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The Engineer Behind the Magic
at Disneyland Resort

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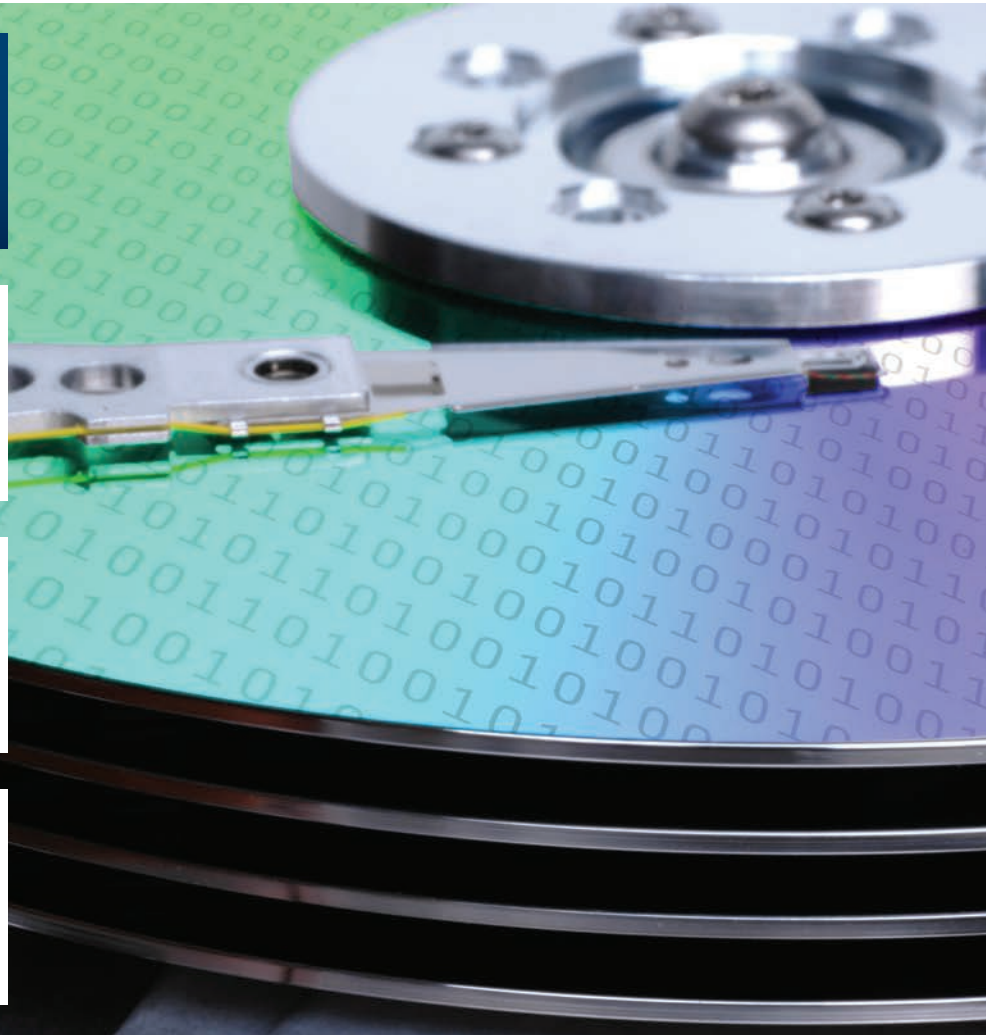
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CONNECTION

NEWS FROM THE COLLEGE
OF ENGINEERING AND
COMPUTER SCIENCE

Issue Five // Fall // 2013

GE's Big Daddy of Big Data Spawns a Revolution

The mention of the industrial revolution generally evokes images of the late 18th and early 19th centuries, when the onset of large-scale mechanized manufacturing and steam-powered factories fortified unprecedented, sustained economic growth.

But alumnus Bill Ruh, vice president and corporate officer of GE Global Software Center, says we are now at the dawn of a new industrial renaissance, powered by intelligent machines and specifically by the development of next-generation big data software.

"We aim to ignite this next industrial revolution by connecting minds and machines. The first frontier of the Internet focused on giving consumers a voice," recalls Ruh. "The next frontier, known as the Industrial Internet, will give every machine – including wind turbines, jet engines, and MRI machines – a voice, and more importantly, something powerful to say. That is big data – valuable, proven big data."

The Industrial Internet, a term coined by GE, is the integration of complex machinery with networked sensors and software. The resulting industrial big data – the massive pool of information generated by the Industrial

Internet – is more complex even than content extracted from other Internet channels, such as social Web and the consumer Internet.

"Collecting, analyzing, and retrieving large amounts of structured and unstructured data is the challenge posed by big data linked to the Industrial Internet," Ruh says.

In the cybernetic heart of the Silicon Valley, Ruh and his team at GE Software are developing programs to effectively and dynamically manage Industrial big data. By doing so, they aim to forever change the way humans interact with machines.

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“The mission of my group at GE is to design a layer of software that makes the concept of intelligent machines a reality,” says Ruh. “Core to our strategy are software-based services provided by GE Software that will enable the brilliant machines of the Industrial Internet to evaluate tradeoffs, optimize decisions, and apply lessons learned. These same services also provide the appropriate information to other machines, companies, and people for decision-making, collaboration, and actionable knowledge.”

By its sheer magnitude, big data has potential to stimulate a new wave of technological and economic prosperity. The abundance of big data in the Industrial Internet is exemplified by the commercial airline industry.

“A single cross-country flight in the United States generates an astonishing 240 terabytes of big data! Using aircraft performance data, prognostics, predictive analytics, and real-time data from nose-to-tail sensors, airline assets can be optimized to extend engine life, turning unscheduled maintenance into scheduled maintenance, and identifying potential operational disruptions before they occur,” explains Ruh. “Across our customer base, a mere one percent increase in productivity will create significant profits – multibillion dollar profits per industry – for our customers.”

A recent platform innovation pioneered by Ruh and his team is already providing deliverable solutions.

“This year, we announced an exciting new architecture; it’s the first big data and analytics platform robust enough to manage the data produced by large-scale, industrial machines in the cloud. As part of this architecture, we delivered Proficy Historian HD, data management software that allows one to harness the power of the Industrial Internet by tracking every key component of a power plant,” he says. “The new platform promises to revolutionize the ways in which industries capture sensor data, perform local processes and industrial analytics in real-time, and distribute data to end-points.”

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The Engineer Behind the Magic at Disneyland Resort



Deep in the heart of the Disney empire, creative teams work day and night to develop the most innovative experiences to delight guests. And when those ideas violate the laws of physics, it’s up to a collaborative team of engineers to make the magic happen.

“We are a group of engineers willfully trapped in an entertainment company,” says Darrell Jodoin (ME ’85), Director of Design and Engineering, Disneyland Resort. “Even though guests may never know what we have done to make their experience memorable, we all take great pride, and have a great time, doing what we do best.”

Jodoin and his team never say “It can’t be done.” Instead, they use their intellect and creativity to solve problems ranging from the mundane to the extraordinary.

“We carefully care for legacy attractions like the Matterhorn Bobsleds, the world’s first

tubular steel continuous track roller coaster, but we also make sure the most state-of-the-art flight simulators on Star Tours – The Adventures Continue are in proper working order,” he explains.

Whether developing and installing new track and switches while maintaining early 20th century steam engines or rebuilding the track of Space Mountain, it’s all in a day’s work for Jodoin, who has been with Walt Disney Parks and Resorts for more than 20 years. Hired in 1990 as part of the Disney Decade – an aggressive building and development plan for the new century – Jodoin began his career as a Disney Imagineer developing ride systems.



Darrell Jodoin (ME ’85) inspects a Disneyland Matterhorn vehicle with (left) ride show engineer Shadi Fallah (ME ’08), and program services planner Mickie Feicht (MATH ’89).

"It was a great opportunity to use my education and experience in developing material handling equipment to join a world-renowned company," he states.

An engineer by accident

While Jodoin always had a knack for understanding how things work, he started his engineering education after suffering an on-the-job injury in the grocery industry. After recuperating from his injuries, he chose Cal State Fullerton and the College of Engineering and Computer Science to continue his education.

"I have great affinity for CSUF engineering students because I was one of them," says Jodoin. "My dad hadn't gone to college and there wasn't much money so I had to put myself through, and I commuted. That's pretty much the same story for most CSUF students today."

Challenged by the curriculum – "I had my head handed to me a few times by some professors in my first year," he admits – Jodoin was inspired to give his studies his full attention.

"My professors drilled it into my head that I had the same text books and was learning the same material other engineering students across the country were. It was up to me to make the most of it," he explains.

After graduation, Jodoin worked first for a small consulting office, then for a larger firm that gave him exposure to working with Fortune 500 companies. A collegial relationship at that company helped him, a few years later, to land the job at Walt Disney Imagineering.

Staying involved on campus

Jodoin makes time around his job responsibilities to stay involved with engineering students on campus. He regularly devotes time to the Professor for a Day program, serves on the College Leadership Council for ECS, helps recruit employees and interns from his alma mater, and makes every effort to encourage prospective engineers in their career dreams.

"We see Cal State Fullerton engineering students as a talent pool we absolutely need. There is no question that we want to continue developing our relationship with the school," he says. "Disney encourages me to be involved with the community, and Cal State Fullerton is near and dear to my heart, so being involved as an alumnus is just second nature."

Jodoin has a great track record mentoring future engineers: Both his sons are engineers – one a mechanical engineer and the other a computer science engineer. Both are also proud of their legacy status as Imagineers for Disney.

"I try to help engineering students by showing them why they should study so hard and devote themselves to a challenging curriculum," he notes. "By telling them how fulfilled I am in my career, I feel I can help inspire them. And when it comes to encouraging more students to become engineers, there's nothing better to invest in." 🌟



Bill Ruh, Vice President and Corporate Officer
of GE Global Software Center

"At CSUF, I learned the value of software in implementing a complex system; I've been fortunate enough to apply that knowledge to the advancement of a career I love."

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Acknowledging the ongoing success of his professional endeavors, Ruh points to Cal State Fullerton as the origin of his passion.

"At CSUF, I learned the value of software in implementing a complex system; I've been fortunate enough to apply that knowledge to the advancement of a career I love."

To young engineers who aspire to achieve as much as he has, Ruh offers wisdom guided by one of his more leisurely passions – golf.

"Golf may seem impossible; hit a 1.68-inch white ball into a 4.25-inch hole more than 500 yards away in only five swings," he says. "Yet, people do it on a daily basis, and the best often do it in fewer than five swings. Why? They have the right tools, training, and technique – it is the same with life." 🌟



From the Dean

As we entered the 2013/14 academic year, ECS could not have been in a stronger position.

- We are the fastest-growing college on campus, achieving FTES enrollment growth of 30 percent over the past five years. Enrollment has increased 104 percent from fall 2000 to fall 2013.
- Our student population has reached 3,370 students enrolled, including 405 international students from 42 nations.
- Over the next two years, we will fill 15 new tenure-track faculty positions. These positions are in addition to existing positions held by retiring faculty.
- We have successfully launched two online MS programs, Software Engineering in 2004 and Environmental Engineering in 2012. Our MS in Software Engineering was ranked 10th in the *U.S. News & World Report* "2013 Best Online Graduate Engineering Programs."
- In 2014 we will launch an integrated four-year BS/MS in Computer Engineering, an accelerated degree program unique in the CSU system.
- Our students are competing and placing in well-regarded national, regional, and state research and collegiate design competitions.
- We are in the exploratory phases of developing a biomedical engineering minor and, eventually, a stand-alone degree program in biomedical engineering focused on workforce development.
- Externally funded research has grown by 83 percent since 2005/06. ECS faculty have undertaken 43 externally funded research projects in areas such as air and water quality, seismology, high strength steel, GPS/INS, high performance computing, web-based telecommunications, robotics, satellite communications, and antennas in wireless communications.
- Engineering and Computer Science features learning communities such as Women in Engineering for first-time female freshmen and ECS Scholars for first-time freshmen from underrepresented populations.

Each of these points are examples of the strength and quality that students, faculty, and businesses find here at ECS. I hope you will join us as we continue our pursuit of excellence here at the College of Engineering and Computer Science at California State University, Fullerton.

Raman Unnikrishnan, Ph.D.
Dean



Freshmen **Kanton Koch** (left) and **Elliott Skeer** hope to leverage their experiences at Cal State Fullerton to enrich their racing careers.

Engineering in the Fast Lane

Most parents of teenagers discourage their kids from driving at high speeds, but then most teenagers don't have over a decade of experience behind the wheel. Elliott Skeer (ME '17) and Kanton Koch (ME '17) are not most teenagers. Between them, these semi-pro drivers have been racing motorized vehicles for more than 25 years – and they're only freshmen!

"It started when I fell in love with go-karts at the LA Auto Show. I was 6 years old," recalls Koch. "After begging my dad for two years, I got my own go-kart on my eighth birthday. From that point on, I've been a motorhead."

Since graduating from go-karts, both drivers now get their speed fix from the MX-5, a factory-made, high-performance variation of the Mazda Miata roadster – a flashier car than you might expect from a couple of studious engineering undergrads.

"From the toaster in my kitchen to the car in my garage, I've always had an interest in how things work," explains Koch. "That's why I decided to pursue a degree in mechanical engineering."

"I'm studying mechanical engineering to advance my understanding of vehicle dynamics," says Skeer. "Car setup is as important as speed, especially when victories are often determined by tenths of seconds. I chose Cal State Fullerton on the advice of some members of its Society of Automotive Engineers team."

Both racers hope to leverage their experiences at Cal State Fullerton to enrich their racing careers. Some of their racing highlights include Koch's win in the Skip Barber MAZDASPEED Pro Challenge, in which he bested competitors during a wet race, and Skeer's victory at the Mazda MX-5 Cup Shootout, which effectively propelled him to semi-pro status. ⚙️

Faculty Achievements



Kenneth J. Faller, Assistant Professor of Computer Engineering (left) and **Garrett Kinum** (CS '14).

Research Supports U.S. Department of Homeland Security

A faculty member and undergraduate student teamed up this past summer to conduct research for the U.S. Department of Homeland Security's automated interviewing and detection system.

Kenneth J. Faller, assistant professor of computer engineering, and senior computer engineering major **Garrett Kinum** worked with the National Center for Border Security and Immigration at the University of Arizona. Together, they worked on the AVATAR system, an embodied conversational agent embedded in a kiosk that uses a variety of non-invasive sensors to evaluate credibility

during an interview. The AVATAR is designed to enable non-invasive, automated, rapid screening of people at border crossings, airports, and other settings. The research experience was the first time a College of Engineering and Computer Science faculty member was selected to participate in the federal agency's Summer Research Team Program for Minority Serving Institutions. 🌟

Collaborative Research Impacts Design of Multi-fingered Robotics

Nina Robson, assistant professor of mechanical engineering, is co-principal investigator of research to develop multi-fingered grasping devices for human-robot and anthropomorphic tasks, funded by the National Science Foundation. She is working on a systematic methodology to inform the design of any kind of multiple-finger grasping device, affecting academia as well as society. The design tool will help cost-effectively speed the manufacture of multi-fingered robotic hands and other end effectors. The proposed curriculum additions resulting from this project will produce competent engineers for industry with a greater ability to approach and solve design problems. Robson is collaborating on the research with J. Michael McCarthy of the University of California, Irvine. 🌟

Professor Joins International Civil Engineering Team in Earthquake Research in Japan

Binod Tiwari, associate professor of civil and environmental engineering, is on sabbatical with the technical disaster assessment team deployed to Japan by the American Society of Civil Engineers. As a visiting associate professor at Kobe University's Research Center for Urban Safety and Security, he is working on experimental simulation of slope failure as a result of landslides and earthquakes. He is partnering with Katsuyuki Kawai, an associate professor at Kobe University and an expert in the characterization of soil behavior. This international collaboration is intended to help validate research predicting the threshold rainfall amount that can trigger a landslide. 🌟



Binod Tiwari, Associate Professor of Civil and Environmental Engineering

Training Civil Engineering Faculty in Vietnam

Pratanu Ghosh, assistant professor of civil and environmental engineering, trained the civil engineering faculty at Duy Tan University in Da Nang, Vietnam this past summer regarding the design, construction standard, and code specifications of reinforced concrete structures in the United States. His two-week collaboration, which was coordinated by the Extended Education System of Cal State Fullerton, also included sharing about the American education system. 🌟

WELCOME NEW FACULTY:

The following faculty members joined ECS in 2013/14:

Hakob Avetisyan, assistant professor of civil engineering. He earned his Ph.D. at the University of Maryland, College Park. His areas of research interest and expertise include construction, energy, and environmental management.

Yun Tian, assistant professor of computer science. She earned her Ph.D. at Auburn University. Her areas of research interest and expertise include storage security, cloud security, distributed computing, parallel and high performance computing, and computer science education.

PROMOTIONS ANNOUNCED:

The following faculty members have received promotions:

Kiran George, to associate professor of computer engineering.

Jidong Huang, to associate professor of electrical engineering.

Michael Shafae, to associate professor of computer science.

Binod Tiwari, to associate professor of civil and environmental engineering.

EXTERNAL FUNDING FOR RESEARCH:

Joseph Costantine, assistant professor of electrical engineering, has been awarded \$50,480 from the California Institute of Technology for "Scaling of Wide-band Deployable Antennas for Cubesats."

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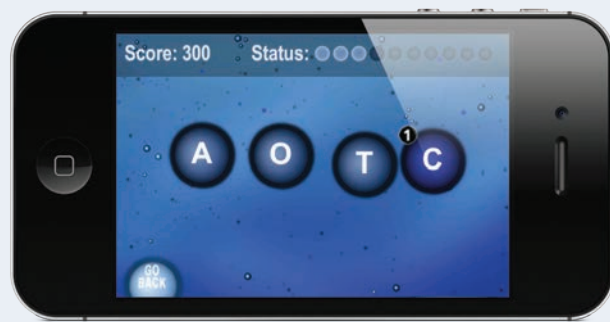
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Student Achievements

Thinking Outside the Bubble: Turning a Classroom Idea into a Sellable App

Whether you worship wordplay or just have a penchant for puzzles, Bubble Scramble is a phonetic phenomenon offering hours of gaming fun. But **Maksim Surguy** (CS '11), Bubble Scramble's sole creator, says the ground-up development of the iPhone application was not all fun and games.



“Bubble Scramble was born from a project assignment in an application development course at Cal State Fullerton,” Surguy explains. “Programming was challenging, but I was excited by the prospect of making a game that required players to unscramble words. The iPhone's touchscreen interface provided an ideal platform for the concept I had envisioned.”

As its namesake suggests, Bubble Scramble poses a straightforward objective: One-by-one, sets of jumbled, bubble-bound letters must be unscrambled to spell words by tapping the letters in the correct sequence.



“Players enjoy *Bubble Scramble* because of its pick-up-and-play simplicity; they can easily have fun while practicing spelling and reading comprehension.” — **Maksim Surguy** (CS '11)

“I'm pleased with the functionality and overall gameplay,” says Surguy. “Players enjoy Bubble Scramble because of its pick-up and play simplicity; they can easily have fun while practicing spelling and reading comprehension.”

Despite the game's unassuming premise, creating a consumer-ready version proved to be an ambitious undertaking for Surguy.

“Plenty of hard work and polishing went into bringing this game to life,” he explains. “The commercially available version is the result of many hours spent overcoming my struggles with graphic design; attaining fluency in Objective C, a complex coding language; and eliminating bugs and quirks revealed through extensive beta testing. Luckily, the game

was approved for distribution after my first submission to the App Store, which is pretty unusual.”

Although marketing efforts were practically nonexistent, Bubble Scramble's launch generated a surge of downloads – 500 in its first month. In the weeks that followed, Surguy sold the application to an online bidder for an undisclosed sum. He is currently channeling his ingenuity into Bootsnipp.com, a popular website that provides HTML snippets for web developers. 🌀

Student Achievements (cont.)

ECS Undergraduate Leads ASI

For the first time in its history, Cal State Fullerton's Associated Students Inc. is being led by an engineering student.

Rohullah Latif (ME '14) began his presidency of the student government organization this summer, meeting with University President Mildred Garcia and associate deans of the University's colleges. During his campaign for president, Latif advocated increasing Titan pride through enhanced communication between students, university administration, and the community.

"The only way we, as a university, are going to be successful, is if students, faculty, and the administration work together in achieving the best possible environment for Cal State Fullerton students to learn, innovate, grow, and achieve as individuals," he says.

Latif is a member of the Phi Kappa Tau fraternity and served as the Interfraternity Council president last year. ☀

Engineering & Computer Science Students among This Year's President's Scholars

Khulood Faruqui (ME), **Chloe Gharos** (CE), **James Shade** (CS), **Bao Binh Nguyen** (CE), and **Ryan Scherer** (E) are among this year's President's Scholars. Traditional college scholarships offer generous financial benefits to reward outstanding performance and attract the best students, but Cal State Fullerton's President's Scholars Program offers much more. The comprehensive, rigorous program offers outstanding experiences and opportunities in academics, leadership, service, and mentorship. The prestigious program provides a foundation for high-achieving students to develop and realize their potential for success – as scholars, leaders, and citizens. ☀

Student Wins First Place for Software Research

Ivan Enrique Espinosa (CS, M '14) won first place in Texas A&M University's Dwight Look College of Engineering's Research Experiences for Undergraduates (REU) Computing for Disasters poster contest this summer. Espinosa's poster, titled "Optimizing the Graphics Pipeline for High-Performance ZeroTouch," presented his research on improving software in order to make a virtual camera that can be read by other software and that can optimize the graphical performance. He competed against nine other students who focused on developing humanitarian applications for prevention, preparation, response, and recovery from disasters. The summer research experience was funded by the National Science Foundation.

Espinosa, who plans to pursue a doctorate in computer science and is vice president of CSUF's Video Game Design Club, was advised by Dr. Andruid Kerne and graduate student Bill Hamilton. ☀

ECS Well Represented in Summer 2013 JPL Internships

Six ECS students participated in the highly competitive and coveted Summer Internships at NASA's Jet Propulsion Laboratory in 2013. Participating students were: **Brittany Parker** (CS '15), **Lexi Shaffer** (ME '14), **Danny Situ** (CS '14), **Miguel Arias** (CS '13), **Eduardo Rojas** (CS '15), and, **Kevin Vincent** (CS '14). While at JPL, students pursued hands-on projects essential for JPL's continuing contribution to NASA's future success and worked side-by-side with JPL scientists and project managers. ☀

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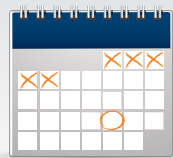
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The College prepares students for careers in engineering and computer science and for further study and specialization in graduate work.



TOP RANKED ¹

The College's online graduate program in software engineering ranks No. 10 on the list of "2013 Best Online Graduate Engineering Programs" among 70 evaluated by *U.S. News*.



INNOVATIVE PROGRAMS ²

ECS is home to STEM recruitment & retention programs including Engineering Innovation – a pre-college summer program partnership with Johns Hopkins University.

Sources:

¹ U.S. News and World Report online programs ranking

² Whiting School of Engineering, John Hopkins University website

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