Industrial and Systems Engineering (ISE)

2019 Newsletter

Life-Changing Experiences. Human Scale.

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From the Department Head
Al Wallace

By the time you read this, our family should be anticipating the arrival of a new person into the world. This will be my first great-grandchild, which means that the Wallace clan will consist of four generations alive at the same time. Such a phenomenon, as you know, was nearly unthinkable even two centuries ago. Since then, humankind has made so much progress in a multitude of areas — including those that contribute directly to our health and well-being — that I believe four-generation families will become a common occurrence.

That is something to be celebrated. It also raises a question. What are we doing to bequeath a better, healthier, more sustainable world to that fourth generation?

Many current trends, as you well know, are moving in the opposite direction. The mechanics of climate change are creating massive disruption in myriad aspects of the human (and planetary) community. Many areas have already felt catastrophic impacts from the extreme events — like Hurricane Maria in Puerto Rico or Hurricane Dorian in the Bahamas — associated with rising levels of greenhouse gases in the atmosphere.

There is only one species whose collective action can deliver a better world to our fourth generation. And that, from my perspective, is what gives ISE such a central role to play: We study that very species and its role in the systems around us. At Rensselaer we have applied that study in innovative ways to many of the questions relevant to future generations. I firmly believe that our faculty and our students will make a difference as a result.

You can see the difference-making in the many projects underway in the ISE department, including those noted in this issue of the newsletter. For example:

- I see it in the work of Tom Sharkey's team, not only to bolster disaster recovery infrastructure in the rapidly changing Arctic, but to do so in a way that benefits everyone involved, including residents.

- I see it in David Mendonça's efforts to create an entirely new, transformative network of ISE researchers to address the fast-evolving, highly complex extreme events we're seeing today.

- I see the difference-making capacity in Kristen Schell's idea for using excess electricity from renewable sources — an ongoing headache for producers — to power the direct capture of carbon dioxide.

- I see us making a difference in expanded opportunities for our students, through our new Data Science and Engineering minor and our Applied Data Science course.

- No one can miss the difference our student research projects — like senior Ana Gabriela Duque's investigation of green fashion design — may someday make.

As this issue demonstrates, such worthy efforts are only a part of ISE's innovation to address some of humanity's most pressing challenges. The work of our people is a big reason why, despite the complexity of those challenges, I am hopeful that we will hand off a better world to those who come after us — right down to the fourth generation.

Keeping the World Online

James Daviero '86 oversees a major portion of the backbone of the internet.

By his own admission, James (Jim) Daviero is a behind-the-scenes guy. So you wouldn't expect episodes from his life to read like a thriller.

Dateline: January 2010. Daviero receives a text about an outage in his network. "All of Haiti is out," he recalled. "Clearly we have a problem, and for us problem means experts all over the world getting on a conference call, scanning the network for root causes." Meanwhile, a team member telephones the Haiti node's local administrator for an on-the-ground report. The call never goes through. "I'm on the bridge hearing someone say, 'I'm getting rings, no answer.' That's when we started watching the news and heard about the earthquake."

When Daviero mentions "the network," he's referring to the internet — or rather, a major portion of its backbone. As director of global IP network operations for AT&T, he oversees the 24x7 management of one of the internet's largest autonomous system numbers ("think ZIP codes," Daviero explained). As you might expect, the stakes are very high: "Hundreds of Fortune 500 companies depend on this network for both global internet access as well as private virtual networking," his resume states.

Daviero joined AT&T in 1999, when the internet looked considerably different. "People were just starting to transact business online," he recalled. "It wasn't mission-critical back then. One of my colleagues kidded about 'bouncing' the network in Europe (taking it down and bringing it back up again). He didn't, of course, but I don't think many people would have noticed."

They'd notice now, given the sheer volume of business conducted online. That fact has turned a longtime challenge for the internet into a top priority.

"One thing that preoccupies me today is providing end-to-end service," Daviero explained. "For instance, one of our customers makes a major purchase online. It may go through our network and then pass on to others. As a result, I can only go so far in tracking down why it never went through. At that point I have to advocate for the customer to the internet — at least to the other network providers — to get the problem solved."

Each year, Daviero speaks to first-year Rensselaer students, and he has no problem communicating the value of an ISE education. "Even after 30 years in the workforce, I'm using the skills I learned here every day," he said. He cites communication, strategic thinking, and an appreciation for process among the most valuable of those skills.

Ask Daviero what makes him proud, and he starts at home: his wife, Jill, their daughters (age 20 and 17), and his volunteer work with the food pantry and the Red Cross, for whom he delivers blood from distribution centers to medical facilities. At work, he points to the environment he has fostered in a global organization.

"It's a respectful environment where everyone knows we have a job to do, but we also foster new ideas and teamwork," he said. "No question we have some rigid requirements: When the technology and the processes are this mature, there are steps that must be taken, in a certain order. But we balance that by allowing flexibility where we can. We have a team with individuals all over the globe with different backgrounds and culture and it's amazing to see it at work 24x7."

Applied Data Science

Want to Be a Data Scientist?

ISE lecturer equips students for the fast-growing fields of data science and machine learning.

In the world of big data, data scientists (and their engineering counterparts) are a big deal.

As a career, machine learning engineer has grown 12-fold since 2014, making it the second fastest-growing job in the LinkedIn 2018 U.S. Emerging Jobs Report. Data science jobs have multiplied by 6.5 in the same period, and many of them carry salaries in six figures.

It's only natural that ISE would prepare students for these careers, and Joana Rosado Coelho has just the thing.

Coelho, a lecturer at ISE, has launched a course in applied data science for graduate and upper-level undergraduate students, and it mimics the daily workflow of a data scientist. Students choose a real-world topic or dataset to explore, then devise the best approach to extracting useful knowledge from the data noise while creating data visualizations for decision-making. Along the way, the course enables students to master the fundamental concepts of machine learning.

It also enables them to decide if the field is right for them. In the first lecture, Coelho outlines the strengths required of data scientists: intense curiosity, design thinking, workflow management, human relationships, knowledge of statistical relationships, and the ability to translate the data into a story. Also during the course, guest speakers will discuss the future of data science and artificial intelligence.

Coelho is well-positioned for such a course. Her research interests include many of the relevant fields, from big data and data science to natural language processing and machine learning. Within industry, she has served as the deputy head of analytics consulting for one of the world's largest financial institutions.

Curtailed Electric Power

Amplifying the Advantages of Renewable Electricity

Kristen Schell's team has found a new use for excess power generated by wind and solar.

To understand the significance of Kristen Schell's latest research, start with one weird fact: Too many solar and wind installations are producing too much electricity.

That may sound like an environmentalist's dream, but it can be a nightmare for power producers.

Because solar and wind have exploded in recent years, they can easily generate more electricity than the market (or the transmission network) can absorb. That leads to curtailment: "the shutting down of electricity production from these generators because the system cannot integrate it," said Schell, an ISE assistant professor. The results: lost uptime, lost reliability, lost revenue.

"The operational decisions involved in integrating renewable power into the grid remain difficult," Schell explained. "Without a system-wide analysis, renewable power would continue to be curtailed."

So Schell's team undertook that analysis — possibly the first of its kind to put excess power from renewables to good use. Rather than curtail wind and solar energy, the team's solution would divert excess electricity to powering technologies that remove carbon dioxide from the atmosphere. Chief among these is direct air capture, in which large fans blow air through an adsorbent to create a pure CO_2 stream.

According to Schell, if direct air capture systems had been deployed in California over the past four years, her approach would have removed more than 6.2 million tons of carbon dioxide — the equivalent of taking more than 1 million cars off the road for a year.

Schell and research partner Ahmed Abdulla, of the University of California, San Diego, and Carnegie Mellon University, unveiled their analysis at the 42nd International Conference of the International Association for Energy Economics.

Health Care

Enhancing System Resiliency

Two ISE senior faculty sound the alarm on the system's vulnerability to disasters.
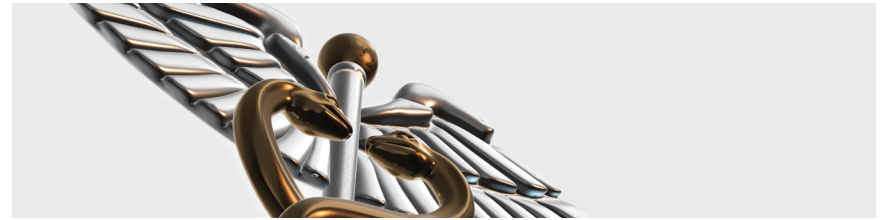
Richard Little and William "Al" Wallace have an urgent message for the health-care community. They hope to send it before it's too late.

"Recent hurricanes have demonstrated the near-total dependence of health care — from the largest hospital complex to the local pharmacy — on transportation, power, water, and communication systems," said Little, ISE's visiting research scholar. "Lessons learned from these storms can drive the design of more robust, resilient systems for health-care delivery, but only if these system interdependencies are recognized and appreciated by the health-care community."

Toward that end, Little and Wallace, an ISE professor and department head, are departing from the usual academic journals to craft a policy white paper for a broad audience. The paper will describe the challenges to health care posed by interdependent infrastructures, propose a range of technical solutions to mitigate disruptions, and discuss the institutional partnerships required to enhance system resiliency.

The interdependencies — and the need to address them — were evident on Puerto Rico in the aftermath of Hurricane Maria. Hospitals with emergency backup generators relied on them until the generator fuel ran out. Even with power, doctors could not perform surgeries because they had no potable water. Both fuel and water were available, but only at ports of entry, and the myriad road closures prevented delivery. Those same closures kept patients in need from traveling to the hospitals and clinics for needed care.

With so many interdependencies, the need for interagency cooperation during a disaster is critical — which is why Little and Wallace are taking their paper to a broader audience.

Little cites the power of computer-aided decision models, many developed by ISE faculty, to support health care in simulating a wide range of systems, damage scenarios, and response strategies while taking community input into account. Such models exemplify the department's distinguished record of investigating and publishing research on the most significant disasters of the past 30 years, from Hurricane Sandy to the Exxon Valdez oil spill to 9/11.

One continued focus for Wallace and Little involves the needs of satellite locations, such as dialysis centers and urgent care facilities. Decisions about the siting of such facilities, priorities in service restoration, and pharmaceutical supply chains should consider the potential impact of extreme events on these satellites, Little said.

For now, getting the word out is of the utmost importance. "At the end of the day," Little said, "we are trying to speed up the learning curve so we don't have to wait for more and bigger storms to figure out better ways to do things. Climate change will only make these needs more urgent."

Data With an Engineering Twist

ISE's new minor carves out a niche for itself by combining two approaches.

Run a web search for data science and engineering courses and see if you can find anything like the newest minor at Rensselaer. For David Mendonça, that's more than enough reason to offer it.

"The new Data Science and Engineering (DSE) minor is notable for its emphasis on situating data science within the context of engineered systems," said Mendonça, an ISE associate professor who designed the new curriculum. "It represents a paradigmatic shift away from purely data- or model-driven approaches, with a broader goal of understanding the trade-offs involved with each approach."

The new 17-credit minor does appear to be unusual. Judging from web searches, universities tend to offer undergraduates a minor in data science only, while DSE programs are reserved for graduates.

To fulfill the requirements, students must take core courses in information systems, statistical analysis, and design of experiments, then choose two other offerings from a range of options — from data and society, to biostatistics, to human performance modeling and support.

During his tenure with the National Science Foundation, where he served as program director for infrastructure management and extreme events, Mendonça saw firsthand the limitations of exclusively data-driven approaches in the design of human/machine systems. That inspired him to search for a better way, and the new minor is the result.

Given the ubiquity and ever-expanding use of data nowadays, Mendonça sees the minor attracting students from a wide range of disciplines. "It should appeal to students who are interested in understanding and improving human/machine systems through model- and data-based approaches," he said. "This is a wide swath of individuals, ranging from engineers to social scientists to computer scientists."

ISE faculty will teach the core of the minor, using mathematical, computational, and data models to support decision-making on global challenges.

Saving Lives — and Ways of Life — in the Arctic

With $1 million from NSF, ISE researchers aim for emergency response that benefits victims and communities alike.

To understand why Thomas Sharkey's Arctic team might merit a $1 million National Science Foundation award, consider this composite scenario:

With climate change opening major waterways in the Arctic, a travel agency offers cruises along Alaska's north coast on a 1,500-person luxury liner. During the maiden voyage, the engines fail and the ship goes adrift; the closest rescue station is hundreds of miles away. Weather alerts predict a fierce storm approaching, so the passengers are moved immediately to a nearby village. But with a population of 200, the village cannot easily accommodate the stranded vacationers, straining the residents' food supplies and shelter facilities.

The bottom line is that extreme events impact the rescued and the communities where they occur. In communities with few resources, far from established rescue operations, the results could be catastrophic.

This is why Sharkey's team — which includes ISE faculty William "Al" Wallace and Martha Grabowski, as well as Marie Lowe, associate professor of anthropology and public policy at the University of Alaska, Anchorage, and Thomas Birkland, professor of public policy at North Carolina State University — aims to upgrade emergency response capacity in the Arctic. What sets this effort apart is its attention to the people who live in the region: A primary project goal is to identify infrastructure options that benefit not only the victims of disasters but also the Arctic communities themselves. Crucially, those community benefits will be defined by community residents.

"The project is unique in that it uses methods from the social sciences, such as community-based participatory research, to help support infrastructure planning," Sharkey said. "We are visiting Arctic communities to get a sense of how they perceive changes in Arctic maritime activities and potential alternatives for emergency response infrastructure."

Many steps in the process relate directly to this goal. The research team has formed an advisory board of Arctic stakeholders, including Alaska Natives, to add local input and help guide the project. Visits to three communities in the region gave the researchers an on-the-ground perspective of what is needed and what may be most appropriate.

"In general, infrastructure that improves 'connectivity' — either through improved communications or improved transportation — is seen as beneficial and would be necessary to improve emergency response capabilities," Sharkey said.

Nor are cruise ships the only concern in the rapidly changing Arctic. The new waterways can also accommodate shipping of various goods, including oil. Anyone who lived through the Exxon Valdez disaster — or researched it, as Wallace and Grabowski have — can attest to the risk involved.

As with many other ISE projects, modeling forms the core of the project. The research team will create prescriptive models to help determine where, when, and how to integrate infrastructure and response resources into Arctic locales. New operations research models will assess disaster response capabilities in remote regions, especially for such efforts as oil spill response and search and rescue.

ISE has built a long track record of research into Arctic emergency response. Most recently, for instance, Grabowski led a National Academy of Sciences team investigating oil spill response in the region.

Martha Grabowski

The seven seas — and other parts of the world — are safer today because of professor Martha Grabowski.

That may seem like a bold claim, but a look at her accomplishments gives it credence. Grabowski has made her mark at the highest levels of the maritime world and well beyond:

- She is the current vice chair and incoming chair of the National Academies' Transportation Research Board/Marine Board.

- She is leading three unmanned aerial systems (UAS) technology integration projects — with GE's Power Systems, with the Syracuse, New York, Firefighters, and with oil spill and search and rescue groups in the Alaskan Arctic.

- She just completed a research project that developed self-healing accident and incident databases using machine learning techniques to improve predictive risk analyses in safety-critical systems.

- Her three-year research project evaluating the impact of wearable augmented reality displays such as Google Glass and Microsoft HoloLens on ship navigators' performance and decision-making will move from simulator evaluation to operational testing on the Staten Island Ferry in January 2020.

- She just completed service on a select committee recommending improvements to U.S. Coast Guard ship stability regulations in the wake of the loss of the container vessel El Faro.

- Her eight-year research project for the American Bureau of Shipping, the U.S. Coast Guard, and three global shipping organizations, which evaluated safety culture in marine operations, identified a series of key performance indicators and improvements now used across the maritime industry.

- Her major maritime risk assessments, in a 20-year partnership with colleagues at The George Washington University and Virginia Commonwealth University, developed the risk framework and assessment tools now used by the Coast Guard in its Port and Waterways Safety Assessment process.

- From 2012 to 2014, she chaired the National Academies' study on Arctic oil spill response, briefing Congress, holding public meetings in Alaska and across the Arctic, and hosting a National Academies webinar for remote and local stakeholders. This study built on her tenure (2008-2010) as vice chair of a policy assessment of the U.S.'s tsunami readiness.

Grabowski showed an interest in things maritime from an early age. She was in the second class of women to attend a federal service academy — before West Point and Annapolis admitted women — and received her B.S. in marine transportation/nautical science from the U.S. Merchant Marine Academy and three advanced degrees, including a Ph.D. in management/information systems, from Rensselaer. Before pursuing her advanced degrees at Rensselaer, Grabowski sailed as a ship's navigator and officer aboard U.S. flag merchant ships and worked in advanced intelligent systems for several GE departments. Not surprisingly, she is a licensed former merchant officer and retired lieutenant commander in the U.S. Naval Reserve.

Grabowski serves as senior research scientist with ISE. She holds the McDevitt Distinguished Chair in information systems and is director of the #18 *U.S. News & World Report*-ranked Information Systems Program at Le Moyne College in Syracuse, New York.

A Life of Equations Shifting to a Life of Words

A longer version of this article, by ISE professor emeritus Thomas R. Willemain, appeared in the *Journal of Humanistic Mathematics*, Vol. 9, No. 2 (July 2019), 329-32.

I was tricked into poetry by receiving "honorable mention" in a student poetry contest at Princeton. Over the years, that must have worked on my subconscious and kept the flame alive while I devoted myself, in turn, to electrical engineering, operations research, and statistics.

As my technical life diminishes, my writing life increases. I became emeritus in 2013 but continue with my research interests. Meanwhile, I continue in a commercial role as research director of my software company, having fun devising new statistical algorithms. What's new since 2017 is that I have been writing, first a memoir of my time in the intelligence community, then poetry and flash fiction.

One of the missions I have assigned to my poetry is to expose to "regular" people the inner life of the mathematical person. The poem "Formulations" pokes a bit of fun at the bloated (and in this case almost musical) titles that can grow from our research. More seriously, it documents the change in self-definition that flows from recognizing the inevitable drift away from high-intensity math as we age.

Formulations

Formulations
for the
    nonbifurcated
    hop-constrained
    multicommodity
    capacitated
    fixed-charge
    network design problem
are not top of mind
when making breakfast.
But they may cross your mind
when brushing your teeth,
As do their fellows.

Until they notice
your fading interest.
And then,
with moderate sorrow,
one by one,
they skulk back
to their technical journals,
and lie in wait
for a young and eager brain to haunt.

So it comes to pass
that one quietly significant day
all you are doing
when brushing your teeth
is brushing your teeth.
And it doesn't bother you
that you're doing that
with no math in mind,
no appreciation for an equation,
no thought to its use.

And you are not the same man.

Transforming a Field

David Mendonça envisions a research network up to the challenge of today's complex catastrophes.

Extreme events are changing too fast, and becoming too complex, for the field that studies them. So the field needs a makeover.

The National Science Foundation saw enough merit in this bold claim — made by ISE associate professor David Mendonça — to award his team nearly $300,000 under the Early-concept Grant for Exploratory Research (EAGER) program, which supports "untested, but potentially transformative, research ideas."

At the heart of Mendonça's program is the creation of a new research network, dubbed OSEEER (Operations and Systems Engineering Extreme Event Research). The network will draw together a diverse range of researchers, collaborators, and disciplines required to address the vastly complex emergencies of today and tomorrow — whose very complexities demand new thinking that cuts across disciplines.

"The portfolio of disasters facing communities is changing, sometimes dramatically," Mendonça said. "The methods we employ for mitigation, response, and recovery therefore need to change as well."

As an example of the gap between current events and current research, Mendonça cited the dearth of work at the "boundaries." Sociologist Gary Kreps stated that disasters provide "strategic sites" for testing the boundary conditions of core theories in social science. According to Mendonça, "the statement also applies broadly to the field of engineering, where such 'extreme events' provide a ground for developing or testing new tools and techniques to mitigate societal losses and to improve prospects for post-

disaster recovery. However, recent reviews of hazards-related research in the [operations engineering] area…suggest that this research has focused on problems that sit well behind these boundaries."

The needed changes are wide-ranging and fundamental, with a focus on both "cross-cutting" and basic methodological issues. The cross-cutting category includes formulation of the right problems to research, more powerful combinations of "big data" and models to better understand system performance, and the cultivation of "next-generation scholars" to lead the work. Those scholars will include early career investigators and those from the underrepresented groups often hit hardest by extreme events.

The methodological issues include needs to tackle the dynamism of emergency systems, revisit the treatment of human/machine systems (especially given the recent explosion of data on human behavior), and create new models of complex, multiscale phenomena.

Once OSEEER is established, the project will stimulate the network, through workshops and other activities, to define specific high-impact challenges and the methodological innovations to address them. New OSEEER publications and other media will build a body of research and an agenda for future directions. By collaborating on interdependent research projects and tasks, OSEEER members will create critical paths for further research and network building.

True to its diverse interdisciplinary nature, Mendonça's initial team includes researchers not only from ISE (William "Al" Wallace and Thomas Sharkey), but also from Georgia Institute of Technology, Rutgers University, The Ohio State University, University of Wisconsin, Northeastern University, and University of Michigan.

Green Is the New Black

ISE undergraduate's research may someday help fashion reduce its eco-footprint.
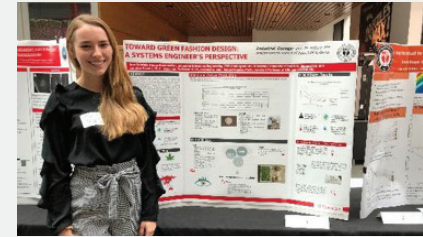
Ana Gabriela Duque's upcoming paper could change the face of fashion — not its styles, but its ecological footprint.

"I see this paper becoming a steppingstone for many other research efforts concerning the potential of industrial hemp within the fashion industry and beyond," said Duque '20, whose investigation into "green fashion design" won Rensselaer's 2019 Undergraduate Research Symposium Poster Presentation.

As Duque will tell you, there are compelling reasons for serious hemp research nowadays. Fashion ranks among the world's highest-polluting industries, thanks in large part to its dependence on cotton, which takes 160 days to grow, consumes vast amounts of water, and represents 16-20 percent of global pesticide use. Hemp, by contrast, grows to maturity in 70-90 days, requires no pesticides, and yields at least eight times the fiber per cultivated hectare, allowing for more efficient land use.

A shift from cotton to hemp, however, comes with daunting challenges, and the United States is a case in point. The U.S. government legalized the sale and growth of industrial hemp in 2018 after banning it for decades. The longtime prohibition has put the U.S., and its fashion designers, at a distinct disadvantage.

"Because industrial hemp has not been part of the United States market, this has caused a large gap in knowledge, technology, and

machinery," Duque explained. "Many countries in Asia and Europe have been investing in industrial hemp for years. Now that we are able to introduce it to the U.S., we have to have a good research foundation for building new ideas and new ways of implementing the plant in different markets."

To create that foundation, Duque (supported by two ISE advisers, associate professor Jennifer Pazour and assistant professor Sergio Pequito) has compiled data from multiple sources that compare the cultivation and operational aspects of industrial hemp and cotton. The objective is to provide a knowledge base that will encourage further research into industrial hemp and inform the development of a supply chain for the material.

Duque's interest in fashion, which goes back to middle school in her native Colombia, took off during an internship with famed designer Johanna Ortiz. "While I was there, I was able to see the whole production process of high-end garments," she said, "and I started to really investigate all of the aspects that cause the industry to be one of the highest polluting in the world."

The internship added to Duque's considerable accomplishments in Colombia — like co-founding a charity at the age of 15. Little Hands Across the Americas hosted numerous charity events to raise money for Manos Unidas Por Colombia, which runs medical missions in the city of Cali.

"It's a joy to work with Ana," Pazour said. "She is rigorous about the data and methods and passionate about working on important, timely problems. Her experience is a great example of two signature strengths in our department: the opportunities in ISE for undergraduates to conduct essential research, and the value we place on undergraduate education."

Alpha Phi Mu Named #4 in National Chapter Competition
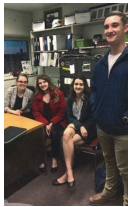
The industrial honor society Alpha Phi Mu has awarded the Rensselaer chapter fourth place in its annual Outstanding Chapter Award competition. The award is based on an evaluation of the chapter's contributions to its university, the field of industrial engineering, and the national society.

The Rensselaer chapter doubled its membership in 2018-2019 amid a flurry of activity — reserving rooms for ISE study sessions, co-hosting an event to prepare students for the Spring Career Fair, and overseeing a session on student Six Sigma/Lean certification, among other initiatives. Chapter members also introduced middle school students to industrial engineering and provided feedback on ISE's proposed curriculum changes.

The society currently has 68 active chapters, with a presence in nearly every major university that has an accredited industrial engineering program. There are currently 68 active chapters of the society and a membership of over 38,000 with approximately 600 new members being initiated each year.

Chapter co-presidents Ana Gabriela Duque and Maddie Fabry led the award-winning chapter, together with executive team members Conor Hanlon, Michelle Samour, and Jenna Dragoo. Associate professor Jennifer Pazour serves as faculty adviser.

Mario Arrieta-Prieto Takes Second Best Poster in Denmark School Competition

Ph.D. student Mario Arrieta-Prieto won second place in the Best Poster competition at the Technical University of Denmark's 2019 energy summer school. He was honored for his poster titled "Short-term Forecasting of Wind Power Output's Predictive Densities via DVINE Copulas."

The competition recognizes outstanding modeling efforts in statistics and operations research for applications in power systems. Under the guidance of ISE assistant professor Kristen Schell, Arrieta-Prieto currently focuses on the application of data-driven optimization to renewable energy sources.

Jennifer Pazour Gives Distinguished Researcher Presentation at World Class Supply Chain Summit

ISE associate professor Jennifer Pazour delivered the Distinguished Researcher Presentation at the 2019 World Class Supply Chain Summit this past May. Her presentation, titled "On-Demand Distribution Systems," compared and contrasted the new on-demand business model with traditional models for acquiring warehouse and order fulfillment capacities.

The event, which brings together more than 100 leaders in the field, serves as a forum to discuss the latest insights and trends in supply chain and logistics.

Pazour develops and uses analytical models to guide supply chain and logistics decision-making. Her research has made contributions to military logistics, distribution and transportation systems, health-care logistics, and on-demand supply chains. Recently her team has been rethinking supply chain design to meet the demands of modern distribution.

Two ISE Students Named Football Co-Captains

Two of this year's three captains for Rensselaer football hail from ISE.

Marc Meislahn, an industrial and management engineering major, has made the Dean's Honor List, interning as a data analyst at Mediacom and in project management at Bon Secours Charity Finance. Meislahn is a slot receiver and a member of the team's Black Watch leadership group.

One of his co-captains, linebacker Grant Tragni, has joined Meislahn as a Black Watch member and Dean's Honor List honoree. He interned at Regeneron Pharmaceuticals in 2018-19. In game action, he made seven tackles last year and served as long snapper on special teams.

ISE Receives "Perfect Review" from Accrediting Agency

ABET, an agency that grants voluntary accreditation to STEM programs worldwide, gave ISE a "perfect review" as part of a regular comprehensive audit of Rensselaer's School of Engineering.

Mohamed Aboul-Seoud, an ISE lecturer who led the department's contribution to the audit, noted that the results included only one "observation" — a suggestion that is offered to assist in improvement but does not relate to accreditation.

ABET accredits college and university programs to ensure they meet "the quality standards that produce graduates prepared to enter a global workforce," says the organization's website. The comprehensive audits assess compliance with those quality standards and identify a program's strengths and weaknesses.

"The verdict is in and we passed with flying colors," Aboul-Seoud said. "Everyone who spoke with the ABET reviewers left a great impression on how well our students are prepared to become tomorrow's leaders. I am so proud to be part of this team."

Biathlon Legends Discuss Data, Performance Modeling in ISE Class

Two members of the U.S. Biathlon Hall of Fame recently visited David Mendonça's class in Human Performance Modeling and Support.
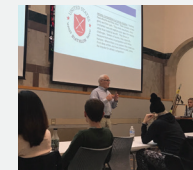
Featured speaker Art Stegen — the former coach of U.S. men's Olympic biathlon — discussed key aspects of performance modeling and assessment in the sport, as well as the importance of hard data in improving biathlon performance. Widely viewed as a legend in biathlon, Stegen was at the forefront in his use of data and literally "wrote the book" on U.S. biathlon, penning the first biathlon training manual in English.

Stegen explained that success in biathlon requires negotiating a difficult balance between the high-intensity physical demands of skiing and the focused precision of shooting. He also introduced the students to strategic dimensions of the sport and described factors critical to success.

Curt Schreiner, a seven-time U.S. biathlon champion and three-time Olympian, provided additional insights from his experience.

Three ISE Students Honored with Founders Award of Excellence

A trio of ISE graduate students — Mario Arrieta-Prieto, Orlando Romero, and Kaan Unnu — have been honored with one of Rensselaer's most prestigious awards.

Each of the students received a Founders Award of Excellence at Rensselaer's 26th Annual Honors Convocation. Established in 1994, the award honors students who embody qualities of creativity, discovery, leadership, pride, and responsibility. Only about 1% of the Rensselaer student body receive the award each year.
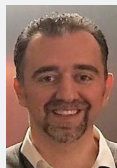
Martha Grabowski Appointed to Merchant Marine Academy Advisory Board

U.S. Transportation Secretary Elaine L. Chao has announced the appointment of Martha Grabowski, ISE senior research scientist, and six others to the United States Merchant Marine Academy (USMMA) Advisory Board. The independent board examines the course of instruction and management of the Academy to further the accomplishment of its mission, execute its strategic plan, and help advance the midshipmen's professional knowledge and skills. By statute, board members must be distinguished in education, industry, and other fields related to the Academy's mission. Grabowski's accomplishments in the maritime field are detailed in this issue's Faculty Spotlight.

IISE Chapter Wins Silver Award

The Institute of Industrial and Systems Engineers (IISE) awarded the Rensselaer student chapter its Silver Award for 2019. The award was given under IISE's Chapter Recognition Program, which uses chapters' activity reports as a measurement of their accomplishments.

Last year, the chapter collaborated with IISE to offer two on-campus certificates for Six Sigma and Lean Green Belts every year. Plans for next year include guest speakers, plant tours, social events, and other activities, and the chapter plans to host the IISE Regional Conference in 2022.

Leading the chapter are president Ana Cristina Nazario, vice president Gabby Fantell, treasurer Sijin (Teresa) Tang, membership director Elizabeth Evans, and webmaster Emily Tibbitts. The faculty adviser is ISE lecturer Mohamed Aboul-Seoud.

Ning Zhang Receives Top Honors in IISE Undergraduate Research Competition
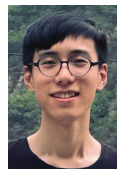
Ning Zhang, who graduated from Rensselaer this past May, received first place in the Undergraduate Student Research Dissemination competition, which took place at the 2019 Institute of Industrial and Systems Engineering (IISE) Annual Conference. His winning paper and presentation were titled "Expected Travel Distance Models for Retail Store Order Fulfillment." Advised by ISE associate professor Jennifer Pazour, Ning focused his research on policies that enable customers to order items online but pick them up at a brick-and-mortar store.

Sergio Pequito Named Senior Member of IEEE

ISE assistant professor Sergio Pequito has been named a senior member of the Institute of Electrical and Electronics Engineers (IEEE).

As the largest technical professional organization in the world, IEEE is focused on technological innovation to benefit humanity. Senior membership is given to those with professional maturity who have shown achievement in their field. To be eligible, a candidate must have been in professional practice for at least 10 years, demonstrating significant performance over at least five years.

ISE Adds Two New Faculty Members

In the past year ISE was pleased to announce the appointment of Kristen Schell as assistant professor and Rostyslav Korolov as lecturer.

In her research, Schell leverages the domains of engineering, operations research, and economics to analyze the complex questions facing the transition to an electric power system dominated by renewable energy sources. (See the article on her recent research elsewhere in this issue.) In 2016-17 she served as visiting researcher with Professor Pierre Pinson's Energy Analytics and Markets Group at the Technical University of Denmark. She holds doctoral degrees from Carnegie Mellon University and the University of Porto, Portugal.

Korolov focuses his research on social media analytics, social network analysis, data science, network science, and human behavior modeling. He earned his Ph.D. in ISE from Rensselaer in 2018.

ISE Advisory Council

The ISE Advisory Council provides input and advice to the department. Members serve as champions for the department and connect opportunities to ISE students and faculty.

The current Advisory Council members include:

- James Birnby, VP in Technology Group, Ayco (Goldman Sachs)
- James Daviero, Director of Global IP Network Operations, AT&T (see profile in this issue)
- Greg Dietrich, VP, Operations Eng. & Excellence, DXC Technology
- Bill Fosnight, Co-Founder and Chief Dev. Officer, Alert Innovation
- Robert Kewley, Head of Systems Engineering, West Point (retired)
- David M. Levermore, Lead Systems Engineer, MITRE
- William Rauch, Director of Analytics, Albany Medical Center
- Ravi Ravichandran, Director of Strategic Dev., BAE Systems (Chair)
- Colleen Shugrue, Manager, Learning Operations, UTC

ISE Stands at 21 in *U.S. News* Ranking

The *U.S. News & World Report* best graduate industrial/manufacturing/systems engineering department ranking lists Rensselaer ISE at 21 in the 2019 rankings. This is an indication of the reputation and impact Rensselaer ISE faculty and students have in the field.

Connect With Us

Visit the ISE site for links to faculty talks and tutorials, our LinkedIn and Twitter feeds, and information on donating to the department. While you're online, check out the ISE YouTube channel as well.

ise.rpi.edu

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