

### *Lehigh ISE Embraces the New Challenges In Energy and Computing*

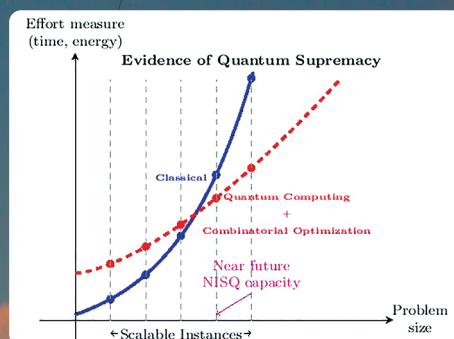
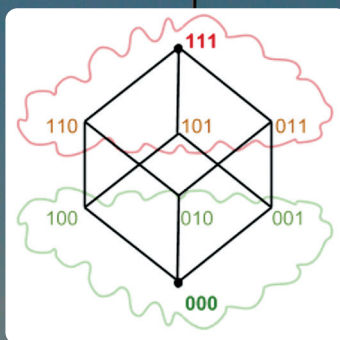
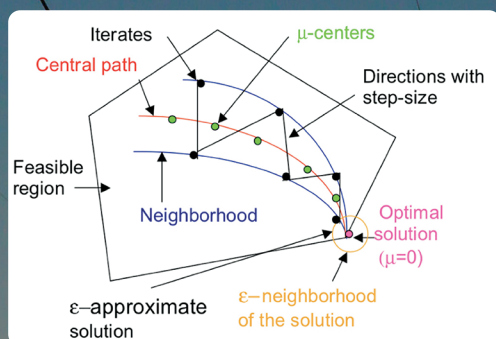
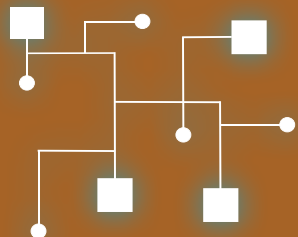


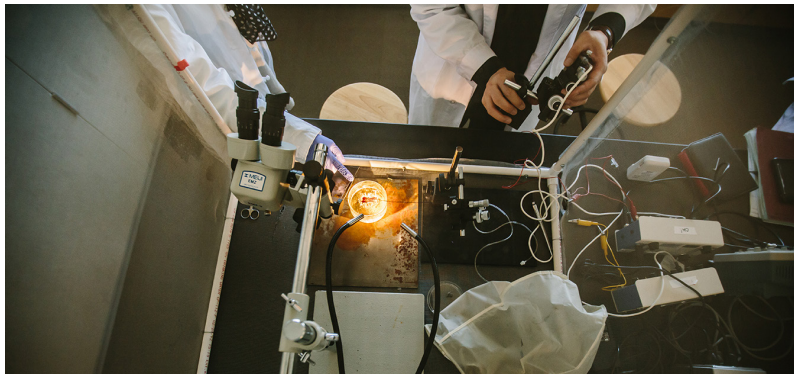
Photo credit Matthew Henry Unsplash



LEHIGH  
UNIVERSITY

P.C. Rossin College  
of Engineering and  
Applied Science





## INSIDE THIS ISSUE PAGE

## PAGE

Chair's Message.....	3
ISE Faculty & Staff News.....	4-10
Research Grants.....	11
2019-2020 ISE Seminar Series.....	12
Industry .....	13
Student News.....	14-17
ISE Alumni Awards .....	18
ISE Student and Faculty Awards.....	19-20
Graduation News.....	21
Degrees .....	22
Alumni News .....	23

## ISE DEPARTMENT NEWSLETTER FALL 2020

ISE DEPARTMENT CHAIR  
Luis Nunes Vicente

ASSOCIATE CHAIR  
Derya Pamukcu

EDITOR  
Sheila Dorney

DESIGN  
Mountain Hawk Design + Print Center

ISE ADVISORY COUNCIL  
Karyn Librader '95 Chair  
Ralph Bohnenberger '89 Past Chair  
Richard Wasch '71, '73G, Past Chair  
Kevin Dehoff '85  
Scott DeNegre '05G '11Ph.D.  
Lisa Farnin '84  
Ira Feinberg '69  
Kathleen Hall '82  
Jack Kloeber '77  
Geoffrey O'Connell '  
Chris Riemann '87  
Dan Scansaroli '05 '06G '09G '12

## ISE DEPARTMENT STAFF

DEPARTMENT AND GRADUATE  
COORDINATOR  
Jennifer Vargas

COMMUNICATIONS SPECIALIST /  
UNDERGRADUATE COORDINATOR  
Sheila Dorney

IT CLIENT SUPPORT COORDINATOR  
Mark Motsko

HSE COORDINATOR  
Linda Wismer

INDUSTRIAL AND SYSTEMS ENGINEERING  
DEPARTMENT  
Lehigh University  
200 West Packer Avenue  
Bethlehem, PA 18015  
610-758-4050

## READER FEEDBACK:

Please send comments to the editor,  
Sheila Dorney at  
skd220@lehigh.edu

Dear Lehigh ISE Community,

I hope this newsletter finds you well and you were able to enjoy some rest and leisure over the summer months. Whether you had a staycation and completed a few projects at home, or traveled to destination for some new scenery and experience, for certain living through a global pandemic offered a very different kind of summer.

As we all have had to adapt to some kind of new normal during the past 6 months, I am very proud and grateful to our amazing faculty, staff, and students for persevering through the daily challenges presented by COVID-19. In this newsletter, you will see ISE's accomplishments achieved through hard work and perseverance. Our ISE family is one of strength and resolution. We are problem solvers!

When our Spring Semester was turned upside down in mid-March, and our students were abruptly forced to return home and finish their semester online, our outstanding faculty rose to the challenge and quickly pivoted to online teaching. Our students adapted and finished their classes; some earned degrees. While we were teaching and learning in a virtual environment, unfortunately, not everything could transition to a remote mode. A number of events were cancelled or postponed, such as our Spencer C. Schantz Lectures, our INFORMS Chapter Distinguished Lectures, the ISE Annual Banquet, and our flagship conference MOPTA.

On the positive side, ISE was honored to present **David Burdakin** '77, President, JBT Aero Tech, with the 2020 ISE Distinguished Alumni Award for his exceptional contribution to industry and society. You can read more about David on page 18 of this newsletter.

This award, along with the ISE Student and Faculty of the Year Awards, Van Hoesen Family Best Publication Award, and Lawrence E. White Fellowship, were formally announced through email to our Lehigh ISE Community. I hope you received those emails. If not, please reach out to our Communication Specialist, **Sheila Dorney** ([skd220@lehigh.edu](mailto:skd220@lehigh.edu)), if you would like your email to be added to our mailing list.

This Summer semester we offered more courses than usual, and we had nearly 60 students enrolled. We offered to students the possibility to start all our in-house master's programs (HSE, ISE, MGSE) in the summer. All remote, of course.

No sooner did Spring classes end and we began planning for the Fall reopening of campus, identifying which courses could be fully remote, hybrid, or traditional. We adopted a hybrid model for Fall 2020. Many hours went into scheduling, as our new normal reduced the physical capacity in classrooms, labs, and lounges and we had to rethink our spaces. We upgraded our classrooms with installation of cameras and microphones in every lab room for enhanced delivery of classes. A Mohler's Safety Management Plan was also created to ensure the safe return for faculty, staff, and students.

There is much good news to share about our dear ISE Department. On August 15, we welcomed two new faculty, **Aida Khajavirad** and **Karmel Shehadeh**, both as Assistant Professors.

Aida has a professional path that includes IBM Research, UT Austin, and the Rutgers Business School. Aida's research

interests are in MINLP and Global Optimization, developing algorithms for nonconvex problems that arise from applications in chemical engineering and computational biology.

Karmel was a Presidential and Dean Postdoctoral Fellow at The Heinz College of Information Systems and Public Policy, Carnegie Mellon University. Karmel's research interests are in healthcare analytics and operations and scheduling theory and algorithms.

Our world class faculty continues to be recognized as leaders in their field. **Tamás Terlaky**, George N. and Soteria Kledaras '87 Endowed Chair Professor, has been elected to the Canadian Academy of Engineering. Fellows of the CAE are nominated and elected by their peers in consideration of their accomplishments and long-standing service to the engineering profession. Tamás was also recently appointed as the Editor-in-Chief of the Journal of Optimization Theory and Applications, a journal with a long reputation in the field. We congratulate Tamás on his new appointments.

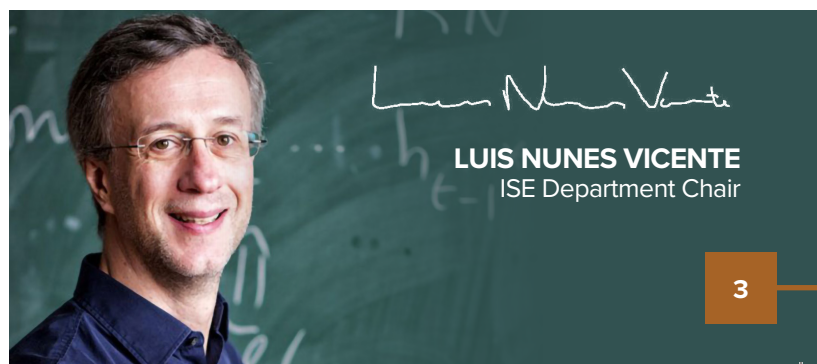
Earlier in 2020, the GO-SNIP team that included ISE Associate Professor **Frank E. Curtis** was awarded second place in the highly competitive Grid Optimization (GO) Competition, run and sponsored by the Department of Energy. The goal of the competition was to solve an advanced security constrained optimal power flow problem, intended to optimize grid design and operations. More than 25 teams competed, and the GO SNIP team second place received a \$400K prize. The ISE Department congratulates Frank and his team on this success.

Last but not the least, on August 31, one of our beloved faculty for over 40 years, **George R. Wilson**, retired as Associate Professor and ISE Associate Chair. George's contributions to ISE will leave a lasting impact. We sent George off with a wonderful tribute via Zoom, where each member of faculty and staff offered complimentary comments in the form of a story, memory or thank you. We are hoping to celebrate in person with a Spring luncheon. You can read more about **George's** successful and respected career on page 6 of this newsletter.

We are proud to announce that Professor of Practice **Derya Pamukcu** is our new Associate Chair since September 1. We all wish Derya a great term in a position that has always been key to our success, in particular for our undergraduate and master's programs.

The year 2020 will be a year we will never forget. As we begin the 2020-2021 academic year, we are excited to work toward new goals and prepare for the challenges that lie ahead. We look forward to the time when we can all be together again and experience all of the great seminars, events and celebrations in person. Until then, we will continue to excel in our new normal...

My most warmest regards. Stay healthy!



**LUIS NUNES VICENTE**  
ISE Department Chair

## ISE FACULTY & STAFF *update*



**AIDA KHAJAVIRAD**

### *ISE Welcomes new Assistant Professor*

The Industrial and Systems Engineering Department is pleased to welcome **Dr. Aida Khajavirad** as Tenure-Track Assistant Professor beginning Fall 2020.

Aida currently holds visiting positions at the Courant Institute of Mathematical Sciences of New York University and the Department of Management Science and Information Systems of Rutgers Business School.

She received her Ph.D. in Mechanical Engineering from Carnegie Mellon University in 2012, under the supervision of Professor Nick Sahinidis. She worked as an Assistant Professor of Operations Research and Industrial Engineering at the University of Texas at Austin during 2014-2016, and as Research Scientist at the Department of Business Analytics and Mathematical Sciences at IBM T.J. Watson Research Center during 2012-2014.

Aida's main research goal has been to advance the state-of-the-art in the global optimization of Mixed-Integer Nonlinear Programming (MINLP) at theoretical, algorithmic, and software levels. To this end, her research builds upon and combines ideas from convex analysis and continuous optimization, integer programming and combinatorial optimization, and constraint programming. On the theoretical side, Aida's research is focused on developing foundational theory to construct strong and tractable convex relaxations for a variety of nonconvex sets that appear frequently as building blocks of nonconvex MINLPs.

Her research in the convexification area has been supported by NSF and DOE. Together with Alberto Del Pia of UW-Madison, her work on convexification of multilinear sets has been recognized by the 2017 INFORMS Optimization Society Prize for Young Researchers. On the computational side, Aida has contributed to more than 30,000 lines of code to the state-of-the-art global solver BARON; her work has resulted in significant algorithmic improvements in the MINLP-software technology.

Recently, Aida has become interested in developing efficient optimization algorithms with performance guarantees for Data Science applications such as community detection and data clustering. In addition, she is enthusiastic about developing algorithms for nonconvex problems that arise from applications in Chemical Engineering and Computational Biology. At Lehigh, she is planning to pursue her methodological work while exploring new application areas by collaborating with the experts across the College of Engineering. *"I am looking forward to joining the ISE Department and contribute to its research and teaching missions. At Lehigh, I am planning to pursue my methodological work while exploring new applications by collaborating with the experts across Rossin College"*. Said Aida.





## *ISE Welcomes new Assistant Professor*

**KARMEL S. SHEHADEH**

The Industrial and Systems Engineering Department is pleased to welcome Karmel S. Shehadeh as Tenure-Track Assistant Professor, beginning Fall 2020.

**Dr. Karmel S. Shehadeh** was a Presidential Postdoctoral Fellow at the Heinz College of Information Systems and Public Policy, Carnegie Mellon University. Karmel obtained her Ph.D. degree in Industrial and Operations Engineering (IOE) from the University of Michigan in August 2019 under the supervision of Professors Amy Cohn and Ruiwei Jiang.

Karmel's broad methodological research expertise and interests include scheduling theory and algorithms, integer programming, and stochastic optimization. Her primary application areas and expertise are in healthcare operations and analytics. Karmel is also interested in the applications of operations research to transportation systems, and facility location. Karmel has written ten research papers, five already published in esteemed international journals and conferences.

Karmel's unique expertise in healthcare will help us develop our research program in the health and healthcare sectors. In fact, Karmel foresees herself establishing research and industrial collaborative programs in healthcare operations and analytics, exploring and expanding current opportunities made available in our Healthcare Systems Engineering Master's Program and the new Lehigh's College of Health.

Notably, Karmel was an influential and inspiring student leader and mentor during her PhD time at Michigan University, and has lectured a graduate-level course on Scheduling Theory and Algorithms as the sole instructor at Michigan's department of IOE. She has received a variety of student and travel awards and has been involved in numerous campus, diversity, and community initiatives. At Heinz, Karmel is involved in projects related to operating room scheduling and capacity planning, hospital readmission, mobile healthcare facility, and last-mile transportation systems. We are very excited about Karmel's future engagement and contribution to all our programs of study, as well as to our intense social and outreaching activities.

*"I am looking forward to joining the ISE family and using my full potential in, among other things, preparing the next generations of scholars and engineers and contributing significantly and positively to the teaching, service, and research mission of Lehigh University."* Said Karmel. *"I plan to use my expertise in operations research to continue making significant contributions to application areas in healthcare and beyond."*

# ISE Honors George R. Wilson, Associate Professor and Associate Chair Upon His Retirement



GEORGE R. WILSON

The ISE family bid a warm farewell to one of their most admired and respected faculty members, **George R. Wilson** who retired on August 31, 2020.

**George** began his career in 1978 when he joined Lehigh as a faculty member of the Department of Industrial and Systems Engineering (ISE) and served our university for more than 40 years as a pillar of dedication, commitment, and professionalism.

**George** was Associate Chair (AC) of the ISE Department from 2011 – 2020. His role as AC has been an integral factor in the recent success and cohesiveness of the department, most notably in the last two years with two consecutive changes in the chair position.

It was remarkable how he managed all AC issues smoothly and tactfully, almost leaving the wrong impression that the work was light and easy. His views were always sensible and his sense for quality robustly sharp. The department has been profiting from his skills in various ways, when assessing faculty and staff, analyzing program curricula, chairing the ISE curriculum committee, coordinating ABET efforts, and selecting and advising undergraduate and master students.

The ISE Department also deeply appreciated his continued commitment to high quality teaching, to which he carried valuable accumulated life experiences and a mature perception of the importance of the subjects lectured in the context of ISE curricula.

Also, laudable, has been was his participation in a number of important college and university committees during his 40 years of service. At the university level, **George** served several times on the Graduate and Research Committee (chairing it also) and on the Faculty Steering Committee (now the Faculty Senate Executive Committee). At the college level, he had been on the Tenure & Promotion Committee quite a few times and was a constant presence on the Academic Policy Committee since becoming AC.

Despite all his administrative duties **George** maintained his own scholarly program, advised PhD students, and kept up with 20 years of consulting activity with IBM. In 2017, he and his colleagues won the INFORMS Daniel H. Wagner Prize for Excellence in Operations Research Practice for their joint work on “The Inmate Assignment and Scheduling Problem and its Application in the PA Department of Corrections”.

**George’s** insight and wisdom will be will be deeply missed by faculty, staff, and students. His contributions and accomplishments will continue to positively impact Lehigh’s ISE’s. The ISE family is grateful for all he has done for the department and wish him nothing but the best in his new chapter of life.



SHEILA DORNEY

**Sheila Dorney** joined the ISE Department as Communication Specialist and Undergraduate Coordinator in February 2020. Sheila was previously employed at Rodale as a marketing project manager where she managed the creative execution of print and digital advertising for Rodale’s major brands. Her experience also includes event planning and client relations. Sheila obtained her B.S. in Business Administration from Kutztown University. She enjoys watching her daughter play high school basketball, flower gardening, reading, and traveling.





TAMÁS TERLAKY

## Tamás Terlaky Elected to Canadian Academy of Engineering and Appointed EiC of JOTA

**Tamás Terlaky**, George N. and Soteria Kledaras '87 Endowed Chair Professor, Department of Industrial and Systems Engineering of Lehigh University, has been elected to the Canadian Academy of Engineering. The election was announced on June 15, 2020. The Induction Ceremony, will be held in Halifax, Nova Scotia in June 2021.

**Professor Terlaky** is a leading optimization expert with four authored books and over 180 scientific papers. He is Founding Editor-in-Chief of the journal Optimization and Engineering. Currently, **Tamás** is a faculty member of Lehigh's ISE Department that he chaired during 2008-2017. He previously served as Canada Research Chair in Optimization at McMaster University, Founding Director of Canada's first School of Computational Engineering and Science. He received the MITACS Mentorship Award, the Award of Merit of CORS, the Wagner Prize of INFORMS, and the Outstanding Innovation in Service Science Engineering Award of IISE. He is a Fellow of the Fields Institute, INFORMS and SIAM, and serves as Vice President of INFORMS.

Fellows of the CAE are nominated and elected by their peers in consideration of their accomplishments and long-standing service to the engineering profession.

The Canadian Academy of Engineering (CAE) is the national institution through which Canada's most distinguished engineers provide strategic council on significant matters of most importance to Canada.

*"It is the highest honor to be elected to the prestigious national Canadian Academy of Engineering. It is very moving to see how much my Canadian colleagues value my contributions stemming from my 'Canadian decade'. My contact to Canada, the Canadian engineering and scientific community remain strong, the School of Computational Engineering and Science keeps making impact, and last but not least, my son lives in Canada".* Said Terlaky.

Furthermore, **Tamás** has just been nominated Editor in Chief of the Journal of Optimization Theory and Applications (JOTA). This is a journal with a long tradition in the Optimization and OR community, a journal that was once regarded as having high quality. **Tamás** will certainly make a great contribution to the community in revamping JOTA. We wish him all the best in this new position!



## International Group of Optimization Experts to Explore Power of Existing, Future Quantum Machines

Lehigh University will soon be on the front lines of the quantum computing revolution.

With support from a recently awarded \$2,128,658 research grant from the Defense Advanced Research Projects Agency (DARPA), an international group led by industrial and systems engineering (ISE) faculty members **Tamás Terlaky**, **Luis Zuluaga**, **Boris Defourny**, and **Xiu Yang** will work on optimization algorithms in quantum computing.

“We want to explore the power of existing quantum computers, and those that are predicted to exist in the future,” says **Terlaky**, who is a member of the Quantum Computing and Optimization Lab (QCOL) in the P.C. Rossin College of Engineering and Applied Science. The lab was established in 2019 to accelerate the development of quantum computing optimization methodology, and associated faculty launched the university’s first quantum computing course in the Spring 2020 semester. “We’ll be looking at combinatorial optimization problems for quantum computing with the goal that, in four years, we’ll be able to demonstrate that quantum computers are surpassing the capabilities of classical computers, at least on some problems.”

**Terlaky** says their work is related to the theory of quantum supremacy, which, very broadly, states that quantum computers will be exponentially better than current silicon computers at quickly solving problems that are unsolvable today. Problems related to fields as diverse as finance, security, genetics, transportation, manufacturing, and machine learning, and that model practical, binary questions such as whether to purchase or not purchase, build or not build, etc.

There is a long way to go to achieve that end. Current quantum computers are about where silicone-based computer chips were in the 1950s, says **Terlaky**, who is also affiliated with Lehigh’s Institute for Data, Intelligent Systems, and Computation (I-DISC).

“In the 50s, we had gym-size computers with very little memory, and very little processing power,” he says. “A lot of programming was written in assembly language, getting the machine the codes, and specifying every gate and route for the information. At this point with quantum computers, the programming language is very similar. It’s not a high-level language where you can write a complicated code easily. So, all this software has to develop along with the upcoming hardware.”

Until recently, he says, most of the work in this area was being done by theoretical physicists, electrical engineers, computer engineers, and theoretical computer scientists. But the theory of quantum supremacy is essentially one big optimization problem.

“And we are the optimizers,” says **Terlaky**. “Very few people in the optimization community have looked at these problems so far. We are definitely the first sizable group to do so.”

Additional researchers involved in the DARPA project include Giacomo Nannicini (IBM T.J. Watson Research Center), Stefan Wild (NAISE, Evanston, IL, and Argonne National Lab), Alain Sarlette (INRIA, Paris, France), **Xiu Yang** (ISE, Lehigh University), and Monique Laurent (Centrum Wiskunde & Informatica (CWI), Amsterdam, Netherlands).

**Terlaky** says the grant reflects the team’s standing as one of the best in the world at what they do. And he says the collaborative, global reach of the team reflects his own professional ethos.

“I’m originally from Hungary,” he says. “I got all of my degrees there in mathematics, and I started to teach there. I spent 10 years in the Netherlands in an operations research department, then 9 years in Canada as a computer science professor, and I’ve been here for 11 years as an industrial engineer. So, for me, science and research and this life is just interdisciplinary and international.”





Photo credit Matthew Henry Unsplash



**FRANK E. CURTIS**

Photo credit Ryan Hulvat

## Lehigh ISE Wins 2nd Place in the DOE's Grid Optimization Competition

A team including Lehigh's Industrial and Systems Engineering Associate **Professor Frank E. Curtis** was awarded second place in the highly competitive Grid Optimization (GO) Competition, run and sponsored by the U.S. Department of Energy, through ARPA-E (Advanced Research Projects Agency-Energy).

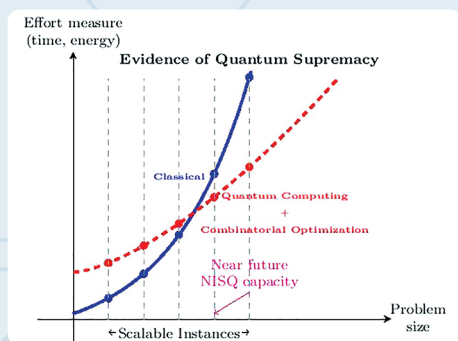
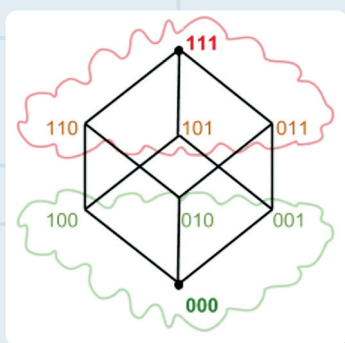
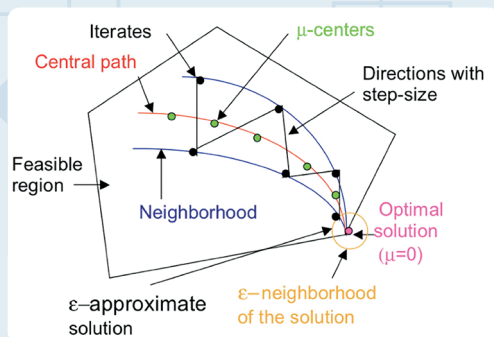
The competition was initiated to address the aging energy infrastructure and develop a more modern, resilient and secure power grid through the development of groundbreaking software. The goal of the GO Competition was to solve an advanced security constrained optimal power flow problem, intended to optimize grid design and operations, considering possibilities of failures, such as of generators or transmission lines.

More than 25 teams of researchers and practitioners from across the country competed to produce software that would be evaluated on datasets—previously unseen by the participants—across four categories ("divisions"). An award of \$100K would be given to each team that placed in the top 10 in each division.

Team GO-SNIP, supported by a grant awarded to Lehigh University (PI: **Frank E. Curtis**), came in the top 10 (with respective placements of #4, #3, #2, and #2) in each of the four divisions, placing the team in second place overall with an award of \$400K.

Optimal power flow problems are mathematical optimization problems that lie at the heart of electrical power grid planning and operation. Traditional techniques for solving such problems have been based on algorithmic strategies that were state-of-the-art decades ago, but have since been superseded by more advanced techniques that are now possible to deploy on contemporary computational platforms. The GO Competition was designed to propel the field further to solve next-generation power grid optimization problems.

The team's success can be attributed to the leading expertise in power systems and optimization algorithm design and software of the team members, which also included Daniel Molzahn (Georgia Tech); Andreas Wächter, Ermin Wei, and Ruby Tushen (Northwestern); and Elizabeth Wong (UC San Diego).



# Lehigh ISE Launches Introductory Quantum Computing Class Spring 2020

Lehigh University's Industrial and Systems Engineering (ISE) Department, recognized as one of academia's premier research institutions in quantum computing, recently launched its first quantum computing course in the Spring 2020 semester. Dr. Giacomo Nannicini, an expert from the Quantum Computing division of IBM's T.J. Watson Research Center taught the introductory graduate course, which focus on the advancement of quantum computing optimization methodologies.

The course brought together 21 participants comprised of eight faculty and thirteen Ph.D. students, including participants from the Departments of Computer Science and Engineering (CSE), Mathematics, and Civil and Environmental Engineering (CEE). The launch of this course is an initiatives taken by Lehigh ISE Professors **Terlaky, Zuluaga, Yang** and **Defourny**, who lead an international team of researchers that was recently awarded a \$2,128,658 grant from DARPA to advance optimization algorithms in quantum computing. Terlaky gives credit to this class for boosting the team's faster progress in their quantum computing DARPA sponsored research.

The quantum computing course work concentrated on fundamentals and the most recent developments on quantum computing (QC) algorithms. Students worked on projects, read additional papers, and experimented on IBM-Q's open QC platform using the Qiskit QC programming language. Although the course began as a traditional in-person class in Mohler Lab, the COVID 19 pandemic forced the QC course to pivot to the distance learning method.

Quantum computers process information in a totally different way from classic computers. Historically, much of the research on QC has been done by theoretical physicists, electrical engineers, computer engineers, and theoretical computer scientists. QC power (supremacy), which is still in its early stage, is essentially measured by looking at the capacity of quantum computers to solve optimization problems with respect to classical computers. In Lehigh's ISE Department, optimization is one of our specialties. Our team of optimizers will be looking at combinatorial optimization problems and other optimization algorithms, in the novel quantum computing paradigm, with the goal of demonstrating, within the next four years how quantum computers can outperform classical computers when solving some distinguished optimization problems. Achieving this goal could result in a real game changer, as it will allow to solve real world problems much faster than ever before; transforming industries and impacting business across the globe.

For more information on ISE's Quantum Computing Lab, visit <https://quantum-computing.lehigh.edu>



# research grants



**TAMAS  
TERLAKÝ (PI)**



**LUIS F.  
ZULUAGA**



**BORIS  
DEFOURNY**



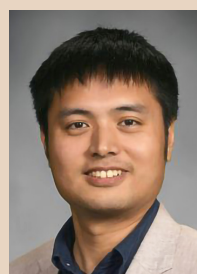
**XIU  
YANG**

The Quantum Computing Revolution and Optimization: Challenges and Opportunities. Department of Defense - Defense Advanced Research Projects Agency \$2,128,658.00. January 31, 2020 - July 30, 2021.



**DANIEL P. ROBINSON (PI)**

III: Medium: Non-Convex for Discovering High-Dimensional Structures in Big and Corrupted Data John Hopkins (NSF Passthrough) \$184,440.00. July 1, 2019 - July 31, 2021.



**XIU YANG (PI)**

Machine Learning Modeling to Correlate Quantum Descriptors of the Redox Molecules with their Physic Properties. Pacific Northwest National Lab (DOE Passthrough) \$150,000. January 13, 2020 - September 30, 2022.

2019-2020

# *ISE seminar series*

ISE hosted lectures and seminars on the latest research from scholars around the globe

## Spring 2020

**FEBRUARY 18, 2020**

Andrew Papanicolaou, New York University  
“PCA for Implied Volatility Surfaces”

**JANUARY 30, 2020**

Elaheh Fata, Massachusetts Institute of Technology  
“Multi-stage and Multi-customer Assortment Optimization with Inventory Constraints”

**JANUARY 16, 2020**

Aida Khajavirad, Rutgers School of Business  
“Convexification and Global Optimization of Mixed Integer Nonlinear Optimization Problems”

## Fall 2019

**DECEMBER 11, 2019**

Temitayo Ajayi, Rice University  
“Objective Selection for Cancer Treatment: An Inverse Optimization Approach”

**DECEMBER 9, 2019**

Karmel S. Shehadeh, Carnegie Mellon University  
“A Distributionally Robust Optimization Approach for Outpatient Colonoscopy Scheduling”

**DECEMBER 3, 2019**

Lavanya Marla, University of Illinois at Urbana-Champaign  
“Data-Driven Greedy Policies and Information-Relaxation Bounds for Ambulance Location and Deployment”

**NOVEMBER 12, 2019**

Kayse Maass, Northeastern University  
“A Systems Approach to Disrupting Human Trafficking”

**NOVEMBER 5, 2019**

INFORMS Chapter Distinguished Speaker Series - Robert Vanderbei, Princeton University  
“The Parametric Self-Dual Simplex Method – A Modern Perspective”

**OCTOBER 8, 2019**

Miju Ahn, Southern Methodist University  
“Learning with Difference-of-Convex Sparsity Functions”

**SEPTEMBER 17, 2019**

Ramteen Sioshansi, The Ohio State University  
“Can We Get Market and Regulatory Designs ‘Right’ for Energy Storage?”

**SEPTEMBER 10, 2019**

Adam Elmachtoub, Columbia University  
“Smart ‘Predict, then Optimize’”





## *Mythreyi Sekar is Honored as the Recipient of the 2020 Rossin College Experiential Excellence Award*

**Mythreyi Sekar** is the 2020 recipient of the Rossin College Experiential Learning Excellence Award. This honor recognizes a staff member who contributes in an exceptional manner to experiential learning initiatives. For more than 25 years, Mythreyi has worked at the **Enterprise Systems Center** where she currently serves as Coordinator.

**Prof. Zimmers** who is the Center Director as well as Managing Director, **Robert “Gus” Gustafson**, have joined in their recognition of her hard work as the primary conduit for students being placed in experiential and leadership development projects at the center. In this role she assembles resumes and develops student skill set profiles as well as interviewing more than one hundred students each year. Typically, at least 75 students are placed on industry projects. As a key member of the **Enterprise System Center** team, **Mythreyi** also follows up as required on their progress and performance with support provided as needed. This includes assisting with their schedules, transportation and leadership development needs. **Gustafson** states, “**Mythreyi** goes above and beyond her normal job duties. She readily follows up with students at all hours of the day including weekends. She cares deeply for our students and treats them as her own.” In addition, **Dr. Zimmers** has said that **Mythreyi** follows an operational guideline which they both strongly believe in. He describes this as a belief that, “*The student is not an interruption to your work, he or she is your work*”. In the operational time period of the center, this has led to over 425 client company partnerships, providing opportunities and mentoring support for the more than 4,000 undergraduate, master’s, and Ph.D. students and completing more than 1,100 projects with client companies.

For the **Enterprise Systems Center**, the pandemic has complicated industry interaction. Never-the-less in the Summer of 2020, the center established 10 new partnerships with industry. The center created 19 new project opportunities for our students. Summer projects largely utilized graduate students who were on campus. This approach served the dual purpose of helping graduate students with income and housing support as well as experiential learning over the summer time. Simultaneously, preparations were being made for undergraduate capstone course work when students resumed their studies in the Fall.

**Dr. Zimmers** further stated, “*As is traditional at the center, our projects are based on defined company needs, real data, and deliverables which translate into quantifiable economic values for our industry partners. The pandemic may make this more difficult, but we will prevail.*”



**Professor Zimmers** acknowledges that in some cases, conduct of a project will have a larger online component. To help turn this potential negative into a positive learning experience, **Prof. Zimmers** has reached out to alumni working at companies and consulting firms who are also increasing the use of online web and video conferencing approaches in their enterprise project work or consulting practice. By learning more about the use of online techniques in companies and consulting firms, educational experiences can be aligned with industry practice. Regardless of the in-person or online structure, students still will deploy the use of one or more ISE techniques in their project as is usually done.

As a further indication of the center’s value add to the Lehigh experience, Molly Benning, ’21 has stated “*The ESC has given me so many opportunities to apply the skills and concepts I’ve learned in my classes in the real world. The projects I’ve worked on through the ESC have been instrumental in building my resume. This also helped me in receiving my job offer from UPS as a Building and Systems Engineering Specialist.*”

Also, **Dr. Zimmers** reports students have told him that during the interview process companies appreciate this online immersion of experiential learning. Many believe that this type of skill set development may increase the likelihood of employment.



## Lehigh ISE Former Students Donate Corona Virus Masks from China

### ISE Former Students Donate Corona Virus Masks from China

Lehigh Valley doctors and nurses, along with some police officers and firefighters, now have a fresh supply of the personal protective equipment they need to continue working during the coronavirus pandemic. This is due to the efforts of some Lehigh University students who know how severe this pandemic is, being from the country where it first appeared — China.

On Jan. 19, Lehigh University senior Yicheng Gao had just returned to Bethlehem from a winter break visit with his family in Shaoxing. That's when Gao first became aware of the coronavirus. By then, less than two months after the first confirmed case in the central-China city of Wuhan, it had spread as far as Beijing, 716 miles north, according to reports.

"I learned about it from my cousin, who works in a hospital over there and warned me about the potential severity of the virus," Gao said in an email interview. "At the time, he was giving treatment to a patient with the virus." "The industrial and systems engineering major became concerned for his family, who lives 378 miles east of Wuhan, but no one has fallen ill. The next day, Jan. 20, is when the U.S. reported its first coronavirus case, an American who traveled from Wuhan to his Washington state home.

The Lehigh Valley and Pennsylvania began seeing coronavirus cases in March, forcing a statewide shutdown to slow the spread of the pandemic. Lehigh University and other college campuses were vacated. Like Gao, students from foreign countries were quarantined in their dormitory rooms if they didn't have family or friends to stay with off campus.

Gao and other quarantined students saw news reports of doctors, nurses, and emergency responders risking their own health as the pandemic raged. "They are the guardian angels keeping us all safe and sound," he said. "I can never thank them enough for their bravery." But, Gao and fellow students figured, there must be some way to honor this bravery and show empathy to a country battling the same virus that ravaged their native China.

"When we learned the hospitals here were not as well equipped as we thought, we started to act," said Lehigh University professor Tiffany Jing Li, who supports the students' efforts. The students in February had bought protective masks from local stores and sent them to China, Li said. So, why not do the reverse and have masks from there sent here?

Using social media, Gao and Beijing native Zhengnan Chen, a senior mechanical engineering major, led more than 100 students in fundraising to have their families ship masks made in China to the Lehigh Valley.

The students received 14,500 packs of masks, include some KN95 masks, the Chinese equivalent standard of the N95 masks; European Union-certified face filtering particle masks; and three-ply disposable masks.

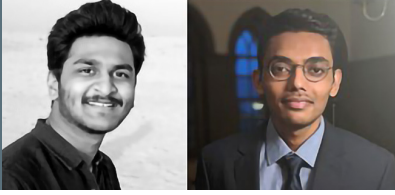
The masks were donated to Lehigh Valley and St. Luke's hospitals, Bethlehem police and firefighters, and Lehigh University police and firefighters.

"It was a very thoughtful donation and gesture," Bethlehem police Chief Mark DiLuzio said. "The masks are an item that all officers use every day. This is another example of Lehigh University, through their students and staff, helping the city of Bethlehem and the police department in their service in these trying times."

Li said, "We have more masks, arriving soon from China, which we plan to donate to Lehigh Valley Hospital. To quote Lehigh University President John Simon, 'We are all in this together.'"

Ben Guerin, manager of occupational medicine sales for the St. Luke's University Health Network, called the students' gesture "inspiring."

"For these students and their families to step up in such a significant way, despite fighting their own COVID-19 battle back at home in China, shows true selflessness," Guerin said. "We are experiencing a global pandemic, but we are also witnessing communities coming together from, quite literally, across the world. It's so encouraging to see."



## Library Shift Scheduling: An Optimization Perspective

BY SUDEEP METHA AND VED PATEL

Charles William Eliot, former Harvard President and academic, described libraries as the “heart of any university”. The Linderman and Fairchild-Martindale libraries at Lehigh University are exactly that; they are hearts that pump knowledge into the university community, and as such are important pillars of student life at the university.

The libraries provide an alluring environment to the university’s diverse student body for research and collaboration. Managing and running a facility of this scale is an endeavoring task and hence libraries often seek help from the student community. It serves as a source of on-campus employment for undergraduate and graduate students. At the start of every semester, the library invites applications for circulation supervisors and work-study positions. More than 40 students are scheduled to work in over 112 shifts throughout the week. The library coordinator is hence faced with a daunting task of scheduling shifts according to the availability of every student. The scheduling requirements also change with holidays and exams which makes the problem more difficult.

Since joining Lehigh University as Master’s students in the Industrial and Systems Engineering Department in Fall 2019, we both started working as circulation supervisors. From our first shifts at the library, we realized the difficulty of the scheduling problem at hand and were in search of a methodological approach to this problem.

We took the course ISE 426: (Optimization Models and Applications) instructed by **Dr. Albert S. Berahas** during the Fall 2019 semester. The course aims to develop skills necessary to model practical optimization problems and solve them efficiently. As part of the coursework, we were tasked with identifying a real-world problem, formulating a mathematical model that adequately captured the problem and solving it using the optimization techniques we learned in the class. We instantly knew what our problem statement would be: Library Shift Scheduling. Library shift scheduling, and more generally shift scheduling, is a combinatorial problem with many intricacies. Our solution was optimization; more specifically, integer programming.

Every optimization problem strives to minimize/maximize a predefined objective while satisfying all the constraints involved. In our case, the objective was to create a schedule that accommodates the preferences and availability of students while ensuring coverage of all shifts. We had numerous discussions with **Dr. Berahas**, and he guided us in developing the model as well as a systematic approach to solving and evaluating our solutions. To tackle a problem of such complexity, we first started with scaling down the model to a small number of students and shifts, and evaluating feasibility and solution quality. After several iterations, we finally came up with a formulation and solution technique that provided feasible, reasonable and actionable results.

Eager to test our algorithm on the real problem, with real student data and at full scale, during winter break we approached the Linderman Library Coordinator at Lending Services, Kathleen Dugan. We offered to help her with shift scheduling for the Spring Semester. In order to do this, we collected data from all students, and quickly understood the importance and power of data. Our model and solutions were only as good as the data at hand. Data collection was a colossal task; we had to explain the proposed system to all students involved and preprocess the information collected. The problem was then solved using AMPL, a popular optimization tool to create schedules for the spring semester, and those schedules were in fact implemented.

CONTINUED ON PG 16



Kathleen Dugan, stresses, “There are usually a lot of iterations to be done after I create an initial schedule but this time the students too were satisfied by the schedule created using the model”. Hiring new students and finding replacements for unattended shifts is a major concern for the Library Coordinator. We were able to assist with that problem too. In addition to the optimal schedule, one that maximized the preferences of the students, we provided a backup schedule, and a general availability schedule to address those issues. The backup schedule provided the coordinator with the list of students most favorable for covering possible unattended shifts. The purpose of the third general availability schedule was to identify students available to take up more shifts and to answer the question of hiring for the coordinator. The 3-schedule system turned out to be very effective for the coordinator when assigning shifts. “This is the first time in 20 years that I didn’t have to create a schedule by myself, and the students were satisfied by the schedule created using the model”, said Kathleen Dugan who was excited about the prospect of adopting this scheduling system as a full-time solution.

We look forward to extending the model’s application to shift assignments in other Lehigh University facilities, student housing allocation, volunteering events, scheduling classes for faculties, and many such preferential based scheduling requirements. We are currently working on developing an end-to-end software interface which would enhance the user experience and streamline the whole process. Having tested the performance of the model on multiple datasets, we feel confident about customizing and extending it, and incorporating additional features according to user requirements. We had the opportunity to present our work at the Virtual Lehigh Expo, an annual event showcasing university wide student projects. We are grateful to have been awarded the first prize under the Master’s category for presenting our work at the ISE Undergraduate and Master’s Research Symposium 2020.

Overall, the process of solving the Lehigh University Shift Scheduling problem helped us realize the power of methodological and systematic approaches to solving real-world problems and the importance of mathematical foundations and tools. We are very grateful to the ISE Department, and Lehigh University, for helping us hone our analytical and problem-solving skills and look forward to our next adventures at Lehigh University and beyond.



## Three Exceptional Teams Were Awarded in the 2020 Industrial and Systems Engineering Undergraduate and Master's Research Symposium

### The ISE Department congratulates these students on their outstanding work

The Industrial and Systems Engineering Department held its annual Undergraduate and Master's Research Symposium on May 1, 2020.

Professor **Xui Yang** organized and facilitated this year's online event that showcased the exceptional capabilities of ISE's undergraduate and master's students, and highlighted the resources and opportunities the department provides to them. Four teams enumerated below were selected to present their dynamic research topics:

#### Team 1:

**Sean Conway** and **Yanhze Ma**, presented **Supply Chain and Reinforcement Learning** under the advisement of Professor **Martin Takáč** and Professor **Lawrence V. Snyder**.

#### Team 2:

**Sudeep Metha** and **Ved Patel** presented **Preferential Shift Assignment Algorithm** a case study on Linderman Library under the advisement of Postdoctoral Research Fellow **Albert S. Berahas**.

#### Team 3:

**Siner Gokham Yilmaz** presented **Quantized SARAH** under the advisement of Professor **Martin Takáč**.

#### Team 4:

**Sean Conway** presented **Yellow Fever Vaccine Manufacturing Optimization** under the advisement of Professor **Robert H. Storer**.

The UG and Master's Research Symposium selection committee included Professor **Luis Nunes Vicente**, Professor **Martin Takáč**, Assistant Professor **Xiu Yang** and Assistant Professor **Karmel S. Shehadeh**. This committee has proudly announced the following winners on the right column of this page.

#### Master's 1st Place:

**Sudeep Metha and Ved Patel** for their presentation **Preferential Shift Assignment Algorithm**

#### Mathematical Model

##### Assignment Model

$$\begin{aligned} \max_{x \in \{0,1\}} \quad & \sum_{i \in C} \sum_{j \in D} \sum_{k \in S} x_{ijk} \cdot p_{ijk} \\ \text{s.t.} \quad & \sum_{k \in S} x_{ijk} \leq q_{ij} \quad \forall i \in C, \forall j \in D \\ & \sum_{i \in C} x_{ijk} = r_{jk} \quad \forall j \in D, \forall k \in S \\ & l_i \leq \sum_{j \in D} \sum_{k \in S} x_{ijk} \leq u_i \quad \forall i \in C \end{aligned}$$

##### Fair Assignment Model

$$\begin{aligned} \max_{x \in \{0,1\}} \quad & \left[ \min_{i \in C} \sum_{j \in D} \sum_{k \in S} x_{ijk} \cdot p_{ijk} \right] \\ \text{s.t.} \quad & \sum_{k \in S} x_{ijk} \leq q_{ij} \quad \forall i \in C, \forall j \in D \\ & \sum_{i \in C} x_{ijk} = r_{jk} \quad \forall j \in D, \forall k \in S \\ & l_i \leq \sum_{j \in D} \sum_{k \in S} x_{ijk} \leq u_i \quad \forall i \in C \end{aligned}$$

##### Decision Variable

$x_{ijk}$  is the decision variable  
where  $x_{ijk} = \begin{cases} 1, & \text{if candidate } i \text{ is allotted shift } k \text{ on day } j. \\ 0, & \text{otherwise.} \end{cases}$

##### Sets

$C$  : Set of all Candidates  
 $D$  : Set of all Days  
 $S$  : Set of all Shifts

##### Model Parameters

$p_{ijk}$  : preference of candidate  $i$  on day  $j$  for shift  $k$   
 $q_{ij}$  : maximum shifts that a candidate  $i$  is allowed to work on any given day  $j$   
 $r_{jk}$  : required number of candidates on day  $j$  for shift  $k$   
 $l_i$  : minimum shifts that a candidate  $i$  is allowed to work during the entire period  
 $u_i$  : maximum shifts that a candidate  $i$  can work during the entire period

#### Master's 2nd Place:

**Siner Gokham Yilmaz**  
for his presentation **Quantized SARAH**



## Quantization

#### General dithering[2]

**Definition 2.2** (General dithering). The *general dithering* operator with respect to the  $p$  norm and with  $s$  levels  $0 = l_s < l_{s-1} < \dots < l_1 < l_0 = 1$ , denoted  $\mathcal{D}_{\text{gen}}^{C,p,s}$ , is defined as follows. Let  $w \in \mathbb{R}^d$ . If  $w = 0$ , we let  $\mathcal{D}_{\text{gen}}^{C,p,s}(w) = 0$ . If  $w \neq 0$ , we let  $y_i = |w_i|/\|w\|_p$  for all  $i \in \{1, 2, \dots, d\}$ . Assuming  $l_{u+1} \leq y_i \leq l_u$  for some  $u \in \{0, 1, \dots, s-1\}$ , we let

$$(\mathcal{D}_{\text{gen}}^{C,p,s}(w))_i = \mathcal{C}(\|w\|_p) \times \text{sign}(w_i) \times \xi_i(y_i), \quad (2.3)$$

where  $\mathcal{C} \in \mathcal{B}(\omega)$  for some  $\omega \geq 0$  and  $\xi_i(y_i)$  is a random variable equal to  $l_u$  with probability  $\frac{y_i - l_{u+1}}{l_u - l_{u+1}}$ , and to  $l_{u+1}$  with probability  $\frac{l_u - y_i}{l_u - l_{u+1}}$ . Note that  $\mathbb{E}[\xi_i(y_i)] = y_i$ .

#### Undergraduate 1st Place:

**Sean Conway** for his presentation **Yellow Fever Vaccine Manufacturing Optimization**

#### Optimization Model

**Maximize**  $\sum_j Y_j + k \sum_i \sum_j P_i(1 - X_{ij})$  where  $k$  is a small, constant penalty

**Subject to:**

$$\sum_j X_{ij} \leq 1 \quad \forall i \quad (\text{Single-use bottles})$$

$$\sum_i W_i X_{ij} \geq Y_j W_{\min} \quad \forall j \quad (\text{Minimum weight bounding on lots})$$

$$\sum_i W_i X_{ij} \leq W_{\max} + M(1 - Y_j) \quad \forall j \quad (\text{Maximum weight bounding on lots})$$

$$P_{\min} \left( \sum_i W_i X_{ij} \right) - (P_{\min} M)(1 - Y_j) \leq \sum_i P_i W_i X_{ij} \quad \forall j \quad (\text{Minimum potency bounding on lots})$$

## ISE ALUMNI AWARDS



### David Burdakin '77 Recipient of the ISE Distinguished Alumni Award

The Industrial and Systems Engineering Department keeps a strong connection with their alumni and they have been contributing tremendously to our success, in the most various ways, through their own accomplishments and contacts, through their knowledge of the industry needs and trends, and also through their unconditional advice and generous support. One of the means we have to recognize the importance of our alumni community is by presenting the ISE Distinguished Alumni Award of the Year.

The ISE Department is delighted to announce **David Burdakin '77** as the recipient of the 2020 ISE Distinguished Alumni Award.

**Dave Burdakin** is Executive Vice President and President JBT AeroTech for John Bean Technologies Corporation (NYSE: JBT), a position he has held since early 2014. JBT AeroTech is America's leading provider of Airport Gate and Ground Support Equipment. Most known for its Jetway® brand passenger boarding bridges, JBT is also a leading global manufacturer of deicer trucks, cargo loaders and pushback tractors as well as providers of technical maintenance services at over 20 major airports.

JBT AeroTech is the third business where **Dave** has served as President, led a Lean Transformation and achieved record sales and profits. He had previously served as President of Paladin Brands and President of The HON Company, the largest operating company of HNI Corp. Before joining HNI, he held various roles at Illinois Tool Works, Bendix Industrial Group and American Can Company. **Mr. Burdakin** also served on the Board of Directors of Wabash National Corporation (NYSE: WNC) for six years and was elected Lead Director in 2006. Dave holds an MBA from Stanford University Graduate School of Business and a BS degree in Industrial Engineering from Lehigh University. He and his wife Kim have four grown children.

The ISE Department is grateful to our alumni for their support of Lehigh's mission and their positive impact on society. We are extremely proud to present **Dave** with this great honor of our alumni association.



## ISE STUDENT AND FACULTY AWARDS



**SURESH BOLUSANI**

### 2020 Van Hoesen Family Best Publication Award

ISE was pleased to announce **Suresh Bolusani** as the recipient of the sixth annual Van Hoesen Family Best Publication Award. Suresh will receive a \$1,000 monetary award for his paper titled:

**S. Bolusani and T.K. Ralphs:** A framework for generalized Benders' decomposition and its application to multi-level optimization, ISE Technical Report, 20T-004, Lehigh University.

An honorable mention is awarded to **Xin Shi** for his paper:

X. Shi and L. F. Zuluaga, A new characterization of symmetric  $H^+$  tensors and applications to polynomial optimization, ISE Technical Report 20T-008, Lehigh University.

The Van Hoesen Family Best Publication competition was established in the ISE Department in 2015. This award inspires students to publish influential research, software tools, and applications.

Everett Van Hoesen graduated from Lehigh University in 1955. He was a Distinguished Military Graduate, attained membership in the engineering honor society Tau Beta Pi, and was honored with the ISE Distinguished Alumni Award in 2014.

A selection committee was chaired by Professor, Frank E. Curtis; however, given the composition of this years' pool of candidates, the ruling was passed to the ISE Awards Committee (formed by department chair, associate chair, and director of graduate studies).

The ISE Department is grateful to the Van Hoesen family for their continued support of ISE and inspiring excellence in research.



**XIN SHI**

### Lawrence E. White Fellowship

The Industrial and Systems Engineering Department was pleased to announce **Griffin Kent** as the recipient of the 2020 Lawrence E. White Fellowship for Master's in Management Science and Engineering offered by the ISE Department. This fellowship is made available through the generosity of Lehigh and department alumnus Lawrence E. White ('64, '65, '69) for a full tuition towards 30 credits of master's degree study.

**Griffin** is currently an undergraduate senior at Utah Valley University, majoring in Statistics and minoring in Computer Science. Over the last two years, he has developed a drive to dedicate and challenge himself to succeed in academia, and as a result has found a passion in the theory and mathematics behind algorithms, optimization techniques, machine learning, and statistics.

Lawrence E. White earned a bachelor's degree in Electrical Engineering from Lehigh in 1964, followed by a master's degree in Management Science in 1965 and a Ph.D. in Industrial Engineering in 1969. While a student, White was a member of the wrestling team and Theta Delta Chi. He has made his career in real estate, and is currently a consultant with Red Jacket Development. White has long supported initiatives at Lehigh, and is a member of the Asa Packer Society and Tower Society. His generosity has supported the renovation of Grace Hall, Athletics Partnership, and the wrestling program. In 1999, White endowed the Lawrence E. White '64 Head Wrestling Coach position. White and his wife Ann have seven children between them, and live in Orlando, FL. Larry was honored with the ISE Distinguished Alumni Award in 2018.

The Selection Committee was formed by Professors Luis Nunes Vicente (chair), Robert Storer, and Tamás Terlaky.

The ISE Department is grateful to the White Family for their generosity and investment in Lehigh's mission to produce leaders who will serve and inspire others.



**GRIFFIN KENT**

**ALLY MACHLIS****SEAN CONWAY**

## MIT Supply Chain Excellence Award 2020

Each year MIT presents its Supply Chain Excellence Award to outstanding graduating seniors from Lehigh. The ISE Department is pleased to announce that **Ally Machlis** and **Sean Conway** are recipients of the 2020 MIT Supply Chain Excellence Award.

Both **Ally** and **Sean** were enrolled in Lehigh's Integrated Business and Engineering Honors Program.

**Ally** graduated in May with a Bachelor of Science in Integrated Business and Engineering, majoring in Finance, and a Bachelor of Science in Industrial and Systems Engineering and Finance.

**Sean** graduated in May with a Bachelor of Science in Integrated Business and Engineering majoring in ISE, and a Bachelor of Science in Industrial Systems and Engineering.

As recipients of this generous award, both **Ally** and **Sean** are each entitled to a tuition fellowship of \$25,000 towards the MIT Supply Chain Management Master's Degree Program, or full-tuition fellowship to an MIT SCALE master's program center in China, Luxembourg, Malaysia, or Spain.

The Lehigh liaisons for the MIT Supply Chain Excellence Award are Professor Lawrence V. Snyder, Department of Industrial and Systems Engineering (Rossin College of Engineering and Applied Science) and Professor Zach G. Zacharia, Department of Decision and Technology Analytics (College of Business).

The ISE Department is extremely proud of these remarkable students and wishes them continued success in their future endeavors.

## 2020 Lehigh ISE Student and Faculty of the Year Awards

- Industrial and Systems Engineering Sophomore of the Year: **Valentine Perevalov**
- Integrated Business and Engineering Sophomore of the Year: **Joseph Min**
- Industrial and Systems Engineering Junior of the Year: **Nathan Blair** and **Sophie Champ**
- Integrated Business and Engineering Junior of the Year: **Abbey Goldenberg**
- Industrial and Systems Engineering Senior of the Year: **Joel Benko** and **Sofia Ramirez**
- Integrated Business and Engineering Senior of the Year: **Sean Conway**
- Industrial and Systems Engineering Master's Student of the Year: **Wei Ke**, **Sudeep Metha**, and **Siner Gokhan Yilmaz**
- Management Science and Engineering Master's Student of the Year: **Shutian Li**
- Health Systems Engineering Master's Student of the Year: **Saral Patel** and **Christina Vikingstad**
- Financial Engineering Master's Student of the Year: **Conor Leahy** and **Jiayi Liu**
- ISE Ph.D. Student of the Year: **Suyun Liu**
- Undergraduate Faculty Member of the Year: **Professor Robert H. Storer**
- Master's Faculty Member of the Year: **Professor Lawrence V. Snyder**
- Ph.D. Faculty Member of the Year: **Professor Martin Takáč**



## GRADUATION 2020

Lehigh University's, Class of 2020 was honored on Sunday, May 17, 2020 during Lehigh University's first ever virtual Commencement Ceremony in its 155-year history. The COVID-19 pandemic claimed responsibility for dramatically altering this anticipated milestone that college seniors work so hard to achieve. For most college seniors, commencement signifies the end of one's academic life and the beginning of a new life that hopefully involves the start of an exciting career and possibly a move to a new city.

Agreeably, we all would have preferred to be at Goodman Stadium celebrating; however, our circumstances did not stop us from honoring our graduates and celebrating this lifetime achievement.

Lehigh's live virtual celebration was broadcast on the university's website allowing family members and friends that may not have been able to attend otherwise, join in the celebration. In addition to congratulatory speeches and conferring of degrees, live streaming of performances by The Lehigh Melismatics and congratulatory video messages from faculty, family, and friends was a very nice complement to the ceremony.

Kevin Clayton, chair of Lehigh University's Board of Trustees opened the virtual ceremony and remarked that he "looks forward to the day when we can all come together for Lehigh's in-person commencement ceremony" while acknowledging there was "much to celebrate as we gathered virtually to honor our new graduates at this extraordinary time".

President John Simon, shared words of appreciation and encouragement with the recognition that students persevered and completed their goals during the "hardest of times; all while undergoing a complete disruption of life, students rose to the

challenge in true Lehigh fashion. President Simon hoped that the virtual celebration would serve as a symbolic recognition of students' achievements". He told them to be proud of their accomplishments and take with them the memories and friendships made during their time at Lehigh. The educational and personal experiences gained at Lehigh have equipped the class of 2020 to make the world a better place.

Patrick Farrell, (former) Provost and Vice President for Academic Affairs had the honor of introducing the deans of Lehigh University's four colleges,

Rossin College of Engineering and Applied Science Dean Stephen P. DeWeerth, reminisced about his first day as Dean of Rossin four years ago when he met with the class of 2020 in Packard lab and shared Lehigh's goals "to educate students and prepare them to go out and have a profound impact on the world around them" He talked about "opportunities students would have to learn from our amazing faculty, to find their passions and to prepare for their future". Fast-forward to May 2020, as graduating seniors that have taken advantage of those opportunities and are now prepared to move forward. "Master's graduates have gone a step further by pursuing that advanced degree for even greater depth and clarity of your education. Doctoral graduates have achieved the ultimate academic degree becoming the true scholars and experts in their field".

On behalf of the faculty and staff of RCEAS, Dean DeWeerth offered best wishes and heartfelt congratulations to the class of 2020!

The Industrial and Systems Engineering Department would like to acknowledge our 2020 graduates and wish them much success and happiness as they embark on a new chapter of life.



# DEGREES AWARDED

## SPRING 2020

### Ph.D. INDUSTRIAL AND SYSTEMS ENGINEERING

- Rui Shi
- Sahar Tahernejad

### M.ENG. HEALTHCARE SYSTEMS ENGINEERING

- Lori Alfonse
- Alex Almonte
- Daniel Butz
- Laurelle Giovannoli
- Jocelyn Godoy
- Saral Patel
- Emily Pellegrini
- Lauren Pyfer
- Amy Wajdula
- Jannah Wing

### M.ENG. INDUSTRIAL AND SYSTEMS ENGINEERING

- Yuquing Chen
- Sinchan Gosh
- Brijesh Goharia
- Harsh Jain
- Sang-Yun Kang
- Sadashiva Satish Karki
- Yunfan Ling
- Aditya-Chetan Mehta
- Karan Jayesh Patel
- Prathmesh Pawar
- Si Ren
- Srivas Seshadri
- Shaun Shibu
- Sagar Sharad Vani
- Ziqi Wang
- Danmeng Xue
- Yuan Yao
- Ming Zeng
- Yu Zhuang

### M.S. INDUSTRIAL AND SYSTEMS ENGINEERING

- Ran Ran
- Siner Gokhan Yilmaz

### M.ENG. MANAGEMENT SCIENCE AND ENGINEERING

- Patrick Champagne
- Weiming Lei
- Kian O'Brien

### M.S. MANUFACTURING SYSTEMS ENGINEERING

- Garrick Alt

### B.S. INDUSTRIAL AND SYSTEMS ENGINEERING

- Shrivats Argawal
- David Atchinson
- Vincent Albanese
- Raahil Amarshi
- Joshua Bailey
- Parker Bass
- Joel Benko
- Jacob Beyloun
- Steven Buscarnera
- Ana Nicole Castillo Anzueta
- Brianna Charvat
- Aaron Cohen
- Sean Conway
- Scott Correia
- Kevin Crow
- Thomas Day
- Kimon Deligiannis
- Alexander Duke
- Andrew Feliciano
- Yicheng Gao
- Joseph Inglis
- Dillon Jacobson
- Tiancheng Ji
- Haonan Jiang
- Xiaming Jin
- Charles Kasman
- Bradley Kelly
- Adam Krieger
- Matthew Lee
- Brett Lobdell
- John Lund
- Shihao Ma
- Alexandra Machlis
- Rose Marini
- Siobhan Mariquit
- Hilary McElwain
- Nadia Michalewski
- Daniel Min
- Maydelin Moya Fernandez
- Benjamin Muldoon
- Zachary Nolan
- Graham Patterson
- Cameron Pearl
- Nicole Piispanen
- Christopher Pollan
- Benjamin Powell
- Scott Price
- Sofia Ramirez
- Alexander Rock
- Aaron Rose
- Jared Scharf
- Katie Shih
- Kathryn Shinopoulous
- Cameron Shollenberger
- Shelby Taylor
- Zachary Weinert
- Charles Williams
- Jamie Wisnia
- Jacy Yang

### B.S. INTEGRATED BUSINESS AND ENGINEERING HONORS PROGRAM (ISE MAJOR)

- Sean Conway
- Cyrus Johannes
- Adam Krieger
- Spencer Leuba

### B.S. INTEGRATED BUSINESS AND ENGINEERING HONORS PROGRAM (FINANCIAL ENGINEERING)

- John Cantwell
- Fiona Nugent
- Dean Sobel
- Dean Zimburg

## DEGREES AWARDED SUMMER 2020

### B.S. INDUSTRIAL AND SYSTEMS ENGINEERING

- Elliot Gilliam
- Jake Mella
- Brenna Lutz

### B.S. INTEGRATED BUSINESS AND ENGINEERING HONORS PROGRAM (ISE MAJOR)

- Ryan Lewis



### THESIS DEFENSE SUMMER 2020

- Congratulations to **Kamil Ciftci**, who successfully defended his Ph.D. thesis: Essays on Value Maximization for Customer Returns in Closed-Loop Supply Chains on July 27, 2020. **Ciftci's** dissertation advisor was ISE professor George Wilson. **Ciftci** continues as Assistant Professor, Department of Information Systems & Decision Sciences at California State University.
- Congratulations to **Yinan Liu**, who successfully defended her Ph.D. thesis, Models and Algorithms for Multi-Echelon Inventory and Infrastructure Systems Under Uncertainty on August 10, 2020. **Yinan's** advisor was ISE professor Lawrence V. Snyder. After graduation, **Yinan** will join Zillow as an applied scientist.

## ALUMNI NEWS ISE Advisory Council

**Karyn Librader** has been elected as the new ISE Chair beginning the 2020-2021 academic year.

**Karyn** graduated from Lehigh with a B.S. Business and Economics in '91 and a M.S. Industrial and Manufacturing Systems Engineering '95.



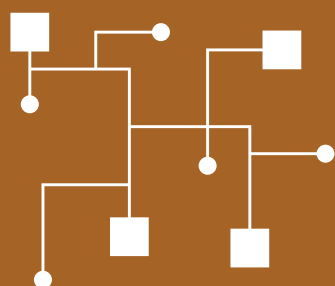
**Karyn** is Director of Operations – Product & Platform Engineering Services at Accenture. She has more than 23 years of IT consulting experience with deep skills in planning, design, and implementation of transformational capabilities with a particular focus on benefits realization and value creation. **Karyn** is currently the New York location lead for Accenture's technology women's group and her current role is Director of Operations for Accenture's Product & Platform Engineering Services business. She is Accenture certified at the highest level as a delivery lead and solution architect and she was honored to win Accenture's North American People Developer award.



The ISE Advisory Council welcomed new member **Geoffrey O'Connell**, Group Vice President, Oracle Cloud Consulting. In his current role, **Geoff's** focus is on helping clients securely take advantage of the most recent innovations associated with highly performing Cloud applications and analytic solutions. Geoff's project

experience includes business process improvement spanning the Finance, Supply Chain, Customer Relationship Management, and Human Capital Management functions of an organization. Geoff has a B.E. Industrial Engineering from Lehigh.





**LEHIGH**  
UNIVERSITY

P.C. Rossin College  
of Engineering and  
Applied Science

Industrial and Systems Engineering Department  
200 West Packer Avenue, Bethlehem, PA 18015  
610-758-4050 | [ise.lehigh.edu](http://ise.lehigh.edu)