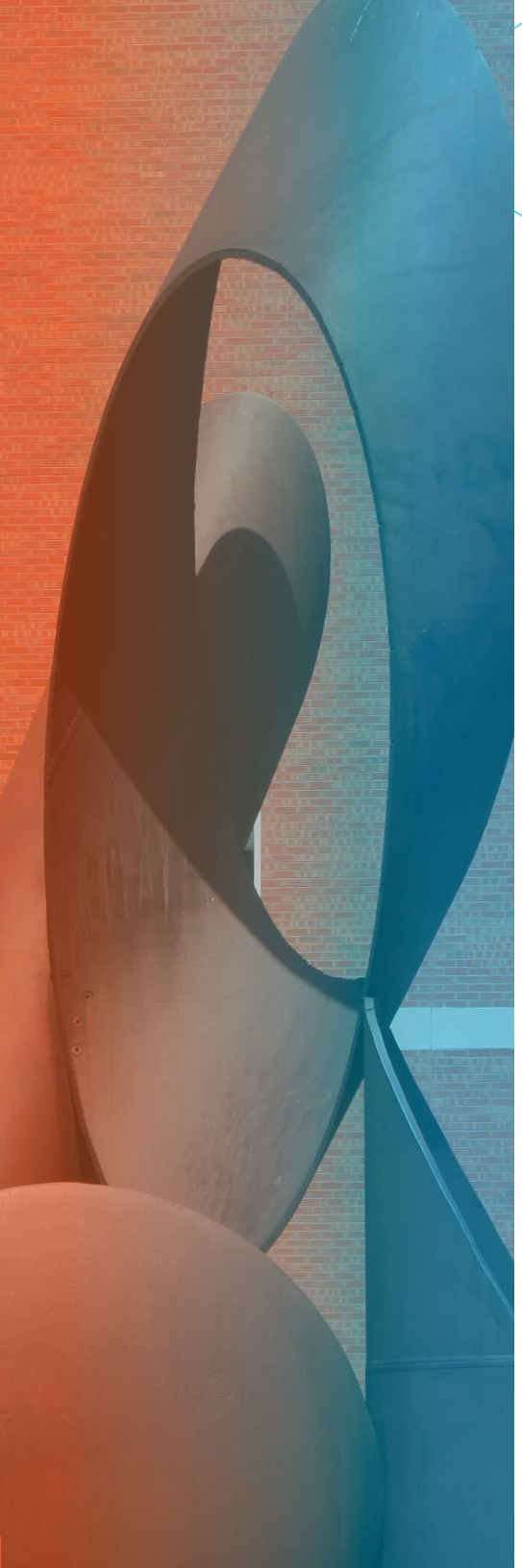
Department of Industrial and Enterprise Systems Engineering

THE GRAINGER COLLEGE OF ENGINEERING

ISE VIEWBOOK 2021



CONTENTS

Throughout you will find photos of 2021 graduates.

COVER: Anka Rashed, BSSED 2021
MAJOR: Systems Engineering and Design
MINOR: International Engineering in Scandinavian.
SECONDARY FIELD OPTION: Autonomous Systems and Robotics
While at ISE, Anka worked on a senior engineering project with Professor Girish Krishnan to perfect the gripper on a fruit-harvesting robot. Anka says, “I would definitely recommend ISE to someone else doing robotics, especially if they wanted an overall understanding of robotics as opposed to specializing in either the mechanical or electrical portions.” Read more about student researchers inside.

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 L. Brian Stauffer.

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

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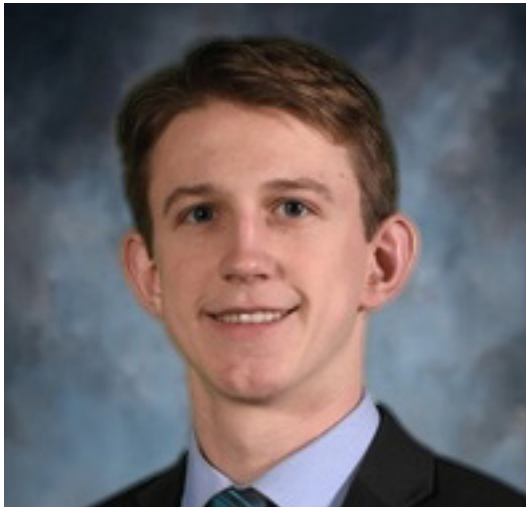
This issue is dedicated to graduating seniors and graduate students, and all who sacrificed their time or comfort on campus to slow the spread of COVID-19.

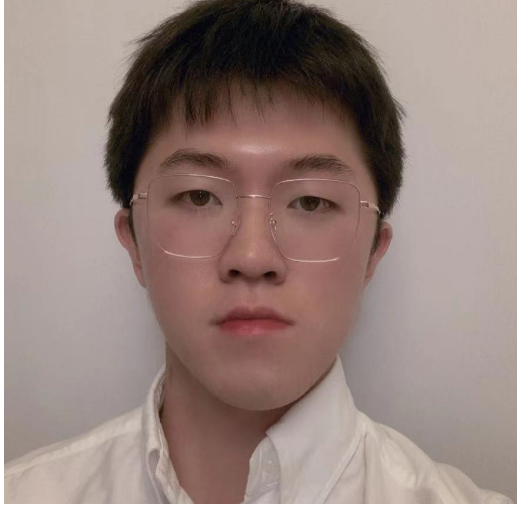
ISE Class of 2021, CONGRATULATIONS!

CLASS OF 2021 BEFORE...


...AND
AFTER!

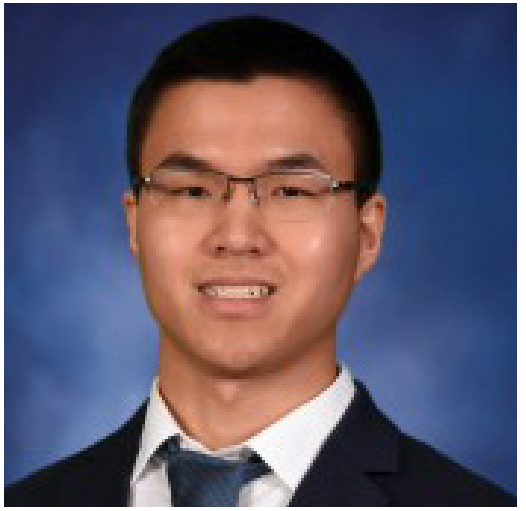






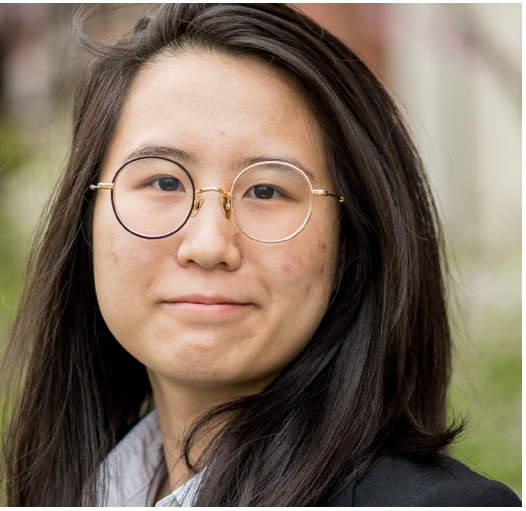


ILLINOIS









ISE UNDERGRADS* PUBLISH!

UNDERGRADUATE RESEARCHERS ARE ADVANCING THE SCIENCE AND PRESENTING THEIR WORK IN PROFESSIONAL VENUES.

When John Morgan was entering his junior year at the University of Illinois, he wasn't sure what kind of job he would aim for after graduation. But that all changed in the fall of 2019 when he had his first taste of undergraduate research, processing data for ISE professor Abigail Wooldridge.

Today, as new ISE graduate, Morgan ias beginning a career in data analytics, thanks to the work he did with Wooldridge through the U of I's Research Experience for Undergraduates (REU) program. Recent ISE graduate Sanghyun Shin tells a similar story, singing the praises of his undergraduate research experience, in which he analyzed data for ISE professor Lavanya Marla.

Shin's work in Marla's lab tackled aviation disruptions, while Morgan contributed to Wooldridge research on the use of a new app to train health workers.

These research projects not only trained undergraduates to analyze data; they also produced award-winning papers.

At ISE, the idea of hands-on education continued to flourish throughout the pandemic. These pages pay tribute to only a few of our student researchers.

Sophie Benmore

Sophie Benmore, sophomore

MAJOR: Systems Engineering and Design

INTERN: Materials Development, Inc.

PUBLICATIONS:

"Small- and Wide-Angle X-ray Scattering Studies of Liquid-Liquid Phase Separation in Silicate Melts". ACS Earth and Space Chemistry Journal. 2020, 4, 10, 1888–1894.

"A high energy x-ray diffraction study of the hydration of amorphous Indomethacin". *The Journal of Pharmaceutical Science* (forthcoming).

"My first year of ISE was a rollercoaster. Working online was a lot more difficult than I expected, and I am very excited for in-person school. I particularly liked my SE101 class, though."

*AND, OF COURSE, GRADUATE STUDENTS!

John Morgan

Full House: A Winning Hand

Wooldridge's Lab Welcomes Undergraduates Into High-Level Research

BY DOUG PETERSON

"With both graduate students and undergrads, I have a full house in my lab—such a full house," says ISE Professor Abigail Wooldridge.

When Wooldridge joined ISE in 2018, she immediately began to involve undergraduates in her research. Since then, she has worked with anywhere from three to four undergraduates at a time, making her lab a busy, bustling place.

Professor Abigail Wooldridge

"It's a balancing act," Wooldridge says. She doesn't want her lab to get too crowded because she wants to be able to pair each undergraduate with a graduate student. The undergrads in her lab work on all types of cutting-edge research on human factors, such as evaluating a virtual-reality app for training health workers, assessing the new mobile laboratory for COVID-19 testing, and analyzing what happens when trauma patients are moved from the operating room to the intensive care unit.

"I'm not a professor only because I love research," Wooldridge says. "I also really enjoy teaching, and this work is another way I get to teach undergrads."

One of her research projects brought in three undergraduate students to evaluate a new app that trains health workers on the use of "code carts." A code cart, or crash cart as it is sometimes called, looks like an ordinary wheeled cabinet with rows of drawers. But when it was introduced in the United States in the 1960s, this unassuming cart revolutionized the way emergencies were handled. The cart organized, in one portable unit, the essential equipment that medical personnel need in an emergency.

Anthony Composto

Now, Wooldridge and the Jump Simulation Center in Peoria, Illinois, are revolutionizing the way nurses and doctors are trained in using a pediatric code cart. The Jump Simulation Center developed a training app, which uses a *virtual reality* code cart to teach health workers where to find supplies in the cart. Wooldridge's team has been testing the effectiveness of the app, and the initial results are promising.

The three undergraduates, Anthony Composto and John Morgan in ISE and Ashley Mitchell in Bioengineering, did extensive data analysis on the app. What's more, Morgan was the primary author of one of the team's papers, which won first place in the student paper competition for the Health Care Technical Group at the annual meeting of the Human Factors and Ergonomics Society in October.

"As the first author, John wrote the bulk of the paper," Wooldridge says. "It's very unusual for a paper to be led by an undergraduate. And undergraduates

Professor Bob Norris

ISE student Sidhanth Asur took 3rd place at the IISE North-Central Region Undergraduate Student Technical Paper Competition. Sidhanth is a sophomore in Systems Engineering and Design. His SFO is Autonomous Systems and Robotics. The winning paper is Hyperspectral Camera Development and Evaluation for Improved Terrain Characterization. The hyperspectral sensor is a revolutionary device that allows for detailed data collection, especially in terrain characterization databases. However, these sensors are commercially available for more than $20,000 which far exceeds many research groups' funding. This project was meant to recreate a hyperspectral sensor camera, for low cost. The research was sponsored by the Research Experience for Undergraduates (REU) program at ISE. Professor Bob Norris served as Asur's advisor.

Sidhanth Asur

Ashley Mitchell

almost never win that competition."

Morgan says the code-cart project was the first time he had ever written an academic research paper, and he says it taught him how to do technical writing and communicate statistical results. The project also helped him to learn R statistical software, with guidance from one of the graduate students on the team, Jyotika Roychowdhury. He says Wooldridge's lab was a "great environment" as he processed data on the usability of the new code-cart training app.

A fully stocked code cart is not often available for training purposes, so the app solves this problem, Morgan explains. When you aim your phone's camera at an empty space, the app will project a virtual code cart in that spot. Health workers can then use the app to open drawers in the virtual code cart and click on various items to see what they do. They can even time themselves in a search for supplies or go through specific scenarios in which they need to locate materials.

For this project, the research team concentrated on training health workers to locate 10 items in a pediatric code cart, such as an IV catheter, needle decompression kit, and oxygen mask for a child.

The new app was tested with nurses, nurse educators, and attending physicians, who then answered 53 questions, including items on the System Usability Scale (SUS), developed by usability specialist John Brooke in 1995. Morgan used this survey information to calculate a SUS score of 82.5, which he says was pretty good for a new app in its initial testing phase.

Composto and Mitchell, meanwhile, worked on data collected by Tobii Pro eye-tracking glasses. Before and after using the app, health workers wore

Ruth-Ann Haefli

the eye-tracking glasses while using the real code cart to search for the 10 items. By gathering data from the glasses, researchers examined eye "fixations," which is when users focus on a particular location. After health workers used the training app, the number of fixations went down while duration increased when using the real code cart, a potential indicator of improved expertise.

Many of the undergraduates in Wooldridge's lab came to her as part of the U of I's Research Experience for Undergraduates (REU) program. "When I work with an undergraduate, I try to assess their career goals and what skills they want to develop," she says. "Then I try to find a spot in a project that will teach them the new things that will set them apart when they're pursing the career they want. But I'm also secretly hoping they'll fall in love with research and will want to go on to complete a graduate degree."

Wooldridge's first undergraduate researcher was ISE student RuthAnn Haefli, who coded data about health care transitions, such as the transfer of patients from the operating room to the intensive care unit—a crucial handoff in which accurate, timely communication is vital among the nurses and doctors. So far, the research team has run seven simulations, in which physicians and nurses simulate the transition of a pediatric trauma patient to a high-fidelity simulation space that looks exactly like an intensive care unit. Then they surveyed the physicians and nurses on how well the handoff went—what worked, what didn't, and what could have been improved.

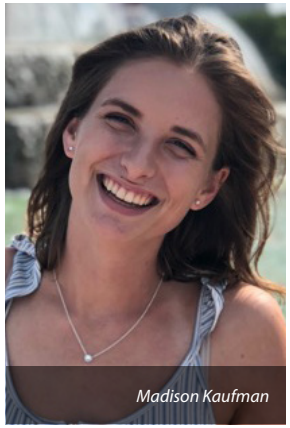
Out of this research, Haefli contributed to an award-winning paper, for which Wooldridge led the writing. It won a best paper award at the International


Maya Burgard

Conference on Quantitative Ethnography in 2019.

"RuthAnn did such a phenomenal job that I became even more enthused about involving undergraduate students in my research group," Wooldridge says.

After Haefli graduated, another ISE student, Maya Burgard, stepped in to continue analyzing


Madison Kaufman

from human factors professionals. This survey focused on their thoughts about using human factors research to address issues related to diversity and social justice. One such example is designing technology to make it accessible to those who are blind or have low vision. Wooldridge also conducted a focus group with the same human factors


Ashley Mitchell

and effects analysis is one of the techniques we use to do that."

John Morgan also had a chance to get involved in a second project—the research on health care handoffs. According to Wooldridge, he did some high-level data analysis for this work.

"I remember that when John approached me to do research, he

> "I would definitely recommend undergraduate research to other students. This work helped me mold my career path. If I had known about the REU program before, I would have tried to do undergraduate research every single semester. I honestly think it was one of my best experiences in college."

qualitative data from the health care handoffs, and she also helped Wooldridge do some secondary data coding.

Not all of the undergrads in her lab are from engineering, however. Madison Kaufman, an undergrad from the College of Applied Health Sciences, worked with Wooldridge during the summer and fall of 2019, conducting a literature review looking at human factors and health inequity—differences in access to health care or health care outcomes due to race, ethnicity, gender, socioeconomic status, or even whether a patient lives in a rural or urban area. In addition, Ariel Alexander, a chemistry undergrad, analyzed survey data that Wooldridge had gathered professionals on diversity and social justice. The focus group data was analyzed by yet another ISE undergrad, Mia Spiwak.

Some the undergrads get involved with multiple projects, Wooldridge notes. Ashley Mitchell, the Bioengineering undergrad, has also been helping with the failure modes and effects analysis of Wooldridge's mobileSHIELD project. MobileSHIELD is a mobile testing laboratory that can do Covid-19 testing from a tractor-trailer driven all around the state.

"When we design a new process or evaluate an existing process, we like to think about what can go wrong, how likely it is to go wrong, and what happens if it goes wrong," Wooldridge says. "Failure modes was a little shy," she says. "But over the course of the last 18 months, he's really developed—and not just in technical skills. Now he can go out and talk to people who are PhDs or physicians and get them excited about the work he has done. When I see students connect with the research, when I see students blossom, that's really exciting. I love seeing the light bulbs go off."

Morgan says his undergraduate research experience has helped point him in the direction of data processing. He just graduated at the end of 2020 and has landed a job doing price analysis for W.W. Grainger, Inc., a Fortune 500 industrial supply company.

As Wooldridge puts it, "I like to think that the fact that John has done some very advanced statistical

analysis as an undergrad made a difference."

"I would definitely recommend undergraduate research to other students," Morgan says. "This work helped me mold my career path. If I had known about the REU program before, I would have tried to do undergraduate research every single semester. I honestly think it was one of my best experiences in college."

Holding Patterns

ISE Researchers Look for Patterns in Aviation Disruptions

BY DOUG PETERSON

You know it's been a tough winter when Las Vegas gets more than three and a half inches of snow in a single day. December of 2008 was rough all over the country, with more than 2,000 daily snowfall records being shattered. Illinois was slammed by seven winter storms that month, while Green Bay, Wisconsin, set a December record of 45.6 inches of snow.

Snow coverage on the ground neared record levels in 2008, but the weather also wreaked havoc in the air as plane delays cascaded throughout the aviation system. ISE professor Lavanya Marla is looking at patterns in aviation disruptions from 2008 to 2017 using a unique graph signal processing model. But what also makes her work unique is that she brought in undergraduates to analyze data through the University of Illinois Research Experience for Undergraduates (REU) program.

Marla says she has been involving undergraduates in her research for the past four years; in the aviation research, she drew on the work of three undergrads—two of them from ISE, Sanghyun Shin and Darsh Jalan. They were joined by computer science major Aritro Nandi.

Professor Lavanya Marla

"The project was great," says Shin, a 2020 Industrial Engineering graduate who worked on the research in the fall of 2019. "Our job was to come up with our own code to process data and calculate variables that the research team could use to do their math work."

According to Marla, the aviation project first got off the ground when she was approached by an MIT graduate student who happened to be from Champaign. This MIT student was looking at data on aviation disruptions at a "very aggregate level"—day-by-day delays in the system. When Marla and the Illinois team joined the effort, they "zoned in more," she says, diving deeper into hour-by-hour data.

Aviation disruptions can be caused by equipment breakdowns, such as the computer outage at Delta Air Lines' Atlanta headquarters in August of 2016. They can also be caused by incidents such as a Chicago control-center fire in September of 2014. But Marla says they focused on the most common aviation disruption of all—weather. They studied "disruption-recovery trajectories," or DRTs, over a span of 10 years, hour-by-hour, at 30 of the most highly trafficked airports in the United States—a massive amount of data.

"It takes some time to look at the initial raw data, prcess it, and get it into a form in which you can start to see patterns," Marla says. "But the undergrads understood how to look at a large system and figure out what was happening. It takes some time, and it means getting their hands dirty with the data."

The research team grouped the DRTs into several categories, including brief disruptions that may last only a few hours, day-long disruptions, and multi-day disruptions that can spread chaos through a highly interconnected aviation system. They found that the average length of time from the beginning of a disruption to a return to normalcy was 5.3 hours.

Sanghyun Shin

"Disruptions can be large enough that the capacity of an airport can drop 20 or 50 percent," Marla says. "In rare cases, they can even shut down an airport. When many factors, like high-traffic airports and tight aircraft or crew connections, come together in a perfect storm, disruptions cascade across the interconnected system, spreading delays from one airport to the next."

The combined MIT/Illinois research team went on to win a best paper award, taking top honors in the systems performance track at the International Conference on Research in Air Transportation in September.

But according to Marla, this is only the team's first foundational step—characterizing the dynamics of disruption and recovery. Eventually, she says, they want this methodology to help authorities in the Federal Aviation Administration know when a disruption will recover on its own and when (and where) the FAA needs to take special measures to control the disruption and keep its costs low.

Right now, those decisions are made based on extensive human experience," she says. "We would like to formalize what's happening and provide data-driven decision-support tools."

The three undergraduates on her team "showed very good teamwork," Marla points out. "They gave me regular updates on what was happening, and given the one-semester timespan, I thought they were really efficient in getting things done."

Shin coordinated the team of undergraduates, setting up regular meetings. He says this research


Darsh Jalan

experience was a "major stepping stone" and even led to an internship last summer at Samsung.

"It also gave me confidence in the field," he adds. "This kind of experience is good whether you're applying for grad school or looking for jobs."

After graduating in Industrial Engineering last May, Shin returned to his home in Suwon, South Korea, where he is pursuing his master's degree at Illinois remotely.

"One of the reasons I chose industrial engineering is because it offers so many options," he says. "I'm still exploring those options, but I would like to go into data processing—and my undergraduate research had a huge impact in choosing that field."

ISE

Rishi Pandey, BSIE 2021
MAJOR: Industrial Engineering
MINOR: Computer Science
TRACK OPTION: Economics and Finance
SPECIALTY: Video
EMPLOYER: Tik-Tok

"The work I am doing at TikTok uses computational photography and computer graphics to create new tools and ways to make visual effects and animation. ISE really helped me a lot in grasping the math behind the creative work..."

Angela Chan (BSSED 2021) has just completed her degree in Systems Engineering and Design and is returning to ISE in the fall to earn an MS in Systems and Entrepreneurial Eningeering. She is presenting her paper, "Engagement in Practice: Social Performance and Harm in Civic Hackathons" at the Annual American Society for Engineering Education Conference this July. She worked on this paper with ISE Professor Molly Goldstein, as part of a Fall 2021 REU. Angela served as director of Social Hack 2021, an event hosted by Design for America, a 501(c)3 non-profit and student led organization. As an undergrad, Angela's team won second in the global Map the System competition, a project of with the Skoll Centre for Social Entrepreneurship at the Saïd Business School, University of Oxford.

Machine learning helps spot gait problems in individuals with multiple sclerosis

BY LOIS YOKSOULIAN

Monitoring the progression of multiple sclerosis-related gait issues can be challenging in adults over 50 years old, requiring a clinician to differentiate between problems related to MS and other age-related issues. To address this problem, researchers are integrating gait data and machine learning to advance the tools used to monitor and predict disease progression.

A new study of this approach led by ISE graduate student Rachneet Kaur, Kinesiology and Community Health Professor Manuel Hernandez and ISE and Mathematics professor Richard Sowers is published in the journal *Institute of Electrical and Electronics Engineers Transactions on Biomedical Engineering.*

Multiple sclerosis can present itself in many ways in the approximately 2 million people that it affects globally, and walking problems are a common symptom. About half of the patients need walking assistance within 15 years of onset, the study reports.

"We wanted to get a sense of the interactions between aging and concurrent MS disease-related changes, and whether we can also differentiate between the two in older adults with MS," Hernandez said. "Machine-learning techniques seem to work particularly well at spotting complex hidden changes in performance. We hypothesized that these analysis techniques might also be useful in predicting sudden gait changes in persons with MS."

Using an instrumented treadmill, the team collected gait data—normalized for body size and demographics—from 20 adults with MS and 20 age-, weight-, height- and gender-matched older adults without MS. The participants walked at a comfortable pace for up to 75 seconds while specialized software captured gait events, corresponding ground reaction forces and center-of-pressure positions during each walk. The team extracted each participant's characteristic spatial, temporal and kinetic features in their strides to examine variations in gait during each trial.

Changes in various gait features, including a data feature called the butterfly diagram, helped the team detect differences in gait patterns between participants. The diagram gains its name from the butterfly-shaped curve created from the repeated center-of-pressure trajectory for multiple continuous strides during a subject's walk and is associated with critical neurological functions, the study reports.

"We study the effectiveness of a gait dynamics-based machine-learning framework to classify strides of older persons with MS from healthy controls to generalize across different walking tasks and over new subjects," Kaur said. "This proposed methodology is an advancement toward developing an assessment marker for medical professionals to predict older people with MS who are likely to have a worsening of symptoms in the near term.

Future studies can provide more thorough examinations to manage the study's small cohort size, Sowers said.

"Biomechanical systems, such as walking, are poorly modeled systems, making it difficult to spot problems in a clinical setting," Sowers said. "In this study, we are trying to extract conclusions from data sets that include many measurements of each individual, but a small number of individuals. The results of this study make significant headway in the area of clinical machine learning-based disease-prediction strategies."

Hernandez also is affiliated with the Beckman Institute of Advanced Science and Technology and the the Carle Illinois College of Medicine.

Rachneet Kaur

Eugenia Maldonado

BY ELIZABETH INNES

Eugenia Maldonado is a senior in ISE. She chose that discipline because it allowed her to look into different areas she wanted to explore. "I wasn't really sure what I wanted to do at the beginning," she explains. "And so I was just like, 'I'm just going to try different things and find my passion and then go into that with a concentration.' And so that's what systems allowed me to do." ISE's secondary field option lets students explore an area more in depth, so she chose data science.

Maldonado shares why she came to Illinois: "I knew that it was such a big university, and I have so many different passions that I wanted to kind of explore. I do music; I play the cello, and I knew the school of music was very good, too. So it kind of gave me that balance." While she's not minoring in music, she performs with a musical group: the Noten Quartet.

One of the challenges Maldonado encountered early on after coming to Illinois was over-extending herself. "I was really eager to get involved in the community," she admits. "And so I took on too many things at once for a while, and because I was passionate about so many things, I think it became really overwhelming at times, and I had to choose." Although she knew she had the ability to choose what she wanted to do, she acknowledges, "I thought I had to do everything at the same time." But, at the end of her sophomore year, she said to herself, "I have a whole lifetime to explore that!" telling herself, "I need to simplify my life a little bit!" So, she started focusing more on the things that gave her joy instead of tasks and being involved in so many clubs and so many different things. "So, I think that was the biggest challenge."

One thing Maldonado has learned at Illinois was actually about herself. "I think I have come to understand that I have many facets to myself instead of just being an engineer." That epiphany has allowed her to integrate "so many aspects of myself and know that I can be all of them at the same time instead of just being solely focused on one thing. So that was music for me." She goes on to explain, "I'm very technical on one side, so I love programming; I love logic and all of these things. And then I also love my artistic, creative side." The life lesson she's learned and passes on is: "You don't have to choose. You can be all of that at the same time."

Actually somewhat unrelated to engineering, Maldonado's dream job is to reframe the education system. "I think we've come to a point where we need to rethink a lot of the things that have been passed down," she acknowledges. "Because we›re this new generation, and we come with new ideas. I think we have that responsibility to speak about what we want to do in the future, and going forward, I want to be

part of that change."

Maldonado will be working for Abbott laboratories in Germany when she graduates. While her first rotation is in Germany, she's going to be working at least the first half here in Chicago. "Then, hopefully, they'll let me go to Germany and experience that culture." She'll be working in the IT professional development program.

Her advice for incoming freshmen to Illinois is to be trail blazers: "There's not one path. You have to create your own path—follow your inner guidance system, and don't try to copy what everyone else has been doing. Don't travel the traveled path. Don't be afraid to go into the unknown and explore, because that's where magic happens—the paths that have not been traveled. So don't be afraid."

Kinga Wrobel

Kinga Wrobel was born in a rural village near Elk, Poland. Even as a little girl, her curiosity always kept her yearning to learn new things and one day discover more of the unknown. Her interest in creating and inventing new things led her to the Uof I where she is majoring in Systems Engineering and Design. She is the first female engineer in her family, and the first to be pursuing a career in the aerospace industry.

Kinga has previously worked on several mechanical design and engineering projects in the Eco Illini Supermileage Club, where she worked with the team to design components and construction of the chassis for a maximally efficient gasoline engine prototype car. She also worked on designing custom automation assemblies for high-precision CNC machines, and developed a custom laser engraving system at Sunlight-Tech during the summer of her freshman year of college. These experiences influenced her to pursue undergraduate research with the Engineering Systems Design Lab at UIUC, where she developed a One-Dimensional Testbed for Attitude Control Studies. She successfully published and presented her work at the International Mechanical Engineering Congress and Exposition (IMECE) in Fall 2020. Through the ESDL and her research project, she became heavily involved in the aerospace industry, and fell in love with space exploration. She became determined to use her skills to create new technology for deeper space exploration.

Her passion in space exploration led her to a Systems Engineering Internship at NASA Headquarters during the Fall 2020 and Spring 2021 sessions where she is developing a NASA Systems Engineering Processes tutorial that will aide future NASA interns and staff. She is conducting interviews with seasoned NASA engineers and scientists involved with Parker Solar Probe to gain detailed insight into the NASA Systems Engineering Process. By analyzing Parker's trade studies, instrument development and integration, Lifecycle Reviews, etc. she is learning what it takes to be a successful Systems Engineer.

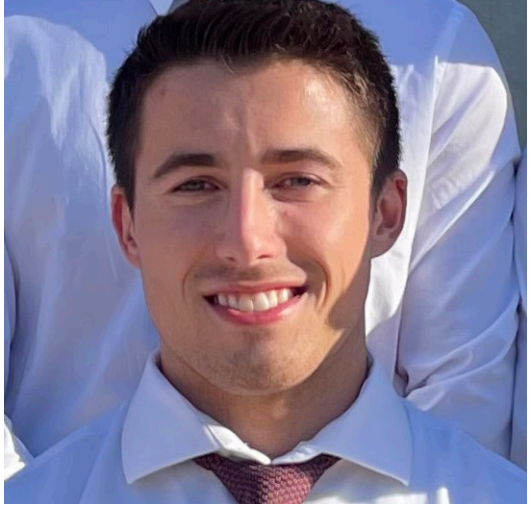
During her free time, Kinga loves to craft and paint as well as travel, play soccer, unicycle, and jump out of perfectly good airplanes.

As a Brooke Owens Fellow, Kinga will be interning with Lockheed Martin in the Advanced Programs Division. She is excited to feed her curiosity and contribute to the discovery of the unknown.

Chaitanya Gulati, senior in Systems Engineering and Design, with a minor in Electrical Engineering, was listed in Chicago Inno's "25 Under 25: 25 rising Chicago entrepreneurs and technologists 25 and younger".

Gluati is Founder and CEO of NASADYA. Founded in 2018, NASADYA is working to create sustainable energy systems for the future. The company addresses waste issues in energy grids by converting excess energy into hydrogen and oxygen. Gulati is pursuing a dual degree in Systems Engineering and Design, and Innovation Leadership and Engineering Entrepreneurship. He and his startup were selected to be in U of I's iVenture Accelerator, as well as the 2020 cohort of Future Founders, a local accelerator program for young entrepreneurs.






GRAINGER






Samantha Simonetti, BSSED 2021
MAJOR: Systems Engineering and Design
SECONDARY FIELD OPTION: Economics and Finance
ACTIVITIES AND SOCIETIES: Engineering Student Alumni Ambassadors (Vice President, Treasurer, Director of Marketing, Engineering Council Representative), Institute of Industrial and Systems Engineers, Society of Women Engineers, Engineering Council, Volleyball (Intramural), Soccer (Intramural), Delta Zeta
TITLE: Supply Chain Associate at PepsiCo, Chicago

MESSAGE FOR NEW STUDENTS:

"You were accepted into this college for a reason. You got this! Work hard, but don't forget to have fun!"

STUDENT AWARDS

Undergraduate Student Awards

Richard N. Baxendale Outstanding Junior Award
Simon Balisi

William A. Chittenden II Award
Zikun Ye

Edward S. Fraser Award
Mariana Conde

The Freshman Award
Dhilan Desai
Priya Shah

L.C. Pigage Award
Kyle Moukheiber
Harrison Oliff
Rachel Wortman

Graduate Student Awards

Brainin Fellowship
Eklavya Sharma

William A. Chittenden II Fellowship
Emma Mayes
Samhita Vadrevu
Jiaxin Wu

Frederick and Rachel Hansen Fellowship
Xiaotian Xie

Phil Ryan Fellowship
Charles Peterson

Sharp Outstanding Graduate Student Award
Rachneet Kaur

Mottier Innovation Challenge

1ST PLACE
Ascent Integrated Tech
Paul Couston
Rishi Choudhary
Alex Gorsuch
Harlee Sorkin

2ND PLACE
IslandLink
Hyeong Chan Cho
Wenyuan (Olivia) Zhang

3RD PLACE
Illini Box
Shaan Ahuja
Justin Holding

3RD PLACE
Farm4You
Michael Elzanati
Rohan Kamatar
Sameep Vakharia
Grayson Will

HONORABLE MENTION
LeftSaver
Shivam Dayama
Pranav Kashyap
Rohit Menezes
Aman Shah

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

EXCELLENCE IN TEACHING

Teaching Awards

The Sharp Outstanding Teaching Award in Industrial Engineering
Doug King

ISE Department Head's Teaching Award
Joe Barich

Grainger College of Engineering Outstanding Advisor Award
Molly Goldstein

Teachers (and Classes) Ranked Excellent by Students

Fall 2020

Industrial Engineering

Liming Feng
IE 522
R.S. Sreenivas
IE 531
Chrysafis Vogiatzis
IE 300,532
Abigail Wooldridge
IE 598

Carolina Carvalho Manhaes Leite
TA IE 400
Juan Xu
TA IE 523

Systems Engineering

Joe Barich
SE 400
Parth Bansal
TA SE 101
* Kangcheng Lin
TA SE 101
* Seyoung Park
TA SE 320

Teachers (and Classes) Ranked Excellent by Students

Spring 2021

Industrial Engineering
Liming Feng
IE 525
Jugal Garg
IE 598
*Chrysafis Vogiatzis
IE 300,398

Systems Engineering
* Joe Barich
SE 400
Carolyn Beck
SE 424

* = Marked as top tier of outstanding rankings by students

How to make the most of your undergraduate education and the rest of your life: ICC Chairman Carrie Zalewski (BSGE 2001)

"Scientists investigate that which already is; Engineers create that which has never been." ~Albert Einstein.

Illinois Commerce Commission (ICC) Chairman Carrie Zalewski attributes the dawning of her interest in STEM, as a young person, to inspirations provided by two men: her brother James Solberg, and Albert Einstein. Although Albert Einstein is the more famous, it was ultimately her brother James who kindled her interest in engineering and preceded her to the University of Illinois' College of Engineering. Four years older than her, he went to the U of I to be a Mechanical Engineering major. But it was ISE Professor and Associate Head of Undergraduate Programs Michael H. Pleck who mentored her as an undergraduate, assuring her that, as a pre-law student with a passion for environmental issues, General Engineering (now Systems Engineering and Design) was the perfect major for her.

She says she loved her engineering education for two reasons. First, the "holistic approach" of systems engineering "focused on problem solving, in a very creative and innovative way, thinking through various ways to get to a solution." Second, she enjoyed the collaboration in the College of Engineering.

And, citing "grit," she persevered through not only the difficult engineering major but a secondary field option in African Studies, which saw her spending six months abroad in South Africa. "Another amazing thing about U of I," she notes, is that she was able to take a class in the Zulu language, spoken only in southern Africa. She was also a member of a women's engineering sorority, Alpha Omega Epsilon. She managed to squeeze in an internship with the Illinois Department of Transportation (IDOT), where she would later find one of her first jobs in the legal profession.

From the U of I she went on to demonstrate the grit necessary to finish her degree at Chicago Kent—College of Law. From law school she went on to serve the state at the Illinois Department of Transportation working on environmental compliance issues. She recommends government work for young attorneys because, among other reasons, "young lawyers working at the government get to do good work, making an impact, solve important, challenging problems, all while being afforded more autonomy representing the state than often afforded to new attorneys in private practice."

From IDOT she was appointed to the Illinois Pollution Control Board (IPCB) where she was a board member for nine years working on environmental regulation. One of the highlights of her work at the Board was setting water quality standards for the Chicago area water system, which ensured better water quality and greater use of the river that runs through downtown Chicago and the recently redeveloped River Walk.

Excited by Governor Pritzker's call to decarbonize Illinois, she applied to and was appointed to the ICC. The Illinois Commerce Commission has about 200

employees, and, among its many activities, is tasked with balancing the interests of consumers and utilities to ensure adequate, efficient, reliable, safe and least-cost public utility services. Comparing her time at ICC to her time with the IPCB, she advises young people interested in sustainability and decarbonization to consider working in energy.

"If you want to work in the sustainability field and are passionate about solving climate change, the ICC is a great place to understand the inner workings of energy markets and the Illinois law incentivizing renewable energy coming online."

When asked how her engineering training in complex systems helps her work at the ICC, she says her engineering degree gave her "the confidence and the ability to learn, understand and synthesize challenging topics, in order to work towards a well thought-out solution", noting "problem solving is perhaps the most useful thing you could learn from any institution."

The challenge-hungry Chairman Zalewski also volunteers on the Illinois Sustainable Technology Center (ISTC) Advisory Board, which is part of UIUC's Prairie Research Institute.

She is cognizant that women are still under-represented in the engineering field, something that was prevalent when she was a student. She recalls an electrical engineering class in which she was one of two females out of 90 students. A secondary passion is trying to solve this problem. While in law school, she volunteered as a tutor for students from underserved communities through the Tutoring Chicago Program (previously the Cabrini Green Tutoring Program) and after law school served on the Chicago Youth Centers Auxiliary Board, which raised funds for after-school support and resources for underserved communities such as STEM opportunities. She is dedicated to providing young women and other underrepresented students the same spark provided by her brother and Einstein.

We congratulate her on her many successes!

CALLING ALL ALUMNI

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>>>Find out what your classmates are up to:
https://ise.illinois.edu/alumni/album

>>>Contribute to the alumni album:
https://go.ise.illinois.edu/ISEAlumniAlbum

>>>Check out what recent graduates are up to:
https://ise.illinois.edu/alumni/yearbook

SENIOR ENGINEERING PROJECTS

FALL 2020

Agri-Fab, Inc
Mow-N-Vac Blower Vane Redesign for Functional Improvement - Phase II
Tom Titone, Advisor
Jake Butera
Timothy Deckard
Eriq Lucero
Nicholas Sandora
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, FIRST PLACE

Crandall Stats and Sensors
Electro-pneumatic Thermostat Design Development
Scott A. Burns, Advisor
Jack Berglind
Ted Loewenthal
Omero Nieto
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, SECOND PLACE

Hausner Hard Chrome, Inc
Value Stream Mapping for Lean Analysis and Cost Tracking - Phase II
Liming Feng, Advisor
Jane Li
Samantha Simonetti
Conrad Tkacz
Alexander Yu

ISE Internal
Clearpath Jackal Vehicle System Identification
Robert Norris, Advisor
Tiancheng Cheng
Alex Darragh
William Jones
Matthew Obradovic

ISE Internal
MAPS (Maintenance and Proximity Sensing) App Development
Alexandra Chronopoulou, Advisor
Melissa Doyiakos
Rishabh Pandey
Siddharth Salklan

ISE Internal
Robotic Gripper Analysis and Redesign
Girish Krishnan, Advisor
Sabin Gianelloni
Shaneelah Rashed
Lucas Semitka

ISE Internal
Simulated Ultrasound Imaging for a Soft Active Heart Simulator
Girish Krishnan, Advisor
Nina Ayar
Spencer Binning
Alexandra Kaste

ISE Internal
Simulation and Analysis of Networked Disease Dynamics
Carolyn Beck, Advisor
Jason Chang
Marwan Elgendy
Jiaqing Mao

North American Lighting
Robotic Pick and Place Vision System Analysis and Application - Phase II
Harrison Kim, Advisor
Jack Bollito
Scott Manhart
Monika Spytek
Kevin Wu

Nexstep Commercial Products
Algorithm Development for Dynamic Warehouse SKU Location Optimization
Wayne J. Davis, Advisor
Andrew Barvinek
Qingyuan Gao
Yuanqing Guo
Jack Sitta

Polyform Products Company
Clay Conditioning Machine Redesign - Phase II
Molly Goldstein, Advisor
Diego Arriaga Salinas
Umer Bandukda
Jimmy Sommer

Polyform Products Company
Predictive Test Analysis for Clay Quality - Phase II
Harry S. Wildblood, Advisor
John Morgan
Caitlyn Person
Justin Sowinski

United - Corporate Support Center
Analysis of Flight Scheduling Effectiveness - Phase II
Lavanya Marla, Advisor
Ketaki Barapatrey
Juan Cepeda
Peter Grahl
Matthew Samuel

Vanfab, Inc
Steel Reel Business Opportunity Analysis
Henrique L. M. dos Reis, Advisor
Jacob Aron
Vincent Chee
Justin Moises Habana
Jake Wolff

SPRING 2021

4B Components Ltd.
Reducing Aerodynamic Drag in Bucket Elevators
Tom Titone, Advisor
Vincent Hu
Jerry Liu
Raj Patel
Francesca Santos

Agri-Fab, Inc.
Semi-Autonomous Validation Test Equipment Design
Robert Norris, Advisor
Angela Chan
Kishan Desai
Nikhil Kumar
Eugenia Maldonado Alvarado

Color Communications, LLC
Color Sample Chip Transfer Press Redesign
Molly Goldstein, Advisor
Estelle Marissa Chavez
Becky Donnelly
Yuzhou Du
Joshua Zhou

Crandall Stats and Sensors
Electro-pneumatic Thermostat Design Development - Phase II
Scott A. Burns, Advisor
Yifan Chen
Chen Ge
Nicholas Gustafson
Thomas Kaufmann
Haolin Zhang

Division of Animal Resources
DAR Animal Facilities Operational Analysis for Improved Efficiency
Dan Thompson, Advisor
Nick Fontana
Gautam Kalluri
Matt Linden
Harsh Singh
Gabrielle Wind

Derby Industries, LLC
Robotic Pick and Place Application and Layout Optimization
Aleksandr Stolyar, Advisor
Zachary Kanjirath
Rahul Mahesh
David Okrzesik
Icabel Rodriguez

Forster Products
Bullet Seating for Measurement and Process Refinement
Henrique L. M. dos Reis, Advisor
Michael Elzanati
Nishant Modi
Samuel Zelman

Hausner Hard Chrome, Inc
Value Stream Mapping and Tracking of Key Operations into ERP System
Harry S. Wildblood, Advisor
Jared Espinosa
Ellie Guido
Nathan Hinnen
Justin Powell

Imagination Products Corp.
(FlexiSnake) Vac Snake Application & Design
Yumeng Li, Advisor
Rosemarie Garza
Fred Hwang
Benjamin Mark
Rachel Wortman

Jtec Industries, Inc.
Robotic Vision System
Rasoul Etesami, Advisor
Taoyu Cai
Ziyang Liu
Jinglan Shi
Wenpeng Wang

Kemp Mfg. Co.
ERP Quality Data Retrieval and Reporting Improvement
Qiong Wang, Advisor
Alexander Enrico
Maxwell Jayes
Benjamin Kofman
Tyler Zhang

Kwik-Wall Company
Flow & VSM & Productivity Increase for New Facility
Jugal Garg, Advisor
Jon Doss
Minjae Kim
Xiang Li
Shen Liu
Honghui Xie

Laystrom Manufacturing
CNC Laser Sheetmetal Part Separation Efficiency Improvement
Ruoyu Sun, Advisor
Chris Abarro
Nirvaan Garg
Grayson Will
Yue Yang

Morton Buildings, Inc.
Dutch Door Frame Unit Manufacturing Process Development
Wayne J. Davis, Advisor
Vishrut Khaitan
Colin O'Reilly
John Snyder
Yumeng Wang
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, SECOND PLACE

North American Lighting
Space Utilization for Efficient WIP Storage and Retrieval
Scott A. Burns, Advisor
Lucas Kinsey
Teresa Riles
Zidan Xiao
Yuanbo Zhang

Northrup Grumman
Aircraft Survivability Test Data Integration for Enhanced Visualization
Rakesh Nagi, Advisor
Blake Lesser
Chaitanya Maroju
Alexander Pieri
Hyunjoon Rhee

Plastipak Packaging Inc.
Automated Material Handling AGV Analysis and Implementation
Lavanya Marla, Advisor
Christian Forster
Molly Maloney
Jaquelin Salcedo
Madison Smith

PPC Flexible Packaging
Medical Packaging Production Troubleshooting and Productivity Improvement with Pick- and Place Technology
Karthekeyan Chandrasekaran, Advisor
Aaryaman Baid
Harrison Oliff
Minxing Sun
Satvika Veeravalli

Precision Products, Inc.
Collapsible Spreader Design
Pingfeng Wang, Advisor
Yongseok Kim
Ryan Muehlfelder
Robbie Torchalski
Bohua Zhang

Psyonic
Optimization of Manufacturing Efficiency and Scalability for the Bionic Ability Hand
Dusan M. Stipanovic, Advisor
Nika Steffen
Anna Steinbrenner
Siwen Wang
Saad Yenepoya

R & R Bindery Service, Inc.
Book Block Layout and Material Handling Optimization
Abigail Wooldridge, Advisor
Arnav Gupta
Evelyn Hughes
Elizabeth Ramos
Anvi Sarbhai

TEC
Analysis of the Three-Hub Model for Distribution System
Xin Chen, Advisor
Daniel Dirienzo
Paul Incapreo
Parth Patel
Connor Steel
Daniel Zhang

Wahl Clipper Corporation
Oscillating Motor Controller and Prototyping
Jeff Shamma, Advisor
Mariana Conde
Sam Dekhterman
Ethan Hoggard
Adam McCarthy
WINNER: BERNT O. LARSON PROJECT DESIGN AWARD, FIRST PLACE

NEW ISE ALUMNI

BACHELOR'S DEGREES

AUGUST 2020 GRADUATES

Industrial Engineering

Abidi, Syed S
Ahn, Kisun
Demirok, Yasemin Burcu
Ng, Connor Chung

Systems Engineering and Design

Ferguson, Kenneth Lee
Wang, Ruolei

DECEMBER 2020 GRADUATES

Industrial Engineering

Chee, Vincent Jeffrey
Couston, Paul Thomas
Dash, Ritesh
Faydasicok, Hasan Batuhan
Li, Tiantong
Morgan, John Edward
Sowinski, Justin T
Wang, Can

Systems Engineering and Design

Addo, Sir-Simons N
Bowbin, William Patrick
Cheng, Tiancheng
Darragh, Alexander William Peter
Elgendy, Marwan M
Gao, Qingyuan
Gianelloni, Sabin Alexander
Jones, William Casey
Li, Jane
Lundstrum, Lucas Reinhart
Pulido, Bella Yolanda
Semitka, Lucas Alexander
Sitta, Jack Miles
Sommer, James Patrick
Spytek, Monika R

SPRING 2021 GRADUATES

Industrial Engineering

Abarro, Christian Anthony Ocampo
Alladi, Sarang
Aron, Jacob C
Ayar, Nina V
Baid, Aaryaman
Barapatrey, Ketaki Charudatta
Barvinek, Andrew R
Bollito, Jack Anthony
Desai, Kishan Rahesh
Dirienzo, Daniel Edward
Donnelly, Rebecca Marie
Doss, Jonathan Michael
Elzanati, Michael Saad
Enrico, Alexander
Espinosa, Jared M
Fontana, Nicholas Joseph
Forster, Christian O
Garg, Nirvaan
Ge, Chen
Grahl, Peter Josiah
Guido, Elizabeth Evelyn
Guo, Yuanqing
Gupta, Arnav
Hinnen, Nathan Isaac
Hughes, Evelyn A
Incapreo, Paul Edward
Kalluri, Gautam Sai Dutt
Kanjirath, Zachary Stephan
Khaitan, Vishrut
Kim, Yongseok
Kinsey, Lucas Anthony
Lesser, Blake Elliot
Li, Xiang
Li, Yijie
Mao, Jiaqing
Maroju, Chaitanya Soma
Modi, Nishant S
Okrzesik, David Thaddeus
Oliff, Harrison George
O'Reilly, Colin Joseph
Pandey, Rishabh
Patel, Parth Alpesh
Patel, Raj Y
Person, Caitlyn Marie
Powell, Justin James
Rahul Mahesh, -
Ramos, Elizabeth Therese
Rhee, Hyunjoon
Riles, Teresa C
Rodriguez, Icabel
Sarbhai, Anvi
Shi, Jinglan
Singh, Harshvardhan
Smith, Madison Anne
Snyder, John Thomas
Spiwak, Mia Alexandra
Steinbrenner, Anna Lisa
Tkacz, Conrad Darek
Wang, Yumeng
Wortman, Rachel Lynne
Wu, Kevin Wayne
Yang, Yue
Yenepoya, Moideen Saad
Zhang, Bohua
Zhang, Dingying
Zhang, Youtian
Zhang, Yuanbo
Zhou, Joshua

Systems Engineering and Design

Bandukda, Umer
Berglind, Jack P
Binning, Spencer
Butera, Jacob Vincent
Cai, Taoyu
Cepeda, Juan Ignacio, Jr
Chan, Angela Lilly
Chang, Jason Jing-Shen
Chavez, Estelle Marissa Curimao
Conde, Mariana
Deckard, Timothy Paul
Doyiakos, Melissa Maria

Du, Yuzhou
Gustafson, Nicholas Reed
Hu, Vincent
Jayes, Maxwell Prescott
Kaste, Alexandra Nicole
Kaufmann, Thomas Anthony
Kim, Minjae
Kofman, Benjamin Paul
Kumar, Nikhil
Linden, Matthew Spohr
Liu, Huaqiu
Liu, Shen
Liu, Ziyang
Loewenthal, Ted Daniel
Lucero, Eriq C
Maldonado Alvarado, Eugenia Sofia
Maloney, Mary Frances
Manhart, Scott
Mark, Benjamin James
McCarthy, Adam Russell
Muehlfelder, Ryan Charles
Nieto, Omero
Obradovic, Matthew C
Pieri, Alexander Robert
Rashed, Shaneelah
Salcedo, Jaquelin
Samuel, Matthew
Sandora, Nicholas Anthony
Santos, Julia Francesca Pedrido
Simonetti, Samantha
Steel, Connor T
Steffen, Nicole K
Sun, Minxing
Torchalski, Robert J
Veeravalli, Satvika
Wang, Siwen
Wang, Wenpeng
Will, Grayson Wyeth
Wind, Gabrielle Kathleen
Wolff, Jake Sterling
Xiao, Zidan
Yu, Alexander
Zelman, Samuel Evan
Zhang, Haolin

MASTER'S DEGREES

AUG 2020 GRADUATES

Master of Science in Industrial Engineering

Balasubramanian, Sharan
Bibaksereshkeh, Seyedali
Chen, Xin
Ruan, Yufei

DEC 2020 GRADUATES

Master of Science in Industrial Engineering

Chen, Shulu
Chen, Yuhao
Liang, Yuhan
Sun, Chang
Susanto, Yohanes
Yan, Shen
Yang, Junchi
Zhu, Qizhi
Zuo, Luo

Master of Science of Systems Engineering and Design

Fu, Tianshi

MAY 2021 GRADUATES

Master of Science in Industrial Engineering

Bi, Xiaoqi
Carvalho Manhaes Leite, Carolina
Challa, Vishnu Pratheek
Feng, Ruoyi
Gupta, Akhil
Kannadka, Sourabh Theertharam
Lu, Cheng
Pan, Zhonghao
Rajasekaran, Badrinarayanan
Rajput, Ayush
Sharma, Anunay
Zhu, Jiahao

DOCTORAL DEGREES

AUG 2020 GRADUATES

Doctor of Philosophy in Industrial Engineering

Zhang, Wenda
Dissertation: *Cyclic best first search in branch-and-bound algorithms*

Doctor of Philosophy in Systems Engineering and Design

Raman, Arun
Dissertation: *On the decidability of problems in liveness of controlled Discrete Event Systems modeled by Petri Nets*

DEC 2020 GRADUATES

Doctor of Philosophy in Industrial Engineering

Ghayoori, Arash
Dissertation: *Budget allocation and optimal use of resources in four different contexts: Data centers, viral marketing, recommendation systems, and the fight with the HIV epidemic*

Li, Menglong
Dissertation: *M#-convexity, S-convexity, and their applications in operations*

Doctor of Philosophy in Systems Engineering and Design

Courtney, Logan Matthew
Dissertation: *Learning from videos with deep convolutional LSTM networks*

Li, Yao
Dissertation: *EEG-based brain-computer interface for human-robot collaboration*

MAY 2021 GRADUATES

Doctor of Philosophy in Industrial Engineering

Murray, Timothy Steven
Dissertation: *Modeling Trustworthy Behavior and Limiting the Impact of Selfishness*

Patterson, Albert Edward, V
Dissertation: *Meso-Scale FDM Material Layout Design Strategies Under Manufacturability Constraints and Fracture Conditions*

Doctor of Philosophy in Systems Engineering and Design

Peddada, Satya Ravi Teja
Dissertation: *A Two-stage Design Framework for Optimal Spatial Packaging of Interconnected Fluid-Thermal Systems*

JEFF SHAMMA

ISE Department Head and Jerry S. Dobrovolny Chair in ISE

(217) 265-6210

HEIDI CRADDOCK

Associate Director of Undergraduate Programs & Chief Academic Advisor

(217) 333-0068

WILLIAM GILLESPIE

Assistant Director of Communications and Marketing

(217) 265-6594

JULIE MURPHY

Assistant Director for Alumni, Corporate, & Student Relations

(217) 244-0095

LAUREN REDMAN

Assistant Director of Graduate Studies

(217) 333-2731

TOM TITONE

Director of Project Design Activity

(217) 265-5359

CONTACT

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ISE: A CENTURY OF EXCELLENCE

The year 2021 marked the 100th anniversary of the Department of General Engineering, the department that became ISE. This year is also the 100th birthday of the Transportation Building, whose northern portion was completed in 1921. General Engineering would grow to fill the building, and merge with Industrial Engineering to form ISE. In those 100 years, we have made innumerable breakthroughs in research and graduated thousands of students. We thank you for being a part of our storied history. Your support makes our next century even brighter than our first.

ise.illinois.edu/giving

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For More Information

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


I S E