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

ISE VIEWBOOK 2020

WINDS OF CHANGE

ISE researchers and students are solving new problems

ISE

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 Fred Zwicky, and most portrsait shots are by L. Brian Stauffer. Illustrations by Miriam Martincic.

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

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Message from the Department Head

Deborah Thurston

ISE Department Head

Gutsgell Professor

Co-Director, Technology & Management

ise.illinois.edu

Dear ISE Community,

In my thirty-three years here at the University of Illinois, I can say this has been the most difficult, and yet at the same time the most rewarding semester I've ever experienced. COVID-19 has forced us to take unprecedented actions (in mid-semester, send everyone home and pivot to online teaching!), answer questions we've never been asked before (just exactly how many students can you fit in Foellinger Auditorium sitting 6 feet apart?), and plan for a future whose uncertainties we've never before had to consider.

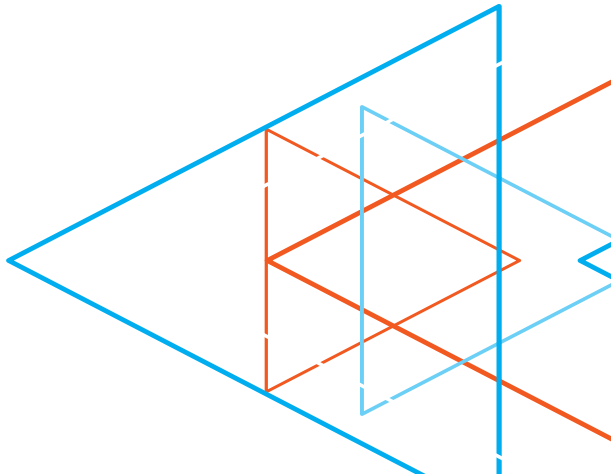
But working with our ISE team to protect our community's health while fulfilling our mission of delivering a world-class education has been extremely rewarding. Students, faculty and staff have really stepped up to the plate.

We survived, even thrived, this Spring. I have never been prouder of our students, who were able to finish their already tough curriculum under difficult circumstances. Our graduating seniors gave up their last months on campus, including graduation ceremonies, in order to protect the health of others. For that, we will be eternally grateful.

Moving forward, the Grainger Teaching Academy Initiative has provided crash courses for faculty so they can perform online the things they do so well in person; "flipping the classroom" for broad student participation, assessing performance via homework and exams, and engaging students in laboratory courses. We are ready for the Fall.

I hope that all of you have been able to stay healthy. Who knows what the future will bring, but we're all looking forward to being together again in person as soon as possible.

Sincerely,
Deborah Thurston











ILLINOIS


THE ART OF ENGINEERING DESIGN

SE 101 COMBINES ANALYSIS WITH ARTISTRY

BY DOUG PETERSON

In the heart of Florence, Italy, there stands the spectacular Florence Cathedral, which boasts the largest freestanding masonry dome in the world. The man behind the dome was Filippo Brunelleschi, an artist, architect, and engineer, who also established the rules of perspective in drawing. “I always tell my students that 500 years ago, you couldn’t distinguish between artists and engineers. They were basically the same person,” says ISE professor James Leake.

Leake uses Brunelleschi as a prime example of this, and ISE's Product Design Lab even has a 3D model of Brunelleschi's dome, which a student created a few years back.

Leake spent 19 years driving this point home through SE 101, the longstanding introductory class in engineering graphics and design, which he oversaw until his retirement in 2018. He also created the Product Design Laboratory and cultivated the department's close relationship with Autodesk, the company behind Inventor, the popular Computer Aided Design (CAD) program that his students have used over the years.

SE 101 is a hands-on design class, which features two tracks—one for civil engineers and the other for students in ISE and agricultural and biological engineering. In the ISE track, students reverse engineer real-world products and then reassemble them digitally, while the civil engineering track has students reconstructing various campus buildings digitally.

However, the real story of SE 101 is not the technology. It is a tale of two professors—Leake, who shaped the class, and Molly Hathaway Goldstein, who currently oversees both the class and the Product Design Lab. Leake estimates he taught roughly 10,000 students over the years before passing the baton to Goldstein.

Goldstein has seen the class from three different perspectives—as a student, as a teaching assistant, and now as a professor. She took SE 101 in the fall of 2000, back when she was a freshman at the University of Illinois and the class was then known as GE 103. Four years later, she was a graduate student at U of I, helping to teach the course as a TA.

"That's when it all clicked," she says. "Seeing how I could help students learn through this class was one of the most transformational points of my life."

The course wasn't any different when she taught it as a TA, but she says, "I was different. I got to see what the instructor put into the class. I saw how much James Leake cared about creating assignments and exams that made sense for the students."

> In engineering education, there's a lot of emphasis on getting students to realize that engineering is not only an analytical profession—it's also a creative profession.

Fourteen years later, in 2018, Goldstein was hired to take over teaching SE 101, only weeks after finishing her PhD from Purdue in engineering education.

"I felt like I won the lottery to be back here," she says.

Ironically, Goldstein bookended Leake's teaching odyssey. She was a student in the class when Leake was only in his second year of teaching SE 101, and she came back at his retirement.

Leake's path to teaching the course at Illinois was a long and winding road. He grew up in Florida and went to high school in Indiana before graduating from Indiana University with an art history degree in 1974. Then he went to Florida Atlantic University, where he received a second bachelor's degree in 1980, this one in ocean engineering—a little known engineering specialty. He put this degree into practice in Washington State, where he worked until 1983 for a naval architecture firm that designed car ferries.

Jim Leake in the Peace Corp

MOLLY GOLDSTEIN

ANDY BLOCK (BSGE 2004), DESIGN ENGINEER FROM FISKARS, HELPS REVERSE-ENGINEER FISKARS PRODUCTS

"I always wanted to go into the Peace Corps. So I did that from 1983 to 1986 in Tunisia, overseeing the construction of boats," Leake continues. He also met his wife in the Peace Corps, and after their stint in Tunisia, they moved back to Seattle, where he designed crab boats and other fishing boats for the Alaska fishery.

"This was when I first started using CAD software," he says.

Next, Leake went back to get his master's degree in mechanical engineering from the University of Washington in 1993, and then he taught CAD and engineering graphics in the United Arab Emirates.

"This was still the early days of the Internet," he says, "and I created a website about using solid modeling, which is what most CAD is based on. Instead of drawing lines, circles, and arcs, you build things up from three-dimensional elements, such as boxes and cylinders."

Finally, after years of moving around, he was lured back to the States by the University of Illinois. Leake found a home at Illinois and has remained there ever since.

Before he came on board at Illinois, students in SE 101 (or GE 103 as it was called then) were using AutoCAD, the first CAD program for personal computers. But it was all in 2D.

"I was basically hired to bring 3D solid modeling to the college," he says.

Leake arrived on campus in 1999, and only one year later, Autodesk began to push a new relationship with universities. Leake says he jumped at the opportunity.

"For a single fee, you could use all of their products, rather than pay separately for AutoCAD and other programs," he says. "I really championed that, and ever since we've had a strong relationship with Autodesk."

Sometime in 2001 or 2002, he says the class got its first 3D printer—among the earliest on campus. And in 2004, the Product Dissection Lab (later renamed the Product Design Lab) was launched. At that time, Leake decided to do away with SE 101's final exam—a very popular decision. Instead, students would make a final presentation on a reverse engineering project that they had worked on in teams for the entire semester. The reverse engineering project remains the cornerstone of the ISE section of the class today.

"This is students' very first design class in engineering," says Goldstein. "It's one of the first opportunities for them to understand the design process and its dichotomy of the artistic and analytical."

This is students' very first design class in engineering. It's one of the first opportunities for them to understand the design process and its dichotomy of the artistic and analytical.

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

Kushagra Mittal (BSIE 2020): a Senior Engineering success story

CARLY DEFILIPPO

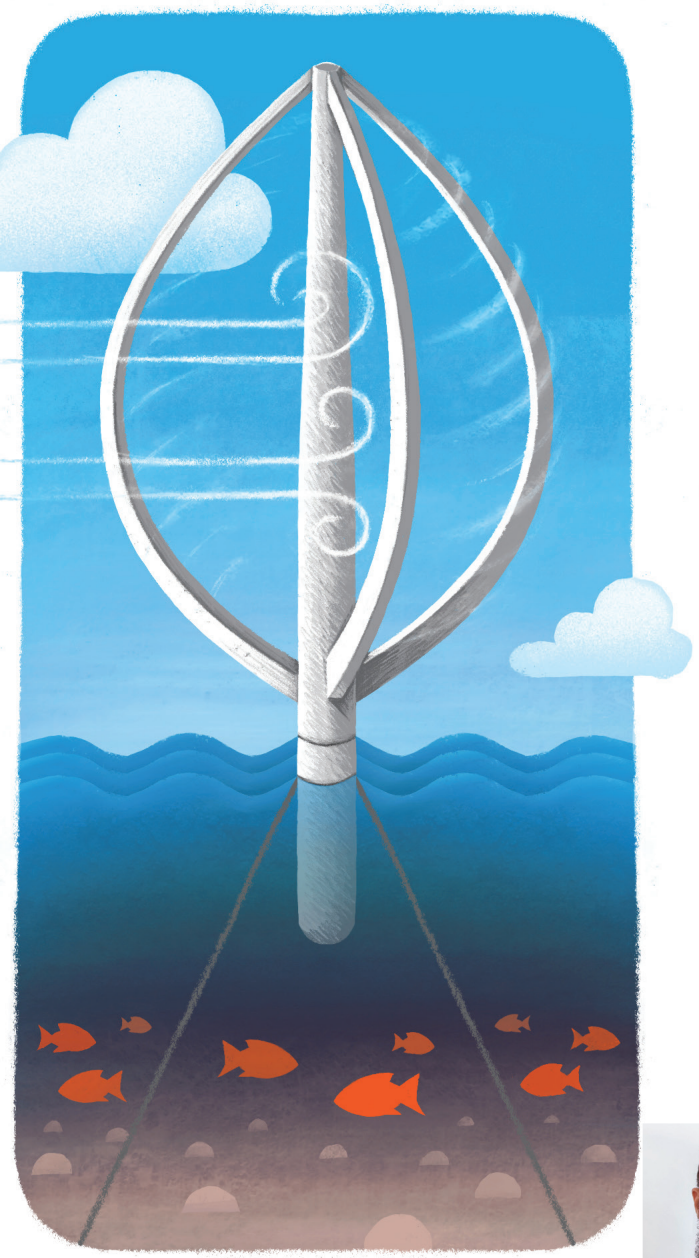
Early in April, Kushagra Mittal (Kush), Senior Engineering Program (SE494) student and IE Spring 2020 graduate, was informed that his first job offer as a Design Engineer was rescinded due to the pandemic. But soon after his final presentation in SE494, Kush was contacted by Agri-Fab (his Senior Engineering Program industry partner) to interview for a Design Engineer position, and received a full-time offer.

In the Senior Engineering Program capstone course, students in teams of three or four are guided by faculty advisors and are challenged to develop solutions to real-world engineering problems provided by industry-partnering companies. "SE494/5 has been an integral part in my transition from an engineering student to an engineer. I was always confident in my personal skills, and the class provided me with an opportunity to apply them to solve real life engineering problems," stated Kush. Professor Harry S. Wildblood is the Director of the Senior Engineering Program, and Kush acknowledges that without Harry'sefforts, guidance and knowledge, he would not have been able to achieve what he has today. The student group got first position for the Bernt O. Larson Award and has been selected for 20 finalists for 2019-2020 Outstanding ISE Capstone Senior Design Projects Award.

Our Senior Engineering Program works hard to bring real-world, professional engineering challenges to the senior students by partnering with companies to tackle and solve their most pressing problems, subject to realistic constraints and supported by economic analyses and recommendations for implementation. There are multiple reports and presentations throughout the term, several trips to their partnering companies, and in Kushagra Mittal's case, a full-time career opportunity post-graduation. "The way Senior Design is structured encourages us to strive for the best," Kush said.

Kush was excited to begin his professional career as a Design Engineer at Agri-Fab on June 8th, 2020. Agri-Fab is an established manufacturer of lawn care products based out of Sullivan, Illinois that specializes in tow-behind implements such as lawn sweepers, spreaders and aerators.

Congratulations to IE Spring 2020 graduate, Kushagra Mittal, on his successful transition to the workforce. As a Department, we are proud to have a Senior Engineering Program that provides fulfilling results both inside the classroom and out, as well as a network to give prospective students (and their parents hope of jobs) after graduation.



This illustration shows the height of the wind turbine as compared to the Statue of Liberty. Drawing by Miriam Martincic.

James Allison receives funding to develop floating wind turbines

ZACK FISHMAN

The ocean waters of the United States may one day be populated by floating wind turbines that will generate renewable energy from strong winds blowing across the oceans—but they might look less like windmills and more like the oversized egg beaters.

Professor James Allison of the Department of Industrial and Enterprise Systems Engineering (ISE) at the University of Illinois Urbana-Champaign joins dozens of U.S. researchers to radically redesign floating offshore wind turbines under the new $26-million ATLANTIS program. He will collaborate with engineers at the University of Texas at Dallas and the U.S. Department of Energy's (DOE's) National Renewable Energy Laboratory (NREL) Golden, Colorado, with a focus on implementing new design approaches in the research. (The main NREL campus is in Golden, but all of Allison's collaborators at NREL are at the Flatirons campus, near Boulder.)

DOE's Advanced Research Project Agency-Energy (ARPA-E) announced the awardees of the program in September with the goal of reducing the cost of offshore wind energy by improving turbine design and control holistically .

James Allison

Ocean winds along U.S. coasts are a highly promising yet mostly untapped source of energy, with the potential to provide 2,000 gigawatts of generation capacity—almost enough to power the U.S. twice over, according to the Department of Energy. Much of the wind blows above waters too deep to fix turbines to the seafloor, so floating wind turbines are necessary to capture that energy.

Current floating offshore turbine designs have large flotation platforms modeled on traditional offshore systems, according to an ARPA-E press release. The ATLANTIS program (short for "Aerodynamic Turbines, Lighter and Afloat, with Nautical Technologies and Integrated Servo-control") aims to design new floating offshore wind turbines and their system controls to be more stable without needing large platforms while also decreasing costs. This leads to challenging trade-offs between stability, efficiency and price, Allison says.

"It's all focused on improving the economic competitiveness of floating offshore wind turbines, but there are all sorts of different things that feed into that, like different technologies and different design methods," he says.

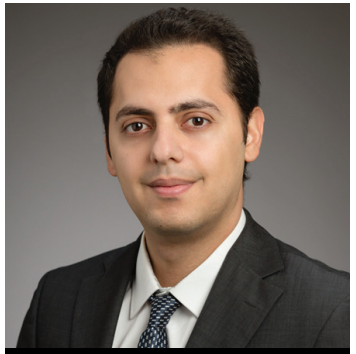
Allison joins the UT-Dallas team, led by researcher Todd Griffith, as a co-principal investigator to fundamentally redesign the wind turbine — by pointing it upward. Unlike traditional wind turbines, which have straight blades that rotate on a horizontal axis, The UT-Dallas researchers are developing a vertical-axis wind turbine (VAWT), which has curved blades that spin around a vertical axis of rotation. It will sit on a small flotation platform that is tethered to the seabed by cables. Allison says the geometry of the VAWT reduces the physical stress it experiences from the wind.

The UT-Dallas team's VAWT design will stand about 600-900 feet tall, but it will be stationed 20 miles from the coast and won't obstruct ocean views from the coast, Griffith says in a UT-Dallas press release.

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

FACULTY AWARDS & OTHER HONORS

New NSF CAREER Awards



Rasoul Etesami
Duality and Stability in Complex State-Dependent Networked Dynamics

Jugal Garg
New Algorithmic Foundations for Fair Division through Competitive Equilibrium

EXCELLENCE IN TEACHING

Sharp Teaching Award
Chrysafis Vogiatzis

IISE Outstanding Faculty Advisor Award (North-Central Region)
Chrysafis Vogiatzis

ISE Department Head's Teaching Award
Abigail Wooldridge

FACULTY (AND CLASSES) RANKED AS EXCELLENT BY THEIR STUDENTS FALL 2020

SYSTEMS ENGINEERING	
* BARICH,J	SE 400
* BLOCK,D	SE 420
ETESAMI,R	SE 320
SPENCER,G	SE 361
STIPANOVIC,D	SE 420
INDUSTRIAL ENGINEERING	
* CHRONOPOULOU,A	IE 400,598
FENG,L	IE 522
SIRIGNANO,J	IE 534
SREENIVAS,R	IE 523
* VOGIATZIS,C	IE 532

* = Outstanding rankings

Rasoul Etesami

Professor works to reduce fake news dissemination

BY ALLIE ARP, COORDINATED SCIENCE LAB

With the United States in the midst of another election cycle, many researchers are trying to prevent the sharing of fake or bad news. CSL Assistant Professor Rasoul Etesami is working to improve the models behind social media tracking, in order to better understand how bad news is shared.

"In social networks, decision-makers are humans and they decide who to interact with and how to manipulate others' opinions," said Etesami. "We want to study the stability of such networks, in terms of if an outcome can be predicted or controlled toward a certain direction."

Most of the current models analyzing social networks act as though a network, whether social or power, is fixed and time-invariant. In these models, there is a network (for example, Facebook), there are agents (humans), and there is interaction (sharing content), which results in an outcome. Etesami believes this doesn't accurately portray how networks operate, because agents' decisions and their interactions dynamically evolve, thereby changing the structure of the network.

"There isn't one well-accepted model in cognitive decision making. There are proposed models and some of them have proved successful and more descriptive compared to others," said Etesami, an industrial and enterprise systems engineering assistant professor. "Our project is to take those models and analyze them critically. If we see shortcomings in existing models, we extend them by adding extra features or constraints to capture more realistic and sophisticated scenarios."

As an example of this, Etesami brought up the last presidential election, the outcome of which some people believe was changed by the spread of false news over social media platforms. Whether or not it's true, Etesami says this type of information dissemination exists.

"You can easily manipulate people's decisions by spreading false news over a network that causes people to connect or disconnect themselves from the true source of information based on whether they like or don't like the message," he said. "If we have a better understanding of the dynamics of agents' decisions and the stability of the networks, we can control the propagation of false news. This can help us protect our social networks from adversarial attacks that can affect the whole population."

As part of the recently funded project "Duality and stability in complex state-dependent network dynamics," Etesami and his team are working to develop a platform that can simulate human behavior within a dynamic social network like Facebook or Twitter.

READ THE FULL STORY ONLINE:
https://csl.illinois.edu/news/csl-professor-works-reduce-fake-news-dissemination

Photography by Fred Zwicky

Finding clarity in the fog

BY LUCAS BUCCAFUSCA

ON A GUSTY OCTOBER DAY, I find myself staring at my wind turbine-simulation results. I take a sip of coffee and smile: The results validate a promising hypothesis.

My research focuses on the design and control of wind farms. Two key factors contribute to the power a wind turbine generates: the incoming wind velocity and how fast the turbine blades rotate. Each turbine hosts its own internal computer that measures wind speed and assigns it a specific operating torque. The computer is designed to maximize the individual turbine's power output.

But my research objective is to get all the turbines in a wind farm to work together as a collective. Early works have shown that each turbine acting in its own best interest will actually lead to less power generation than control schemes that focus on the farm as a whole.

My hypothesis about how to do this arose unexpectedly one day as I was driving to Chicago to visit my fiancée. For some reason, my GPS chose to take me off the main highway and onto country roads, and I found myself traveling through a wind farm. It was a lucky coincidence: A thick mist lay on the horizon and, thanks to the fog, I could see the turbulence fields each turbine generated in its wake.

I knew that turbines generate a disturbance field, and that the turbulence from one can affect the turbines downwind. But I had never thought of the turbines as being coupled together – the impact of upstream turbulence directly correlates to the power generation of downstream turbines. The fog allowed me to visualize this coupling explicitly.

> ...the power of the wind farm as a whole can be improved without necessarily changing any of the external components.

Back in the lab, I was able to take this insight to build better control systems. Now I can run high-fidelity simulations to test – and in this case, validate – each new idea.

What began as just an idea blossomed into an exploration of different methodologies to lessen the effects of upstream turbines. I'm now exploring a technique called "wake steering." By intentionally misaligning turbines, I can design a controller to skew the wakes to one side, even avoiding some downstream effects altogether! This means that the power of the wind farm as a whole can be improved without necessarily changing any of the external components.

I gaze down and see that my mug is nearly empty. I enter a new set of simulation parameters, hit "RUN SIMULATION" and go to refill.

LUCAS BUCCAFUSCA TOOK SECOND PLACE IN THE GRADUATE COLLEGE'S 2019 "RESEARCH LIVE!" CHALLENGE.

CURRENT FACULTY RESEARCH

James Allison. Center for Exascale-enabled Scramjet Design. NNSA (DOE).

Carolyn Beck et al. Algorithms and Software Tools for Modeling, Data Assimilation and Control of COVID-19. C3.ai Digital Transformation Institute.

Xin Chen. Recommendation system for Kiwai videos. Kiwai.

Molly Goldstein, et al. Educating Generative Designers in Engineering. NSF.

Niao He. CIF: Medium: Collaborative Research: Maximal Leakage and Active Receivers for Side-and Covert Channel Analysis. NSF.

Harrison Kim. Quantification of financial and Environmental Benefits Tradeoff in Multi-Generational Product Family Development Considering Re-X Performances. DOE.

Girish Krishnan. Design and Validation of a Soft Robotic Cardiac Transseptal Puncture Simulator. JUMP (ARCHES).

Lavanya Marla et al. Real-time Resilient Intelligent Scheduling Engine (RRISE). MIT Lincoln Labs.

Rakesh Nagi, Robert Norris, R.S. Sreenivas. Mission Planning and Optimization with Multiple Robotic Agents for Engineer Operations in the Deployed Environment. DoD Corps of Engineers.

Robert Norris. Modular, Interactive and Adaptive Personalized Unique Rolling Experience. National Robotics Initiative 2.0: Ubiquitous Collaborative Robots.

Robert Norris. Autonomous Steering, Speed and Implement Control Using Expert Systems and Machine Learning with Model Based Path Planning. DoD Corps of Engineers.

Richard Sowers, et al. Signatures and Barcodes: Data-driven Understanding of Transportation System Performance during Extreme Events. NSF.

R.S. Sreenivas. Explainable AI for Mission Planning and Execution with Interpretable Courses of Action. Office of Naval Research.

R.S. Sreenivas. Robust and Adaptive Autonomy for Multi-agent Maneuvers (RAAMM). U.S. Army Research Laboratory.

Dusan Stipanovic. Trustworthy collision avoidance over information links. Boeing.

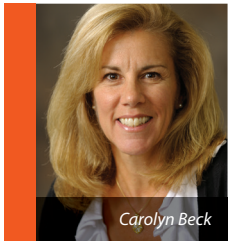
Deborah Thurston. Reducing Embodied-energy and Decreasing Emissions (REMADE) Institute. DOE.

Chrys Vogiatzis. Innovations in Graduate Education: Developing a Research Engineer Identity. NSF.

Abigail Wooldridge. Using Simulation to Evaluate and Improve Team Cognition in Handoffs. JUMP (ARCHES).

Q&A With Carolyn Beck

For many years, ISE professor Carolyn Beck has been building mathematical models to predict how epidemics spread through populations, and her research has gained renewed relevance in the wake of the worldwide COVID-19 pandemic. Beck explains how epidemic models can inform policymaking and how her research improves their accuracy.



Carolyn Beck

Q: Can you describe what an epidemic model is, and how your new network model differs from others that are used

A: We're looking at how infectious diseases and viruses propagate in a population. For a couple hundred years, modelers have used what they call compartment models, which for the simplest model say the population is divided into two groups: They're either susceptible, meaning they're healthy and susceptible to infection, or they're infected. There are also different simulation models that describe this process and tell you what proportion of the population will be susceptible or infected over time — or if you're talking about just an individual, the probability that they'll be infected or healthy. These models assume the population mixes evenly — that is, everyone interacts with everyone else roughly to the same extent.

But rather than assuming the population is mixing evenly, we're assuming that there's an underlying network structure that affects how these viral processes are distributed in the population. The compartment models assume everyone is interacting with everyone else equally, but the network models try to take into account the fact that we're not equally in contact with each other. In our models, we impose network structures on the population and then look at how different network structures affect how quickly people get infected and healthy, and whether they stay healthy.

I had a Ph.D. student, Philip Paré, who graduated about a year and a half ago, and this was the basis for his thesis work. He said, let's consider what happens if these networks themselves change over time. For example, during the week, we may be going to work and interacting with one group of people, but on the weekend, we may be interacting with a different group of people. So there's a time-varying nature to the network. Then he looked at what network structures will lead the population to converge to a healthy state, or alternatively converge to a state where we can't get rid of the disease.

Q: Can you give a couple examples of these networks?

A: At the finest level, you can model human contact networks; that would be on the level of every single person. That would make it pretty hard to run a lot of simulations, due to the size of the population under consideration, but you might be able to do it for, say, small towns. Another level might be aggregated populations. You can aggregate at the household level, the neighborhood level, the city level, the state level, the country level, etc. Then you can look at these different levels to get multiscale models of the interconnections between the population groups. You can also take into account where people are commuting and how they're commuting, and that can change the network dynamics as well. So we try to capture some of these varying levels in our network models to look at how diseases are propagating in a larger population.

Q: Looking at your most recent research, what do you gain by creating a model that includes time-varying aspects, and what outcomes does it create?

A: It's more precise. If you take into account traffic flow, that actually has a pretty prevalent effect in our society today since we're globally connected. If you take this into account, you realize that if a sick person gets on a plane in one country and lands in another country, it creates and opportunity for a virus to become pandemic quickly.

We're able to capture some of these effects and see what the results of them are. If you assume we're all mixing equally countrywide or worldwide, as in compartment models, then you're assuming we're all connected, but people typically aren't. So the network models give us a more realistic way to understand how diseases are going to spread to other places and how fast they might spread. Then we can quantify the effects of our movements and over what timeframes these matter, and we can do this at a more precise level.

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

RESEARCH IN THE AGE OF COVID-19

Seventeen research projects are sharing nearly $800,000 in funding through the Jump ARCHES research and development program. The Jump Applied Research for Community Health through Engineering and Simulation (Jump ARCHES) program is a partnership between OSF HealthCare and The Grainger College of Engineering at the University of Illinois (U of I) at Urbana-Champaign.

These projects were submitted to an unprecedented special call for Jump ARCHES proposals to address COVID-19, pandemics, and other public health crises through smart health, data analytics, AI, and other technologies. The ARCHES program supports research involving clinicians, engineers, and social scientists from OSF HealthCare, University of Illinois, and U of I College of Medicine in Peoria (UICOMP) to develop technologies and devices that could revolutionize medical training and health care delivery.

A requirement of the grant applications was for solutions that could be deployed quickly, within four to six weeks.

"When COVID-19 was declared a pandemic, we felt that it was our responsibility to help researchers find solutions," said ISE Professor T. Kesh Kesavadas, of the Health Care Engineering Systems Center at U of I at Urbana-Champaign and Engineer-in-Chief of Jump ARCHES.

Supply-Driven Hospital Resource Planning and Community Engagement for COVID-19 Treatment

Lavanya Marla – Department of Industrial and Enterprise Systems Engineering; Qiong Wang – Department of Industrial and Enterprise Systems Engineering, Grainger College of Engineering; Benjamin Davis – Carle Illinois College of Medicine, U of I at Urbana-Champaign; Dr. Kurt Bloomstead – EMS Medical Director, OSF HealthCare Heart of Mary Medical Center in Urbana

Gaps exist in our understanding of how to simultaneously manage workforce and resource supplies in a pandemic over time. This proposal will develop algorithms for supply-side planning of both health care workforce and supplies tailored to pandemics by integrating resource inventory aspects and behavioral response to messaging. It will also generate knowledge on the right type of information dissemination to the community that models patients' response to help manage demand and not create congestion at hospitals within communities.

Data-driven Modeling, Analysis and Simulation of Epidemic Processes: Controlling COVID-19

C.L. Beck – Department of Industrial and Enterprise Systems Engineering, Grainger College of Engineering, at U of I Urbana-Champaign; M.T. Basar – Department of Electrical and Computer Engineering, Grainger College of Engineering, at U of I Urbana-Champaign; Dr. Joseph Kim – Clinical Medicine, UICOMP

This project proposes to develop a comprehensive data-driven approach to the modeling, analysis, and control of epidemic processes over time-varying networks on multiple layers. This approach considers the impact of mitigation efforts. Ultimately, the project hopes to advance understanding of spread and control of epidemic processes over complex networks, focusing on infectious diseases, but the models can apply to the spread of computer viruses, misinformation, and adversarial processes over complex networks, such as those found in natural and engineered systems.

Rapid, Contactless Vital Signs Collection Using Computer Vision and Consumer Technologies

Ramavarapu Sreenivas – Department of Industrial and Enterprise Systems Engineering, Grainger College of Engineering, U of I at Urbana-Champaign; Roopa Foulger – Vice President of Data Analytics, Jump Trading Simulation and Education Center; Brent Cross – Simulation Engineer, Jump Trading Simulation and Education Center; Stefan Malmber and Taha Khan – Dectivio, LLC

The goal of the proposal is to develop a computer vision algorithm for rapidly assessing an individual's key vital signs (temperature, heart rate, respiratory rate, and blood pressure) relevant to COVID-19 utilizing a consumer grade camera in the absence of contact or additional sensing elements not readily available (ambient temperature, sound). The algorithm should be appropriately containerized to integrate with on market electronic medical records and telehealth applications including Epic and Vidyo.

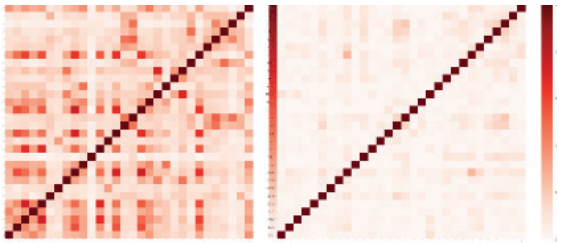
REU

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.



Visualizations by Ted Loewenthal, Zhou Zhou, Darsh Jalan, and Sanghyun Shin

FALL 2019

Darsh Jalan and Sanghyun Shin
Advisor: Lavanya Marla
Project: Hourly Analysis on Air Traffic Network Disruptions.

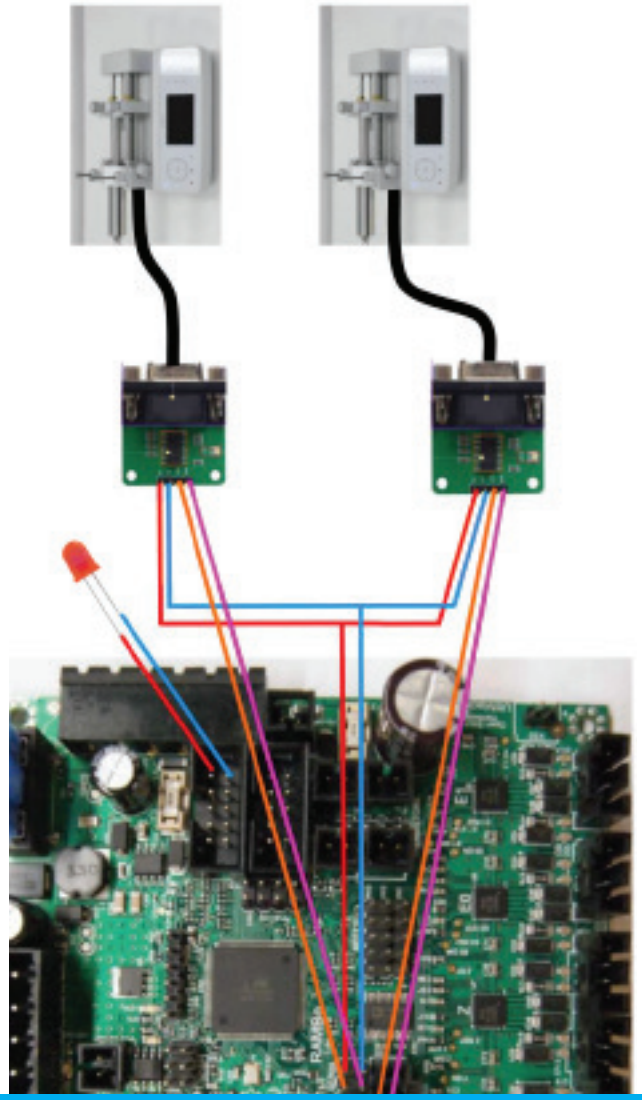
Zhou Zhou
Advisor: Professor Chronopoulou
Project: Data analytics to better portray couples' relationship health

John Morgan
Advisor: Abigail Wooldridge
Project: Analyzing the Usability and Satisfaction for Code Cart Application".

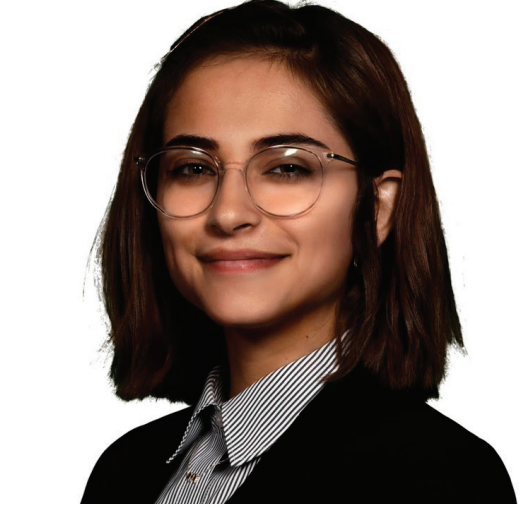
Anthony Composto,
Advisor: Abigail Wooldridge,
Project: Evaluating the Efficacy of a Mobile, Augmented Reality Education Application Using Eye Tracking Data

SPRING 2020

Ted Lowenthal
Faculty Advisor: Girish Krishnan
Project: Controlling a Soft Materials 3D Printer

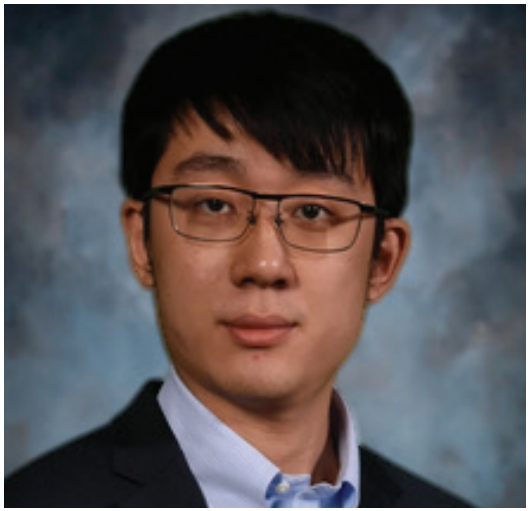










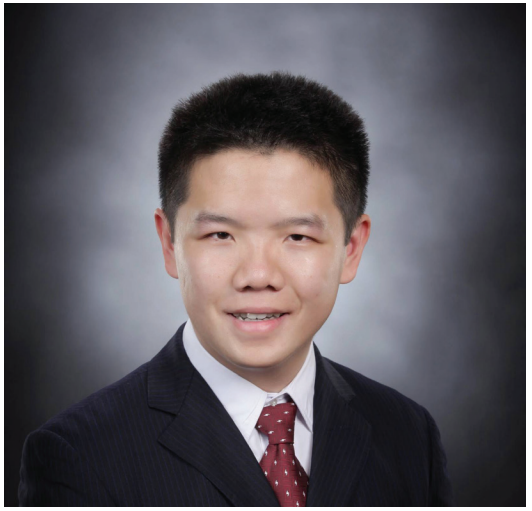



















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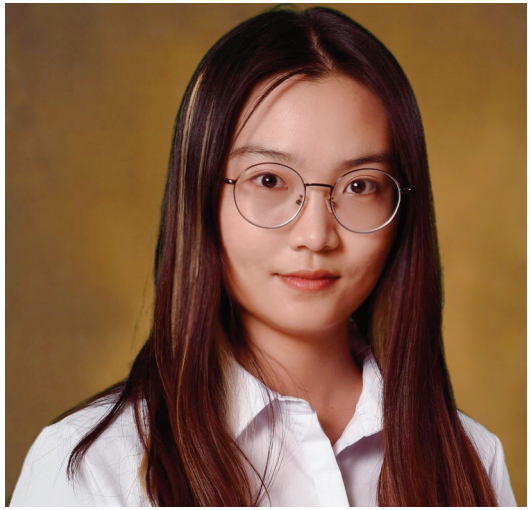
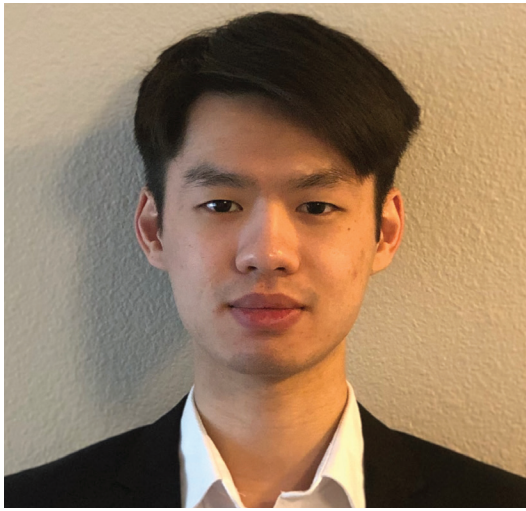
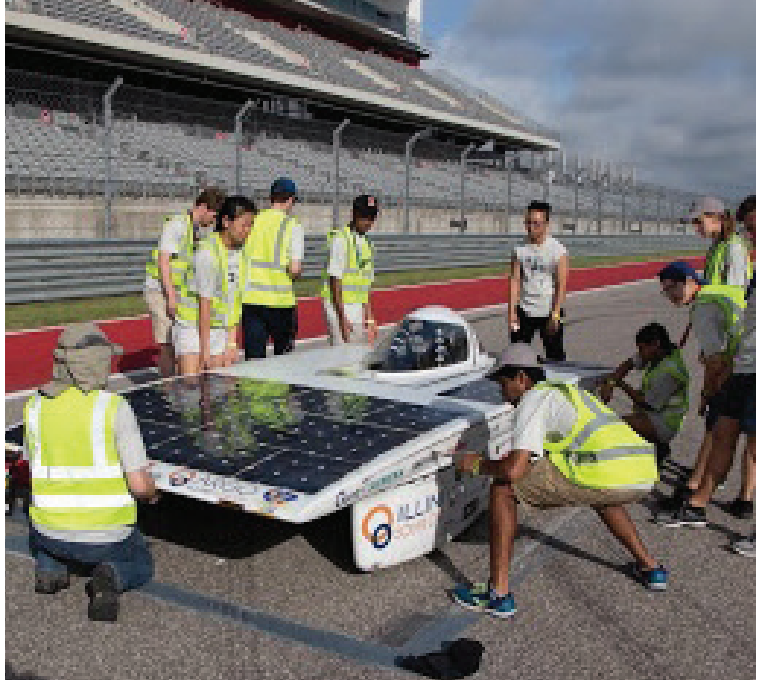






Photos courtesy of Illini Solar Car Team

ISE Students help build, market solar-powered car

BY PATTI GOOD

Rishi Mohan (BSIE 2023) and Ben Hoyer (BSSED, 2023) are two ISE freshmen who have dedicated their time and talents to the Illini Solar Car team on campus.

The Illini Solar Car team started on campus back in 2014, and took 3 years to construct their first car, Argo, participating and placing in several races throughout the years.

Now, the team has been working on a new solar car, named Brizo.

"We're estimating that we need 12 weeks of solid work on design, fabrication, construction, and testing to bring Brizo up to the specifications that we need to ensure driver safety and optimal performance at our next race," Mohan said.

Both Mohan and Hoyer first learned of the Solar Car team on quad day this year.

"I first learned about the team and saw Argo at Quad Day in 2019," Mohan says. "Although I was interested in several of the car teams at the time, Solar Car was the only one that mentioned the operations side of the team at information sessions. Though I am of course interested in the engineering aspects of the car, I've always enjoyed working with operations."

After learning of the Solar Car team on quad day, Mohan has become increasingly involved with the group. "I'm currently on the business and media teams," Mohan says. "These will be combined into a single team next year to prevent each subteam from becoming too small, and I'll be serving as the team lead for this group next year."

Hoyer is on the Business and Media teams, as well as the solar aray team. It has offered him the chance to explore what he is interested in, and also learn about new topics.

"I wanted to learn more about solar energy and how to use it effectively," Hoyer says.

Mohan says that SE101, engineering graphics and design, has helped him with his role on the Solar Car team.

Something that stands out about Illini Solar Car to Mohan is the comradery amongst the teams. "I enjoy working at the garage and in the OpenLab with the team," Mohan says. "It's a great environment, and the knowledge that no project is non-essential makes everyone working on a project feel involved."

The solar car team was originally planning to participate in a race this summer, but it has been postponed tentatively until the fall. Without a doubt, the CoronaVirus has placed additional obstacles in the team's path. Although the next time the team will be able to work on the car is uncertain, these two ISE students are optimistic about its future.

STUDENT AWARDS

Richard N. Baxendale Alpha Pi Mu Outstanding Junior Award
Jiaqing Mao

William A. Chittenden Award
Menglong Li
Peter McGlaughlin

Edward S. Fraser Award
Alexander Pieri

L.C. Pigage Award
James (Jack) Kane

The Freshman Award
Justin Holding

Sharp Outstanding Graduate Student Award
Arun Raman

Alumni Board Award
James (Jack) Kane

Mottier Innovation Challenge

FIRST PLACE

Sip Safe
Spencer Binning
Arsanious Boctor
Joseph Conte
Matthew Meyer

SECOND PLACE

NASADYA
Rishi Choudhary
Chaitanya Gulati

THIRD PLACE

Sonic's Speedway
Alex Darragh
Gabriel Delgado
Chaitanya Maroju

HONORABLE MENTION

The 1-Dish-Wash
Alex Koscica
Satori Ishihara

Vane
Josh Bussan
Ben Hoyer

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

SENIOR ENGINEERING PROJECTS

FALL 2019

A-1 Tool
Injection Molding Prototype Tooling Value Stream Mapping for Lead Time and Cost Reduction
Molly Goldstein, Advisor
Eashaan Gunapati
Jacky Li
Alec Nolan
Haosheng Xiong

DPI Logistics.
Warehouse Logistics Operation Optimization for DPI Washington, DC Facility
Lavanya Marla, Advisor
Bill Agung
Aashin Amin
Miguel Fernandez
Jinyuan Zhou

Bunn-O-Matic Corporation
Coffee Brewer Water Tank Temperature Sensing Redesign
Dusan M. Stipanovic, Advisor
Connie Fu
Jonathan Park
Blake Rosenbusch
Maria Werba

Clark-Lindsey Village
Analysis for Cost-Effective Improvement of Transportation Services for a Retirement Community
Abigail Wooldridge, Advisor
Brandon Benge
Selin Sipahi
Xuren Zhou

Clifford-Jacobs Forging Co., Inc..
Billet Saw Optimization and Cost Reduction
Harrison Kim, Advisor
Eric Brecklin
Luis Maldonado
Keshav Patel
Adam Rush
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, FIRST PLACE

Cornelius
IDC Pro Touch Panel Packaging, Transfer and Assembly Process Improvement
Qiong Wang, Advisor
Nicholas Kasner
Michaela Ana Lobato
Alban Shehu
Nikolay Tzankov

Cushman & Wakefield
Cushman Wakefield Intranet Gamification for Enhancement of Employee Participation
Karthekeyan Chandrasekaran, Advisor
Shijun Cao
Anjana Narasimhan
Shane O'Brien
Yu Wang

Harger Lightning & Grounding
Robotic Automation of Lug Manufacturing Cell
Scott A. Burns, Advisor
Gayatri Dandu
James Gandy
Patric Liu
Ketaki Tamhankar

Hausner Hard Chrome, Inc
Value Stream Mapping for Lean Analysis
Liming Feng, Advisor
Hasan Batuhan Faydasicok
Jayant Gude
Manuel Kappen
Alexander Rotello

Magnetrol International
R86 Radar Horn Fabrication Redesign for Cost Reduction
Girish Krishnan, Advisor
Michael Adams
William Bowbin
Joseph Conte

Magnetrol International
Radar Calibration Bench Redesign for Improved Throughput
Henrique L. M. dos Reis, Advisor
Aditya Kishore
Harsh Patel
Alexandra Wittinger

Mayco Industries
Extrusion Productivity Analysis and Improvement
Rasoul Etesami, Advisor
Austin Lofquist
Mateusz Maturski
Samuel Rasnic

Mayco Industries
Extrusion Quality Improvement to Meet Customer Requirements
Yumeng Li, Advisor
Ruixuan Gong
Ryan Jaeger
Emmanuel Oduola

Nudo Products, Inc.
New Layout Development for Improved Production Efficiency – Phase II
Wayne J. Davis, Advisor
Juliette Shesgreen
Kristin Simkus
Ronak Velluvakkandy
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, SECOND PLACE

Spraying Systems Company
Data Analytics for PulsaJet Nozzle Performance Status
Xin Chen, Advisor
Nathan Joshi
Tiantong Li
Yijie Li
Vishnu Varada

Spraying Systems Company
Predictive Data Analytics for VX-70 Nozzle Status and Required Action
Niao He, Advisor
Kayhan Eryilmaz
Peter Maneykowski
Adithi Murthy

SPRING 2020

Agri-Fab, Inc.
Mow-N-Vac Blower Vane Redesign for Functional Improvement
Tom Titone, Advisor
Michelle LaFemina
Kushagra Mittal
Keith Ng
Amay Thakkar
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, FIRST PLACE

Bridgeway
Consolidation of Work Centers for Bridgeway
Chrysafis Vogiatzis, Advisor
Syed Abidi
Michael Doyle
Adarsh Manawa
Suhaib Qazi

Chief Enterprises, Inc.
Inventory Analysis and Optimization for Elmhurst Facility
Rasoul Etesami, Advisor
Wuyue (Wesley) Sun
Yanjie Wang
Nicholas Wiesbrock
Mingqian Wu

Crandall Stats and Sensors
Humidistat Design Modernization
Scott A. Burns, Advisor
Sir-Simon Addo
Arjun Goradia
Kai Motoyama
Priyam Shah

Fort Dearborn Company
Reuse of Book-Stock for Press Make-Ready Cost Reduction
Tom Titone, Advisor
Kevin Baczek
Alexander Berube
Jake Guth
Armin Sanei Moghadam

Harger Lightning & Grounding.
Electric Transit Rail Clamp Manufacturing Design
Henrique L. M. dos Reis, Advisor
Christina Chen
Kenneth Ferguson
Lucas Lundstrum
Armaandip (Armaan) Saraina

Julian Electric Co. Inc.
Redesign of Sensor System Housing for Robustness
Yumeng Li, Advisor
Sara Baase
Jeremy Cai
Simran Singh
Mia Spiwak

North American Lighting
Robotic Pick and Place Vision System Analysis and Application
Harrison Kim, Advisor
Woojin Ahn
Cameron Ge
Bella Pulido
Derek Tam

Northrup Grumman
Aircraft Survivability Testing Data Integration for System Troubleshooting and Development
Rakesh Nagi, Advisor
Raymond Chao
Ritesh Dash
Kayleigh Manley
Ashvath (Ash) Sekhar
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, SECOND PLACE

P & P Industries, Inc.
Injection Molding Operations with Cobot Technologies
Girish Krishnan, Advisor
Rami Fouani
RuthAnn Haefli
Darsh Jalan
Roshan Shankar

Polyform Products Company.
Clay Conditioning Machine Redesign
Molly Goldstein, Advisor
Lawrence Lin
Cameron Shaffer
Arnav Simha
Zhengdong (Tosca) Sun

Polyform Products Company
Predictive Test Analysis for Clay Quality
Harry S. Wildblood, Advisor
Dongyup (Kelvin) Han
Anisha Karande
Sanghyun Shin
Can Wang

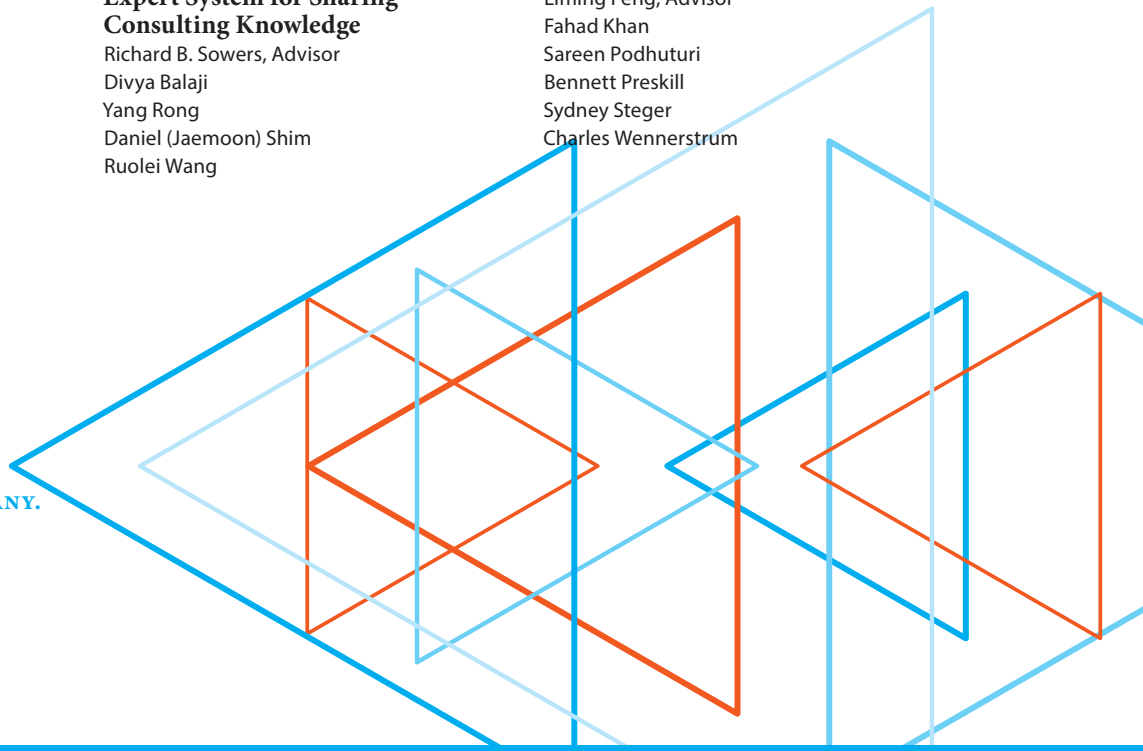
United - Corporate Support Center
Analysis of Flight Scheduling Effectiveness
Lavanya Marla, Advisor
Daniel Belfort
Joseph Chetupuzha
Michael Gale
Connor Ng

West Monroe Partners
Design Analysis for AI-Expert System for Sharing Consulting Knowledge
Richard B. Sowers, Advisor
Divya Balaji
Yang Rong
Daniel (Jaemoon) Shim
Ruolei Wang

Zelis
Design of Reusable Shipping Container System for Efficiency and Cost Reduction
Karthekeyan Chandrasekaran, Advisor
Kisun Ahn
Maya Burgard
Reilly Devine
Aqsa Owais

Zelis
Production Floor Layout Redesign for Optimization and Capacity Increase
Wayne J. Davis, Advisor
Sarang Alladi
Jack Kane
Milutin Perovic
Zhuo Zhou

Hausner Hard Chrome, Inc
Value Stream Mapping for Lean Analysis and Cost Tracking
Liming Feng, Advisor
Fahad Khan
Sareen Podhuturi
Bennett Preskill
Sydney Steger
Charles Wennerstrum



NEW ISE ALUMNI

BACHELOR'S DEGREES

AUGUST 2019 GRADUATES

Industrial Engineering

Haazib Awan
Min Soo Kim
Binh Phung
Emir Sonmezler
Matthew Ramon Tune

DECEMBER 2019 GRADUATES

Industrial Engineering

Aldrin Matthew De Ramos Alvarez
Eashaan Gunapati
Manuel Cyriac Kappen
Aditya Kishore
Bohan Li
Xinhang Li
Cheryl Jessica Lynn Macklin
Alexander David Rotello
Kristin Elise Simkus
Amelia Li Snyder
Xuren Zhou
Jiahao Zhu

Systems Engineering and Design

Eric Brecklin
Shijun Cao
Gayatri Dandu
Miguel Fernandez
Adam Heinz
Grace Kelley
Jacky Li
Ana Michaela Lobato
Peter Mark Maneykowski
Emmanuel Olatunde Oduola
Jonathan Jungjin Park
Keshav Prashant Patel
Adam Robert Rush
Alban Shehu
Nikolay Tzankov
Yu Wang
Maria Lee Werba
Alexandra Rose Wittinger
Vincent Matthew Wong
Jinyuan Zhou

SPRING 2020 GRADUATES

Industrial Engineering

Bill Morgan Minoru Agung
Mia Alvergue
Aashin A Amin
Sara Gabrielle Baase
Kevin Kacper Baczek
Divya Balaji
Brandon Charles Benge
Alexander Scott Berube
Michael Joseph Doyle
Kayhan Kubi Eryilmaz
Rami Fouani
Michael Eric Gale
Ruixuan Gong
Jayant Gude
Dongyup Han
Ryan Jeffrey Jaeger
Darsh Vinod Jalan
Nathan Joshi
James Kane
Anisha Karande
Lawrence Lin
Austin Connor Lofquist
Adarsh Manawa
Kayleigh Elise Manley
Mateusz Maturski
Kushagra Mittal
Adithi Murthy
Anjana Narasimhan
Connor Chung Ng
Milutin Perovic
Bennett Samuel Preskill
Suhaib Qazi
Samuel Charles Rasnic
Blake Anthony Rosenbusch
Armaandip Saraina
Ashvath Swaminathan Sekhar
Cameron Craig Shaffer
Roshan Shankar
Juliette Lihong Shesgreen
Jaemoon Daniel Shim
Sanghyun Shin
Wuyue Sun
Amay Jatin Thakkar
Vishnu Pranav Varada
Ronak Velluvakkandy
Yanjie Wang
Charles Thomas Wennerstrum
Nicholas Daniel Wiesbrock
Mingqian Wu
Haosheng Xiong
Zhuo Zhou

Systems Engineering and Design

Michael James Adams
Sir-Simons N Addo
Woojin Ahn
Daniel Belfort
Maya Tally Burgard
Jeremy Cai
Raymond Chao
Christina Tianyu Chen
Joseph Paul Chetupuzha
Joseph Enrico Conte
David Robert Dailey
Reilly Devine
Kenneth Lee Ferguson
Connie Macy Fu
James John Gandy
Jianqiao Ge
Arjun Goradia
Jake Guth

Ruth Ann Ilene Haefli
Nicholas Aron Kasner
Fahad Khan
Michelle Eleanor LaFemina
Patric Fengyi Liu
Luis Enrrique Maldonado
Kai Motoyama
Keith Chukyin Ng
Alec Jesse Nolan
Shane Michael O'Brien
Aqsa Owais
Harsh Patel
Sareen Reddy Podhuturi
Bella Yolanda Pulido
Thomas Daniel Purtell
Yang Rong
Armin Sanei Moghadam
Priyam Shah
Arnav Simha
Simran Singh
Selin Sipahi
Sydney Patricia Steger
Zhengdong Sun
Derek Hochun Tam
Ketaki Sanket Tamhankar
Ruolei Wang
Grant Williams

MASTER'S DEGREES

AUG 2019 GRADUATES

Master of Science in Industrial Engineering

Deborshi Goswami

DEC 2019 GRADUATES

Master of Science in Industrial Engineering

Niranjan Uday Kulkarni
Boyu Li
Reuben Benjamin Wong
Summer Scharfe

Master of Science in Systems and Entrepreneurial Engineering

Ryan Somerfield

MAY 2020 GRADUATES

Master of Science in Industrial Engineering

Sharan Balasubramanian
Kunika Gupta
Zhouyun Jin
Xinyang Liu
Sanjana Menon
Seyoung Park
Olivia Helene Reynen
Zekun Yang
Sihan Yong

MAY 2020 GRADUATES

Master of Science in Systems Engineering and Design

Bo Chen

DOCTORAL DEGREES

AUG 2019 GRADUATES

Doctor of Philosophy in Industrial Engineering

Dedy Suryadi
Dissertation: *Data-Driven Methodologies for Decision Making in Engineering Design*

Haohua Wan
Dissertation: *Optimal Inventory Control for Assemble - to - Order Systems: A Stochastic Programming Based Asymptotic Analysis Framework*

Doctor of Philosophy in Systems Engineering and Design

Sree Shankar Satheesh Babu
Dissertation: *Surrogate Models for the Design and Control of Soft Systems*

DEC 2019 GRADUATES

Doctor of Philosophy in Industrial Engineering

Shuanglong Wang
Dissertation: *Managing Multiple Services on the Ride-Hailing Platform*

Doctor of Philosophy in Systems Engineering and Design

Danny John Lohan
Dissertation: *Topology Optimization Methods for Heat Sink Design Applied to Power Electronics*

Gaurav Singh
Dissertation: *Modeling and Design of Fiber Reinforced Pneumatic Actuators for Soft Robotic Applications*

MAY 2020 GRADUATES

Doctor of Philosophy in Industrial Engineering

Hyeongmin Han
Dissertation: *Design analytics for product family optimization*

Doctor of Philosophy in Systems Engineering and Design

Shrey Pareek
Dissertation: *iART: An Intelligent Assistive Robotic Therapy System for Home-Based Stroke Rehabilitation*

Sree Kalyan Patiballa
Dissertation: *A Kinetostatic Conceptual Framework to Design Deformable Architectured Materials*

Naveen Kumar Sankaran
Dissertation: *Design and Development of Systems for Interventional Surgical Robot*

Naveen Kumar Uppalapati
Dissertation: *Design and Characterization of Soft Continuum Manipulators Using Fiber Reinforced Actuators*

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

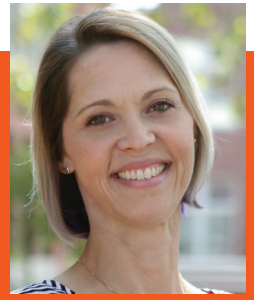
For all philanthropic inquiries, contact:

KATY SWANSON
Assistant Director of Advancement

(217) 300-3651

For all inquiries, contact:

DEBORAH THURSTON
Gutsgell Professor and Interim ISE Department Head
(217) 244-3848



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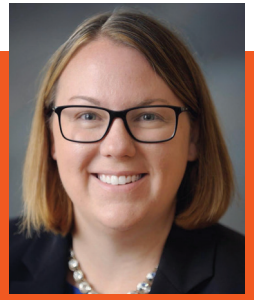

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Assistant Director of Graduate Studies
(217) 333-2731

To inquire about our Senior Engineering Program, contact:

HARRY WILDBLOOD
Coordinator of Senior Engineering Project
105 Transportation Building
(217) 265-5359

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ISE: NOW MORE THAN EVER

Safe to say, times are changing, and with them our financial priorities and needs. Though the University and ISE managed to ensure continuity of classes, the problems of safely reopening are complex. The financial impact on the Univeristy overall was sizeable, and came from loss of revenue from closing dorms, ceasing athletics, and many other measures taken to protect our community's health and our students' financial interests through refunded costs.

The University, however, has weathered many a storm, and ISE with it. We remain strong and have our best minds trained on the problems facing us. Despite this, your support is invaluable, now more than ever. We encourage you to visit our website and learn more about how you can help ISE.

ise.illinois.edu/giving

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The number of postal mail addresses we have for you outnumbers the email addresses we have for you at about 4-to-1.

Please consider visiting this web form to update your contact info, and pass along news of where your degree has taken you

Take a minute to visit https://go.ise.illinois.edu/ISE-Alumni-Update and fill us in. Thanks!

For More Information

Contact Katy Swansonat (217) 300-3651 or email kswnsn@illinois.edu


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