minimizes traffic delays and minimizes fuel consumption. As you get closer to home, the car's computer communicates with your home network, adjusting the thermostat and pre-heating the oven.

Then a traffic-monitoring network detects an accident as it happens immediately in front of you, and sends a signal to your car to brake and turn onto an alternate route. A body sensor records the few beats your heart skipped, and sends that data to your doctor for reference at your next check-up. If the fibrillations progressed into a heart attack, those sensors could even stop your car and call an ambulance.

UT ECE faculty working on the Network of Systems Vision see it happening. This big-picture project pulls together existing centers of excellence in wireless communication, circuit design, and computer architecture to enable new applications that combine communication and computation in never-before-imagined ways.

This vision of what could be accomplished might eventually involve dozens of faculty in the Cockrell School and elsewhere in the university. It includes research areas spearheaded by Chiou; Robert Heath, PhD, associate professor in UT ECE and associate director of the Wireless Networking and Communications Group; and Andreas Gerstlauer, assistant professor in UT ECE.

"The basic vision is interactions of networks of networks and systems of systems, driven by new applications, all talking together," Heath says. "There is already a huge amount of intelligence out there. Coupling together multiple networks and systems, layering them on top of each other where they work both in parallel and in tandem, increases the possibilities."



**Dr. Derek Chiou** is an Asst. Professor at UT ECE. Prof. Chiou is interested in computer architecture, parallel computer architecture, Internet router architecture and computer engineering.



**Dr. Robert Heath** holds the David and Doris Lybarger Endowed Faculty Fellowship in Engineering. He has published over 190 refereed articles in these areas and holds eleven U.S. patents.



**Dr. Andreas Gerstlauer** is an Assistant Professor at UT ECE. Dr. Gerstlauer has coauthored 2 books and more than 30 book chapters, conference and journal publications.

## Sustainable Energy: Barriers, Realities and Future Plans

Professor Ross Baldick discusses the policy barriers, vivid realities and future strategies to close the gap between the need for diversified, sustainable energy and the steps toward that goal.



Take a thicket of sometimes contradictory incentives, subsidies, and regulations, add traditional emphasis on fossil fuels, and stir in low prices. That recipe makes transition to renewable energy difficult in this country, according to Ross Baldick, professor of electrical engineering, with price representing one of the greatest barriers.

"We could be sustainable now," he says, "but those sources are considerably more expensive than fossil fuels, and more than people are apparently prepared to pay."

Policies keep energy artificially inexpensive compared to true costs, including environmental externalities, and Baldick believes academia has not convinced average Americans that our costs should reflect those externalities. The failure to make that case bears more blame than does our lack of a coherent policy.

"We're blowing a ton of money on rooftop solar, which is a very expensive method of saving the planet," he says. "That is driven less by coherent

policy than the sexiness of rooftop solar panels. Money would be better spent on insulation, especially in low-income homes. We're misguided in our evaluation of appropriate choices. Wind energy is more sensible but alternatives such as wind and solar are only growing today because they are subsidized. A generic policy misstep, in my opinion, is that we subsidize what we think is good rather than penalize what we think is bad." Penalties for carbon emissions, for example, would move our society toward these other methods of energy production, he believes.

Encouraging research and development to decrease costs for renewables would be better policy right now than deploying renewables at current costs. Federal tax credits encourage the "build now" mind-set over bringing costs down first.

"We need to do both, it's not either/or, but as a policy we need to emphasize more R&D and less deployment, at least with solar until costs are reduced. There are a number of ways in which we fail to appropriately price our uses of energy. Until we fix that, we're always going to have to subsidize sustainable energy, and we'll be unlikely to see large-scale, fiscally responsible sustainable development taking off."



**Dr. Ross Baldick** holds the Leland Barclay Fellowship in Engineering. Dr. Baldick has published over forty refereed journal articles and has research interests in a number of areas in electric power.

## UT Solar Car Shines in National Competition

Professor Gary Hallock and The University of Texas at Austin Solar Vehicles Team camped, pulled all-nighters and ran into some unique mechanical issues on their seven-day, solar-powered road trip adventure.



Unlike other road warriors, these travelers spent the previous four years building their solar car together. And for the first time in 15 years, a UT car completed the 1,100 mile American Solar Challenge cross-country race. Through class projects, more than 50 undergraduate students per year worked on the solar car, which helped the nucleus team of about 25 students who worked year-round in the official student organization.

Named the Samsung Solarean, in recognition of their largest sponsor, the car was powered by Sunpower A-300 monocrystalline solar cells that generated 800 watts of electricity. That energy was used on demand to run the 600-pound futuristic-looking vehicle, or stored in batteries. The car's carbon fiber body was covered by 393 solar cells and the solar-generated electricity stored in 506 lithium-ion batteries (LG Chemical type 18650) that helped power its in-wheel electric motor.

Engineering challenges were plentiful of course, but harnessing the elements was a small part of the learning experience, say all who participated. The intangibles provided indispensable lessons:

communication skills for a large team, persistence to meet rigid deadlines and resourcefulness to keep the machine performing on the road.

“The race was a test of real-time problem solving,” says Dr. Gary Hallock, an electrical engineering professor. “Things break, time is very limited, and we have only the tools and diagnostic equipment we bring along. Good decisions have to be made under pressure and with limited information”

UT ECE Graduate Student Fred Engelkemeir, another member of the core solar vehicles team, emphasized the value of hands-on experience. “One thing that I learned that I couldn't have learned in a classroom was, as for most of us, how to debug and come up with a solution to problems rapidly with limited resources in assorted places. We also learned how to talk with the public and the media, as well as how to live and sleep in very bizarre conditions.”

This year's biennial race pitted 17 university teams against each other and 13 completed the course.



**Dr. Gary Hallock** holds the Archie W. Straiton Endowed Faculty Fellowship. Dr. Hallock's work has resulted in 39 refereed journal publications, 35 refereed conference proceedings, 42 technical reports, 134 professional society presentations, and 26 invited lectures.



## Students Making Their Mark

### UT ECE Students Place 2nd in IET Competition

UT ECE students **Kyle Fernald**, **Chao Chen**, **Maher Dakkak**, and **Bryant Tran** won second place at the IET Present Around the World Americas Finals, in Ottawa, Ontario on Sept. 11th. The Present Around the World Competition is an annual event held by the Young Members and Professionals of the Institution of Engineering and Technology. The multi-stage event includes members and students from all around the world, participating from different fields of engineering.



The Gestune team, presented by Kyle Fernald (pictured above), finished second among eleven competitors from Texas, New England, Canada and Trinidad and Tobago. Kyle graduated in May 2010 with a B.S. in Computer Engineering and currently works at Intel in Austin.

The IET Around the World Competition is an international competition focusing on showing presentation and preparation skills as well as technical skills and knowledge. IET is one of the world's leading professional societies for the engineering and tech community, with more than 150,000 members in 127 countries in Europe, North America and Asia-Pacific.

### Jyotirmoy Deshmukh Receives Multiple Honors

UT ECE Ph.D. candidate **Jyotirmoy Deshmukh** received the Distinguished Paper Award at the 24th IEEE/ACM International Conference on Automated Software Engineering in Auckland, New Zealand. Jyotirmoy's paper, "Symbolic Deadlock Analysis in Concurrent Libraries and their Clients," was co-authored by Sriram Sankaranarayanan and supervising professor Dr. E. Allen Emerson of the Computer Sciences department.

The ASE conference has become one of the world's premier Software Engineering conferences with technical research papers, experience reports, demonstrations, short papers showcasing emerging topics, a doctoral symposium, associated workshops and tutorials.

Jyotirmoy has also been named a 2010 Computing Innovation Fellow by the Computing Research Association (CRA) and the Computing Community Consortium (CCC). The CI Fellows project, funded by the National Science Foundation, is an opportunity for recent and upcoming Ph.D. graduates to obtain one- to two-year postdoctoral positions at universities, industrial research laboratories, and other organizations that advance the field of computing.

### UT ECE Student Joao Awarded Intel® Fellowship

UT ECE student **Jose Joao** has been selected to receive the Intel Graduate Fellowship, a prestigious honor awarded to "Ph.D. candidates pursuing leading-edge work in fields related to Intel's business and research interests." The fellowship includes a cash award, an Intel Technical Liaison and travel funds to meet the liaison either at a conference or at Intel. These students are also prioritized for internships and hiring within the company. This is a highly competitive program with a limited number of fellowships awarded annually.



## Companies Who Hired UT ECE Students

Agilent Technologies, Inc.	Magma
Accenture	Media Tech
AMD	Mi5Networks
American Airlines	Micron
Analog Devices	Microsoft
Apple, Inc.	National Instruments
ARM, Inc.	NVIDIA
AT&T Labs	Obsidian Software
Austin Energy	Organic ID
Bechtel	NetQoS
Bloomberg	Plexon Neurotechnology Systems
Boeing	Pulsewave RF
CenterPoint Energy	Pyxis
Cisco Systems	Qualcomm Inc.
Cirrus Logic	Rockwell Collins
Conoco Phillips	Qwest Communications
Dell, Inc.	Samsung Electronics
EPRI Solutions	Sandia National Laboratories
Ercot, Inc.	Schlumberger Oilfield Services
Ericsson	SEMATECH
Freescale Semiconductor	Siemens Medical Solution
GE Energy	Silicon Laboratories
Google	Synopsys
IBM	TECO-Westinghouse Motor Company
Intel Corporation	Texas Instruments
Intrinsity	T.J. Watson Research Center, IBM
LG Electronics	VMware, Inc.
Lockheed Martin Co.	Windmill Cardiovascular System

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