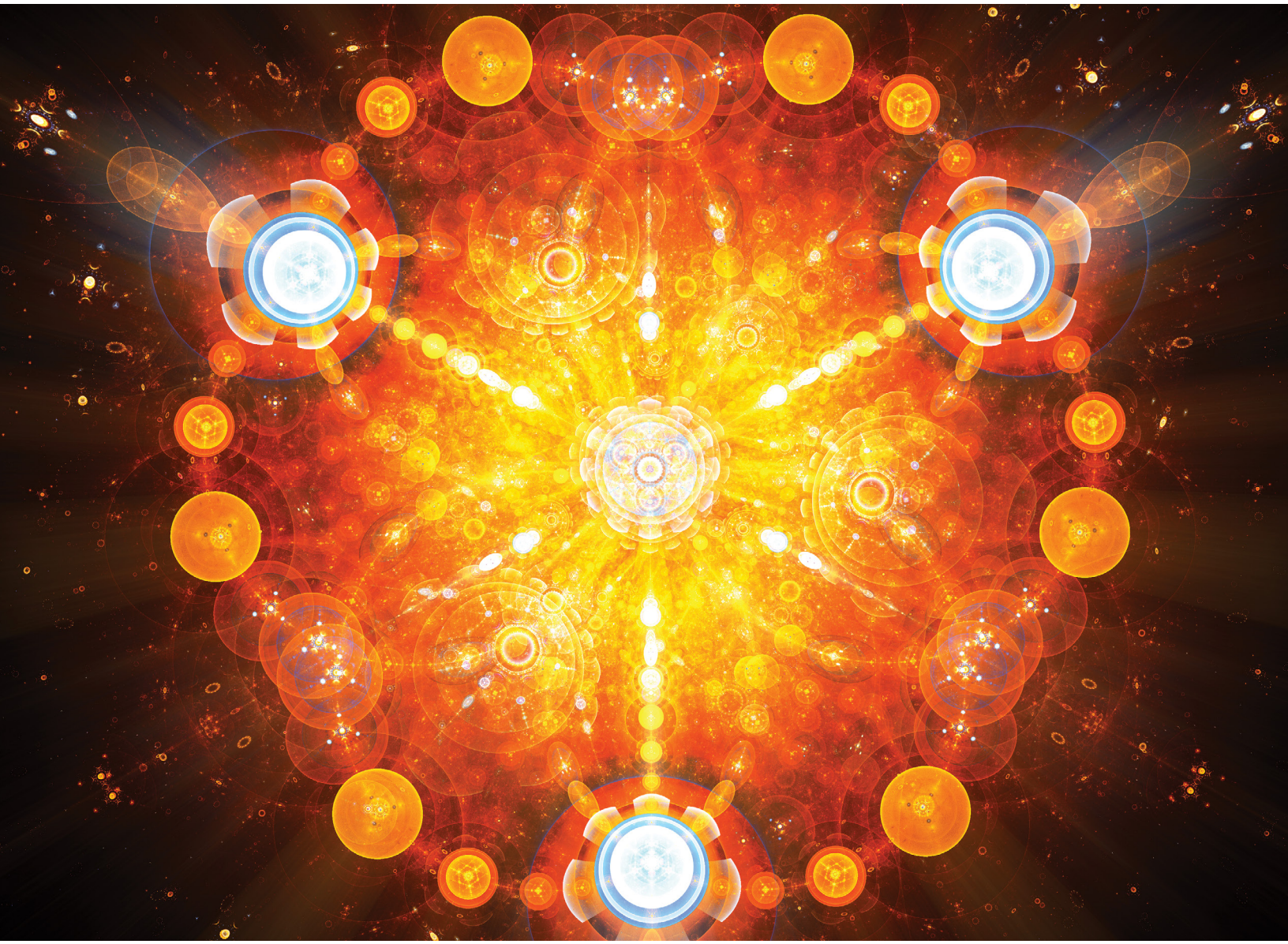
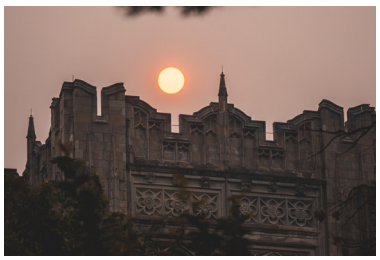
INDUSTRIAL AND SYSTEMS ENGINEERING

SPRING NEWSLETTER 2023



Celebrating ISE's past, present, and future!

LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science



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READER FEEDBACK:

Please send comments to the editor, Sheila Dorney at
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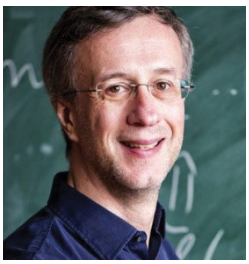
Dear Lehigh ISE Community,



As we look forward to the long-awaited summer season, I would like to take a minute to reflect on ISE's spring 2023 semester and share with you some of the remarkable accomplishments of our faculty, students, and staff. I hope you will take a minute to catch up with our latest news and support some of the exciting programs we have planned for the coming months. Please enjoy some of the highlights from our 2022-2023 academic year!

We ended our spring 2023 semester on a high note, celebrating our outstanding faculty and student's hard work and achievements!

We are extremely proud to have seen 4 ISE faculty members receiving University awards:

- **Karmel S. Shehadeh** has won the 2023 Lehigh University Alfred Noble Robinson Faculty Award
- **Frank E. Curtis** has won the 2023 Lehigh University Libsch Research Award
- **Lawrence V. Snyder** has won the 2023 Lehigh University Christian & Mary Lindback Award for Distinguished Teaching
- **Tamás Terlaky** has won the 2023 Lehigh University Hillman Faculty Award

We are also extremely proud to announce 4 ISE faculty members were awarded research grants:

- **Frank E. Curtis** in collaboration with Katya Scheinberg from NSF (CISE Directorate, CCF Division, Algorithmic Foundations program)
- **Tamás Terlaky** in collaboration with UCalgary and UPenn from Varian Medical Systems for their work on Optimize Intensity Modulated Proton Therapy
- **Aida Khajavirad** from the Air Force Office of Scientific Research
- **Luis Nunes Vicente** from the Air Force Office of Scientific Research

ISE Assistant Professor **Karmel S. Shehadeh** research in healthcare operations and analytics is making an impact by developing and applying better models to healthcare systems to ensure greater equity and access to all patients. Karmel has won the **2022 INFORMS MIF Paper Competition!**

And speaking of awards, congratulations to **Lehigh INFORMS Student Chapter**, who won a Magna Cum Laude 2022 Award and were recognized at the 2022 INFORMS Annual Meeting, and to Professor **Frank E. Curtis** for his **2023 Rossin Excellence in Research Scholarship & Leadership Award**.

Our **Enterprise Systems Center (ESC)** has teamed up with the local ArtsQuest organization to harness the power of data mining and predictive analytics. The collaboration between the ESC and ArtsQuest has been a solid example of how university skillsets can be applied to partner with the local community to achieve mutually beneficial outcomes

We were wowed by a full and fascinating lineup of esteemed researchers who visited Lehigh to talk about their work during our weekly ISE Seminar Series.

We have held two Spencer C. Schantz lectures since last time. The first was a collaborative event with Lehigh's **College of Health** and our **Healthcare Systems Engineering** Program, and we were honored to welcome Michael Carter, Professor at the University of Toronto, and enjoyed his public lecture *How Can we Make a Real Difference in Healthcare*. We were also honored to welcome **Lorenz T. Biegler**, Professor at CMU, to give the technical talk *Optimization Strategies for Integrated Process Design and Operations*.

Paul Camuti, was the recipient of the 2023 ISE Distinguished Alumni Award and we were honored to have him deliver the ISE Spencer C. Schantz Distinguished Lecture on May 4, 2023. An afternoon of celebration continued at the 2023 ISE Award Ceremony and 2023 ISE Banquet.

Lehigh celebrated its 155th Spring Commencement Saturday May 20, and Sunday, May 21, 2023 and a number of ISE Master's and Undergraduates degrees were conferred. Please see our full list of ISE graduates inside this newsletter. We extend our best wishes to all our graduates for their future success!

With the arrival of summer, we are extremely excited to announce the prestigious SIAM Summer School for Quantum Computing and Optimization will take place at Lehigh July 31 through August 11, 2023. This event is being led by Professors Terlaky, Zuluaga, Carr, and Yang, in collaboration with Ph.D. students from the QCOL team.

We are anticipating the celebration of a significant milestone, the 100th Year Anniversary of Industrial and Systems Engineering Education at Lehigh. We will celebrate this milestone in academic year 2024-2025 and make available numerous sponsorship opportunities for a terrific lineup of events. There are many perks to join as a sponsor and we hope you will support us in this centennial celebration!

LEHIGH ISE IS CELEBRATING 100 YEARS

Please join us in celebrating Lehigh ISE 100!

In the academic year 2024/2025 we will accomplish 100 years of Industrial Engineering at Lehigh. Yes, we started offering our first undergraduate program in Industrial Engineering a century ago!

We are making available a number of great sponsoring opportunities for the many events offered on the occasion of Lehigh ISE 100. These opportunities are open to all, from members of the Lehigh ISE community (including alumni and parents of students) to industry companies interested in promoting Lehigh ISE.

You can build your name and brand awareness in our community and partnering companies, explore great networking opportunities, and associate your name with Lehigh ISE 100 in perpetuity.

Lehigh's Industrial and Systems Engineering (ISE) Department has a world-renowned reputation of research excellence and is continually innovating in all educational, outreach, and industrial programs. We thrive as a diverse and inclusive community and provide an inspiring environment to study and discover. Our extremely successful alumni form a supportive ecosystem for extensive professional networking opportunities. Our highly ranked programs include data analytics, healthcare systems, financial engineering, and management science.

Lehigh ISE 100 Program Events:

- Lehigh ISE Alumni Lectures, 2024
- Lehigh ISE Alumni Lectures, 2025
- Lehigh ISE Annual Banquet, 2024
- Lehigh ISE Annual Banquet, 2025
- Lehigh ISE Awards Ceremony, 2024
- Lehigh ISE Awards Ceremony, 2025
- Lehigh ISE Career Fair, 2024
- Lehigh ISE Career Fair, 2025
- Lehigh ISE First Year Student, 2024
- Lehigh ISE First Year Student, 2025
- Lehigh ISE Graduation Party, 2024
- Lehigh ISE Graduation Party, 2025
- Lehigh ISE Seminar Series, 2024
- Lehigh ISE Seminar Series, 2025
- Lehigh ISE Student Alumni Mixer, 2024
- Lehigh ISE Student Alumni Mixer, 2025
- Lehigh ISE UG and Master's Student Research Symposium, 2024
- Lehigh ISE UG and Master's Student Research Symposium, 2025
- Women at ISE, 2024
- Women at ISE, 2025

Modeling and Optimization: Theory and Applications (MOPTA) Conference (the Lehigh ISE flagship conference), Summer 2024

Modeling and Optimization: Theory and Applications (MOPTA) Conference (the Lehigh ISE flagship conference), Summer 2025

DIAMOND LEVEL
$50,000.00 (single opportunity)

- **Naming of the whole Lehigh ISE 100 Program**
- **Verbal/slide recognition at the opening session of all Events**
- **One-time email use to address the entire Lehigh ISE alumni community**
- 125-word listing online
- Recognition on website, signage, and print of all events
- Recognition on website of the Lehigh ISE 100 Program (size proportional to sponsorship level)
- Name engraved on a plaque "Lehigh ISE 100" to be posted at Mohler 1st Floor Lounge (font size proportional to sponsorship level)
-

PLATINUM LEVEL
$25,000.00 (single opportunity)

- **Naming of the Mobile App Lehigh ISE 100 Program**
- **Naming of 3 Events and verbal/slide recognition at the opening session of the 3 Events**
- 100-word listing online
- Recognition on website, signage, and print of 3 Events
- Recognition on website of the Lehigh ISE 100 Program (size proportional to sponsorship level)
- Name engraved on a plaque "Lehigh ISE 100" to be posted at Mohler 1st Floor Lounge (font size proportional to sponsorship level)

GOLD LEVEL
$10,000.00

- **Naming of one Event and verbal/slide recognition at the opening session of the Event**
- **Co-sponsorship of the Lehigh ISE social media platforms for 2 years (Facebook, LinkedIn, twitter, Instagram)**
- 75-word listing online
- Recognition on website, signage, and print of the Event
- Recognition on website of the Lehigh ISE 100 Program (size proportional to sponsorship level)
- Name engraved on a plaque "Lehigh ISE 100" to be posted at Mohler 1st Floor Lounge (font size proportional to sponsorship level)

SILVER LEVEL
$2,500.00

- 50-word listing online
- ISE Newsletter front cover co-sponsoring (3 numbers)
- Recognition on website of the Lehigh ISE 100 Program (size proportional to sponsorship level)
- Name engraved on a plaque "Lehigh ISE 100" to be posted at Mohler 1st Floor Lounge (font size proportional to sponsorship level)

BRONZE LEVEL
$1,000.00

- ISE Newsletter back cover co-sponsoring (3 numbers)
- Recognition on website of the Lehigh ISE 100 Program (size proportional to sponsorship level)
- Name engraved on a plaque "Lehigh ISE 100" to be posted at Mohler 1st Floor Lounge (font size proportional to sponsorship level)

Please contact directly Lehigh ISE Department Chair, Professor Luis Nunes Vicente (ise@lehigh.edu).

Luis will first address questions about the sponsorship opportunities, and then:

(1) Call Lehigh's Office of Development and Alumni Relations (DAR) to acknowledge your sponsorship;

(2) Together with DAR, provide you the means to process your sponsorship;

(3) Develop at ISE your chosen sponsorship according to the chosen level.

SIAM's Prestigious Summer School awarded to Lehigh for Quantum Computing and Optimization

The prestigious **Gene Golub SIAM Summer School (G2S3)** program was founded by **Society for Industrial and Applied Mathematics** (SIAM) as a result of a generous bequest of former SIAM president Gene Golub. Once a year, the G2S3 program offers a graduate level summer school in an area of applied mathematics, computational science, and/or industrial mathematics. The 2023 G2S3 was awarded to Lehigh's **Quantum Computing and Optimization Laboratory** (QCOL) team with the theme "Quantum Computing and Optimization". For this purpose, SIAM has provided the team with $147,400 in funding to cover organization and participation costs.

By harnessing the properties of subatomic particles, quantum computing (QC) has the potential to radically transform our capability to solve extremely difficult optimization problems for which no efficient classical algorithms exist. Prof. Carr says that "the goal of 2023 G2S3 is to help build the next generation of QC researchers by bringing together QC and optimization experts and students in an inquiry-based learning environment". The program will provide a concentrated review of necessary prerequisite math, optimization, and classical and quantum computing material. The QC-specific curriculum will then be broken into three parts: foundations of QC, quantum optimization techniques, and advanced topics and applications in QC. Students will work closely with lecturers to apply their learning by engaging in interactive.seminars and labs. Participants will be graduate and advanced undergraduate students from all over the world.

The summer school will be held from July 30 to August 11, 2023. Professors Terlaky, Zuluaga, Carr, and Yang, in collaboration with Ph.D. students from the QCOL team, will host 2023 G2S3 in Mohler Lab, the home of the ISE Department, which provides an ideal infrastructure for lectures and computer labs with state-of-the-art QC tools. Prof. Zuluaga says that ``hosting this distinguished SIAM School at Lehigh University is an additional and valuable step by the QCOL group to make Lehigh a leader in the area of Quantum Computing and Optimization". For more information, please visit: siamquantum.lehigh.edu.

ISE FACULTY *news*

KARMEL S. SHEHADEH

Lehigh ISE Assistant Professor Karmel S. Shehadeh has won the 2022 INFORMS MIF Paper Competition

We are excited to share with you that Lehigh ISE Assistant Professor **Karmel S. Shehadeh** has won the 2022 INFORMS Minority Issues Forum (MIF) Paper Competition. This award was created in 2016 to promote and bring visibility to recent contributions of MIF members in the field of operations research, management science, or information systems. The work awarded is the single-authored paper entitled Distributionally Robust Optimization Approaches for a Stochastic Mobile Facility Routing and Scheduling Problem, which will appear in the top journal Transportation Science. There were 16 applicants and 3 finalists in this year's competition. The award was announced at the MIF Business Meeting, in a room packed with more than 160 participants.

Moreover, Karmel has reached the finalist level of the 2022 Junior Faculty Interest Group (JFIG) Forum Paper Competition of INFORMS. The paper awarded was M. Y. Tsang and K. S. Shehadeh, Convex fairness measures: Theory and optimization, co-authored with her PhD student Man Yiu (Tim). This was an extremely competitive award with 42 applicants and only 6 finalists. Karmel was also a finalist for the 2022 Service Science Best Cluster Paper Award of INFORMS.

Karmel was elected as a Director of Operations Research Division of the IISE for 2021-2023. Her work as a peer reviewer has been recognized by the prestigious journals INFORMS Journal on Computing (IJOC Meritorious Reviewers 2021) and Transportation Science (2022 Meritorious Service Award). Professor Shehadeh was featured in a recent article of Lehigh's Engineering Resolve Magazine, covering her research on optimization under uncertainty, mixed-integer programming, and scheduling theory and algorithms, and its applications in healthcare operations and analytics.

Lehigh ISE Chair has been elected Chair of Optimization at SIAM

LUIS NUNES VICENTE

Luis Nunes Vicente has been elected Chair of the **SIAM Activity Group on Optimization** for the upcoming 2023-2025 term. Luis is currently the Timothy J. Wilmott Endowed Chair Professor and Chair of the Department of Industrial and Systems Engineering at Lehigh University.

The **Society for Industrial and Applied Mathematics (SIAM)** is the largest and most prestigious applied math society. Among its many research activity groups, the Optimization one (SIAG/Optimization) was one of the very first groups and is one of the largest, counting with more than 1,000 researchers from academia and industry.

SIAG/Optimization organizes the triennial SIAM Conference on Optimization since 1999. Three prizes are awarded every three years, namely the SIAG/Optimization Best Paper Prize, Early Career Prize, and Test of Time Prize. SIAG/Optimization has a mailing list/discussion board on SIAM's Engage platform and publishes the biannual newsletter **Views-and-News**.

The other officers for SIAG/Optimization for the term 2023-2025 are Coralia Cartis (Professor at Oxford University, elected Vice-Chair), Gabriele Eichfelder (Professor at TU Ilmenau, elected Program Director), and Juliane Mueller (Researcher at the National Renewable Energy Lab, elected Secretary).

In cooperation with
Society for Industrial and Applied Mathematics

ISE FACULTY *news*

SHOWN LEFT TO RIGHT ARE PROFESSOR EMORY ZIMMERS, CENTER DIRECTOR DR. CHARALAMBOS MARANGOS, PROJECT MANAGER AND TOM BRINKER, MENTOR/CONSULTANT

Enterprise Systems Center and ArtsQuest Organization Collaborate on Analytics Project

The **Enterprise Systems Center (ESC)** has teamed up with the ArtsQuest organization to harness the power of data mining and predictive analytics. ArtsQuest is well-known in the community, best recognized for its annual Musikfest festival, which is the largest non-gated free music festival in the country. The organization's mission is to provide access to exceptional artistic, cultural and educational experiences, using arts and culture as key elements of economic development for the community. Each year ArtsQuest presents approximately 4,000 programs including performing and visual arts, film, comedy, arts education classes, youth programming, and cultural events.

The ESC has been providing the necessary technology and resources to perform data mining and predictive analytics on data accumulated by ArtsQuest on its patrons' event attendance over the years. The resulting new knowledge is used to support their strategic business decisions, which contributes to the success of the organization. The project was made up of a team of undergraduate and graduate students, faculty, and alumni primarily from the ISE Department, and key personnel from ArtsQuest.

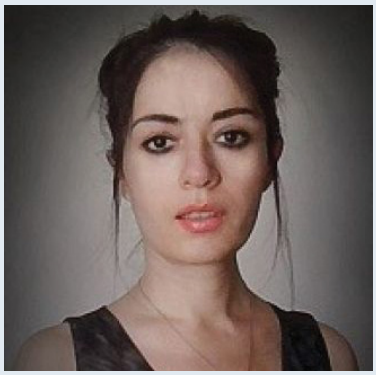
Dr. Emory W. Zimmers, who oversaw the project as Director of the Enterprise Systems Center, has made the following observation: "ISE Alumni such as Tom Brinker and John McGlade as well as Adjunct Professors Charalambos Marangos and Brent Peterson were highly supportive of this effort. Selena Lavonier and Adelle Mantle, along with other key ArtsQuest personnel, were also instrumental in the

project's success. A number of graduate and undergraduate students participated and gained practical knowledge from their work on this project, and the experience has been invaluable for their future careers."

The objective of the project was to support ArtsQuest's continuing efforts to better serve its existing communities, and attract and reach out to new patrons. The collaboration between the two organizations was a key factor in the project's success. The ESC team brought technical expertise and analytical skills to the table, while ArtsQuest provided valuable knowledge of their operations, data, and the population which they serve. The team mined and leveraged multiple years of patron data, particularly event attendance activity data, e.g., number of events attended by venue and number of tickets purchased by venue. Predictive analytical models were developed to identify future patterns of patron event attendance activities. The insights obtained from the models, plus ArtsQuest's knowledge of the data and patrons, were leveraged to support advancement and marketing operational and strategic activities.

In conclusion, the collaboration between the Enterprise Systems Center and ArtsQuest has been a solid example of how university skillsets can be applied to partner with the local community to achieve mutually beneficial outcomes. This project has highlighted the importance of analytics techniques in making informed business decisions and has shown how Industrial and Systems Engineering expertise can be leveraged to support the local community, which is in line with Lehigh strategic planning goals. Also, providing input from the ArtsQuest perspective, Selena Lavonier, Executive Director, ArtsQuest Foundation has commented, "As a local nonprofit, ArtsQuest values building strong relationships which foster access to the artistic, cultural, and educational experiences for our community. Thank you to the ESC team for helping ArtsQuest better understand the community it serves through data analytics."

research grants



AIDA KHAJAVIRAD

LUIS NUNES VICENTE

Air Force Office of Scientific Research awarded nearly $1M to Lehigh ISE

The Mathematical Optimization Program of the Air Force Office of Scientific Research (AFOSR) has recently awarded two grants to Lehigh ISE in a total close to $1M.

Lehigh ISE Assistant Professor **Aida Khajavirad** was awarded a three-year AFOSR $389K grant as the Principal Investigator (PI). The project is called "Novel Optimization Algorithms for Data Science Applications" and will be developed in collaboration with Professor Antonio De Rosa, from the University of Maryland. A variety of applications in data science can naturally be formulated as large-scale mixed-integer nonlinear optimization problems. In general, these problems exhibit multiple locally optimal solutions that are not globally optimal. Existing methods either rely on heuristics hence forgo any guarantee on the quality of the solution or use semi-definite optimization relaxations hence do not scale well and are impractical for large-scale problems. The goal of the proposed research is to develop scalable linear optimization relaxations with theoretical performance guarantees for data science applications such as data clustering, image matching, and sparse regression.

Khajavirad says:
We are very excited as this grant enables us to better illustrate the vital role of optimization techniques in modern data science applications.

Lehigh ISE Timothy J. Wilmott Endowed Chair Professor and Department Chair **Luis Nunes Vicente** was awarded a three-year AFOSR $503K grant as PI, titled "Multi-Level Multi-Objective Stochastic Methods for Learning and Optimization". The main objective of this project is the development of innovative problem formulations for stochastic multi-level multi-objective optimization problems and the design of effective stochastic approximation methods (such as stochastic gradient methods) for the solution of large-scale instances of these problems. These methods will address relevant problems arising in machine learning, cybersecurity, and defense, such as adversarial learning, network interdiction, and power network defense.

Nunes Vicente says:
Stochastic gradient methods are well studied for single-level problems, however, many application problems exhibit features such as conflicting objectives at different levels which have never been studied from a stochastic approximation view point. I am grateful to AFOSR to support research in such an exciting topic!

Lehigh and Cornell to Design a Unified Framework for Analyzing Probabilistic Algorithms for Stochastic Optimization

FRANK E. CURTIS

Modern artificial intelligence tools rely on the use of machine learning technology, and this technology would not be possible without the availability of efficient algorithms for solving mathematical optimization problems. Lehigh ISE is the home of a unique concentration of experts in mathematical optimization with multiple faculty members working to push the boundaries of algorithms for solving optimization problems arising in machine learning and various other data science applications.

Lehigh ISE faculty member **Frank E. Curtis**, in collaboration with Katya Scheinberg of Cornell University, have been awarded a three-year half-million-dollar award from the National Science Foundation (CISE Directorate, CCF Division, Algorithmic Foundations program) to design a unified framework for analyzing probabilistic algorithms for solving stochastic optimization problems. One of the disadvantages of contemporary algorithms is that they need to undergo extensive tuning procedures before they can be employed effectively in practice. The proposed framework of Curtis and Scheinberg, on the other hand, shows how adaptive "self-tuning" algorithms can be designed so that they possess strong theoretical guarantees and significantly reduce the overall computational time needed to solve challenging real-world learning problems.

Frank: "NSF's Algorithmic Foundations program has provided strong, long-lasting support for our research groups' work on the design and analysis of next-generation algorithms for solving stochastic optimization problems arising in critical areas such as machine learning. We're extremely grateful for this support and are excited to share our work with the community of researchers and practitioners who aim to solve challenging data-driven learning problems with algorithms that are efficient in terms of time and computation."

Lehigh, UCalgary, and UPenn Researchers Aim to Optimize Intensity Modulated Proton Therapy Treatment

TAMÁS TERLAKY

Intensity Modulated Proton Therapy (IMPT), compared to Intensity Modulated Radiation Therapy (IMRT), along with its greatly extended capacity to deliver highly conformal 3D dose to the target tumor represents a number of unique challenges for treatment planning optimization. The great advantage of higher degree of conformity of IMPT comes with the challenge that IMPT is more susceptible to uncertainties. These complexities combined require advanced optimization modelling and methodologies to deliver optimized, high quality treatment plans.

The Lehigh ISE Department is known for its unique expertise in mathematical optimization. Lehigh ISE faculty member **Tamás Terlaky**, in collaboration with Yuriy Zinchenko of the University of Calgary, and radiation oncology experts Wei Zhou and Lei Dong from the Perelman School of Medicine of the University of Pennsylvania has been awarded a two-year $282,540 award from VARIAN Medical Systems. Additionally, the award includes an **Eclipse Workstation** furnished with the Eclipse treatment planning and visualization software system.

In this project, the multidisciplinary team lead by Terlaky aims to address the clinical need to systematically develop a methodology for truly optimal IMPT treatment planning which structurally addresses uncertainties through robust optimization modeling. This is to be done by rigorous state-of-the art optimization methodologies, of which the applicants possess an in-depth expertise, and the UPenn partners bring state of the art radiation oncology expertise and relevant clinical data to test the proposed methodologies.

A Lehigh PhD student and a graduate student from the University of Calgary complete the team that collaborates to design comprehensive and robust IMPT treatment optimization models that incorporate both the fluence map and the beam angle selection optimization. Such an integrated robust optimization approach to IMPT would, among other benefits, potentially lead to lower treatment toxicity to the patients and further clinically relevant improvements.

Terlaky: "We are extremely excited to receive this support from VARIAN and looking forward to further contributing to cancer treatment by our optimization expertise. Such challenging, and critically important problems require multidisciplinary collaboration, and the team is excited to contribute to the "Cancer Moonshot" initiative.

SPENCER C. SCHANTZ *lecture series*

ISE-COH-HSE hosted a Spencer C. Schantz Public Lecture on November 3, 2022

MICHAEL CARTER

The **ISE Department**, the **College of Health**, and the **Healthcare Systems Engineering Program** were pleased to welcome guest speaker **Dr. Michael Carter**, Professor in the Department of Mechanical and Industrial Engineering, at the University of Toronto and Founding Director of the Centre for Healthcare Engineering, deliver a **Spencer C. Schantz Distinguished Public Lecture** titled: **How Can We Make a Real Difference in Healthcare? The Challenges of Implementation** held Thursday, November 3, 2022, from 5:00 pm to 6:30 pm in the HST Building, Room HE 101. A cocktail reception and dinner followed from 6:30 pm to 8:30 pm in the same room.

Please read more below about Dr. Carter's lecture and impressive career.

Abstract:
Most of us who work in operations research applications in healthcare are frustrated by the fact that planners, managers, and decision-makers do not seem to be suitably impressed with the mathematical beauty of our models. The literature abounds with hundreds of application papers; but when we take a closer look, few of them describe implementation. The problems in the healthcare industry are generally very similar to corresponding problems in any other sector. Hospitals have staffing issues, budget constraints, purchasing decisions, scheduling, planning, etc. The differences are subtle and often related to the culture. Over the years, I have encountered many challenges and I have been able to design approaches to deal with many of them. A few years ago, I was asked to pick the five top challenges. I can easily rattle off 30, but selecting five was itself a challenge. In this talk, I will outline my perception of the major hurdles, provide a few examples and discuss strategies for overcoming them.

Bio:
Michael Carter is a Professor in the Department of Mechanical and Industrial Engineering at the University of Toronto and Founding Director of the Centre for Healthcare Engineering (in 2009). Since 1989, his research focus has been in the area of health care resource modeling. He was the winner of the Annual Practice Prize from the Canadian Operational Research Society (CORS) four times (1988, 1992, 1996 and 2009). In 2000, he received the CORS Award of Merit for lifetime contributions to Canadian Operational Research. He is on the editorial board for the journals "Health Care Management Science", "Operations Research for Health Care", "Health Systems" and "IISE Transactions on Healthcare Systems". He is an Adjunct Scientist with the Institute for Clinical Evaluative Sciences in Toronto (**www.ices.on.ca**) and a member of the Faculty Advisory Council for the University of Toronto Chapter of the Institute for Healthcare Improvement (IHI). He is a member of the Professional Engineers of Ontario. He is a Fellow of the Canadian Academy of Engineering, INFORMS, the Canadian Academy of Health Sciences and the Engineering Institute of Canada. In 2019, he won the Northrup Frye Award for Teaching Excellence from the University of Toronto Alumni Association and in 2021, he was awarded the University of Toronto President's Impact Award for his contributions to Canadian healthcare.

Lehigh ISE Spencer C. Schantz Distinguished Lecture Series:
The lecture series is endowed in the name of the late Spencer C. Schantz, who graduated from Lehigh in 1955 with a B.S. in Industrial Engineering. Following progressive responsibilities with several electrical manufacturing companies, in 1969 he founded U.S. Controls Corporation and became its first CEO and President. The Spencer C. Schantz Distinguished Lecture Series was established by his wife, Jerelyn, as a valuable educational experience for faculty, students, and friends of Lehigh's Industrial and Systems Engineering department.

LEHIGH College of Health

INDUSTRIAL AND SYSTEMS ENGINEERING ISE

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ISE Hosted the 2023 Spencer C. Schantz Technical Talk with Lorenz T. Biegler, CMU

LORENZ (LARRY) BIEGLER

The ISE Department was honored to have Professor **Lorenz (Larry) Biegler**, the Covestro University Professor of Chemical Engineering, Carnegie Mellon University give the **Spencer C. Schantz Technical Talk** titled **Optimization Strategies for Integrated Process Design and Operations** held Thursday, April 27, 2023, from 4:30 p.m. to 5:30 p.m. in Mohler Laboratory room 453, 200 West Packer Avenue, Bethlehem, PA.

Faculty, students, and staff enjoyed a luncheon earlier in the day at Zoellner Arts Center, Butz Lobby (2nd Floor), 420 E. Packer Avenue, Bethlehem, PA 18015 from 12:15 p.m. to 1:45 p.m.

Please read more below about Professor Biegler's lecture and outstanding career.

Abstract:
Optimization strategies are essential at all levels of decision-making in chemical and energy processes, including process development, process synthesis and design, and finally process operations, control, scheduling and planning. Challenges include the formulation of well-posed and well-conditioned models, development and application of efficient, reliable optimization algorithms, and post-optimality analysis to interpret solutions and assess robustness to model and external uncertainties.

This talk describes a synthesis of optimization concepts and algorithms that enable

- large-scale nonlinear programming
- nonintrusive decomposition strategies
- inclusion of reduced order models,

in order to address challenging nonconvex, multi-scale process problems. These elements will be demonstrated through systematic strategies for the optimal design of energy management systems, demand-side optimization for specialty chemicals and integrated optimization for polymer process operations.

Bio:
Lorenz T. (Larry) Biegler is Covestro University Professor of Chemical Engineering at Carnegie Mellon University. His research interests lie in computer aided process engineering (CAPE) and include process flowsheet optimization, optimization of systems of differential and algebraic equations, reactor network synthesis and algorithms for constrained, nonlinear process control. Contributions in these areas include analysis and development of nonlinear programming algorithms, optimization software design and application to real-world chemical processes and energy systems. He is an author on over 550 archival publications and 2 textbooks, a Fellow of AIChE, IFAC and SIAM, and a member of the US National Academy of Engineering.

Lehigh ISE Spencer C. Schantz Distinguished Lecture Series:
The lecture series is endowed in the name of the late Spencer C. Schantz, who graduated from Lehigh in 1955 with a B.S. in Industrial Engineering. Following progressive responsibilities with several electrical manufacturing companies, in 1969 he founded U.S. Controls Corporation and became its first CEO and President. The Spencer C. Schantz Distinguished Lecture Series was established by his wife Jerelyn as a valuable educational experience for faculty, students and friends of Lehigh's Industrial and Systems Engineering department.

SPENCER C. SCHANTZ *lecture series*

Lehigh ISE Alumni Paul Camuti, Vice President and Chief Sustainability Officer gave a Spencer C. Schantz Distinguished Lecture

PAUL CAMUTI

The ISE Department was honored to have ISE alumni **Paul Camuti**, give the **Spencer C. Schantz Distinguished Public Lecture** titled **A Purpose Driven Innovation System, Delivery ESG Impact** on Thursday, May 4, 2023 from 4:15 p.m. to 5:00 p.m. in Mohler Laboratory room 355, 200 West Packer Avenue, Bethlehem, PA.

The **ISE Awards Ceremony** which recognized the achievements of ISE students, faculty, and staff followed immediately after the lecture (5:00 p.m. to 5:30 p.m.).

The evening finished with the **ISE Banquet Dinner** where guests enjoyed delicious food over great conversation. The venue was at Zoellner Arts Center, Butz Lobby (2nd Floor) 420 East Packer Avenue, Bethlehem, PA 18015 from 6:00 p.m. to 9:00 p.m.

You'll want to read more below about Paul's lecture, impressive career, and bio.

Abstract:
Over a decade ago, Trane Technologies set out to align its business strategy to match the global megatrends and sustainability challenges that also presented growth opportunities. By focusing on engaging employees, implementing a business operating system, and deploying a team-based approach to innovation, the company was able to accelerate its sustainability-focused strategy in 2020 following separation from its industrial segments, and transformation to a more focused climate innovator with a purpose to challenge what's possible for a sustainable world.

The thermal management of built environment and the transportation cold chain are responsible for approximately 20% of global greenhouse gas emissions. With a more populated, warmer planet these emissions could increase dramatically. By committing to this challenge, Trane Technologies has taken as systems approach – engaging our employees, focusing on our customers, developing new technologies, and innovating our product and service offerings globally. This has resulted in top levels of employee engagement, business growth and total shareholder return.

This talk will explore the key components of the system, our learnings, and the importance of goal setting in an industrial transformation. Through examples we will highlight the opportunities for all organizations to set a clear purpose and to deliver impact. We will address questions and discuss how a systems engineering background and perspective can accelerate business success.

Bio:
Paul Camuti is executive vice president and chief technology and sustainability officer of Trane Technologies plc, a global climate innovator focused on sustainable solutions for buildings, homes and transportation.

In this role, Paul oversees the company's innovation practices and sustainability-led strategy that powers the company's strong financial and environmental, social and governance (ESG) performance. He also provides leadership to the shared technology and advanced manufacturing networks, sustainability practice, strategy and corporate development functions.

Since joining the company in 2011, Paul has helped establish its award-winning, sustainability-led innovation culture. He has led the company's enterprise focus on sustainability, advocacy for smarter energy usage, and partnership with industry experts, academia and NGOs. Under his leadership, the company has formed external advisory councils on both sustainability and healthy and efficient spaces. In addition, he led the introduction of Operation Possible, a global crowdsourcing innovation program focused on solving major environmental and social challenges.

For more than 30 years, Paul has been at the intersection of industrial digital transformation and sustainability. Prior to joining the company, he was founder and president of Smart Grid Applications for Siemens Energy, Inc. and CEO of Siemens Corporate Research. In these roles he had global business responsibility for technology and innovation. He also held several leadership roles with Siemens Energy and Automation, where he founded the company's Industrial Software business. In addition, he has worked with Eaton Corporation and Westinghouse Electric.

Paul's leadership has helped Trane Technologies earn a position as a global leader in sustainable innovation. Most recently, the company was listed on the Dow Jones Sustainability Indices for the 12th consecutive year, ranked 18th on the 2023 as a JUST 100 list and ranked on Fortune's World's Most Admired Companies for the 10th consecutive year. The company was also the first in its industry and one of the first across all sectors to have its net-zero emissions targets approved by the Science-based Targets Initiative (SBTi).

Paul serves on various boards and advisory councils and holds a bachelor's degree in Industrial Engineering from Lehigh University.

Lehigh ISE Spencer C. Schantz Distinguished Lecture Series: The lecture series is endowed in the name of the late Spencer C. Schantz, who graduated from Lehigh in 1955 with a B.S. in Industrial Engineering. Following progressive responsibilities with several electrical manufacturing companies, in 1969 he founded U.S. Controls Corporation and became its first CEO and President. The Spencer C. Schantz Distinguished Lecture Series was established by his wife Jerelyn as a valuable educational experience for faculty, students and friends of Lehigh's Industrial and Systems Engineering department.

ISE Seminar Series

ISE enjoyed an impressive lineup of guest speakers during the 2022–2023 academic year

SPRING 2023

MAY 2, 2023
Kristin Bennett, RPI
"**AI for Health Equity**"

APRIL 25, 2023
Mahyar Eftekhar, Arizona State University
"**Improving the Quality of In-Kind Donations: A Field Experiment**"

APRIL 18, 2023
Victor Blanco, Universidad de Granada, Spain
"**Math Optimization and Data Science: A Facility Location Perspective to Supervised Learning**"

APRIL 4, 2023
INFORMS Chapter Distinguished Speaker Series - Sridhar Tayur, Tepper School of Business at Carnegie Mellon University
"**Quantum Operations Research Applications, Hardware, Algorithms (QOR:AHA)**"

MARCH 21, 2023
Antonio DeRosa, University of Maryland
"**Solutions to two conjectures in branched transport: stability and regularity of optimal networks**"

MARCH 7, 2023
Yangyang Xu, Rensselaer Polytechnic Institute
"**Decentralized gradient methods for composite minimax problems**"

FEBRUARY 21, 2023
Bo Shen, New Jersey Institute of Technology
"**Advanced Data Analytics for Smart Additive Manufacturing**"

FEBRUARY 7, 2023
Dmitriy (Tim) Kunisky, Yale University
"What average-case optimization can tell number theory"

FALL 2022

NOVEMBER 29, 2022
Alfredo Garcia, Texas A&M University
"**Trading between Electricity Markets: Incentives and Learning**"

NOVEMBER 15, 2022
Ryan Cory-Wright, Herman Goldstine postdoctoral fellow at IBM Research
"**A New Perspective on Low-Rank Optimization**"

NOVEMBER 1, 2022
INFORMS Chapter Distinguished Speaker Series - Yinyu Ye, Stanford University
"**DRSOM: A Dimension-Reduced Second-Order Method for Nonconvex Optimization**"

OCTOBER 18, 2022
Yuejie Chi, Carnegie Mellon University
"**Coping with Heterogeneity and Privacy in Communication-Efficient Nonconvex Federated Optimization**"

OCTOBER 4, 2022
Carleton Coffrin, Senior Scientist Los Alamos National Laboratory
"**On the Emerging Potential of Quantum Annealing Hardware for Combinatorial Optimization**"

SEPTEMBER 6, 2022
Ashok Viswanathan, Director of Supply Chain Analytics, Best Buy
"**Analytics - Key to Supply Chain Digital Transformation**"

FRANK E. CURTIS

KARMEL S. SHEHADEH

Four Lehigh University Faculty Awards have been given to ISE faculty

Professor **Frank E. Curtis** has won the **2023 Lehigh University Libsch Research Award**. This is one of the most prestigious senior faculty awards at Lehigh. Prof. Curtis fully deserves to be among those distinguished past awardees, some of the finest researchers Lehigh has ever had. We are grateful to him for continuously helping to raise the reputation of the department and being a great department citizen. The award citation says that *"The objectives of this award are to recognize excellence in research, scholarship and/or artistic achievement, including the overall impact, as well as the quality and quantity of scholarly contributions; reward those who perform distinguished research; place research and scholarship on an equal footing with teaching and university service in the annual awarding of recognition."*

Frank E. Curtis is a Professor and Director of Graduate Studies in the Lehigh ISE Department. His research spans theory, algorithm design, and numerical computation in the field of continuous mathematical optimization. He won an Early Career Research Award from the U.S. Department of Energy. He was a recipient of the 2021 Lagrange Prize in Continuous Optimization awarded by the Mathematical Programming Society and the Society for Industrial and Applied Mathematics and of the 2018 Computing Society Prize awarded by INFORMS.

Professor **Karmel S. Shehadeh** has won the **2023 Lehigh University Alfred Noble Robinson Faculty Award**. We are grateful to Prof. Shehadeh for having brought so much inspiration and visibility to Lehigh ISE in such a short time. This is one of the most prestigious junior faculty awards at Lehigh, always the first being listed, and a great recognition for the ISE Department. The award citation says that *"The Alfred Noble Robinson Award is awarded to a faculty member, or in exceptional cases, divided between two members of the Lehigh faculty. Winners of this award have shown extraordinary enthusiasm for Lehigh's goals and priorities, often working beyond their direct area on university-wide projects or committees."*

Karmel S. Shehadeh is an Assistant Professor in the Lehigh ISE Department. Her research spans optimization under uncertainty, mixed-integer programming, and scheduling theory and algorithms, and its applications in healthcare operations and analytics, facility location, and transportation systems. She was elected as a Director of Operations Research Division of the IISE for 2021-2023. Professor Shehadeh won the 2022 INFORMS Minority Issues Forum Paper Competition. In addition, her work reached the finalist stage of the INFORMS Junior Faculty Forum Paper Competition and INFORMS Service Science Best Cluster Paper Award. Her work as a peer reviewer has been recognized by the prestigious journals INFORMS Journal on Computing and Transportation Science.

LARRY SNYDER

Professor **Larry Snyder** has won the 2023 Lehigh University **Christian & Mary Lindback Award for Distinguished Teaching**. This is one of the most prestigious teaching awards at Lehigh. ISE students use words like brilliant, caring, charismatic, fantastic, and passionate to describe Prof. Snyder's teaching style. We are grateful to him for touching the lives of our students. The award citation says that this prize is *"Awarded to a tenured member of the faculty (professor or associate professor) for distinguished teaching performed during the academic year."*

Professor Lawrence V. Snyder is the Harvey E. Wagner Endowed Chair Professor in the Lehigh ISE Department and the Director of Lehigh's Institute for Data, Intelligent Systems, and Computation. His research spans modeling in supply chain management and energy systems, transportation theory, facility location, and decision-making under uncertainty. He is co-author of the textbook *Fundamentals of Supply Chain Theory*, published in 2011 by Wiley, which won the IIE/Joint Publishers Book-of-the-Year Award in 2012. He won the 2019 IISE Logistics and Supply Chain Division Teaching Award.

TAMÁS TERLAKY

Professor **Tamás Terlaky** has won the **2023 Lehigh University Hillman Faculty Award**. This is one of the most prestigious senior faculty awards at Lehigh. We are grateful to Prof. Terlaky for everything he did for Lehigh, from having chaired ISE for 9 years to now being at the forefront of quantum computing. Lehigh University has awarded one of its best ambassadors and finest leaders. The award citation says that this prize is *"Awarded for excellence in teaching or research work, or for advancing the interests of the university in any way the Trustees may select, or for a special financial need requiring aid, of which the Trustees may become aware, or for any other reason which they may deem just and proper."*

Professor Tamás Terlaky is the George N. and Soteria Kledaras '87 Endowed Chair Professor in the Lehigh ISE Department. He received the MITACS Mentorship Award, the Award of Merit of CORS, the Egerváry Award of HORS, the 2017 Wagner Prize of INFORMS, and the 2019 Outstanding Innovation in Service Science Engineering Award of IISE. He is a Fellow of The Fields Institute, IFORS, INFORMS, SIAM, and the Canadian Academy of Engineering, and served as Vice President of INFORMS. He is Founding Editor-in-Chief (EiC) of the journal Optimization and Engineering and the current EiC of the Journal of Optimization Theory and Applications.

2023 Rossin Awards

On Thursday, May 4, 2023, the ISE Department held its annual Awards Ceremony in Mohler Laboratory. It was our pleasure to announce and celebrate the achievements of our alumni, faculty, staff, and students. The first award below was given by the Rossin College on May 8.

2023 Rossin Excellence in Research Scholarship & Leadership Award

Professor **Frank E. Curtis** has won the 2023 P.C. Rossin College of Engineering and Applied Science Excellence in Research Scholarship & Leadership Award. This award recognizes a Rossin college faculty member who has demonstrated outstanding scholarships (through publications, patents, etc.) and is considered to be a prominent research leader in their field, thus bringing recognition to Lehigh. Frank E. Curtis is a Professor and Director of Graduate Studies in the Lehigh ISE Department. His research spans theory, algorithm design, and numerical computation in the field of continuous mathematical optimization. He won an Early Career Research Award from the U.S. Department of Energy, was a recipient of the 2021 Lagrange Prize in Continuous Optimization awarded by the Mathematical Programming Society and the Society for Industrial and Applied Mathematics, and was awarded the 2018 INFORMS Computing Society Prize.
Congratulations Frank!

2023 ISE Distinguished Alumni Award

We are pleased to announce **Paul Camuti**, Executive Vice President and Chief Technology and Sustainability Officer as the recipient of the 2023 **ISE Distinguished Alumni Award**. This annual award acknowledges the importance of our remarkable alumni community, and its many contributions to our educational mission and industry engagement over the years. For more than 30 years Paul has been at the intersection of industrial and digital transformation and sustainability. Prior to joining Trane Technologies, he was founder and president of Smart Grid Applications for Siemens Energy, Inc. and CEO of Siemens Corporate Research. Paul also held several leadership roles with Siemens Energy and Automation, where he founded the company's Industrial Software business. In addition, he has worked with Eaton Corporation and Westinghouse Electric.
Congratulations Paul!

Lehigh ISE Graduate Student Chapter won a Magna Cum Laude 2022 Award

We are excited to share that the Lehigh ISE INFORMS Student Chapter has won a Magna Cum Laude 2022 INFORMS Student Chapter Annual Award. In past years, we have won Cum Laude or Honorable Mention Awards. We are honored to be recognized in 2022 at the Magna Cum Laude level. **INFORMS** is the leading Operations Research society in the country, and this **award program** is to recognize achievements of graduate student chapters and to motivate them to perform even better.

The Chapter very actively organizes a number of events and activities. Our PhD Student Seminar is held by the Chapter on every Thursday of Fall and Spring semesters, and it provides a stage for PhD students to present their research. The Chapter also promotes tutorials on topics of interest to the student's careers such as personal webpages and CV preparation.
The Chapter supports the ISE Seminar Series by inviting an INFORMS Chapter Distinguished Speaker every semester, which gives PhD students a chance to connect to leading researchers. Moreover, the Chapter organizes various social events every year, including a picnic, a potluck party, a games night, and a secret Santa.

"The credit for the Chapter should be shared with all Lehigh ISE students, faculty, and staff who support and participate in the activities," says the current Chapter's President, Qi Wang. "We are lucky to pick up the baton from Mohammadhossein's team who served the Chapter remarkably well!"

The Chapter's board consists of 4 student officers (president, vice-president, secretary, and treasurer). The names of current and past board members are listed on the **Chapter's webpage**. The Chapter has also a faculty adviser, currently Professor Frank E. Curtis. The Chapter's efforts over the years have contributed to the Lehigh ISE graduate environment, stimulating student's interest and fostering network opportunities.

From 2nd left to right: ISE PhD students: Oumaima Sohab, Zeguan Wu, Mohammadhossein Mohammadisiahroudi, Ramin Fakhimi, Qi Wang, Yutong Dai, Man Yui (Tim) Tsang, Pouya Sampourmahani

JOSIE CHARLES

MOHAMMADHOSSEIN MOHAMMADISIAHROUDI

LAUREN FOUNTAIN

ROMAN MITCHELL

ANA I. ALEXANDRESCU

2023 Lawrence E. White Fellowship

We are pleased to announce **Josie Charles** as the recipient of the 2023 **Lawrence E. White Fellowship** for Master's in Management Science and Engineering. 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. Josie Charles is a May 2023 Lehigh graduate completing her Bachelor of Science in Industrial and Systems Engineering and a minor in Computer Science Engineering. During her time at Lehigh she has competed on the Division 1 Lehigh Softball team. Her hometown is Issaquah, Washington. The Selection Committee was formed by Professors Luis Nunes Vicente (committee chair), Bob Storer, and Tamás Terlaky. Congratulations Josie!

2023 Van Hoesen Family Best Publication Award

We are pleased to announce **Mohammadhossein Mohammadisiahroudi** as the recipient of the seventh annual **Van Hoesen Family Best Publication Award**. Mohammad will receive a $1,000 monetary prize for his paper *"An Inexact-Feasible Interior Point Method for Linear Optimization with High Adaptability to Quantum Computers".* Co-authors: Ramin Fakhimi and Professor **Tamás Terlaky**. This award inspires students to publish influential research, software tools, and applications, and was made available through a generous gift of Everett Van Hoesen '55. The Selection Committee was formed by Professors Karmel S. Shehadeh (committee chair), Professors Frank E. Curtis and Luis Zuluaga. Congratulations Mohammad!

2023 ISE Diversity, Equity, and Inclusion Award

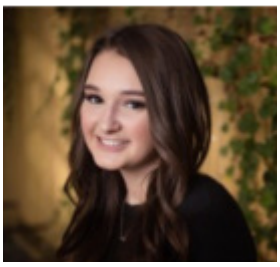
The Diversity, Equity and Inclusion Awards were newly created in 2023 to recognize members of the ISE Community who have shown exemplary commitment, leadership, and service to the advancement of the ISE DEI goals during the current academic year. The Selection Committee was formed by Professor Luis Zuluaga (committee chair), Miki Sakai, Mythreyi Sekar, and Professor Gregory L. Tonkay. ISE is pleased to announce three inaugural winners:

Lauren Fountain is pursuing dual degrees in B.S. ISE and B.S. IBE Finance. Lauren serves on the Society for Women in Engineering (SWE), Lehigh University Section. In this position she has led numerous initiatives to further opportunities for women in Engineering. In particular, Lauren organized the sixth annual Women and Non-Binary in STEM Dinner at Lehigh University this spring. Also, Lauren attended and helped to raise funds for other women students to attend the annual Society for Women in Engineering conference. Quoting from Lauren's award nomination letter: ``In [Lauren], I see a young professional with a strong desire to better the world for women and young girls...". Congratulations Lauren!

Roman Mitchell serves on the executive board of Lehigh University's Lehigh's African Student Association and National Society of Black Engineering. In this position, Mitchell has led numerous initiatives to further opportunities for black students in STEM and Engineering. In particular, Mitchell fundraised to support the attendance of a group of students to the annual National Society of Black Engineers Conference. Also, Mitchell moderated a panel discussion on "Traveling while Black Through the Education System" as part of Lehigh's Traveling While Black Virtual Experience. Mitchell's nomination letter emphasizes the high level of commitment with which Mitchell approaches all these important DEI activities. Congratulations Roman!

Professor **Ana I. Alexandrescu** is Director of Health Systems Engineering and among many other responsibilities, Ana leads the ISE Outreach Program. In this position, Ana has led numerous initiatives to maintain and further a diverse, equitable, and inclusive environment at the ISE Department. These initiatives has been geared towards K-12 students, women, minorities, and underrepresented groups. In particular, Ana has established connections with two local K-12 programs to promote engineering problem-solving and introduce K-12 students to systems engineering. Also, Ana has worked with a group of undergraduate women in engineering to create K-12 activities for middle-school girls to gain exposure to STEM concepts. As stated in Ana's nomination letter, Ana has actively participated in every facet of the plan established by the ISE Department to fulfill its DEI goals. Congratulations Ana!

Morgan Heller
MIT Supply Chain Excellence Award



Abagail Poulin
MIT Supply Chain Excellence Award

Meghan Wood
Honorable Mention

Julia Helliesen
Qualified Nominee

2023 MIT Supply Chain Excellence Award

Each year MIT presents its Supply Chain Excellence Award to outstanding graduating seniors from Lehigh. The awards recognize students' potential for leadership in supply chain management and provide tuition scholarships to the MIT Supply Chain Management Master's Degree. Winners were selected based on personal statements and on their academic excellence at Lehigh.

The ISE Department is pleased to announce that **Morgan Heller** and **Abagail Poulin** are the recipients of the 2023 MIT Supply Chain Excellence Award. **Meghan Wood** received an Honorable Mention for the 2023 MIT Supply Chain Excellence Award and **Julia Helliesen** was named as a Qualified Nominee of the 2023 MIT Supply Chain Excellence Award. Congratulations Morgan, Abagail, Meghan, and Julia!

2023 Lehigh ISE Student and Faculty of the Year Awards

Lehigh ISE is honored to announce the following awards in recognition and appreciation of students and faculty, for their achievements throughout the 2022-2023 academic year. The department congratulates these students and faculty and thanks them for their contributions and dedication to the ISE Department.

Industrial and Systems Engineering Sophomore of the Year: **Melissa Caracciolo**

Integrated Business and Engineering Sophomore of the Year: **Sara Menand**

Industrial and Systems Engineering Junior of the Year: **Brooke Cannon**

Integrated Business and Engineering Junior of the Year: **Keith Cheung**

Industrial and Systems Engineering Senior of the Year: **Sarah Butensky and Josie Charles**

Integrated Business and Engineering Senior of the Year: **Tobey Bill**

Industrial and Systems Engineering Master's Student of the Year: **Parth Malkan**

Management Science and Engineering Master's Student of the Year: **Matthew Harrison**

Healthcare Systems Engineering Master's Student of the Year: **Amanda Curry**

Financial Engineering Master's Student of the Year: **Asim Turk**

ISE Ph.D. Student of the Year: **Secil Sozuer**

Undergraduate Faculty Member of the Year: **Professor Gregory L. Tonkay**

Master's Faculty Member of the Year: **Professor Lawrence V. Snyder**

Ph.D. Faculty Member of the Year: **Professor Xiu Yang**

DEGREES AWARDED SPRING 2023

M.ENG. HEALTHCARE SYSTEMS ENGINEERING

- Noah Harrison
- Karen Traboulsi
- Tom Perillo

M.ENG. INDUSTRIAL AND SYSTEMS ENGINEERING

- Parth Deven Ghandi
- Niraj Shinde
- Arzoo Karki
- Sarah Vaknin
- Parth Hitesh Malkan
- Yuming Yang
- Rahul Shahapure

M.S. INDUSTRIAL AND SYSTEMS ENGINEERING

- Nick Masri

M.S. MANAGEMENT SCIENCE AND ENGINEERING

- Jorge Hernandez

B.S. INDUSTRIAL AND SYSTEMS ENGINEERING

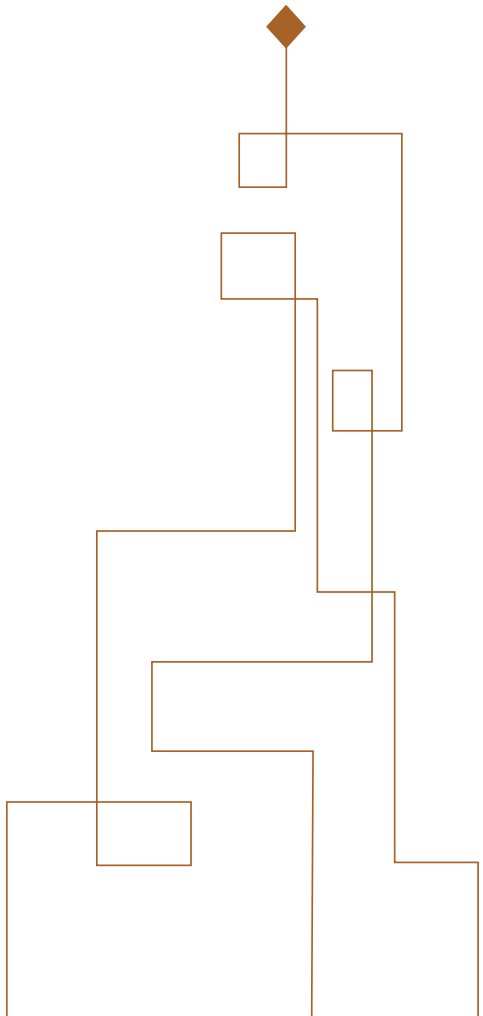
- Dylan Alexander
- Christian Antry
- Filip Barun
- Sarah Bennett
- Tobey Bill
- Sarah Butensky
- Josie Charles
- Annalise Davis
- Jesus Dominiguez Castandeda
- Morgan Heller
- Danny Inroon
- Colin Kelly
- Carly Lavine
- Marcos Leal Wittkowsky
- Huixuan Lin
- Sean Lockwood
- Michael Peralta
- Abagail Poulin
- Meaghan Rockey
- Ryan Sabol
- Luisa Slomp
- Aiden Stanton
- Juan Vidal
- Tyler Waldvogel
- Meghan Wood

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

- Zach Armour
- Marc Hamati
- Matthew Calvin
- Sam Konop
- Annalise Davis
- Erin McDonald

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

- Gabby Alves
- Anna Harvey
- Allie Gallego
- Karine Marculino
- Isaac Grodin
- Michael Rich



ALUMNI NEWS

ISE Welcomes Four New Members to the ISE Advisory Council

Christine Burke graduated from Lehigh University with a BS in Industrial Engineering in 1989. After seven years at Coopers & Lybrand Consulting in New York and Sydney, Australia she joined Morgan Stanley in New York City where she held a number of management positions with global remit. She has spent over 4 years working in the public education sector, has her own digital media and merchandise company, and is currently the Global Head of Technology Talent at Morgan Stanley. Throughout this time, Christine has had a strong focus on philanthropy.

At Coopers & Lybrand Christine worked on process reengineering and organization design projects in manufacturing, telecommunications, mining and financial services. Over her career at Morgan Stanley, she ran large scale process redesign and data governance projects and held COO/ COS roles in the Operations and Cybersecurity organizations. She co-founded the FX Client Connectivity Team, working with clients to increase cross-organization efficiency. She was the Talent Management Officer for Global Wealth Management Operations prior to taking on her current role. In between Morgan Stanley roles, Christine pursued her passion for education - She taught high school math in the Bronx NY as part of NYC Teaching Fellows, consulted with the NYC Department of Education on teacher recruitment/ retention and parent/school communications, was the Founding Director of Operations & Finance for Brooklyn Prospect Charter School, and developed/ ran the Start Right Program for new charter schools in NYC. Across these roles, Christine explored her entrepreneurial side through founding Only In, LLC - a digital media and merchandise company focused on celebrating unique aspects of places around the world and supporting creative talent.

Christine has served on the Board of Directors for the Sydney Foodbank, Partnership With Children, and Brooklyn Prospect Charter School. She is a candidate for Masters' in Elementary Education and Education Leadership at Teachers College Columbia, and lives in New York City with her daughter.

Mike Rinkunas is a Venture Discovery Director at BIV's Generation Food Rural Partners (GFRP). Prior to joining BIV, Mike worked with early-stage startups in developing growth, commercialization, and fundraising strategies at the University of Delaware, the Delaware Innovation Space, Dreamit Ventures, and as an independent advisor.

He is a lifelong entrepreneur, founding his first business before graduating college. After graduation, he established, merged, led, and sold several boutique digital media & marketing companies. When not accelerating businesses, he can often be found in the cab of a steam locomotive while volunteering as a railroad locomotive engineer and conductor at Steamtown National Historic Site.

Norm Sanyour is a Senior Vice President and Private Wealth Advisor for Capital Group Private Client Services. He began his post-LU life as an Industrial Engineer for Conrail on the Terminal Improvement Program Team. Next was a stint in Operations Management for a Philadelphia mega-auto dealer, The Faulkner Group. He then went to business school (The Wharton School at UPenn) and joined the Coopers & Lybrand management consulting practice. In 1996, he pivoted to Wall Street and the Institutional Equity Research industry, where he spent 16 years, first at Sanford C. Bernstein & Co. and, later, at Empirical Research Partners. In 2012, he joined the Private Client business at Capital Group (manager of the American Funds mutual fund family). At Capital Group, he helps families, endowments and foundations manage their assets and address the full gamut of planning issues. Norm is married to Karen and they live in Summit, NJ, keeping tabs on their 5 children (1 of whom graduated from Lehigh in 2017 and 2 of whom are currently ensconced on South Mountain). He is an active volunteer, currently serving on the Board of The Summit Area YMCA.

Kate Graf is an air practice leader who oversees a team of scientists and engineers that execute environmental projects for industrial clients. GHD is a full-service environmental engineering and consulting firm, providing transportation engineering; water and wastewater design; environmental, health, and safety (EHS) permitting and compliance. Kate assists clients to understand and comply with complex environmental regulations. She routinely coordinates with state agencies and serves as the senior technical advisor for environmental permit applications and compliance documentation. For industrial facilities working to achieve carbon neutrality, Kate has assessed greenhouse gas emissions, performed carbon foot printing analyses, and developed carbon neutrality plans. She has also served as a technical expert in litigation matters involving nuisance air pollution matters and ethylene oxide.

Kate has applied her expertise across many industries, including cement, rock products, wastewater treatment, electric utility, asphalt, landfill, aerospace, metal recycling, manufacturing, and the legal services sector. Prior to her work as an environmental consultant, Kate served as Air Permitting Division Manager for the Maricopa County Air Quality Department in Arizona. In that role, she led a team of engineers to issue air permits for new and existing facilities, while ensuring that regulatory requirements were met. Her regulatory background coupled with her industrial knowledge provide a unique perspective to effectively and efficiently resolve issues on behalf of her clients. Kate obtained her undergraduate degree in Chemical Engineering from Lehigh University and after over 20 years in environmental engineering roles, she obtained her professional engineering licensure in environmental engineering.

LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science

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