ILLINOIS
ISE | Industrial & Enterprise Systems Engineering
GRAINGER COLLEGE OF ENGINEERING

ISE VIEWBOOK 2019

IE

Industrial engineers make things BETTER.

ISE

Systems engineers make better THINGS.

ISE

Recognize this building?
Turn to page 29.

CONTENTS

The Department of Industrial and Enterprise Systems Engineering (ISE) at the University of Illinois, Urbana-Champaign, *innovates* the engineering discipline with forward-thinking research and scientific discoveries; *serves* education, industry, and society; *educates* a new generation of leaders in general, systems, industrial, and financial engineering.

ISE Student Viewbook is edited by William Gillespie. Additional photography by Heidi Craddock, Thompson McClellan, and L. Brian Stauffer. Illustration and design by Miriam Martincic.

Readers, alumni, students: contact us at: communications@ise.illinois.edu

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In this building,
in the fires of calculus
and caffeine,
engineers were minted
and sent forth
to conduct the world.

ISE Class of 2019, cleared for liftoff!



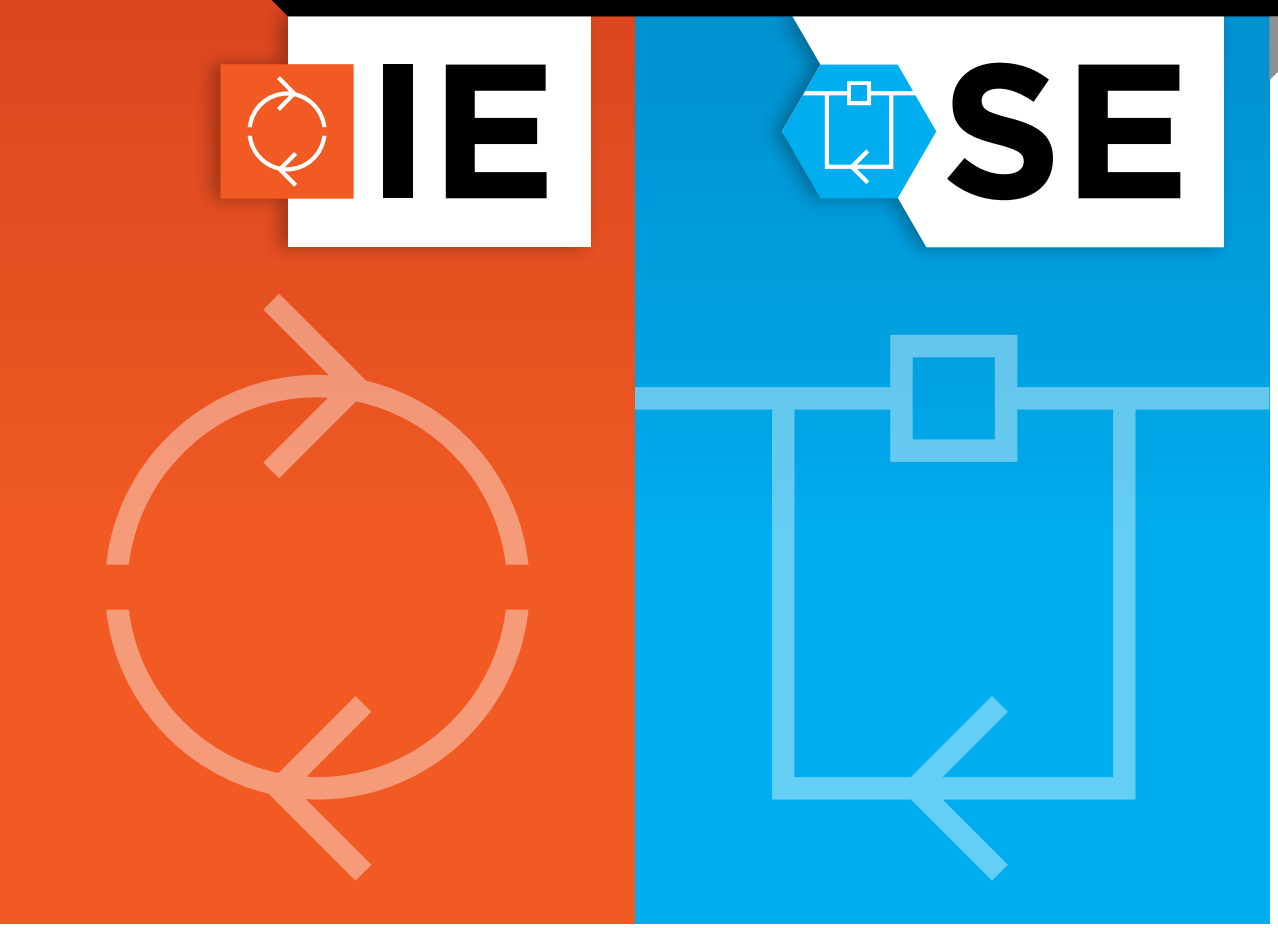







ILLINI

The 2 WINGS of ISE



BY DOUG PETERSON

IT'S EASY TO MISS when you enter the Transportation Building on Mathews Avenue, the home of ISE. But if you look closely, you'll see images of railroads on the walls and railings.

As you approach the main entrance, direct your eyes to the roofline, and you'll see 4 winged locomotive wheels carved in stone, with 2 more winged wheels on the north side of the building and 1 on the south. Even the handrails on the banisters inside carry the design of a train wheel.

The railroad imagery is there because the Department of Railway Engineering was once housed in the Transportation Building. Today, the railway department is long gone, and the Transportation Building is now home to ISE. But these symbols are a reminder that technology is constantly evolving and so are departments, including ISE.

ISE's last major transformation came in the spring of 2006, when the College of Engineering decided to combine the Department of General Engineering (established in 1952) with the college's industrial engineering program. Like the 2 wings depicted on the building's locomotive wheels, this merger brought together 2 important realms of engineering—industrial engineering and systems engineering.

"When I was thinking of coming to Illinois, there was chatter about this brand-new department called ISE," recalls Harrison Kim, an ISE professor. "So, as I was considering options for my career, I knew that Illinois was a top engineering program, and now they were creating a new department. When would I have an opportunity like this again?"

Kim joined ISE in 2005 as one of the inaugural members of the new department, and he never looked back.

There is a lot of overlap between both parts of ISE—systems engineering and industrial engineering—but Kim says that the department's catch-phrases help to distinguish between the 2 wings.

Systems engineers make better things.
Industrial engineers make things better.

In other words, systems engineers develop new systems and new ways of doing things, while industrial engineers take existing systems and improve them at a new level.

"Think of it this way," Kim says. "If you have a gas-powered engine, industrial engineers will find ways to improve it." Systems engineers might go in an entirely new direction, developing an engine using renewable energy.

Systems engineers make better THINGS. Industrial engineers make things BETTER.

The following stories focus on research from both wings of the department—systems engineering (making better things) and industrial engineering (making things better). However, some of the professors featured in these stories, such as Carolyn Beck, split their research between systems and industrial engineering.

According to Beck, "Optimization is a big part of ISE's work—trying to make things perform as well as they can. For instance, we have people looking at optimization in respect to financial process, and that was fairly original.

"The department is going in a lot of new directions," she adds. But continual change is precisely what makes a dynamic system. It's also what makes a dynamic department.

It's Getting Easier to Be Green

GREEN IS THE COLOR of both money and the environment, but the 2 are not mutually exclusive, says Harrison Kim, ISE professor. For the past 14 years at Illinois, Kim's lab has been pioneering and refining a methodology that helps manufacturers design machines and devices that are both profitable and more environmentally sustainable.

"Our team calls it Green Profit Design," Kim says. "Companies need to be green and make money at the same time."

"Our team calls it Green Profit Design," Kim says. "When companies go green simply to boost their public image, it's not going to work. Companies need to be green and make money at the same time."

Kim's methodology can be used for designing products of all types, from cellphones that fit in your pocket to large-scale farm machinery and even airplanes. In fact, Kim's Green Profit Design has been embraced by John Deere, the farm machinery giant known for its green-colored equipment. Deere product designers use Kim's methodology to calculate the environmental impact of a machine over its entire lifespan.


Harrison Kim

"Our methodology can calculate a machine's global-warming potential, or GWP," he says. For instance, their system might determine that 1 machine design will emit 1.3 kilograms equivalent of CO2 over the equipment's lifespan, while another design will emit 1.5 kilograms equivalent.

What's more, Kim's system makes it possible to do this calculation in minutes.

"An analysis that used to take 6 months to do now takes only 6 minutes," he says.

This groundbreaking methodology earned Kim a John Deere Supplier Innovation Award in 2015—a major award that the company had never given to a university research partner before. Each week, Kim's team has a conference call with Deere managers to talk about product development and manufacturing from the perspective of environmental sustainability.

"Every product generates an environmental footprint over its lifespan," Kim says. Therefore, his methodology takes into account energy consumption over a product's life, and it even factors in energy used during the manufacturing process.

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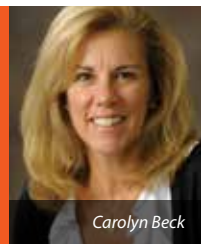
Tracking Epidemics and "Good Infections"

Carolyn Beck has been probing how epidemic processes work, and her models can be applied to diseases of all types, as well as to computer viruses or even the spread of "fake news."

MEASLES WAS OFFICIALLY eradicated from the United States in 2000, and yet 2019 has emerged as the worst year for measles outbreaks in 25 years.

For the past 6 years, ISE professor Carolyn Beck has been probing how epidemic processes work, and her models can be applied to diseases of all types, as well as to computer viruses or even the spread of "fake news."

"Our epidemic models are based on network structures," Beck says. "Humans form what are called human contact networks. So we've been looking at how epidemics spread on these human networks, which are constantly changing. Also, we consider how interconnected different people are and how strong their connections are."



Carolyn Beck

Although this work focuses on disease epidemics, Beck says the models can be used with many other processes that spread and evolve over network structures. For instance, computer viruses.

Beck's epidemic models can even be applied to the spread of opinions over a network, as well as the spread of a tweet on a social network. What's more, marketing people can use these models to track the dissemination of their products.

"Marketers want to know the parameters under which they can be assured their idea or product will rapidly disseminate over a network," she says. For them, the spread of their product is a type of "good infection."

Beck says that over the years numerous research papers have analyzed these kinds of network processes, but in most cases the scenarios being studied are static. But Beck is looking at dynamic networks that are constantly morphing over time—such as an ever-changing disease process.

In the past, she points out, if you had a static network and the ratio of the infection rate to the healing rate was less than 1, than you could safely say the disease will eventually leave the system. But her team is looking at how that ratio holds up in a more dynamic model, in which the population is constantly changing and moving.

"My greatest pride is in my students—where they have gone and what they have done," Beck says. For example, some of her students work on "clustering algorithms," which break Big Data into more manageable subgroups. After researching clustering algorithms in Beck's lab, some of her students went on to apply these techniques at Facebook and Amazon.

In a sense, her students form a dynamic network all their own, spreading the influence of what they accomplished at Beck's lab all across the country—another example of a "good infection."

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Waiting Rooms in Cyberspace

Stolyar is one of the country's leading experts in the stability of queues, or jobs lined up to be processed by servers.

IMAGINE A DOCTOR'S waiting room with people coming and going throughout the day. "Stability" means that at any given time, you might have 3 or 4 people waiting to see the doctor, maybe even five. But if the patients begin to back up, filling the room so there isn't a spare seat or magazine to go around, then you've got problems. This is an unstable system, says Alexander Stolyar, ISE professor.


Alexander Stolyar

This is also a picture of the kind of work that Stolyar has been pursuing for most of his 30-year career, only the "waiting rooms" in his research are mostly in cyberspace.

"In cloud computing, I look at how to process large amounts of data," Stolyar says. Thousands of servers in a cloud system accept jobs from computers, so the problem is getting the system to distribute these jobs in an efficient way. This is known as a resource allocation problem. With all of the data flooding the servers in the cloud, how do you dynamically distribute the workload in the simplest and most effective way?

Stolyar has a solution to this problem, and he calls it "pull-based algorithms."

Pull-based algorithms make it possible for servers to tell the router, or dispatcher, to send them the load. The servers "pull" the jobs to themselves, rather than wait for the router to "push" the load to them.

His algorithms also deal with "stochastic bin packing." As he explains, some jobs being sent out to servers in the cloud may require a lot of memory but little processing power. Other jobs may require the exact opposite—a lot of processing power but little memory. Thus, the jobs coming in have different "sizes," so the question is how to fit the right job with the right server. It's like packing bins, he says, and hence the name.

"It's a classical mathematical problem," adds Stolyar, who tackled similar problems while working at Bell Labs in New Jersey from 1998 to 2014. One of his colleagues there was Qiong Wang, now also an ISE professor who works in the office right next door to him in the Transportation Building on the Illinois campus. Ironically, Stolyar and Wang never directly collaborated at Bell Labs, but at Illinois they have been working together on some classical problems in inventory theory.


Quoing Wang

They have completed the proof of concept, and he says, "Now we have big plans on how to make the new inventory control algorithm practical."

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Just What the Doctor Ordered

ANYONE WHO REGULARLY watches medical dramas on TV knows the drill. In the chaos of an emergency, doctors fire off orders right and left as a team gathers around the patient. In the very first episode of the TV show *Grey's Anatomy*, for instance, a patient suddenly goes into convulsions, and the doctor snaps, "Phenobarbital! Load her with phenobarbital!"

No dosage is mentioned—a big mistake, according to a doctor analyzing this particular *Grey's Anatomy* scene in an online show. What's more, he says that in a real situation, the nurse would've repeated the exact dose to make sure communication was clearly received.

Abigail Woolridge

> Wooldridge specializes in studying team communication in all types of medical scenarios.

Medical shows aren't expected to be 100-percent accurate, but in a real-world setting, this kind of team communication must be clear and coordinated, or the consequences can be fatal, says Abigail Wooldridge, an ISE professor. Wooldridge specializes in studying team communication in all types of medical scenarios; in fact, she recently launched a pilot project that examines teamwork during hospital handoffs.

Handoffs are when the authority, responsibility, and information about a patient are transferred from one set of clinicians to another. This can happen at shift changes, when patients are moved from one health care facility to another, or when they are moved between units within a hospital.

As Wooldridge explains, handoffs are a double-edged sword. "On the positive side, when you have a new group of people starting to take care of a patient, they might realize something was missed, or they may have a new perspective on what should happen for a patient that could improve the quality of care."

But there are also risks. Information can be lost or missed during handoffs. For example, she says, a clinician might forget to tell the new team that a patient needs a certain dose of a medication.

To study transitions between an operating room and an intensive care unit, Wooldridge is working with the Jump Simulation Center in Peoria. The center has life-sized simulation rooms of both an operating room and an intensive-care unit.

"It's a high-fidelity simulation," she says. "It's a setting that looks like a real operating room and a real intensive care unit."

"If we can improve this really important part of their care—the transition—then we can save lives."

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Balancing Acts

IN 2018, THE Chinese e-commerce giant, JD.com, announced its new mascot—a large-headed, big-hearted dog named Joy. The announcement even came complete with a delightful, Pixar-style, animated short film, *Joy Story*, in which the dog tries to prevent a heron from stealing his master's fishing worms from the boat. When the dog realizes the heron only wants the worms to feed her chicks, he welcomes her back for more.

Chen's mathematical models balance inventory so companies can meet online orders, while keeping physical stores stocked.

Joy appears courtesy of JD.com.

You might say that Joy, faced the kind of inventory management problem that ISE professor Xin Chen has been helping the Chinese company tackle in his research.

Joy had to make sure there were enough worms for his master to use for fishing, while still letting the heron fly off with some in her beak. In the real world of business, Chen has been developing mathematical models that can help JD.com do something quite similar—balance the inventory of its new stores, known as 7 Fresh, so it can meet the needs of both online and in-store purchases.

Xin Chen

People can use an app to order fresh food to be delivered from the 7 Fresh stores, but they can also drop in and buy at the store. Chen's mathematical models balance inventory so companies such as JD.com can meet online orders, while still making sure there is enough food on the shelves for those who come to the physical store. He points out that companies try especially hard to keep in-store customers happy because they might make additional purchases while visiting the store.

Chen's lab also develops mathematical models of customer behavior—systems to maximize revenue by modeling the choices made by customers. His team combines data from companies with publicly available data to put their models to the test.

"Currently, companies use simple models, but we're trying to look at more accurate, more complex models," he says. "Hopefully, these models can better capture customer behavior and companies will be interested in using them."

He says models with greater complexity make sense because, after all, "Human beings are quite complex."

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REU

Research Experience for Undergraduates Program

OBJECTIVE: In keeping with our legacy of hands-on, project-based, real-world experience, the purpose of the REU program is to:

1. Expose top undergraduate students to research practice
2. Encourage ISE faculty to engage undergraduate students in research early in their academic career.

This year, students produced breakthrough projects, and presented them at numerous venues in Illinois and beyond.

Elizabeth Ramos presenting her REU Project at Illini ISE Days at the Big 10 Center in Chicago. Right: a Raspberry Pi 3–Model B from her project on air quality monitoring.

Undergraduate research squad Yangjie Wang, Ziyang Liu, Mingquian Wu, Ibidat Chatha, and Bill Ayung, ready for action.

FALL 2018

Elizabeth T. Ramos
Faculty Advisor: Richard Sowers
Project: IoT Air Quality Monitoring for Health

RuthAnn Haefli
Faculty Advisor: Abigail Wooldridge
Project: Comparing Care Transition Outcomes in Pediatric and Adult Trauma Patients

SPRING 2019

Bill Morgan Minoru Agung
Faculty Advisor: Lavanya Marla
Project: Performance Evaluation Models for Emergency Medical Services

Ibadat Singh Chatha
Faculty Advisor: Girish Krishnan
Project: Design of a Robust Berry Picking Manipulator and Gripper

Kamea Williams
Faculty Advisor: Pingfeng Wang
Project: Design of an intelligent battery management system (BMS) for enhanced electric vehicle safety

Mingqian Wu
Faculty Advisor: Alexandra Chronopoulou
Project: Analyzing volatility risk in option contracts

William C. Jones
Faculty Advisor: James Allison
Project: Generative Design of Heatsinks for Additive Manufacturing

Ibadat Singh Chatha
Faculty Advisor: Girish Krishnan
Project: Design of a Robust Berry Picking Manipulator and Gripper

Yanjie Wang
Faculty Advisor: James Allison
Project: Design of a Low-cost, Versatile Wind-Turbine Tower

Ziyang Liu
Faculty Advisor: Ruoyu Sun
Project: Solving Large Scale Wasserstein Distance Minimization Problem

Photos courtesy of Illinois Athletics.

Alex Wittinger (BSSED 2019): Born to block

BY PATTI GOOD

Her name is Alex Wittinger.

Track, Volleyball, Basketball. She's a whiz at all 3. By the time her senior season ended, she had set the University of Illinois' Women's Basketball all-time Blocked Shots record, surpassing the total set by the dynamic Karisma Penn—no small feat, to be sure. She set the record even after injuring her right ankle late in the season.

She's majoring in ISE with a secondary field in environmental quality. Wittinger, a Delano, Minnesota native, is truly an apple that doesn't fall far from the tree as her father and brother are also mechanical engineers.

While her college hoops days are behind her now, Wittinger is still hopeful she'll be recruited to play in the WNBA. If that falls through, she hopes to play ball overseas after she completes her degree. She has an agent, but because of school commitments until January, she will have to wait to see where she might land with a European team. She continues to rigorously train so she'll be ready for that call.

In an interview with Wittinger, she said she found the pairing of engineering and basketball difficult because of the extraordinary effort it takes for both disciplines. She said she learned humility along the way as she had to ask for help to stay on track with her studies. She'd like to thank her coaches, parents, academic support staff at ISE, CARE, and the tutors at the Irwin Academic Center. She'd also like to give a shout out to our very own, Heidi Craddock, who acted as Wittinger's academic advisor.

When asked about her time at Illinois, Wittinger had this to say, "My time at the University of Illinois has been incredible. I'm grateful for all the people that were willing to help me with my journey as a student athlete as it's not been an easy road, but it has been one of the most rewarding experiences in my life."

The Department of Industrial and Enterprise Systems Engineering would like to congratulate the accomplishments of senior, Alex Wittinger. We look forward to your continued awesomeness on and off the court.

Excellence in Teaching

Here are a few of the honors our instructors received this academic year and the popular classes they taught.

SHARP TEACHING AWARD
Jugal Garg

ISE DEPARTMENT HEAD'S TEACHING AWARD
Doug King

Fall and Winter 2018:
TEACHERS RANKED AS EXCELLENT BY THEIR STUDENTS

INDUSTRIAL ENGINEERING

Alexandra Chronopoulou
IE 400
Design & Analysis of Experiments

Liming Feng
IE 430
Economic Foundation of Quality Systems
IE 522
Statistical Methods in Finance

Harrison Kim
IE 513
Optimal System Design

Doug King
IE 412
Operations Research Models for Manufacturing Systems

R.S. Sreenivas
IE 523
Financial Computing

Sasha Stolyar
IE 598
Queueing Systems

SYSTEMS ENGINEERING

Joe Barich
SE 400
Engineering Law
(See ISE Annual Report 2017)

Carolyn Beck
SE 524
System Identification

S. Rasoul Etesami
SE 320
Control Systems

Henrique Reis
SE 412
Nondestructive Evaluation

Pingfeng Wang
SE 450
Decision Analysis I

Harry Wildblood
SE 494
Senior Engineering Project

2018 INFORMS Annual Meeting, Phoenix, AZ

Rahul Swamy (PhDIE) presented a poster with Douglas King and Sheldon Jacobson, which won the first place at the INFORMS poster competition! Their paper on "Political Districting with Fairness Objectives" also received Honorable Mention in the Public Sector Operations Research Best paper award.

Rahim Hudda

SED freshman and aerospace aficionado Rahim Hudda received his first co-op offer for this summer/fall—impressive for a first-semester freshman! He got an offer from Rockwell-Collins who was just bought by UTC (which was his dream company). He got offered the co-op/internship after interviewing, pretty much on-the-spot. Congratulations, Rahim!

NeurIPS Conference, Palais des Congrès de Montréal

Graduate students Vipul Satone (MS IE) and Rachneet Kaur (PhDIE) had papers in a highly competitive Neural Information Processing Systems (NIPS) Workshop.

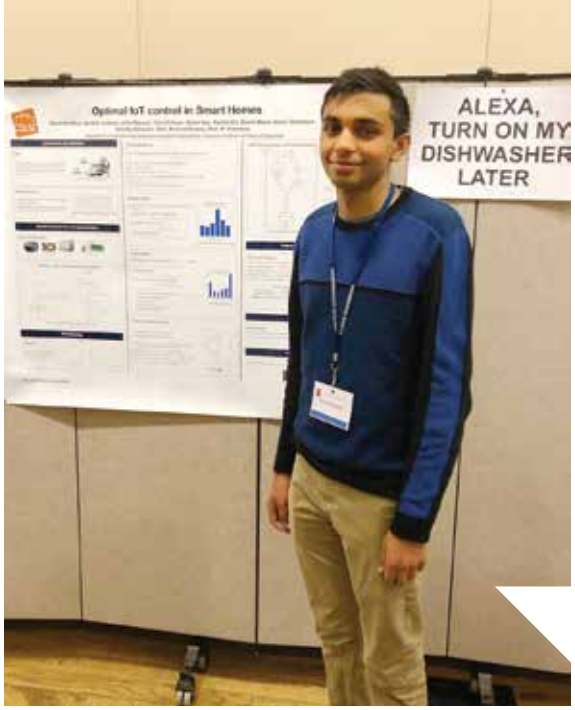
"Learning the progression and clinical subtypes of Alzheimer's disease from longitudinal clinical data", by Vipul Satone, Rachneet Kaur, Faraz Faghri, Mike A Nalls, Andrew B Singleton and Roy Campbell, NeurIPS 2018, Machine Learning for Health (ML4H) Workshop, Dec 2018.

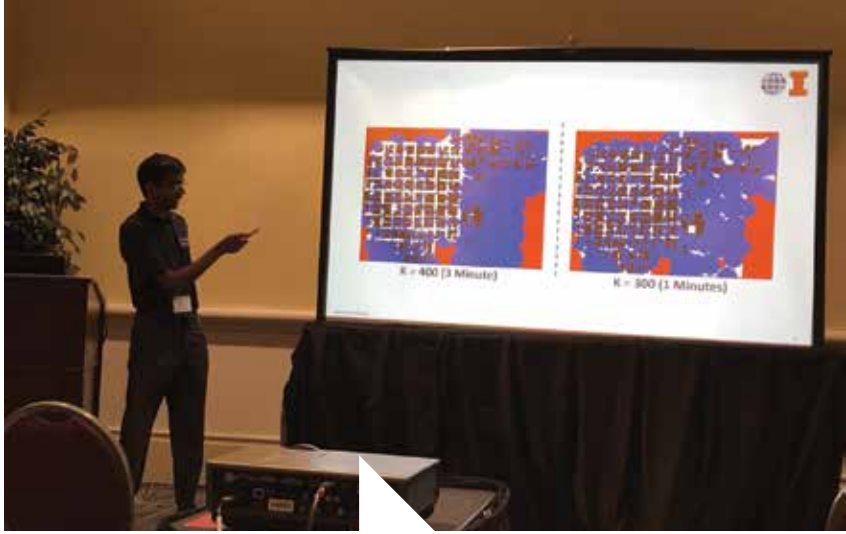
Vipul Satone

Rachneet Kaur

IISE Annual Conference and Expo 2019 in Orlando, Florida

With a booth, a social event, and students in the mix presenting posters, papers, and Senior Engineering Projects, ISE was *all in* at IISE this year.

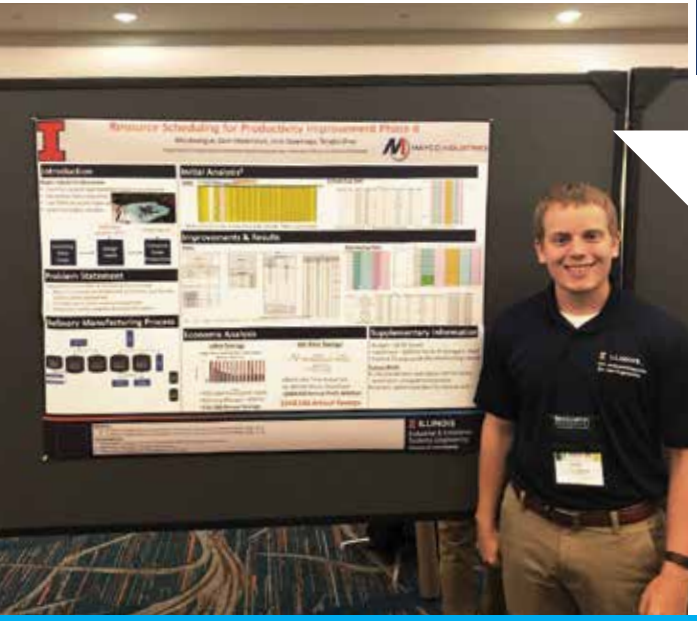




Nirmal Prakash presenting at the 2019 Engineering Research Fair on "Alexa, turn on my dishwasher later."

Nirmal Prakash, presenting "Modeling Wi-Fi Signal Interference for Municipal Wireless Network Planning" at the IISE Undergraduate Student Technical Paper session at the IISE Annual Conference and Expo 2019 in Orlando, Florida.

INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS



Zach Hinderman, at the Capstone Poster Presentation at the IISE Annual Conference and Expo 2019 in Orlando, Florida, presenting a poster for their Senior Engineering Project "Resource Scheduling for Productivity Improvement Phase II."

Rachel Berg and Megan Elliott, at the Capstone Poster Presentation at the IISE Annual Conference and Expo 2019 in Orlando, Florida, presenting a poster for their Senior Engineering Project "Supply Chain Analysis for ERP Operations and Cost-Effective Production Support."

Alex Darragh: The blue and orange rocket

BY PATTI GOOD

SED junior, Alex Darragh, has entered the right career. Growing up, he became increasingly concerned about the effects of climate change; from there, his concerns became a calling. Currently an intern at SpaceX at Cape Canaveral, Florida, Alex Darragh has to be hush-hush on just exactly what he's doing there. But SpaceX isn't the only Elon Musk company Darragh has spent time with; twice, he has interned at Tesla, where he worked in the world renowned "Gigafactory". There, he was part of the Automation Control's Engineering team; he wrote ladder logic code to control industrial automation.

But when did the love of engineering start? According to Alex, it began when he participated in the "Team Indus" Google Lunar Xprize competition his freshmen year of college. "The company invited students from around the world to submit designs of projects they could take with them to the moon." Alex and his teammates designed a miniature greenhouse that could possibly grow plants in lunar soil—real lunar soil—directly from NASA's Johnson Space Center. That prototype and their research led to them being selected as 1 of 14 teams out of 3000 that got to present in India; once there, they were 1 of 6 teams that advanced.

No matter what he does with his degree, 1 of the main focuses of Alex's career will be the environment. "My dream project would be inventing a new product that in some way lowers our GHG emissions and hence helps us address man-made climate change."

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"If you look up into the world around us you'll find excellent engineering saving lives, improving living conditions, and making our world a better place."


Dan Herber


James Allison

Dan Herber (PhDSEE 2017) Joins Colorado State

BY PATTI GOOD

Dan Herber has completed his postdoc at ISE, and has left Illinois to become an Assistant Professor at Colorado State University.

It will probably be strange walking the halls of another school as Dan has spent 11 years in orange and blue; after all, his whole wardrobe will have to change to green, gold, and white. But Dan will have no problem fitting in at the CSU engineering department thanks to his achievements: two-time honorable mention recipient in the NSF Graduate Research Fellowship Program; nominee for the Best Paper Award from the Design Automation Committee; among others.

Dan says he will miss working with Professor James Allison and the diversity among students at ISE.

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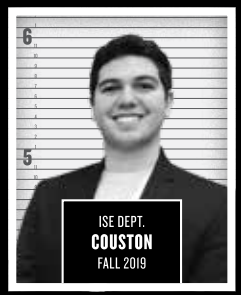


ISE'S Most Wanted

Paul Couston's startup Optivolt is taking off (see ISE Viewbook 2018). But his degree awaits him. C'mon, Paul, I need to move you from student to alumni news! Whether as ISE alumnus or career-undergrad, I salute your success!— William










ILLENNIUM PARK


TM 3792 R
HC


J. ALLISON

Brian Truesdale BSGE 1994:

An engineer leading in business

BY ZACK FISHMAN

Brian Truesdale, the president of Marmon Foodservice Technologies and an ISE alumnus, stays highly engaged with the Urbana-Champaign campus. He participates in the ISE Engineer in Residence program regularly, holds season tickets for football and has a son studying Systems Engineering and Design as he did years before. He was recently on campus to share his career experience with students as an Engineer In Residence and had a chance to share his story as an Illini and business leader.

Before he became president over a group of 5 industrial companies with revenues exceeding $300 million, Truesdale was a student in General Engineering, during which time he worked on redesigning the process of polishing pans for cookware company Revere Ware as a senior design project. Since graduation, Truesdale has largely taken on leadership roles in businesses across several industries yet attests to the usefulness of his degree, particularly because of its many specialization options.

"I developed a specialization in engineering management, which is more of a business slant to engineering—how do you optimize business processes, how do you simplify manufacturing, how do you manage product development?" Truesdale said. "The degree helped my career path going into senior leadership roles in product development and manufacturing."

He assumed such roles throughout his career in several general management positions at Illinois Tool Works, a Fortune 500 company, and as Sector President at Marmon , a Berkshire Hathaway-owned industrial conglomerate.

As a member of the ISE Alumni Board, he informs the department about the reality and demands of industry so as to better prepare students for their careers. Through his company, he has sponsored several senior design projects much like the one he worked on so many years ago, giving seniors a taste of being professional engineers.

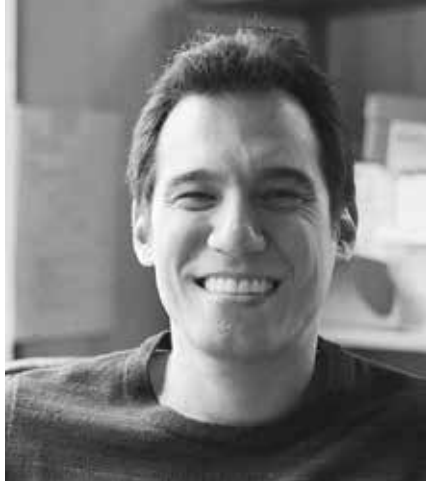
"The senior design project program is, to me, the best I've seen in the country," he says. "It's real-world engineering work, and we end up getting a direct benefit from having invested that money into the project, so more often than not, we see 5, 10, sometimes 20 times our investment returned. It's amazing to see what a small student team can do in a matter of 3 or 4 months and have a real impact on the company."

"We love sponsoring these projects and want to continue to do it for as long as we can," he adds. Truesdale shows appreciation and admiration of the ISE program, praising its help in his own life and those of its many other graduates. "I was hired because I had an engineering degree from Illinois, and I was hired by a company that recognized the breadth of skills and problem solving that the ISE program uniquely provides."

> "I can honestly say that I wouldn't be where I am without my Illinois engineering degree."

Koji Intlekofer BSGE 2006:

Spreading healthcare through innovation



The Shift Labs team. From left: Claire Storck, Chie Kawahara, Beth Kolko, Koji Intlekofer, Molly Blank, Ariana Marcassa Kim, Michael Connolly.

BY ZACK FISHMAN

In the Democratic Republic of the Congo, dozens of people have died from frequent Ebola outbreaks. The disease requires precise intravenous (IV) fluid infusion, but the field hospitals in the affected area aren't properly equipped to ensure accurate and safe treatment of Ebola patients. Starting in 2016, this problem was solved by a device released with the help of an ISE alumnus.

Koji Intlekofer, the Chief Technology Officer of Shift Labs, was a leader in developing and marketing DripAssist, a battery-powered device that monitors IV drips at high precision. The palm-sized electronic slides onto an IV line and counts individual drops, displaying the drip rate with an error of under 1 percent.

The Drip Assist.

The DripAssist began as a prototype by Beth Kolko, a professor at the University of Washington and co-founder of Shift Labs. Intlekofer joined the team as a fellow co-founder, where he used his technical expertise to design the device for manufacturing and organize with the necessary suppliers.

After a particularly hands-on assembly process—"we built the first 500 or 1000 by hand in our office, literally till our fingers split," Intlekofer says—Shift Labs sold its first DripAssist in 2015 to the veterinary market, where regulations were less stringent. To release the product in the medical field as intended, however, the startup's invention needed FDA approval, which is costly. Shift Labs subsequently turned to Y Combinator, a prominent seed accelerator, for support.

"I knew they had a lot of valuable resources, so I convinced my founder that we should apply," Intlekofer says. "We were running out of money, and to do that with a medical device—I don't know if stupid is the right word, but hard."

Shift Labs received the funding and FDA approval and has since marketed the product for international use, private clinics and at-home elderly care.

"You could say our mission statement is to bring health care equality to the masses and improve health care equity," he says. "Everybody should have healthcare, and everyone should have the tools and their disposal to provide good healthcare."

READ THE FULL ARTICLES ONLINE:
ise.illinois.edu/newsroom

> "You could say our mission statement is to bring health care equality to the masses and improve health care equity."

Tracey Meares BSGE 1988:

Yale professor promotes procedural Justice

BY DOUG PETERSON

Tracey Meares still remembers the day she was driving through the heart of Chicago with her 3 young children in the back seat of her van. In the process of responding to her 3 kids—a baby, toddler, and six-year-old—she inadvertently rolled through a stop sign.

Suddenly: flashing lights. She was pulled over by the Chicago police.

The encounter turned out to be positive, because the police officer allowed her to explain, and he even let her off with a warning.

Today, Meares works on fairness in the criminal justice system, and this incident underscores 1 of the 4 key elements of "procedural justice." The first pillar of procedural justice is the desire to be heard by a police officer or other representatives of the criminal justice system.

"If you ask most people, 'Would you rather be yelled at and called every kind of name and then not get a ticket, or get a ticket and be treated respectfully, most people will choose the latter," she says. "They care more about how they're treated than the outcome."

Meares' work on procedural justice with her colleague, Tom R. Tyler, has brought her to the forefront of research and debates about police encounters with the public. She has been a law professor at Yale University since 2007 and is Yale Law's first African-American woman to receive tenure. She also served on President Obama's Task Force on 21st Century Policing, and she runs Yale's Justice Collaboratory with Tyler.

Her degree in General Engineering (now called Systems Engineering and Design) gave her the skills to set the stage for a crossroads decision at the end of her undergraduate years—either law school or medical school.

"I have no regrets about choosing law over medicine," Meares says. "My sister is a doctor, and I can pretty much play a doctor on TV. And I now have the best job in the world, which is to be a law professor at the best place in the world to do it—Yale Law School."

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ise.illinois.edu/newsroom

"We found that when it comes to the fairness of legal authorities, people care about 4 things."

4 elements of fairness from Meares' and Tyler's research: 1.) Voice, 2.) Dignity, 3.) Neutrality, and 4.) Motives of the decision-maker.

Michael O'Connor PhDME 1986:

Engineering to save lives

BY MADELEINE HUBBARD

In 1969, O'Connor graduated with his bachelors in Industrial Engineering, focusing in OR. Following graduation, O'Connor went to work for the US Air Force as an engineer at Chanute Air Force Base in Rantoul, Illinois.

Explaining why he chose his career path, O'Connor says, "I felt kind of a responsibility to help the government. I was draft deferred and I wasn't going to go to Vietnam but I thought I could still help support the government by working for the air force or the army."

In 1974 O'Connor and his family was transferred back to Champaign. O'Connor began working for the US Army Construction Engineering Research Lab (CERL).

Eventually, O'Connor was able to take what he describes as a year "sabbatical from work" and complete his PhD in 1986.

By 1996, O'Connor became the director of CERL. 2 years later, O'Connor was reassigned to Washington, DC and became the director of research and development for the US Army Corps of Engineers.

One of the major projects conducted by a Laboratory that O'Connor oversaw was the renovation of the Pentagon. He says they, "were rehabilitating the Pentagon and putting in blast resistant windows and improved structural components in the exterior shell." When the Pentagon was attacked on 9/11, the plane crashed between the section that had been rehabilitated with extra safety measures and a section that had not.

O'Connor says, "The difference between how the 2 preformed was quite significant…. There were people in offices that had been rehabilitated with hardening and these windows who survived since the fireball didn't come through the windows…"

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Top: Aerial View of Chanute Air Force Base, 1981, courtesy of the Urbana Free Library

Bottom: A peaceful quad as the band Feather Train plays.

Bottom inset: National Guard Troops by the Illini Union, circa 1970, courtesy of the University of Illinois Archives.

Laura Albert PhDIE 2006:

Operations Research or die

Laura Albert, PhD, is the Assistant Dean for Graduate Affairs in the College of Engineering and an Associate Professor of Industrial & Systems Engineering at the University of Wisconsin-Madison. Her research interests are in the field of operations research, with a particular focus on discrete optimization with application to homeland security and emergency response problems. Dr. Albert's research has been supported by NSF, DHS, and the Department of the Army, Sandia National Laboratory. She has authored or co-authored more than 50 publications in archival journals and refereed proceedings.

Her research has been awarded several honors, including 4 best paper awards, a National Science Foundation CAREER award, and a Department of the Army Young Investigator Award. Dr. Albert is the INFORMS Vice President for Marketing, Communication, and Outreach. She is the author of the blog "Punk Rock Operations Research."

From the mosh pit, we salute you Dr. Albert!

READ THE FULL ARTICLES ONLINE:
ise.illinois.edu/newsroom

SENIOR ENGINEERING PROJECTS

FALL 2018

Arbor Investments
Logistics Operation Expansion for Subway Product Line
Lavanya Marla, Advisor
Brady DePratt
Rasika Deshmukh
Sriram Katragadda
Ann Murphy

Chief Enterprises, Inc.
Automotive Fuse/Relay Block Seal Assembly Troubleshooting for Economic Production
Dan Thompson, Advisor
Jakub Lewandowski
Kevin Malinis
Rafael Razo

Clifford-Jacobs Forging Co., Inc.
Ergonomic Forging Manipulator Design and Development
Carolyn Beck, Advisor
Calvin Brubaker
Derek Grant
Theresa Ponicki

Cornelius (2018-FA)
Viper Assembly Improvement for Increased Efficiency
Aleksandr Stolyar, Advisor
Michael Gary
David Kim
Ketan Patel
Kim Vatani

Danville Metal Stamping Company, Inc.
Ram EDM Tooling Fixture Reset and Calibration
Harrison Kim, Advisor
Sean Coltrin
Angelica Czarnecka
Sir Lathan Wynn

Danville Metal Stamping Company, Inc.
Turbine Blade Hole QC Methods Improvement
Rasoul Etesami, Advisor
Vincent Hoff
Thomas Riegler
Chi Zhang

Harger Lightning & Grounding
Wire Lug Crimping Tool New Product Design
Henrique L. M. dos Reis, Advisor
Mateus de Camargo Jonas
Frances Ponicki
Dominic Rossi

John Deere Technology Innovation Center
Tango Autonomous Mower Path Planning Algorithm Improvement, Phase II
Karthekeyan Chandrasekaran, Advisor
Shaan Bhakta
Daniel Hill
Xinhang Li
Rikin Mehta

John Deere Technology Innovation Center
Tango Cutting Path Map Development
Niao He, Advisor
Ibadat Chatha
Feiyang Gu
Thomas Liu
Chris Park

Julian Electric Co. Inc.
Heat Shrink Process Design and Optimization
Yumeng Li, Advisor
Fiona Kalensky
Lawrence Romangsuriat
Ashwin Udayaprakash

Mayco Industries
Resource Scheduling for Productivity Improvement Phase II
Jugal Garg, Advisor
Mia Alvergue
Zachary Hinderman
Josie Stawinoga
Tongbo Zhao

Mayco Industries
Improved Lead-Brass Separation Methods for Increased Profitability
Alexandra Chronopoulou, Advisor
Alison (Danrong) Li
Mary Ponicki
Siyuan Xiong
Xueying Yu

Nexstep Commercial Products
Supply Chain Analysis for ERP Operation and Cost-Effective Production Support
Qiong Wang, Advisor
Rachel Berg
Megan Elliott
Zhouyun Jin
Steven Plutchak

Nudo Products, Inc. (2018-FA)
New Layout Development for Improved Production Efficiency
Wayne J. Davis, Advisor
Benjamin Davis
Shaun Hurdelbrink
Gabriel Suarez
Daniel Yee

Principal Global Investors
Principal Portfolio Strategies Model Mapping
Richard Sowers, Advisor
Kathleen Hu
Riya Sanjay
Ross Sinar
Ashwath Srinivas

Principal Global Investors
Principal Portfolio Strategies Portfolio What-If Analysis
Xin Chen, Advisor
Zack Jin
Sanjit Narendra
Roman Ordonez
Siyi Zhang

Plastipak Packaging Inc.
Optimization of Temporary Worker Utilization in Mixed Production Environment
Ruoyu Sun, Advisor
Haley Anderson
Maxwel Cichon
Zachary Harris
Erik Nelson

Prince Castle, LLC
Assembly Process Optimization Through New Technologies
Scott A. Burns, Advisor
Robert Dargatz
Min Soo Kim
Bohan Li
Emily Stanfield

Van Voorst Lumber
Wood Reel Production ERP/MRP Analysis and Specification
Harry S. Wildblood, Advisor
Matthew Koscak
Huaze Li
Qinfeng Zhong
Leticia Zhou

SPRING 2019

Arbor Investments
Logistics Operation Warehouse Optimization for DPI
Lavanya Marla, Advisor
Daniel Black
Sinead DiStasio
Simon Hong

Caterpillar, Inc.—Mapleton Foundry
Cylinder Project Line Simulation for Vertical Integration Part Flow
Dan Thompson, Advisor
Owen Bloomfield
Zhonghao Pan
Austin Truesdale
Grant Williams

Chem-Plate Industries, Inc.
Heat Treating Total Productive Maintenance Analysis and Optimization
Justin Sirignano, Advisor
Aldrin Matthew Alvarez
Alexandra Moxon
Vincent Wong

Chem-Plate Industries, Inc.
Plating Total Productive Maintenance Analysis and Optimization
Jugal Garg, Advisor
Daniel Ayala
Dhruv Gondalia
Henry McDonald
Mitchell Muller

Chief Enterprises, Inc.
BRIC/Microplex Demonstration Unit Design and Prototyping
Richard Sowers, Advisor
Charles Case
Xiyu Chen
Grace Kelley
John Nguyen

Chief Enterprises, Inc.
New Plant Location Optimization Analysis
Scott A. Burns, Advisor
Jack Lenihan
Jiahao Liu
Jessica (Cheryl) Macklin
Meehika Patel

Harger Lightning & Grounding
Hand Crimper/Cutter Design, Phase II
Henrique L. M. dos Reis, Advisor
Dante Nava
Emir Sonmezler
Jacob Stone
Gregory Tan

John Deere Technology Innovation Center
Autonomous Mower Coordination for Fleet Mowing
Robert Norris, Advisor
Kaila Day
Oliver Dobon
Siobhan (Marie) Fox
Matthew Tune

John Deere Technology Innovation Center
Tango Map Development for Internal Tango Storage
Rasoul Etesami, Advisor
Arjit Jaiswal
Ryan Lee
Ailin Wang

Kwik-Wall Company
Design of Reusable Shipping Containers or Folding Wall Partitions
Molly Goldstein, Advisor
Anne Fahey
Thomas Harrington
Adam Heinz

Manor Tool & Mfg. Co.
Improved Space Utilization to Balance Production with Customer Requirements
Wayne J. Davis, Advisor
Anthony Alvizu
Nicola Dama
Zechen Sun

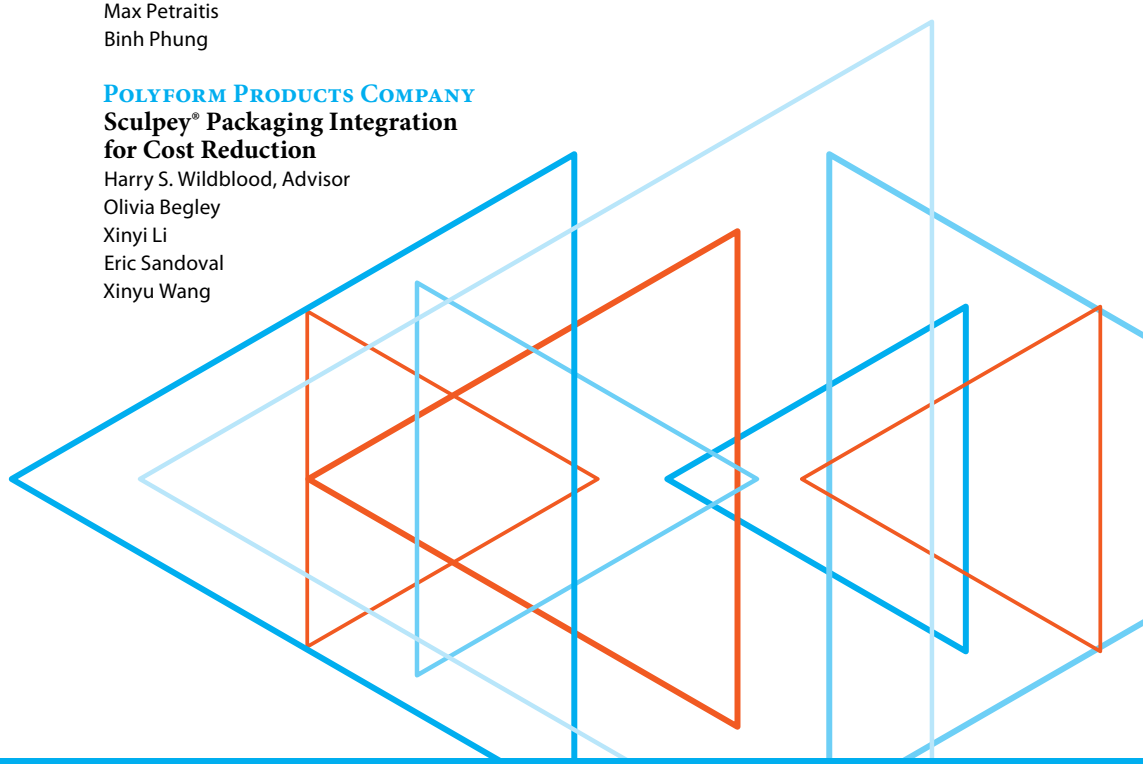
Pavlov Media
Fiber Optic Directional Drilling and Installation Optimization
Qiong Wang, Advisor
Jake Graham
Andrew Peruba
Stanley (Jiahao) Zhu

Polaris Laboratories
Value Stream Mapping and Cost Reduction for Incoming Sample Logging
Harrison Kim, Advisor
Haazib Awan
Raghav Mandhana
Max Petraitis
Binh Phung

Polyform Products Company
Sculpey® Packaging Integration for Cost Reduction
Harry S. Wildblood, Advisor
Olivia Begley
Xinyi Li
Eric Sandoval
Xinyu Wang

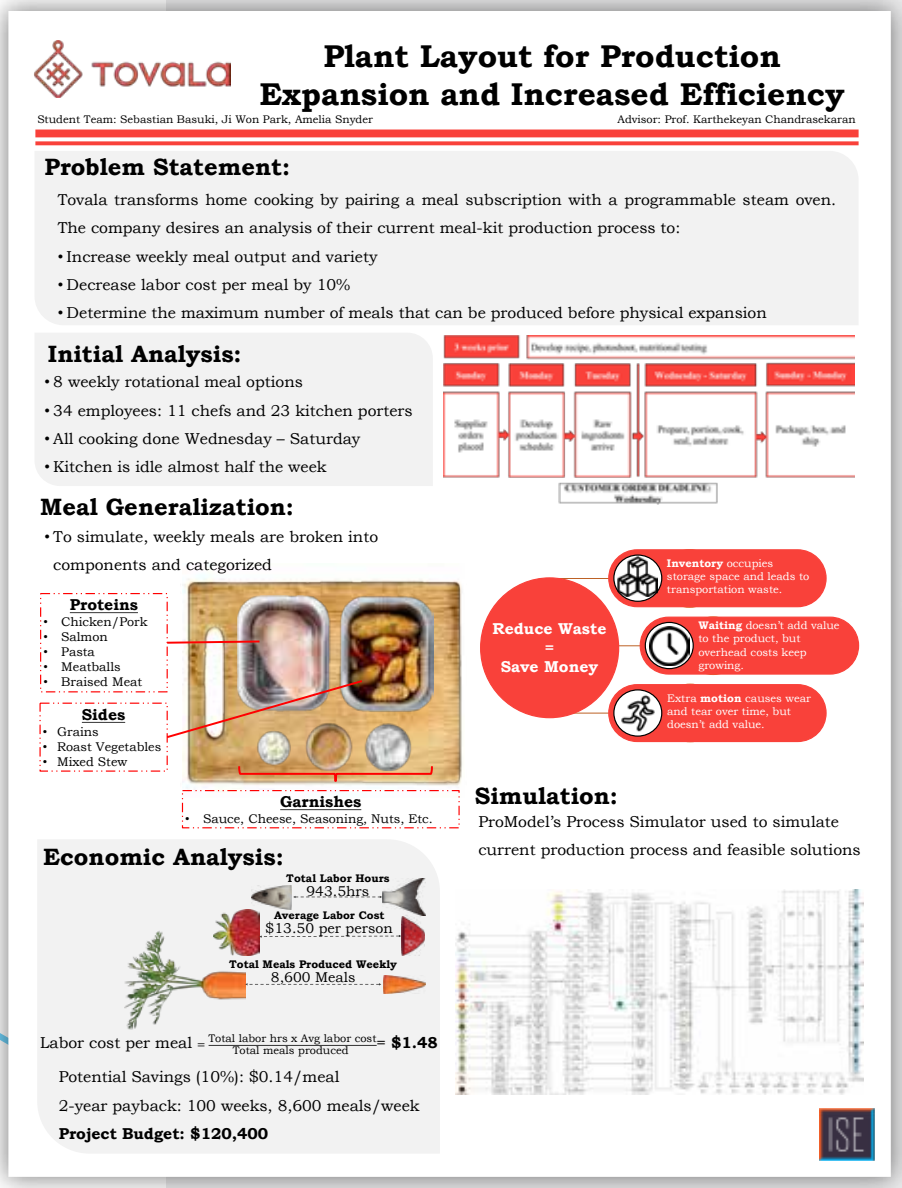
Prince Castle, LLC
Toaster Design for Efficient Just-In-Time Restaurant Operation
Carolyn Beck, Advisor
Steven Gray
David (Xinchen) Wang
Andrew Xu

Tovala
Plant Layout for Production Expansion and Increased Efficiency
Karthekeyan Chandrasekaran, Advisor
Sebastian Basuki
Ji Won Park
Amelia Snyder

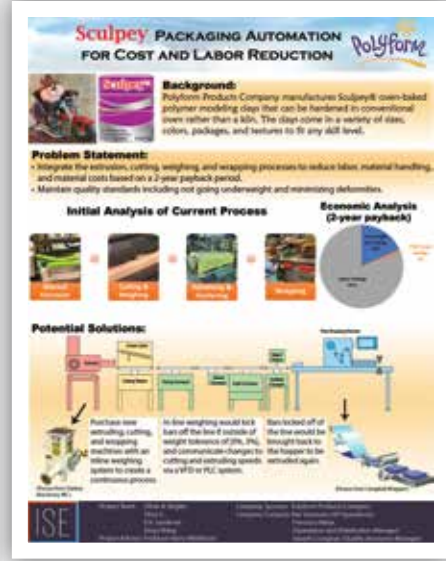


S.E.P. POSTER WINNERS

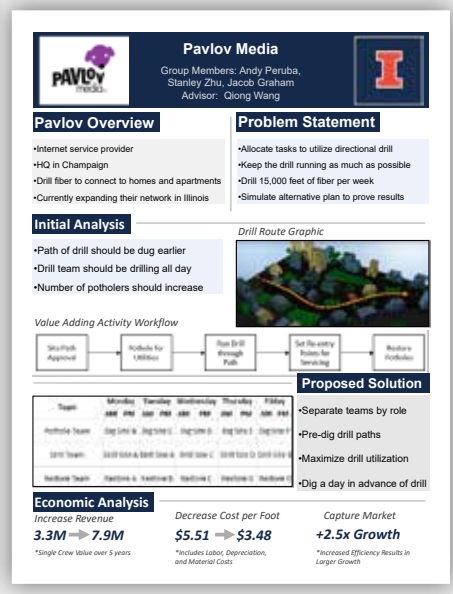
Since 1961 our award-winning Senior Engineering Program has harnessed the team cognition of ISE students to save companies money. As part of the semester-long process, each team must compete in a poster competition. Here are the 3 winning posters.



FIRST PLACE TEAM (Tovala)
Sebastian Basuki, Ji Won Park, Amelia Snyder.



SECOND PLACE TEAM (Sculpey)
Olivia Begley, Xinyi Li, Eric Sandoval, Xinyu Wang.



THIRD PLACE TEAM (Pavlov)
Jake Graham, Andrew Peruba, Stanley (Jiahao) Zhu.

STUDENT AWARDS

Richard N. Baxendale Alpha Pi Mu Outstanding Junior Award
Simon Balisi
Jacob Ettleson
Fei Lin
Yuanbo Zhang

William A. Chittenden Award
Hossein Nick Zinat Matin

Edward S. Fraser Award
Elisabeth Martin

L.C. Pigage Award
Mia Alvergue
Siobhan Fox

The Freshman Award
Rose Chiodo

The ISE Senior Service Award
Emily Stanfield

The IISE Service Award
Mia Alvergue | Vice President 2018/19, Treasurer 2018
Rachel Berg | Treasurer 2018/19, Secretary 2017/18
Shaan Bhakta | President 2017/18, Social Chair 2018/19
Josie Stawinoga | Vice President-2017/18, Mentorship Chair 2018

ISE Distinguished Alumnus Award
Phil Ryan

Mottier Innovation Challenge
FIRST PLACE
Therapalz
Shaan Bhakta
Fiona Kalensky

SECOND PLACE
Click Heels
Jason Chang
Hanna Chen
Ethan Hoggard

THIRD PLACE
Lend-a-Brella
Chaitanya Maroju
Siwen Wang

HONORABLE MENTION
Arctus
Chaitanya Gulati
Alexander Magganas
Allen Ni

Alpha Pi Mu Outstanding Member Award
Siobhan Fox

Alpha Pi Mu Initiates
Mia Alvergue | Treasurer 2018/19
Rachel Berg
Siobhan Fox | Vice President 2018, President 2019
Vincent Hoff | President 2018
Alison Li
Bohan Li
Raghav Mandhana | Vice President 2019
Meehika Patel | Secretary 2018/19
Frances Ponicki
Mary Ponicki
Theresa Ponicki
Riya Sanjay
Qinfeng Zhong

Many thanks to the Donors, Alumni, and Faculty for your unwavering support of the Department of Industrial and Enterprise Systems Engineering.

“Students need to understand the dynamics of a changing world and ALWAYS BE OPEN to different careers and opportunities that they may not have even imagined when in college.”

—Ron Fogle
BSIE 1973

NEW ISE ALUMNI

BACHELOR'S DEGREES

AUGUST 2018 GRADUATES

Industrial Engineering
Jingtian Zhou

Systems Engineering and Design
Matthew R. Duncan
Jeong Hu Lee

DECEMBER 2018 GRADUATES

Industrial Engineering
Arielle Loran Anderson-Venerable
Juan Carlos Argenal Hermosa
Timothy J. Bermingham
Brady Thomas DePratt
Haoyang Ding
Michael H. Gary
Kathleen Qianmin Hu
Alex John Huff
Shaun Andrew Hurdelbrink
Zhouyun Jin
Matthew Edward Koscak
William P. Lai
Jessica Xian-Ling Lee
Rikin Rajneesh Mehta
Roman Franco Ordonez
Stephen Jacob Plutchak
Thomas Jake Riegler
Josie Marie Stawinoga
Kim Niki Vatani
Daniel Chang-Hwa Yee
Xueying Yu
Qinfeng Zhong

Systems Engineering and Design
Haley J. Anderson
Gregory E. Bloden
Calvin Michael Brubaker
Sean David Christopher Coltrin
Benjamin Roy Davis
Derek L. Grant
Vincent Gabriel Hoff
Fiona Eileen Kalensky
Sriram Katragadda
David Hyonseo Kim
Jakub Piotr Lewandowski
Kevin Carl Cruz Malinis
Chris Heejun Park
Rafael Razo
Paige Lorayne Sekely
Gabriel Suarez
Sir Lathan Larocque Wynn
Hao Yue

SPRING 2019 GRADUATES

Industrial Engineering
Anthony L. Alvizu, Jr.
Sebastian Wilbert Basuki
Olivia Nicole Begley
Rachel Emily Berg
Daniel Black
Owen Price Bloomfield
Nicola Tommaso Dama
Robert Wilson Dargatz
Rasika R. Deshmukh
Sinead M. P. DiStasio
Dhruv Ashok Gondalia
Jacob P. Graham
Feiyang Gu
Zachary I. Harris
Zachary T. Hinderman
Samoon (Simon) Hong
Arjit Jaiswal
Zack J. Jin
Ryan Junsup Lee
Jack Benjamin Lenihan
Danrong (Alison) Li
Huaze Li
Xinyi Li
Jiahao Liu
Raghav Sampat Mandhana
Henry T. McDonald
Alexandra Lee Moxon
Ann Deirdre Murphy
Sanjit Narendra
Zhonghao (Erik) Pan
Ji Won Park
Ketan Rameshbhai Patel
Meehika Mehul Patel
Max L. Petraitis
Lawrence Romangsuriat
Eric Sandoval
Riya Sanjay
Kristy Jeongnyun Shin
Ross J. Sinar
Amelia Li Snyder
Ashwath Srinivas
Emily Kathryn Stanfield
Jacob M. Stone
Zechen Sun
Ashwin Udayaprakash
Ailin Wang
Xinchen (David) Wang
Xinyu (Ginny) Wang
Chi Zhang
Siyi Zhang
Tongbo Zhao

Systems Engineering and Design
Daniel Ayala
Shaan Tarun Bhakta
Charles Russell Case
Ibadat Singh Chatha
Xiyu Chen
Maxwel Tyler Cichon
Angelica Natalia Czarnecka
Kaila Ann Day
Mateus De Camargo Jonas

Oliver Mark Dobon
Megan Elaine Elliott
Anne C. Fahey
Siobhan Marie Fox
Stephen C. Gray
Thomas P. Harrington
Daniel Franklin Hill
Thomas Liu
Mitchell James Muller
Dante G. Nava
Erik M. Nelson
John V. Nguyen
Andrew James Peruba
Frances Ann Ponicki
Mary Rose Ponicki
Theresa Catherine Ponicki
Dominic J. Rossi
Jacob M. Stone
Siyang Sun
Gregory X. Tan
Austin Thomas Truesdale
Siyuan (Tony) Xiong
Andrew Xu
Leticia Ruiqi Zhou

MASTER'S DEGREES

AUG 2018 GRADUATES

Master of Science in Industrial Engineering

Sravya Aremanda
Yijun Dai
Kyoungsoo Lee

Master of Science in Systems and Entrepreneurial Engineering

Molly Sturgis

DEC 2018 GRADUATES

Master of Science in Industrial Engineering

Shizhao Wang
Weirong Xiao

Master of Science in Systems and Entrepreneurial Engineering

Satya Ravi Teja Peddada

MAY 2019 GRADUATES

Master of Science in Industrial Engineering

Shubham Bansal
Siddharth Chakravarthy
Shenghan Chen
Nithish Kaviyan
Dhanyananda Ganesh
Kavjit Durairaj
Kriti Gupta
Narayana Jonnalagadda
Karthik Venkata
Reshma Lal Jagadheesh
Jiyao Li
Sathwik Tejaswi Madhusudhan
Zhenye Na
Jigar Bhupendra Patel
Dhayabaran Ponsingh
Sarvesh Rajkumar
Bilal Abubakar Safree
Vipul Kishor Satone
Vedika Lalit Shah
Naman Shukla
Myung Hwan Song
Lihui (Frank) Sun
Chutian Tai
Nitin Babu Tangellamudi
Nishant Velugula
Tianqi Wu
Yanwen Xu
Jinran Yang
Chao (Alex) Yu
Wenwei Yu
Yang Yuan
Mingyu Zha
Yin Zhang
Yantong Zheng
Ziyu Zhou

MAY 2019 GRADUATES

Master of Science in Systems Engineering and Design

Joshua E. Love
Siyao Luan

DOCTORAL DEGREES

AUGUST 2019 GRADUATES

Doctor of Industrial Engineering

Shanzad Fazal Bhatti
Dissertation: *Scalable Centralized and Distributed Spectral Clustering*

Tinghao Guo
Dissertation: *On the Use of Machine Learning with Design Optimization Data for System Topology Design*

Shanzad Fazal Bhatti
Dissertation: *Scalable Centralized and Distributed Spectral Clustering*

MAY 2019 GRADUATES

Doctor of Philosophy in Industrial Engineering

Runqi Hu
Dissertation: *Inverting Multivariate Analytic Characteristic Functions with Financial Applications*

Note: due to publication deadlines, this list may contain inaccuracies.

Left: The Transportation Building circa 1950. Right: a drawing of architectural details repeated near the roof line.

T²: TRANSPORTATION TRANSFORMATION

We are in the early stages of a fundraising effort to update our beloved Transportation Building with, among other improvements, smart Internet-of-Things systems both to optimize energy efficiency as well as to provide a real-world IoT workshop for students. So far, we have replaced the elevator and made other significant improvements; for the next phase, we are reaching out for support from alumni.

The Transportation Transformation Initiative will support the modernization of the historic Transportation Building where students will learn in an environment where "smart" technologies abound and will become a living, learning laboratory. In order to increase ISE's national ranking, keep pace with a growing student body, and offer modern instructional methods needed to meet the demands of changing technologies, the century old facility must be renovated.

The initiative is overseen by the ISE Alumni Board T² Committee.

T² COMMITTEE

JIM EHRHART
Chair
BSIE 1986
Board Member Since 2017
Jim is currently Director of Enterprise Solutions for Paracosma, a start-up in field of Virtual and Augmented Reality. Previously he worked with Salesforce developing service offerings for their largest global clients.

BRUCE HUBER
A/E/C and Marketing Advisor
BSGE 1971
Board Member Since 2018
Bruce is a business and technology executive recently retired after a career in the electronics, banking and consulting engineering professions.

JOE HARTMAN
Program Finance Advisor
BSGE 1992
Board Member Since 2010
Joseph C. Hartman, PhD, PE, serves as newly-appointed Provost of the Francis College of Engineering and Professor of Mechanical Engineering at the University of Massachusetts Lowell.

DIANE STEINKAMP
Events and Alumni Relations
BSGE 1996
Board Member Since 2007
Diane is a Senior Associate at Clayton Capital Partners, an investment bank specializing in mergers and acquisitions. She has previously worked at Accenture, Anheuser-Busch, Inc., and Monsanto Company and is a Past President of the ISE Alumni & Advisory Board.

For More Information

Contact Jim Ehrhart at (415) 691-1999
or email t2@ise.illinois.edu


I S E