2017 Annual Report

Engineering Excellence

College of Engineering and Applied Sciences
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Investing in the Future of CEAS
Opportunities to partner with CEAS as we build a fully featured college of engineering and applied sciences.
Explosive Growth

The College of Engineering and Applied Sciences is one of nine schools and colleges within the University at Albany SUNY (UAlbany). Currently, UAlbany is making a major investment in building engineering degree programs, and the College of Engineering and Applied Sciences is in an exciting period of rapid expansion. In just two short years, the Departments of Electrical and Computer Engineering and Environmental and Sustainable Engineering have joined our legacy programs in Computer Science. Enrollments are far exceeding expectations, and we have recruited world-class faculty from prestigious universities from around the world. Although our college is young, we are on an upward moving trajectory and we expect our numbers to improve. Here is a snapshot of the past year.

Enrollment Growth

14% Undergraduate Programs*

62% Graduate Programs

*133% in Computer Engineering

3 YEARS AHEAD OF PROJECTIONS

Faculty and Staff Growth

2 NEW DEPARTMENTS

55 PERCENT INCREASE IN FACULTY

17 NEW TENURED/TENURE TRACK FACULTY

3 NEW LECTURERS

6 NEW STAFF

94 Conference Leadership Roles

14 Patents Issued
Faculty Honors

- 2 IEEE Fellows
- 1 ABET PEV
- 1 Jefferson Science Fellow
- 1 IAPR Fellow
- 2 NSF Career Awards
- 1 NSF CISE CRII

Research

- $5.2 Million Extramural Research Funding
- 14 Current Awards

In the past year, more federal submissions than the previous 6 years combined

Publications

- 81 Journal Papers
- 151 Conference Papers
- 3 Books
- 35 Book Chapters
- 5 Journal Editorships

International Partnership

- Dual Degree Program with COUPT in Chongqing, China
- 194 students in 2nd year

Engineering Opportunity
A few years back, I was fortunate to spend a very enlightening year as a Jefferson Science Fellow at the U.S. Department of State. As Senior Science Advisor for the Bureau of Western Hemisphere Affairs, I was considered the “Science Guy” who would contribute to and assess policy discussions, and translate technical issues bearing on those policies for a non-technical but highly intelligent audience. My work spanned the spectrum from agriculture and biofuels, to medicine and space science.

During my year-long residency at Foggy Bottom, I became acutely aware of the following truth: Engineering educators need to do more to prepare students to communicate about engineering and the role of engineers to the general public and to those making policy decisions.

In today’s world, there are any number of intersections between public policy and engineering. Issues such as climate change, cyber-vulnerability, transportation infrastructure, resilient and sustainable design, clean water, stem cell research, arms control, migration of pathogens and invasive species, and natural disaster mitigation and recovery all require some level of engineering literacy simply to make rational policy decisions about them.

And yet, in this environment an appalling lack of scientific literacy on the part of much of the general public and some political leaders is creating a dangerous situation. Recent appointments (or the lack of them) to leadership positions in the EPA, the White House Office of Science and Technology Policy, and review panels at the Department of Energy and other agencies do not bode well for data-driven, fact-based, scientifically sound decision making and policy design.

It could get worse. Legislation introduced in mid-October by Sen. Rand Paul would impose a significant change in the reviewing process for grant proposals at all Federal agencies by requiring public referees with no expertise in the research subject area on all Federal review panels. The senator, an ophthalmologist, claims that there is a lot of “silly research” that wastes money, and proposes the non-experts as “taxpayer advocates.”

In a recent hearing on the senator’s proposal, Terence Kealey of the Cato Institute put forth the bizarre assertion that publicly funded research has not been shown to contribute to economic development. I beg to differ, and will point to just one example. (You will have your own favorites, I’m sure.) In the 1970s, autonomous vehicles and automated highway systems might have been labeled “silly” by Senator Paul. Self-driving cars? Really? But pioneering work by Dr. Robert Fenton at Ohio State, who was elected to the National Academy of Engineering in 2003, paved the way for the developments we now see from Tesla,
Google, and most major automobile manufacturers. No one laughs at the idea of self-driving cars now.

“Today’s engineers and scientists will be called upon to articulate clearly and effectively for science in the formulation of public policy.”

And no one can ignore the economic growth resulting from the government’s investment.

As a consequence of these developments, today’s engineers and scientists will be called upon to articulate clearly and effectively for science in the formulation of public policy. It is imperative that we prepare students to accept this role by providing them with the communications skills they will need in a global society. We must also prepare them to accept roles as ambassadors for science and engineering in the public discourse. We can afford to do no less. Does this imply that we need to teach engineering to all those non-engineers out there? Of course not. But by creating greater awareness of, and appreciation for, the demand for engineering solutions to so many of the issues facing society today, we as engineers can serve that society far more effectively.

Despite the claims of the Cato Institute, science and technology are widely recognized as drivers of economic growth in advanced industrialized nations; once an economy achieves “developed” status, innovation is the only sustainable driver of economic growth. For these economies, including the United States, engineers are “professional innovators” who build the national wealth. It is only through engineering that science evolves into technology to serve society and, in doing so, becomes part of the economic fabric.

Observing developing nations that succeed at this transformation, as I did during my studies at the State Department, provides compelling evidence for the importance of a well developed and functioning national innovation system, as well as the need for societal technological learning and the increase in technical sophistication on the part of society as a whole.

The technical challenges that face us today are, in fact, opportunities to create significant wealth for those nations with capable, functioning innovation systems and the shrewdness to invest rather than sequester. Renewable energy is just one, painfully obvious domain in which American technical leadership could be surrendered. The risk of self-entrapment in a structural technology dependency looms for those who don’t invest in research, because those who must buy technology are of necessity behind, and dependent on, those who create it.

As an engineering educator, I believe it is imperative to reaffirm the role of the American research university as part of a national investment strategy. The university’s role is to undertake long time-horizon, high-risk research of the type private enterprise cannot afford, but which society as a whole cannot afford to neglect. The natural interconnection of research and graduate education, and the knowledge flow-down that enhances undergraduate education, makes an American engineering education the best in the world. To disregard universities as key elements of the national innovation system is to neglect a critically important tool for economic development.

The United States has arguably the largest existing scientific knowledge base in the world, and — not coincidentally — the world’s strongest research universities. It is a hard-won advantage not to be squandered.

To read more about Kim Boyer, visit his faculty page.
the New Faces of Engineering

**AVEEK DUTTA**
Assistant Professor
Electrical and Computer Engineering
University of Colorado, Postdoc Princeton University
*Research Interests:* Enforcement of spectrum policy, vehicular channel analytics, heterogeneous networks, hybrid radio architecture

**SHAGHAYEGH SAHEBI**
Assistant Professor
Computer Science
University of Pittsburgh
*Research Interests:* Human-centered data mining, including educational data mining, recommender and personalization systems, user modeling

**YELIN KIM**
Assistant Professor
Electrical and Computer Engineering
University of Michigan
*Research Interests:* Computational human behavior and interaction analysis, human-centered and affective computing, multimodal signal processing, machine learning, computer vision

**TOLGA SOYATA**
Associate Professor
Electrical and Computer Engineering
University of Rochester and Johns Hopkins University
*Research Interests:* Cyber physical systems, digital health (D-Health), high-performance medical data processing and visualization

**RANDY MOULIC**
Associate Dean for Applied Learning and Cooperative Education
Professor
Electrical and Computer Engineering
Acting Chair, Computer Science
Polytechnic Institute of New York
University and University of Illinois
*Research Interests:* Digital electronics, computer architecture, design

**CHINWE EKENNA**
Assistant Professor
Computer Science
Texas A&M University
*Research Interests:* Robotics, machine learning, computational biology

**MING-CHING CHANG**
Assistant Professor
Electrical and Computer Engineering
Brown University
*Research Interests:* Video analytics, computer vision, machine intelligence

**CHARALAMPOS CHELMIS**
Assistant Professor
Computer Science
University of Southern California
*Research Interests:* Modeling; algorithmic, computational and practical aspects of all Vs of Big Data

**MARIYA ZHELEVA**
Assistant Professor
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University of California, Santa Barbara
*Research Interests:* Wireless networks, deployment and monitoring, cognitive radio and dynamic spectrum access, networking for developing regions

**GUY CORTESI**
Professor of Practice
Electrical and Computer Engineering
Clarkson University
*Research Interests:* Effective use of information technology in distance reporting and virtual organizational settings; the relation of communication channel and task on group composition, participation and performance in virtual organizations
YANNA LIANG  
Assistant Professor  
Electrical and Computer Engineering  
Utah State University  
Research Interests: Fundamental and applied research and development on environmental and energy sustainability

WEIFU WANG  
Assistant Professor  
Electrical and Computer Engineering  
Dartmouth College  
Research Interests: Robotics, motion planning, manipulation

DOLA SAHA  
Assistant Professor  
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University of Colorado, Postdoc Rutgers University  
Research Interests: Analytics for wireless networks, spectrum forensics, indoor localization, CloudRAN, MAC-PHY crosslayer techniques, software defined radio

HANY ELGALA  
Assistant Professor  
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Jacobs University, Postdoc Boston University  
Research Interests: Telecommunications, digital signal processing, embedded systems

KIM BOYER  
Dean and Professor  
College of Engineering and Applied Sciences  
Purdue University  
Research Interests: Computer vision and medical image analysis, perceptual organization, structural analysis, graph theoretical methods, stereopsis in weakly constrained environments, optimal feature extraction, large model bases, robust methods

GARY SAULNIER  
Chair and Professor  
Electrical and Computer Engineering  
Rensselaer Polytechnic Institute  
Research Interests: Communications, signal processing, electronic instrumentation, impedance tomography systems for medical applications, acoustic data and power transmission systems

QI WANG  
Lecturer  
Computer Science  
California State University at Northridge, California  
Research Interests: Computer science, software development

MUSTAFA AKSOY  
Assistant Professor  
Computer Engineering  
The Ohio State University  
Research Interests: Microwave remote sensing, electromagnetic theory, geosciences, signal processing and data analytics

VLADIMIR KUPERMAN  
Professor of Practice  
Computer Science  
Moscow Mendeleyev University of Chemical Technology  
Research Interests: Information and computer technologies, computer networking, mathematics for decision making, global economics

DAPHNEY-STAVROULA ZOIS  
Assistant Professor  
Electrical and Computer Engineering  
University of Southern California, Postdoc University of Illinois  
Research Interests: Decision making under uncertainty, machine learning, Internet of things and e-health applications, detection and estimation theory, intelligent systems design, signal processing and communications, optimization, pervasive computing, sensor networks, stochastic control, embedded systems

Attracting the Best Minds

TO LEARN MORE ABOUT OUR NEWEST FACULTY, PLEASE VISIT:  
http://www.albany.edu/ceas/76069.php
Outgoing Student Association President **Felix Abreu** had the honors on 2017 Torch Night, igniting the flame symbolic of senior students shifting to UAlbany alumni, as Provost James Stellar looked on. Felix earned a BS in Computer Science in May 2017. (Photo by Paul Miller)
Creating Smart and Connected Communities

Daphney Zois, Charalampos Chelmis, and Wonhyung Lee (not pictured) were awarded an NSF grant of $1 million to develop a technology that will connect those in need with those willing to help. This multidisciplinary project addresses the social problem where those in need of help often do not know how to locate or access service providers. Likewise, service-providing agencies are often poorly coordinated, and volunteers who would like to donate time or money cannot easily determine who to help or how to best use their resources. This becomes more problematic when a situation demands the coordination of service providers, volunteers, and government structures, or when people are searching for help after business hours when communication channels become sparse.

This technology will facilitate an integrated “one-stop shop” for services that can be used both by the general public and agencies. Zois will lead the project and apply her engineering expertise in decision making under uncertainty; Chelmis will develop novel data mining and machine learning algorithms to identify best practices in helping those in need navigate the maze of available services; and Lee will connect the team with community stakeholders, integrating community feedback into their solution, and examine community dynamics to understand what a “smart and connected community” would look like. Zois, Chelmis, and Lee are assistant professors in Electrical and Computer Engineering, Computer Science, and Social Welfare, respectively. Read about this research on the university news page or the college news and research pages.
Determining the Authenticity of Digital Images

Siwei Lyu is part of a team of researchers who were awarded a federal grant of $2.5 million to develop algorithms to identify forged digital images and videos and to recover the traces of such digital tampering. The past decade has produced stunning advances in digital photography, and high quality digital camera and digital image processing techniques are now commonplace in personal electronics. Billions of digital images are uploaded to social media portals on a daily basis, and the average user’s ability to edit digital images has improved dramatically. Despite the obvious benefits and conveniences these technologies have brought to users, there also comes an unpleasant ramification—digital images have become more vulnerable to malicious tampering, and the ease of digital image manipulation has started to erode the long-held trustworthiness of photographs as reliable records of events.

Using statistical and computational analysis, the research team developed techniques that measure noise strength across a photo to determine which parts of the photo originated from different sources. Their algorithm, as part of the overall medifor platform, will automatically detect manipulations, provide detailed information about how these manipulations were performed, and reason about the overall integrity of visual media to facilitate decisions regarding the use of any questionable image or video.

Lyu, an associate professor in Computer Science, is part of a larger team led by Kitware Inc. (Clifton Park, N.Y.), with other participating institutions, such as University of California at Berkeley, Columbia University, and Dartmouth College. Read more about the project here.

Uncertainty Management for Dynamic Decision Making

Feng Chen received a US Army research grant of $329,910 to work on the development of efficient decision making in highly disadvantaged environments where there may be unreliable, incomplete, or conflicting information. He says, “In this project, we will conduct pioneer efforts for exploring multiple dimensions of uncertainty in a decision making process.”
Mariya Zheleva received an NSF grant of $175,000 to study Next Generation Spectrum Measurement Algorithms and Infrastructures. Radio spectrum is what we use for popular technology, wireless access points, mobile phones, fun and entertainment, health applications, and more. Various aspects of our lives increasingly hinge on our being wirelessly connected. The problem with wireless connectivity in its current state is that when Internet or cellular service providers set out to build a network, they are generally allocated a small chunk of exclusive radio frequencies for their use. When the demand grows and traffic increases, they still only have that small amount of spectrum because that is all the government has allocated to these technologies. The current paradigm of exclusive spectrum allocation is creating artificial scarcity of spectrum resources that has a dramatic impact on network performance and user experience.

The future of wireless connectivity is through opportunistic spectrum access. This new approach is a flip side of the current paradigm. Instead of locking devices into one small portion of the radio spectrum, the device will be a cognitive radio that is able to know its environment and then access a main spectrum that is currently unoccupied. The device will be intelligent enough to determine this on its own.

This has ramifications not only for the redesigning of the Internet, but also for the redesigning of devices. Phones will have to be smarter in order to adapt to the environment. Traditionally, devices have been conceived as a fixed architecture: in this new paradigm, the smart phone will have to know how to look for these frequencies and how to adjust to them.

This research also opens up opportunities for advancement in policy. Some of the inherent challenges and questions include how to roll out the future without impairing current technologies, policing of the spectrums, user privacy and security issues.

Zheleva and a team of researchers have been applying the opportunistic spectrum access concept at a farm in upstate New York to see how it works in real life. Mariya Zheleva is an assistant professor in Computer Science. Read more about the project here.

For more about these and other College of Engineering and Applied Sciences research projects, please visit our college webpage.
Department of Environmental and Sustainable Engineering

We are pleased to announce the launch of our new Department of Environmental and Sustainable Engineering (ESE) with the arrival of its founding chair, Professor Yanna Liang. ESE joins Computer Science and Electrical and Computer Engineering in our growing CEAS family and will take us in new directions as it expands our academic footprint. Dr. Liang comes to us from her position as a professor at Southern Illinois University’s Department of Civil and Environmental Engineering. Read more here.

International Partnership with Chongqing, China

The University at Albany has entered into an academic partnership with Chongqing University of Posts and Telecommunications that will bring Chongqing students to the UAlbany campus for the last year of their four-year program in computer science and software engineering. The program will allow Chongqing University students to obtain two degrees in four years, and will provide UAlbany faculty and students with opportunities for internships, research and project engagement at the university. Jonathan Muckell of Electrical and Computer Engineering was our first faculty member to teach in this dual degree program in Spring 2017, and Qi Wang of Computer Science followed in Fall 2017. In just one year into the program, there are 194 freshmen and sophomores enrolled. For more information about the program or to read more about Muckell’s connection to China, see some UAlbany news coverage about the program and about our first faculty member who taught in the program.
Excellence in Research and Creative Activities

Siwei Lyu, pictured with VPR James Dias (L) and Provost James Stellar (R), received a University at Albany President’s Award for Excellence in Research and Creative Activities. Siwei Lyu is an associate professor in Computer Science.

Department of Electrical and Computer Engineering

The Department of Electrical and Computer Engineering was launched in July 2015, and the computer engineering undergraduate program one year later. In Fall 2016, we welcomed 14 new faculty and our first group of engineering majors. Since then we have hired Professor and Chair, Gary Saulnier, who comes to us from Rensselaer Polytechnic Institute. This has been a year of explosive growth as our enrollments are three years ahead of projection. ECE graduate programs are currently in development. More information here. Visit the department here.

GPU Parallel Program Development Using CUDA

By Tolga Soyata

GPU Parallel Program Development Using CUDA teaches GPU programming by showing the differences among different families of Graphics Processing Units. This approach prepares the reader for the next generation and future generations of GPUs. The book emphasizes fundamentals that will remain relevant for a long time, rather than concepts that are platform-specific. At the same time, the book also provides platform-dependent explanations that are as valuable as generalized GPU concepts.
Do Smart Phones Hold the Key to Making Cities Smarter?

The following article was written by Michael Parker for the UAlbany NewsCenter on November 30, 2017. It showcases research conducted by Tolga Soyata, an associate professor in Electrical and Computer Engineering, and his students. Versions of this article have been published in news outlets around the world.

Whether it’s improved traffic patterns, energy savings or reduced noise pollution, cities across the world are actively introducing “smart” technologies to improve the quality of life for their citizens. But with costs and maintenance standing in the way, are there existing resources that could be deployed to bring about the same benefits to communities of the smart city movement?

University at Albany researcher Tolga Soyata and a team of students looked at one possible solution in a new study. They found that technology found in our phones and tablets have the capability to cover about two-thirds of the data that smart cities currently collect through dedicated sensors. By applying a mobile crowd-sensing (MCS) approach, communities may have the capability to transmit the same amount of data, with virtually the same level of accuracy.

Publishing in the Dec. 1, 2017, issue of *IEEE Sensors Journal*, Soyata and his students review the types of
smart technologies currently deployed in cities, which break down into two primary categories: dedicated and non-dedicated sensors, the latter being available as a built-in capability in every smartphone.

Most communities use a combination of cameras, microphones, temperature sensors, GPS devices and RFID (radio frequency identification) technology to monitor traffic, weather and energy consumption. These devices in turn supply data that makes it easier to track utilities, lighting, parking, health and the environment.

But among the key drawbacks to dedicated sensors are higher deployment and maintenance costs. And yet, almost all of the data cities collect can also be captured by our smartphones. The question becomes, can we trust the captured data, and protect the privacy of users who might be supplying information in lieu of a dedicated sensor network?

“The MCS concept also has known implementation challenges, such as incentivizing the crowd and ensuring the trustworthiness of the captured data, and covering a wide sensing area,” said Soyata, an associate professor of Electrical and Computer Engineering in the College of Engineering and Applied Sciences. “Considering the pros and cons of each option, the decision as to which one is better becomes a non-trivial answer. In this paper, we conduct a thorough study of both types of sensors and draw conclusions about which one becomes a favorable option based on a given application platform.”

For instance, while one smart device delivering data might diverge by up to 10 percent of dedicated sensors, as more users are added, the cumulative information was found to be within a percentage point. According to the Mobility Report by Ericsson.com, there could be as many as 6.1 billion smart phones in circulation by 2020. That’s a vast number of potential data collectors for communities large and small. But smart phones aren’t quite a catch-all answer for the type of data dedicated sensors currently provide. “We show that while all sensors are available in dedicated form, about two-thirds are available in non-dedicated form,” said Soyata.

Still, the potential impact of non-dedicated sensors to make cities more efficient and improve the lives of residents is substantial.

“Based on our comprehensive survey, which followed a feasibility study of non-dedicated sensor usage, we argue that non-dedicated sensors provide a viable alternative to future smart city applications,” Soyata said.
6th Annual Bunshaft Lecture

Wendi Heinzelman, Professor and Dean of the Edmund A. Hajim School of Engineering and Applied Sciences at the University of Rochester, gave our 6th Annual Bunshaft Lecture to a standing-room only crowd in the Assembly Hall at the University at Albany on November 1, 2017. Her lecture, “Inspiring the Next Generation of Leaders to Make the World Ever Better,” was an inspiration to students, faculty, and staff alike. Established through the generosity of Albert Bunshaft ’80 and Caryn Bunshaft ’82, The Bunshaft Endowment in the College of Engineering and Applied Sciences provides support for this lecture, which was designed to provide information to the student community about a broad range of topics related to careers in computing science. With the advent of the new college and its engineering programs, the Bunshafts graciously agreed to expand the series to include engineering sciences as well. Read more about the Bunshaft Lecture here.

Engineering Enthusiasm

In Spring 2017, Professor Betty Lise Anderson of The Ohio State University and a team of faculty and staff from the College of Engineering and Applied Sciences (CEAS) brought a hands-on engineering project to students at Hackett Middle School in the Albany School district. Anderson, a professor of Electrical and Computer Engineering at Ohio State also directs a K-12 Engineering Outreach. In that capacity, she and her students have reached more than 100 schools and over 18,000 students, developing 20 different kid-friendly engineering projects. CEAS is interested in piloting similar initiatives as research indicates that the 6th grade is the “sweet spot” for igniting interest in engineering.

“Projections indicate a large disparity between future demand for engineers and the estimated number of people who will be qualified to fill those jobs,” Boyer said. “By bringing tangible projects that introduce students to engineering principles, we challenge already inquisitive children to think like inventors and problem-solvers.”

As part of the University’s planned initiative to introduce STEM fields to local schools, Anderson spent the morning leading faculty and staff in building speakers made out of paper, and a DC motor, so that they could show a 6th grade science class at Hackett Middle School how to build their own paper speakers that afternoon. Read more and see slide show here.
At the College of Engineering and Applied Sciences, we embrace the values of academic excellence, research excellence and service excellence. These values apply just as much to our students as to our faculty and staff. Following are brief highlights of just some of the accomplishments of our exceptional students. Other students who deserve recognition are: Shantrece Fludd for receiving the William A. Bloom ’85, Women in Technology Scholarship; and Andrew Furgiuele for receiving the Ken W. and Thelma Miller Abele ’38 Research Fund. Stuti Misra was honored with the Outstanding Senior Award, a President’s Award for Leadership, and Akanksha Atrey presented her research (under the direction of Professor Feng Chen) on “Twitter Popularity Diffusion of Presidential Candidates through Detection of Twitter Bots” at the MIT Undergraduate Research Conference 2016.
IEEE AI City Challenge

Computer Science doctoral students Yi Wei and Jonathan Song, and Lipeng Ke, a visiting student from the University of Chinese Academy of Sciences in Beijing, were part of a team led by Professors Ming-Ching Chang and Siwei Lyu from UAlbany’s Computer Vision and Machine Learning (CVML) Lab that was awarded an “Honor- ary Mention” in the first IEEE Smart World NVIDIA AI City Challenge on August 5, 2017 in San Jose, California. The purpose of the challenge was to solve real-world transportation problems related to safety and congestion.

The CVML team received an “Honorary Mention” award for their overall contributions to the competition. Their model in the Vehicle Detection Challenge was ranked number one in best performance in the AIC 1080 test set, and their vehicle detection and tracking results were used as a baseline to support all the other teams in the Smart Transportation Challenge. Read more about the project here.

Chancellor’s Award

Stuti Misra won a 2017 SUNY Chancellor’s Award for Student Excellence. A double major in Computer Science and Mathematics, Misra was a member of the Honors College, Omicron Delta Kappa and the Presidential Honors Society. She co-founded Cultural Connections and was vice chair of the campus chapter of ACM-W, an international scientific and educational computing society for women, and a documentation specialist for the Association for Information Science & Technology UAlbany Chapter. Misra was also the 2016-2017 recipient of the Bruce B. and Louise Steen Gravitt Scholarship, which provides financial assistance to full-time, female students majoring in mathematics. Read more here.

Presidential Award for Undergraduate Research

Stuti Misra was also selected to receive the 2017 Presidential Award for Undergraduate Research.
Spellman Award

Akanksha Atrey received the Spellman TOP Academic Achievement Award in 2017. The Spellman Awards recognize accomplished students of African, Latino, Asian and Native American descent. Atrey graduated in December 2016 with a double major in B.S. in Computer Science and Applied Mathematics and a B.S. in Mathematics. She was also the recipient of the 2015-16 Bruce B. and Louise Steen Gravitt Scholarship. Click here for more.

Undergraduate Research

Dong Woo (Steven) Yoo was selected to participate in the University at Albany’s 14th Annual Undergraduate Research Conference. He presented on his work on “Affective Viewer Analysis: Analyzing Facial Activities of Viewers Based on Videos and Multiple Choices.” Yoo created a web framework that can capture facial movements and self-reported emotions of viewers who watched affective video content.

Ultra-wideband Technology Project

Priti Pachpande, a PhD candidate in Computer Science, worked on the ultra-wideband technology project with a research team from the Center for Technology in Government (CTG) and the Signals & Networks Lab (SINE) in the College of Engineering & Applied Sciences. The team worked with UAlbany’s Parking and Mass Transit and the Office of Facilities Management to study the feasibility of using ultra-wideband (UWB) technology, a wireless radio system that uses a small amount of energy to transmit large amounts of data over a wide range of frequency bandwidths to allow for ranging and localization at the same time. For more about this research project, see the news coverage here.
Undergraduate Research Spotlight

Undergraduate student researcher Jesse Parent presented at the 2017 Association for the Advancement of Artificial Intelligence’s Fall Symposium Series (AAAI FSS) in the Artificial Intelligence for Human-Robot Interaction (AI-HRI) track. During the symposium, Parent did a presentation and poster session about the research he has been doing with Professor Yelin Kim of Electrical and Computer Engineering. His report about the conference experience highlights the tremendously positive impact undergraduate research opportunities have on our students. Parent noted, “I only encountered one other research project featuring undergraduate students, which is a nod to the quality of our work. Most students were PhD candidates with their PIs - so this was an informative glimpse at what continuing in graduate research looks like.”

Parent was enriched by the experience in a variety of ways, from the conversations and interactions with both experts and fellow students to learning more about robots and intelligent systems that are used in a variety of ways to modify human interaction. However, one of the biggest “take-aways” was in his role as a researcher and presenter.

Parent said, “There was a period of acclimation the first day when being exposed to graduate and advanced research, but this may be the most valuable takeaway: I got to see what higher level research look like, and I eventually came to understand how this symposium functions to help develop the AI research community. It’s a group of people working to develop a field of study and set of research priorities, and an arena to discuss ongoing research, with veterans in the field ready to listen and offer advice. I saw its role in the broader sense of research.”

Parent is inspired to continue in his own personal research involvement. He says, “My life is very different from the start of this year when I first saw one of [Professor Kim’s] flyers on a wall. It’s been one of the most challenging experiences of my life, with unprecedented and unexpected rewards. I am left with a stronger sense of community about research and a desire to help develop it.” He also strongly encourages fellow undergraduate students to get involved in research as “it offers a lot of useful perspective – on a specific topic but also a much broader scope of how a whole range of associated developments fit together. There’s value in understanding the questions and challenges, in other people’s specific research aims, and for the broader community.”

For more about Undergraduate Research at UAlbany, view our undergraduate research page or video.
The University at Albany, SUNY (UAlbany) is home to the largest population of underrepresented minority students of any SUNY University Center and includes a population of 49% female students. Located within this diverse population, CEAS is poised to support members of our female student body in their pursuit of STEM fields in computing and engineering. Our vision is to inspire and educate a new generation of innovators who will solve problems of great importance to society. We believe supporting women in computing and technology innovation is critical to this initiative.

Statistics show that a high percentage of women do not complete STEM degrees. In order to encourage the retention of our female students, CEAS registered as a platinum sponsor for the 2017 Grace Hopper Celebration, the world’s largest annual gathering of women technologists, and sponsored eight of our promising female students. Under the leadership of faculty members Chinwe Ekenna and Dola Saha, and assisted by academic advisor Michelle Mora, our students attended exciting, informative, and dynamic presentations from experienced female technology leaders. They also networked with a number of the other 18,000 conference attendees at various events.

One of our students received multiple job offers and was faced with the good problem of deciding which
one to accept. Another student also received a job offer, while others were able to interact with potential employers and secure interview spots. The interview experience was illuminating as the students learned what skills potential employers required, which would further inform areas to bolster in their academic development.

Overall, this experience made a positive impact on the lives of these young women. Here is some of what they had to say:

“Being the only girl in my engineering classes and one out of a handful in my programming classes, I just felt lonely and at a disadvantage. What I didn't know was that there was always a huge support network for us women in technology. By attending the Grace Hopper Conference, I met such brave and remarkable women who have suffered so much, yet come so far in their lives. These women gave me inspiration that I was lacking and I've come back to UAlbany with a new and determined mindset. Also, being a sophomore, I even got two interviews which were very unexpected! Thank you UAlbany, for this amazing opportunity and I'm so fortunate to be a woman in technology.”

(Nimra Faheem)

“GHC is a grand celebration of women in computing. The conference is not only a place for knowledge sharing and networking opportunities but also fun and empowering women through the inspirational stories of many women role models! [And] the keynotes were phenomenal.”

(Aparna Joshi)

“I was impressed by the scale, scholars and new techniques. It broadened my view, touched me deeply and inspired me to work harder… And the grace hopper celebration lets me feel that I am not alone, thousands of people have similar issues, we can communicate with each other, help each other.”

(Yu Zhang)

“GHC was the best experience of my life. I had an opportunity to interview with companies… Keynotes were so inspiring, I feel so motivated after hearing the speakers' stories…”

(Shreshta Kota)

“I received an opportunity to communicate with people from different ethnicities and races, and could share my thoughts with them related to academics and technologies. The keynote and open source sessions were really inspiring…”

(Aakriti Upadhyay)

“The atmosphere was amazing… I must say overall it was the best experience ever… I learned a lot in just a few days and I left the conference with three job offers. The conference showed me the importance of networking and experience; it also taught me that no matter the difficulties that happens, there is always a way.”

(Titilayo Robinson)

The 2017 Grace Hopper Conference took place at the Orange Convention Center in Orlando Florida in October 2017. Chinwe Ekenna and Dola Saha are assistant professors in Computer Science and in Electrical and Computer Engineering, respectively. Additional conference photos can be found here.
According to a definition provided by the World Commission on Environment and Development, sustainability is meeting the needs of the present generation without compromising the ability of future generations to meet their needs. In today’s world, as resources are being depleted, the environment is becoming deteriorated, and the natural disasters are increasing in their frequencies and damaging power, we, as scientists and engineers, must find creative solutions to maintain sustainability in at least environment and energy. One way to ensure a sustainable future is to dig valuables from low value materials or zero value wastes. Read about three projects that do just that.

Scientists and engineers must find creative solutions to maintain sustainability in environment and energy. One way to ensure a sustainable future is to dig valuables from low value materials or zero value wastes. Read about three projects that do just that.

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cong to a definition provided by the World Commission on Environment and Development, sustainability is meeting the needs of the present generation without compromising the ability of future generations to meet their needs. In today’s world, as resources are being depleted, the environment is becoming deteriorated, and the natural disasters are increasing in their frequencies and damaging power, we, as scientists and engineers, must find creative solutions to maintain sustainability in at least environment and energy. One way to ensure a sustainable future is to dig valuables from low value materials or zero value wastes. After all, waste is not waste until it is wasted. On this aspect, we have embarked on three different projects.

First, producing biofuels from biomass feedstocks. Biomass including engineered energy crops/plants, agricultural residues, farm and yard wastes, animal wastes, sludge generated from wastewater treatment plants, and any other wastes that contain organic materials, are renewable, domestic, and sustainable. These abundant supplies of > 1 billion dry ton can be processed through two platforms: biochemical and thermochemical, to generate a broad variety of fuels and chemicals (Fig. 1). This biorefinery has the potential to replace all chemicals and materials we obtain traditionally from non-renewable resources, such as petroleum and coal. In our lab, we have worked extensively on both platforms. On the biochemical side, we have studied biomass pretreatment, enzymatic hydrolysis, and microbial fermentation. The direct products from these treatment trains include ethanol, lactic acid,
and microbial lipids. The former two can be used directly or as building block chemicals in industrial processes and the latter can be further transformed to jet fuel, gasoline, and diesel. On the thermochemical side, a straightforward process, hydrothermal liquefaction operated at 300° C for 1 hour can generate biocrude from biomass at an efficiency higher than 62%. The resulting biocrude has similar properties as petroleum crude. Once validated by life cycle analysis, our holistic approach is ready to be applied at large scales.

Second, developing innovative approaches for using coal. Certainly, coal is not renewable and sustainable in the long-term. But considering the copious presence of coal which has nearly 275-year supply, it is wise to use it properly in an environmentally friendly and responsible way rather than leaving it underground or blaming it for our environmental problems. One original way to using coal is to generate methane out of it either in situ or ex situ. This is termed as biogasification. In the in situ case, coal is untouched and unmined. Once suitable nutrients are added to the coal seam, the indigenous microbes will degrade coal and convert it to methane. For ex situ, mined-out coal can be treated as any organic materials and digested anaerobically (Fig. 2) to generate biogas that contains around 50-80% of methane. The resulting methane can be used as a raw material to produce a wide range of chemicals and fuels.

Another approach for generating high value commodities from coal and coal-derived products is to extract rare earth elements (REEs) out of these materials. REEs are a group of 17 elements including the 15 lanthanides plus yttrium and scandium. They have broad uses in clean energy production, health care, automotive, electronics, and defense industries. Currently, the US does not produce REEs at commercial scales and the lack of a secure and stable supply of domestic REEs could result in potential risk to the U.S. economy and defense. Considering the potential negative impacts of mining, separating and extracting REEs from coal and coal by-products is a promising solution. Our investigation at this end has demonstrated that leaching REEs out of coal fly ash through microbial activities, a process coined as bioleaching, is highly effective. Using Ytterbium (Yb) as an example, around 68% of this element can be dissolved from fly ash at 28° C for 6 hours (Fig. 3). Compared to thermal and chemical leaching processes, bioleaching offers the benefits of low cost and minimum environmental impacts.

Third, perfecting leading-edge strategies for converting CO2 to fuels and chemicals. To mitigate CO2 emission from stationary sources, such as power plants, capturing and sequestering CO2 have been investigated extensively. However, these expensive approaches do not generate any values from CO2, not to mention the great unknowns and possibly dire consequences from storing CO2 underground. For the purpose of converting CO2 to commodities, we are studying the microbial electrosynthesis cells (MECs). MEC requires a small external potential, in addition to the potential produced by microbial
CO2 and will lead to a biomanufacturing process where valuable building block chemicals can be generated from carbon stored in highly stable CO2.

In summary, a sustainable environment and energy market is achievable, but it demands research and development in multiple arenas, expertise from different backgrounds, and a workforce trained in interdisciplinary fields. There is no one silver bullet that can solve the sustainability challenge possessing such an immense dimension. Working together, from policy decision makers, investors, scientists, engineers, communities, to citizens is the only way to tackle this giant of sustainable development. It is not going to be an easy task for sure, but doable if we all share the same vision and roll our sleeves up together.

Yanna Liang is Professor and Chair of the Department of Environmental and Sustainable Engineering. Visit her faculty page.
The Future of Complex Pattern Discovery in Big Attributed Network Data

By Feng Chen

While existing pattern detection methods rely on basic subgraph mining or feature selection techniques, we believe the field of pattern discovery is about to experience a major paradigm shift from the era of big network topology or big attribute data to the era of big attributed network data.

Recent advances in sensing and computing techniques have led to a need for massive quantities of data to be aggregated from both traditional and nontraditional data sources in fields such as science, engineering, and business that are naturally modeled in the form of big attributed networks. A big attributed network (BAN) is characterized by a combination of (a) high-dimensional and heterogeneous network topologies that may contain billions of vertices and edges of multiple types and (b) high-dimensional and heterogeneous attribute data composed of hundreds or thousands of heterogeneous attributes. Examples of BAN data include networks that combine “Big data” from sources such as Twitter feeds with traditional surveillance data to support influenza studies and biological networks that combine molecular profiling data with mutation data and gene regulatory data for cancer research.

Our work focuses on the role that artificial intelligence and machine learning methods can play in a wide range of complex pattern discovery tasks that utilize BAN data, such as the detection and forecasting of societal events (disasters, civil unrest), anomalous patterns (disease outbreaks, cyber attacks), discriminative subnetworks (cancer diagnosis), knowledge patterns (new knowledge building), and storylines (intelligence analysis), among others. We define complex pattern discovery as a search of subsets of vertices, edges, and attributes in a BAN dataset that identifies subsets that maximize some measure of interestingness or anomalousness. For example, consider a situation in which a large amount of live disease surveillance network data is collected from heterogeneous information sources such as hospitals, drug stores, news reports, and Twitter feeds. Given the availability of a disease surveillance network such as the one illustrated in Figure 1, public health practitioners would be able to identify at an early stage whether an outbreak is occurring, what type of outbreak it is (characterized by a subset of heterogeneous attributes), and which areas have been infected (characterized by a subset (subgraph) of vertices and edges), thus enabling a timely and effective public health response. To complete this analysis, we need to find...
subsets (subgraphs) of vertices and edges that have higher-than-expected counts for some subset of attributes likely to serve as indicators of an emerging outbreak.

The last decade has seen major advances in various pattern detection methods that fall into two different research areas, namely (1) subgraph mining in big network topology, involving the detection of dense subgraphs, subgraph isomorphism, or important common structures in big network data; and (2) feature selection in big attribute data, including the detection of subsets of features/attributes that have preferred sparsity structures (e.g., block-sparsity; cluster-sparsity) that can be used to predict one or multiple response variables (discrete or numerical). However, as yet little has been done to bridge these two important research areas, which will be an important requirement for the effective analysis of BAN data.

While existing pattern detection methods rely on basic subgraph mining or feature selection techniques, we believe that the field of pattern discovery is about to experience a major paradigm shift from the era of big network topology or big attribute data to the era of big attributed network data. This shift towards the analysis of data at the societal scale will require a corresponding shift in the methodologies employed that will (1) support the development of a unified, theoretical framework capable of discovering complex patterns in BAN data; (2) enable users to perform simultaneous subgraph mining and feature selection that can detect subtle, complex patterns (Figure 2); and (3) render the detected complex patterns transparent and interpretable to facilitate the incorporation of rich user feedback into the detection process.

The researchers in CS are currently developing the next generation diagram for complex pattern discovery in BAN data. The new diagram will include (1) advanced combinatorial optimization methods capable of detecting subtle, complex patterns in a extremely large combined space of vertices, edges, and attributes; (2) deep structured and adversarial methods capable of learning complex patterns of interest from both massively available unlabeled BAN data and sparse human-annotated labels; and (3) an interactive, user-friendly system for interpreting the complex patterns discovered by identifying the data modalities, heterogeneous dependency structures, and subsets of attributes most responsible for the discovered patterns.

We anticipate a dramatic increase in the number, quantity, and complexity of BAN data in various application fields in the very near future, with complex pattern discovery playing an ever more important role in various aspects of our lives. For example, the IoT (Internet of Things) will create a gigantic attributed network that connects physical devices, vehicles, home appliances, and other items with embedded electronics such as software, sensors and actuators around the world (Figure 3). Complex pattern discovery in the IoT-enabled BAN data will enable more effective detection and forecasting of emerging events at both the societal level (natural disasters, disease outbreaks, cyber attacks, financial crises) and the individual level (cancer diagnosis, new knowledge building). We are working on the tools we will need to manage this avalanche of new information effectively.

Feng Chen is an Assistant Professor in Computer Science.
There is no deep understanding about deep learning...

By Siwei Lyu

Overview

Until very recently, computers were dumb and their capacities were primitive, limited to repetitive and low level tasks. We could only dream about the artificial intelligence (AI) at the level of the omnipotent HAL 9000 as in the Stanley Kubrick’s classical, Space Odyssey 2001.

Somehow unexpectedly, AI experienced a “big bang” in just a few years. Nowadays, it has become the hottest buzzword, and tech giants and nova startups keep stunning us with advances unimaginable even 5 years ago: a car that can drive itself, an algorithm that can beat a human master in the game of Go, and more importantly, computers that can “think” like humans. Predictions have been made that AI will become a driving force in the coming decades and contribute $15.7 trillion to the world economy by 2030.

All these attribute to the development of “deep learning.” A deep learning model is a type of artificial neural network (ANN). This is a loose analogy to the human brain, where tens of millions of biological neuron cells are interconnected, so that we can think and act intelligently. These neuron cells in human brains are formed as layers, with lower layers feeding processed information to the higher levels, each with increased complexity and abstraction. The deep neural network uses instead “artificial neurons” which simulate at a very crude level the function of its biological counterparts, and are also formed into many layers that are interconnected with each other. It is through the “training” of all these interconnected artificial neurons, i.e., feeding the model with many input-output pairs (e.g., images of different fruits and their names), that it can “learn” those concepts (e.g., if an image contains an apple or a pear).

ANN is known since the 1960s, but like the human brain, it needs billions of computations over lots of data to train. Such a task in 1980s PCs required months, when good training data themselves were rare. Other alternatives like SVM, boosting or decision trees can solve most problems fast, so ANN was forgotten. However, with today’s hardware (NVIDIA GPUs, Google TPUs etc.), we can train an ANN in hours, optimal parameters are known, and more labeled data are available. After 2010, one AI field after another was mastered by deep ANNs, winning over other methods, and it is not rare they beat us on those tasks. Here are some examples of what they can do:

- Deep learning models can see, and master many vision jobs, like identify cancer or other diseases from medical images, statistically better than human radiologists, ophthalmologists and dermatologists.
- They can hear, not only to understand voice, but to infer the speaker’s emotion when they make the voice. They can also understand languages, and can translate languages fairly accurately on cellphones.
- Cars are now driven automatically by deep learning models with no human intervention.
- Trained deep models are winning over human masters on the super-difficult game of Go, an achievement that until a few years ago was predicted be impossible until 2050.
- Deep learning models are also learning to interact with humans. They win at poker games by learning to bluff, handling missing and potentially fake, misleading information. Bots trained to negotiate and find compromises, learned to deceive too, guessing when someone is not telling them the truth, and lying as needed.
- They are also capable of being “creative.” Deep learning models can paint in any style learnt from samples (for example, Picasso or yours), and apply
the style to photos. And the inverse: guess a realistic photo from a painting, hallucinating the missing details. Deep learning models can look at screenshots of web pages or apps and write code producing similar pages or apps. They can also compose music in style from Bach to the Beatles. The average person cannot differentiate what painting, code or music was composed by humans or by machines, making the current deep learning models tantalizingly close to passing the Turing test.

Our work

We were early adopters of deep learning, and the Computer Vision and Machine Learning (CVML) Lab at the College of Engineering and Applied Sciences of UAlbany has many projects aimed at understanding deep learning and extending their applications to solve more real life problems.

In an early work, collaborating with a neurologist, we develop deep learning based models for brain computer interface and helped patients with amputated limbs to recover partial mobility, by deciphering the brain signals and turning them into actions (e.g., moving cursors on a screen and click).

Since 2015, we have been working on ideas using recursive neural networks (a variant of deep learning methods for time series data) to recognize human poses in 3D structures. From a sequence of skeleton joints collected using RGB-D cameras, such as those found on Microsoft Kinect, our deep learning model tries to figure out with what activity they correspond. Such is an important task for many applications; for instance, a service robot working with patients in a hospital or rehabilitation center can use this information to understand and predict a patient’s situation, or a smart surveillance system can use the information to predict intentions of individuals in order to prevent incidents.

We have also used trained deep learning models to understand human poses from images and videos. An application of this work is sign language understanding.

Additionally, we have been using deep learning models’ exceptional capacity to detect and track moving vehicles on the road, which is useful for city-wide traffic surveillance applications.
Another application of deep learning model is in the detection of doctored photographs or videos found on the Internet. As an example shown here, the model can see regions of an image that have been spliced into another image.

**Challenges**

However, after years working on this topic, I still feel like we do not know a lot about deep learning, in a sort of punch line that “there is no deep understanding about deep learning.” For one thing, despite the impressive achievements, the deep learning algorithms are still “black boxes” with nebulous and complex internal reasoning that we do not totally understand. Even computers can “learn,” unlike humans, they cannot explain what they have “learned,” or if they have “learned” the right thing. This is problematic if results from deep learning are to be used in front of a jury or non-experts that require interpretation. Researchers at the CVML Lab are working on the interpretation of deep learning image recognition models. When the deep learning model detects “mouse traps” for an image, we ask the question “why it sees a mouse trap there?” The algorithm we are developing returns an analysis showing which parts of the image support the recognition of the mouse trap (red part) and which parts of the image weaken it (see figures to left). Such analyses can provide us with more insight to look deeper into the deep learning models.

Siwei Lyu is an Associate Professor in Computer Science.
As our lives get increasingly connected, an overwhelming number of innovation driving economic growth and social well-being are strongly rooted in wireless technologies. As a result, today’s wireless networks must accommodate an increasingly large amount of heterogeneous traffic. In terms of volume, the joint increase of number of wireless devices and the amount of traffic generated (and consumed) has grown exponentially with widespread adoption of various “smart” devices. This trend is likely to continue with the recent boom in the Internet of Things, or IoT for short, which are broadly composed of dense networks of small and constrained devices enabling a gamut of new services and applications.

Another innovation in this space is seen in building smart and connected communities that require interoperability of disparate entities spanning government and private ownership. At the same time, the performance of modern wireless networks is plagued by limited radio frequencies, critical for emerging communication paradigm and tightly controlled vertical markets that limit agility of devices across network boundaries. Furthermore, as we strive to bridge the cyber world to our physical realm with adoption of real-time immersive applications like augmented and virtual reality applications, reducing latency in wireless networks become imperative. For example, telesurgery requires reliable transmission of extremely high quality multimedia content across large geographical regions with minimal latency. Addressing these issues in the new age of information requires focused research in maximizing the capabilities of existing networks while exploring ideas that are only limited by the imagination.

This wide spectrum of problems necessitates fundamental research that lead to practical solutions in wireless and mobile networks. This has also been recognized by various federal agencies, such as National Science Foundation, DARPA, etc, by allocating substantial resources towards advancing research in network interoperability and virtualization, massive multi-antenna and millimeter wave communications. Emphasis is made on making networks, devices and applications spectrally agile and nimble with cognitive abilities to adapt in dense, resource constrained wireless environment.

The College of Engineering and Applied Sciences at University at Albany is well-positioned to actively contribute to this scientific revolution in next generation of wireless networks. Multiple faculty members in the departments of Computer Science and Electrical and Computer Engineering are engaged in interdisciplinary research on various problems in the mobile wireless networks. Specifically, Dr. Mariya Zheleva, Dr. Dola Saha and Dr. Aveek Dutta address topics in spectrum efficiency, agile wireless network architectures and network coexistence for heterogeneous IoT traffic, and low-latency technologies. Their work has been funded by the National Science Foundation and Private institutions like Huawei Technologies combining for over 60 publications in notable conferences and journals. They are also diligently working towards developing graduate and undergraduate curriculum to train the next generation of researchers and skilled work force in the field of mobile and wireless networks.
Aveek Dutta is an assistant professor in Electrical and Computer Engineering and co-directs the Mobile and Emerging Systems and Application (MESA) Lab with Dr. Dola Saha.

Mariya Zheleva is an assistant professor in Computer Science, and the founder and director of the UbiNET Laboratory at University at Albany.

Dola Saha is an assistant professor in Electrical and Computer Engineering and co-directs the Mobile and Emerging Systems and Application (MESA) Lab with Dr. Aveek Dutta.
Yelin (Lynn) Kim

Lynn Kim loves watching her students grow and is excited to be part of growing the College of Engineering and Applied Sciences.

Yelin Kim joined UAlbany a year ago as an assistant professor in the Department of Electrical and Computer Engineering at the College of Engineering and Applied Sciences, just after completing her PhD at the University of Michigan, Ann Arbor.

Kim’s research focuses on systems that can sense and interpret social signals, and she is a director of the INSPIRE lab, which stands for Interaction Sensing and Perception in Real Environment.

What are you working on now?

I work on automatic emotion recognition, a technology that can provide emotional intelligence to AI systems. My work focuses on developing statistical and algorithmic approaches that can quantify and analyze nonverbal human behaviors in multimodal (audio-visual) data, particularly emotion expressions during interactions. This research builds upon multimodal signal processing, machine learning, and behavioral science.

What made you decide to pursue your field?

I’m deeply interested in understanding human interactions. I want to quantitatively uncover and analyze our affective behavior to advance the fundamental understanding of how humans socially interact with each other, with machines, and with the outside world.

Emotion is an essential component of human interaction and experience, and it can provide clues about our needs, preferences and attitudes. It also affects and regulates how we perceive, judge and react. I believe that automatic emotion recognition research can open a new window to human-centered, affective technology that can impact a variety of fields, such as robotics, healthcare, security, education and marketing.

If you weren’t teaching at a university what would you be doing?

I love teaching and it is one of the most rewarding experiences to see how my students grow over time. If I wasn’t teaching at a university, I would be still teaching at a secondary school or...
My first teaching experience was when I was a freshman at a college. I was a part of a volunteering club at my university, which organized annual three-day camps at Muju, a rural area in South Korea. We mentored high school students in economic difficulties to support their academic and personal growth. From that experience, I learned that education can change one’s life and career.

What's the best thing about working at UAlbany?

One of the most exciting things about UAlbany is our new College of Engineering and Applied Sciences. We are at the exciting growth mode right now, and I am thrilled to be part of this. Along with an undergraduate engineering program to serve a diverse student body, we are committed to building a strong, research-focused graduate program. The University has invested heavily in CEAS and the commitment to developing the faculty and the program are very strong!

What’s one thing students might be surprised to know about you?

During college, I worked as a part-time volunteer tour guide in Seoul, South Korea (my hometown), showing foreign tourists beautiful places in Seoul — such as Gyeongbok Palace, Deoksu Palace, and Insa-Dong. Let me know if you are planning to visit Seoul!

For more about Professor Kim’s research, visit her research page.

Mariya Zheleva

Wireless networks and the rugged places of the world.

Mariya Zheleva first came to UAlbany in 2014 as a visiting assistant professor at the College of Engineering and Applied Sciences. She became an assistant professor in the College’s Computer Science Department in the early 2016.

“I am excited to be a part of such energetic and diverse community and have truly enjoyed my work with the undergraduate and graduate students in the department,” she said.

What are you working on now?

My research is on next-generation wireless networks. I like studying existing large-scale wireless network deployments in various environments, from urban to rural, and from rural Africa to agricultural U.S. and refugee camps. These studies allow me to pinpoint shortcomings in off-the-shelf technologies and figure out ways to improve them or fundamentally change them.

For example, one key limitation of today’s wireless networks is the predefined, small amount
of radio spectrum they use. We are designing technologies that will allow future wireless devices to scavenge for and use any available spectrum. This is not easy, because current wireless devices by design operate on fixed frequencies and all the protocols and applications assume such operation. Next-generation scavengers will not only have to be fast and robust in picking frequencies but will also need to be cautious not to disrupt the operation of user applications.

While I love fiddling with research prototypes in the lab, what truly energizes me in my research is the opportunity to go out and study real networks and to deploy some of the new technologies we develop in real-world environments. This line of my research has brought me to rural Zambia, where we have deployed software-defined cellular networks and to agricultural U.S., where we are deploying networks with dynamic spectrum access.

What made you decide to pursue your field?

I received my bachelor’s and master’s degrees in electrical engineering with concentration in wireless networks. Then I worked in a large internet service provider and a national mobile operator. I liked finding ways to automate or improve different aspects of the networks we managed. At one point, I realized I want to make a difference in the future of these technologies, in a way that will allow people to have equal Internet access, despite their income or geographical location. This brought me to the decision to pursue my PhD and later pursue an academic career. It’s been a great journey so far.

If you weren’t teaching at a university, what would you be doing?

I would probably be running an NGO to bring wireless connectivity and applications in infrastructure-challenged environments such as rural Africa, refugee camps and agricultural lands.

Dinner tonight with anyone, living or not: Who, and why?

Living for extended periods of time in different places around the world has resulted in us having many dear friends all over the place. If there was a chance for all these amazing people to come together for a night, this will be the best dinner I could ever wish for.

What’s one thing students might be surprised to know about you?

I love adventuring in nature: from diving in airplane wrecks to long backpacking trips and spelunking. One of my favorite backpacking adventures was hiking Mount Kilimanjaro, which we ascended in five days and descended in one (followed by a day for leg recovery in a coffee-shop in Moshi).
What made you decide to pursue your field?

Impact opportunity. Nothing has a higher impact potential than technology that can improve human lives, let alone bring back the motor functions they lost.

Who is someone who influenced you?

Carl Friedrich Gauss, the brilliant German mathematician whose work influenced number theory, algebra and geometry. In addition to being an amazing academic, he graduated Ph.D. students who ended up being as successful as himself. His impact is unmeasurable.

What’s the best thing about working at UAlbany?

It’s exciting to be part of the new College of Engineering and Applied Sciences, a small school with an unknown name — at least for now. But all it takes is that one big thing coming out of here, and suddenly we are no longer unknown. This opportunity is pretty exciting.

What was your first job?

My first job was at a company – in Istanbul – that built/sold RF antenna amplifiers to feed a single large antenna into multiple TVs in a 10-12 story skyscraper. I was responsible for soldering the amplifier boxes and testing them using a test antenna with a few test TVs inside the company, before we delivered them.

Tolga Soyata

The thrill of starting a new college.

Tolga Soyata is an associate professor of electrical and computer engineering in UA-

bany’s College of Engineering and Applied Sciences. Soyata joined the University last year, leaving a similar position at the Uni-

versity of Rochester because, he said, “the highly promising prospects for the Electrical Engineering Department and the credentials of Dean Kim Boyer convinced me that this department would go really far.”

Soyata’s research involves cyber physical systems — networked embedded systems such as those that monitor seismic activity and send out warnings — as well as digital health and high-performance medical data processing and visualization.

What are you working on now?

I’m working on a project to read the human brain activity from the EEG signals it emits. This research could lead to high-impact results by helping individuals who lost their motor skills by using prosthetic arms that are powered by strictly brain signals.
Pradeep Atrey
Associate Professor
National University of Singapore
Research Interests: Multimedia data analytics with a focus on security and privacy issues in application areas such as surveillance, social media, and cloud computing

George Berg
Associate Professor
Northwestern University
Research Interests: Machine learning, computational biology, natural language processing

Peter Bloniarz
Associate Professor
Massachusetts Institute of Technology
Research Interests: Curriculum and pedagogic innovations, public sector information systems

Petko Bogdanov
Assistant Professor
University of California, Santa Barbara
Research Interests: Data mining and management with a focus on graph data and applications to bioinformatics, neuroscience, material informatics and sociology.

Charalampos Chelmis
Assistant Professor
University of Southern California, Los Angeles
Research Interests: Modeling, algorithmic, computational, practical aspects of all V's of Big Data, Network Science

Feng Chen
Assistant Professor
Virginia Polytechnic Institute and State University
Research Interests: Detection of emerging events and other relevant patterns in the mobile context and/or data mining of spatial temporal, textual, or social media data

Mei-Hwa Chen
Associate Professor
Purdue University
Research Interests: Software reliability modeling, software testing, software architecture

Chinwe Ekenna
Assistant Professor
Texas A&M University
Research Interests: Robotics, machine learning, computational biology

Harry Hunt
Professor
Cornell University
Research Interests: Combinatorial and sequential logic, database systems, program development and code optimization in high-performance scientific programming, simulation science, combinatorial optimization and approximation

Jeong-Hyon Hwang
Associate Professor
Brown University
Research Interests: Databases, distributed systems, real-time data analysis

Siwei, Lyu
Associate Professor
Dartmouth College
Research Interests: Statistical modeling of images, digital image forensics, computer vision, image processing, machine learning, pattern recognition

Amirreza Masoumzadeh
Assistant Professor
University of Pittsburgh
Research Interests: Information security and privacy, including access control policy models and privacy-preserving data sharing in application domains such as social media and location-based services

Paliath Narendran
Professor
Rensselaer Polytechnic Institute
Research Interests: Automated reasoning, formal verification, pattern matching

Qi Wang
Lecturer
California State University at Northridge, California
Research Interests: Computer science, software development

Shaghayegh Sahebi
Assistant Professor
University of Pittsburgh
Research Interests: Human-centered data mining including educational data mining, recommender and personalization systems, and user modeling

Tomek Strzalkowski
Professor
Simon Fraser University
Research Interests: Information intelligence, terrorist-tracking techniques
Department of Electrical and Computer Engineering

Vladimir Kuperman  
Professor of Practice  
Moscow Mendeleyev University of Chemical Technology  
*Research Interests*: Information and computer technologies, computer networking, mathematics for decision making, global economics

Dan Willard  
Professor  
Harvard University  
*Research Interests*: Mathematical logic (with a concentration in proof theory), the complexity of retrieval algorithms, computational geometry, databases, sociobiology

Mariya Zheleva  
Assistant Professor  
University of California Santa Barbara, Santa Barbara  
*Research Interests*: Wireless networks, deployment and monitoring, cognitive radio and dynamic spectrum access, networking for developing regions

Aveek Dutta  
Assistant Professor  
University of Colorado Boulder  
*Research Interests*: Enforcement of spectrum policy, vehicular channel analytics, heterogeneous networks, hybrid radio architecture

Yelin Kim  
Assistant Professor  
University of Michigan, Ann Arbor  
*Research Interests*: Computational human behavior and interaction analysis, human-centered and affective computing, multimodal signal processing, machine learning, computer vision

Randy Moulic  
Professor  
Polytechnic Institute of New York University  
*Research Interests*: Digital electronics, computer architecture and design

Mustafa Aksoy  
Assistant Professor  
The Ohio State University  
*Research Interests*: Microwave remote sensing, electromagnetic theory, geosciences, signal processing and data analytics

Kim Boyer  
Professor  
Purdue University  
*Research Interests*: Computer vision and medical image analysis, including perceptual organization, structural analysis, graph theoretical methods, stereopsis in weakly constrained environments, optimal feature extraction, large model bases, and robust methods

Ming-Ching Chang  
Assistant Professor  
Brown University  
*Research Interests*: Video analytics, computer vision, and machine intelligence

Mei Chen  
Associate Professor  
Carnegie Mellon University  
*Research Interests*: Computer vision, biomedical imaging, computational photography, robot perception

Guy Cortesi  
Professor of Practice  
University at Albany  
*Research Interests*: Effective use of information technology in distance reporting and virtual organizational settings; the relation of communication channel and task on group composition, participation, and performance in virtual organizations.

Hany Elgala  
Assistant Professor  
Jacobs University, Germany  
*Research Interests*: Telecommunications, digital signal processing and embedded systems

Dola Saha  
Assistant Professor  
University of Colorado Boulder  
*Research Interests*: Analytics for wireless networks, spectrum forensics, indoor localization, CloudRAN, MAC-PHY crosslayer techniques, software defined radio

Gary Saulnier  
Professor  
Rensselaer Polytechnic Institute  
*Research Interests*: Communications, signal processing, electronic instrumentation, impedance tomography systems for medical applications, acoustic data and power transmission systems

Tolga Soyata  
Associate Professor  
University of Rochester and Johns Hopkins University  
*Research Interests*: Cyber physical systems, digital health (D-Health), high-performance medical data processing and visualization

Weifu Wang  
Assistant Professor  
Dartmouth College  
*Research Interests*: Robotics, motion planning, manipulation

Daphney-Stavroula Zois  
Assistant Professor  
University of Southern California, Postdoc University of Illinois  
*Research Interests*: Decision making under uncertainty, machine learning, Internet of things and e-health applications, detection and estimation theory, intelligent systems design, signal processing and communications, optimization, pervasive computing, sensor networks, stochastic control, embedded systems
Department of Environmental and Sustainable Engineering

Yanna Liang
Chair and Professor
Utah State University
Research Interests: Fundamental and applied research and development on environmental and energy sustainability: Waste conversion to commodity fuels and chemicals through biochemical, thermochemical and bioelectrochemical pathways; use of omics-approaches for understanding complex natural and engineered systems; and process optimization for maximizing yield of value-added products for commercial scale-up.

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Event and Detection Lab
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Intelligent Big Data Analytics, Applications, and Systems (IDIAS) Lab
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Interaction Sensing and Perception in Real Environment (INSPIRE) Lab
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Mobile Emerging Systems and Applications (MESA) Lab
Aveek Dutta
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Robotic Manipulation Lab
Weifu Wang

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Engineering will lift up UAlbany

In a letter to the editor (Albany Times Union), Dr. Walter Robb, former Senior VP of GE’s global research division, strongly urges Governor Cuomo and the state Legislature to invest in UAlbany’s engineering college. (Photo credit: Paul Buckowski/Times Union. Used with permission. Direct link to letter in TU here.)

UAlbany’s engineering programs will ensure a steady supply of bright young minds who are willing to take risks in order to tackle society’s most pressing problems.

Letter:

Since the Edison Machine Works opened shop in Schenectady more than a century ago, the Capital Region has defined itself as an incubator for innovation. Our collective ingenuity and entrepreneurial spirit has kept us at the forefront of research and development on emerging technologies like the CT scanner that have changed the world.

Ensuring a steady supply of bright young minds who are willing to take risks in order to tackle society’s most pressing problems is essential to sustaining that momentum, which is why I write to applaud the anonymous donor who recently pledged $4 million to the University at Albany’s new College of Engineering and Applied Sciences.

As a graduate of public engineering programs at Penn State and the University of Illinois, I well understand the value of an affordable, world-class engineering education. A career in the applied sciences should be accessible to everyone, and UAlbany should be commended for making that a priority.

I strongly urge Gov. Andrew Cuomo and the state Legislature to invest in UAlbany’s vision to house its new engineering college in the renovated Schuyler Building in Albany. The university is currently seeking $20 million from the state to start these renovations. This plan will not only strengthen UAlbany’s academics but also bolster SUNY’s mission to leverage its campuses as centers of regional economic development.

As a businessman, I know that a regional economy that is propelled by innovation thrives more generally, lifting all boats. I hope that the state also will recognize wisdom in UAlbany’s vision.

Walter L. Robb
Latham
Chemical engineer; former senior vice president for corporate research and development, GE
The College of Engineering and Applied Sciences (CEAS) provides our students with a first-class educational experience. We pursue this goal through innovative pedagogy, excellent facilities, and our world-class faculty. Ours is a community of scholars, comprising a faculty equally adept in the laboratory and the classroom, our incredibly talented and engaging student body, and a caring, dedicated staff. We are justifiably proud of our accomplishments, proud of our growing reputation for excellence, and proud of our accomplished, successful alumni.

To help us realize and sustain our vision as we build a college with an international reputation for excellence, we rely on donors who are – for the most part – people like you. Support from alumni and other friends create opportunities for students in the form of education or research support, laboratory and infrastructure development, travel grants, invited lectures, and so much more. These gifts underwrite the investments so critical to our collective future as we educate the engineers and applied scientists who will address society’s most vexing problems.

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All gifts are fully tax deductible. For more information, please visit http://www.albany.edu/ceas/give, or contact Cathy Farrell, CEAS Development Officer, at 518-591-7209 or cfarrell@albany.edu. Please specify that your gift is for CEAS, and how you wish your gift to be designated (Annual Fund or a specific department or purpose).

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