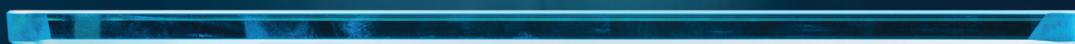
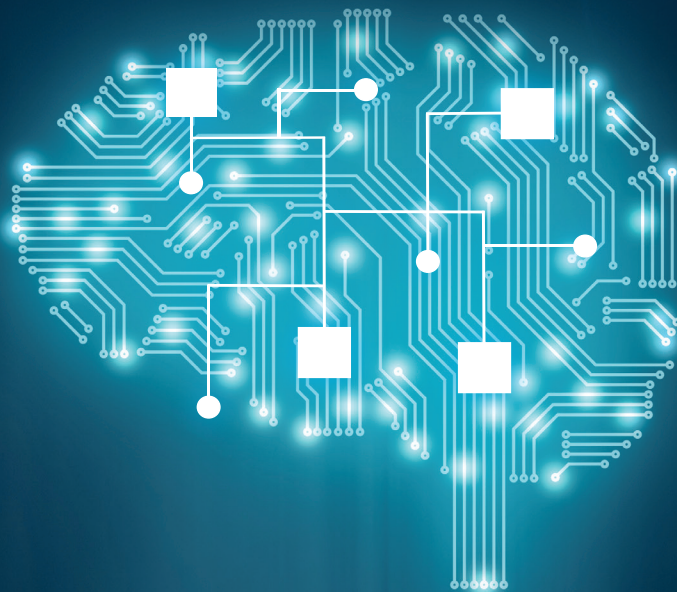


INDUSTRIAL AND SYSTEMS ENGINEERING

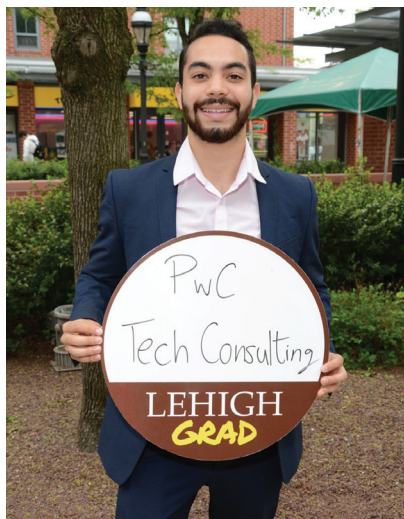
NEWSLETTER 2019

Engineering Decision Making



LEHIGH
UNIVERSITY

P.C. Rossin College
of Engineering and
Applied Science



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ISE DEPARTMENT NEWSLETTER FALL 2019

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DEPARTMENT AND GRADUATE
COORDINATOR
Jennifer Vargas

COMMUNICATIONS SPECIALIST /
UNDERGRADUATE COORDINATOR
Alison O'Connell

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,
Alison O'Connell at:
alo209@lehigh.edu

A newsletter serves different purposes. It is a way to broadcast at once and in a single document all the communication done throughout the year. You will thus see a number of news items and updates in the subsequent pages. The Chair's Message in our Newsletter is an excellent opportunity to once in a while convey who we are, what we do, and how we stand, and that is what I will do in the next two paragraphs.

Lehigh ISE is among the most prestigious departments in industrial and systems engineering in the country. The graduate program of the department is currently ranked #17 according to U.S. News World Report. Although relatively small compared to some of its competitors, the department faculty composed of 20 members is of the finest quality, as can be easily demonstrated by the numerous major prizes recently awarded from the most reputed societies and institutes of operations research and industrial engineering, such as IISE, INFORMS, MOS, and SIAM. The Department has established an excellent research group on Optimization, known around the world. We are also doing cutting-edge research in Data Analysis and Machine Learning, oriented towards supporting decision making. We also have extensive expertise on Energy, Service, Health, and Manufacturing Systems as well as on High Performance Computing. Our research is naturally interdisciplinary and our faculty play a key role in the new Lehigh Interdisciplinary Research Institutes I-DISC and I-CPIE.

I strongly believe that our undergraduate ISE program is solid and meeting the highly demanding industry needs, and it comes as no surprise when College Factual ranks us #5 nationwide in this regard. The Department offers multiple master's programs, ranging from ISE and Management Science to Financial Engineering and Healthcare Systems, and this represents a major contribution to the overall graduate effort of our College of Engineering. Our strong industrial interaction is expressed in a variety of forms, including a large number of industrial partnerships, project and leadership courses, applied research grants, and an intense and close collaboration with our alumni network. We have roughly 35 PhD students and 350 undergraduate and master's students.

You may wonder now what is new since I arrived one year ago. A lot has happened actually! Let me start by the most important primary factor --- our faculty --- in the sense that everything else depends on its quality. We lost Katya Scheinberg for Cornell and we wish her all the best in her new academic journey. As a research department, we expand knowledge continuously, and Katya is certainly a loss in this regard. As the family we are, we did offer a nice farewell dinner party at the Portuguese-American Club of Bethlehem this past June. However, two new brilliant young faculty are joining us this Fall, Xiu Yang from the Pacific Northwest National Laboratory, as Assistant Professor, and Daniel P. Robinson from Johns Hopkins University as Associate Professor. Xiu does Uncertain Quantification and Multiscale Modeling. Daniel is a rising star in the field of Continuous Optimization and its applications to Data Science and Learning. We are very proud of our recent hires, and expect Daniel and Xiu to contribute immensely to the development of the ISE Department.

A number of vicissitudes led to a complete change in the ISE staff. The staff members who were at work when I arrived August 2018 are no longer with us. Kathy Rambo, our department

coordinator for decades, retired in May. We threw her a warm farewell luncheon and offered her a lovely memorabilia book full of pictures and messages from all of us. Ana Quiroz, the graduate coordinator for the last two years, is now working at the Dean's Office. Our technician, Ed Force, left us in December 2018. All of these changes represented a tremendous challenge for a new department chair, but here at ISE we turn challenges into opportunities! We have suffered absolutely no disruption at all, and we are now again in full power, with a young and talented staff team. Jennifer Vargas is our new Department and Graduate Coordinator. Alison O'Connell is our new Communication Specialist and Undergraduate Coordinator. Mark Motsko is our new IT Client Support Coordinator, supporting all computer and equipment needs in Mohler, from the Manufacturing and Automation Labs to the High Performance Computing resources.

As I mentioned in the Mid-Year Update, we have a new webpage, now fully stable and vibrant. After having remodeling our virtual space, we have started taking care of the physical one. Using our own resources provided by generous donors a long time ago, we are remodeling the very few spaces in Mohler which were not yet up to the standards of current days. We finished the remodeling of our first floor lounge. It now looks fully contemporary and quite cool! We remodeled also the Gott Lounge on the fourth floor, giving it a new look and function. The reception traditionally offered during the Reunion Weekend was already held at the Gott Lounge. Following suggestions of our Advisory Council, we are now retouching the exterior of the building, bringing it to the expectations of today in terms of signage and lighting. We will soon report on all of this with a portfolio of images. Stay tuned!

I promoted very few changes in the Department. One does not change a team that wins championships! But there are indeed a few things that we are doing new. At the beginning of a new academic year, we hold a Department Organizational Meeting, with all faculty, course instructors, staff, and PhD students. It is the moment to exchange our Summer experience, welcome new people, make important announcements, and introduce ourselves to the new arrivals. We now do a welcome/orientation session to our incoming sophomore students, fully synchronized with career services and college advising.

On a personal note, this has been a second consecutive challenging Summer. After my move here last year in July-August, this Summer was again very busy, now with faculty management and all the recent university re-staffing activity. I also had to work hard to establish a new research agenda here in the United States, but feel that things are finally operating in a full power mode. I believe that a chair must be a scholar first since after all we are indeed a research department. I am looking forward to the new academic year with plenty of positive energy.

My warmest wishes to all ISE Lehigh's friends, in particular those who are no longer physically with us in Mohler Lab.



ISE FACULTY & STAFF *update*



DANIEL ROBINSON

The ISE Department welcomed Daniel P. Robinson as an Associate Professor in July 2019. Daniel earned his Ph.D. in Mathematics from the University of California, San Diego. He has previously served as a Postdoctoral Researcher at Oxford University, a Postdoctoral Researcher and Visiting Professor at Northwestern University, and most recently as an

Assistant Professor at Johns Hopkins University.

Daniel works at the intersection of Mathematical Optimization and Data Science. His broad research interests include Applied Linear Algebra, Operations Research, and Applied Mathematics. He designs, analyzes, and implements algorithms for solving continuous optimization problems arising from real-life applications.

His articles have appeared in top applied mathematics journals, such as Mathematical Programming and SIAM Journal on Optimization, as well as in top data science conference proceedings, such as for the International Conference on Machine Learning and IEEE Conference on Computer Vision and Pattern Recognition. He is already an Associate Editor for a reputed journal, Computational Optimization and Applications.

Daniel was a founding member of Johns Hopkins' Mathematical Institute for Data Science (MINDS) and helped to establish JHU's Master of Science in Data Science program. He received multiple teaching awards during his time at JHU, including twice winning their Professor Joel Dean Award for Excellence in Teaching. He has been awarded numerous grants from the National Science Foundation and other funding agencies. We are pleased to welcome him to Lehigh.



KATYA SCHEINBERG

Katya Scheinberg, Harvey E. Wagner Endowed Chair Professor, has departed the ISE faculty for a new opportunity at Cornell University. Katya joined the ISE faculty in 2010 as an Associate Professor following a career as a research scientist with the IBM Thomas J. Watson Research Center. While at Lehigh she co-founded

Lehigh's Optimization and Machine Learning (OptML) group and the TRIPODS Institute on Optimization and Learning at Lehigh, and she served as co-director of the Lehigh Institute on Data, Intelligent Systems and Computation. The ISE Department thanks Katya for her years of service and wishes her well in her new role.



KATHY RAMBO

Kathy Rambo retired as ISE Department Coordinator in May 2019. Kathy was with the department for nearly 41 years. She began her career as graduate coordinator before stepping into the role of office and undergraduate coordinator. Kathy was a professional in every aspect; she managed all things department-related and was a wealth of knowledge for faculty, staff, and students. We wish her well on her next adventure.



JENNIFER VARGAS

Jennifer Vargas joined the ISE Department as Department Coordinator in May 2019. She comes to Lehigh from Vinart Collision Center with skills in office management, customer service, and financial accountability. Jennifer is a

Brooklyn, NY native who now resides in Bethlehem. She obtained her B.A. at Penn State University. She was interested in joining Lehigh University due to how respected it was as an institution and how the SouthSide is transforming for the better. Some of her hobbies include kayaking, road trips, and checking out local breweries.



MARK MOTSKO

Mark Motsko is the new IT Client Support Coordinator and Lab Manager for the ISE Department. Mark has extensive experience in the public and private sectors supporting IT, Linux Clusters, Linux Servers, and Windows based machines. He is a Navy Veteran with an Electronics background and holds a Bachelor's Degree in Information Systems.

Mark moved back to the Lehigh Valley in 2015 and resides in Catasauqua. He enjoys bicycling, reading, and learning new things. Mark was very excited to join the ISE Department and contribute to its many achievements.



Tamás Terlaky, along with his former students Mohammad Shahabsafa (PhD) and Anshul Sharma (MS), and their company Optamo LLC, received the first edition of the Outstanding Innovation in Service Systems Engineering Award at the IISE Conference in May 2019. They won for their work “Optimized Population Management in Correctional Systems: Inmate Assignment, Program Scheduling and Transportation”. The award recognizes the development of innovative and effective implementation of industrial and systems engineering principles and practices on real applications in service institutions.

Larry Snyder was awarded the Logistics and Supply Chain Division Teaching Award at the Institute of Industrial and Systems Engineers (IISE) Conference in May 2019. The award recognizes excellence in teaching based on leadership, course design and content quality, applied learning, innovation, and student satisfaction. Larry will also assume the Co-director position for the Lehigh Institute for Data, Intelligent Systems & Computation (I-DISC). I-DISC is an interdisciplinary research institute that focuses on collaboration with industrial, academic, and governmental partners to attack some of the most pressing data problems in technology and society.



Martin Takáč was named the recipient of the Rossin College of Engineering and Applied Science’s 2019 Richard P. Vinci Award for Educational Excellence. This award recognizes a Rossin College faculty member who has demonstrated effective teaching and/or enhanced the student learning experience by introducing innovative teaching methods into the classroom and shows an outstanding commitment to the success of their students. The award is named for the late Richard P. Vinci, professor of Materials Science and Engineering.

research grants

**Tamás Terlaky (PI), Luis Zuluaga (Co-PI),
Boris Defourny (Co-PI)**

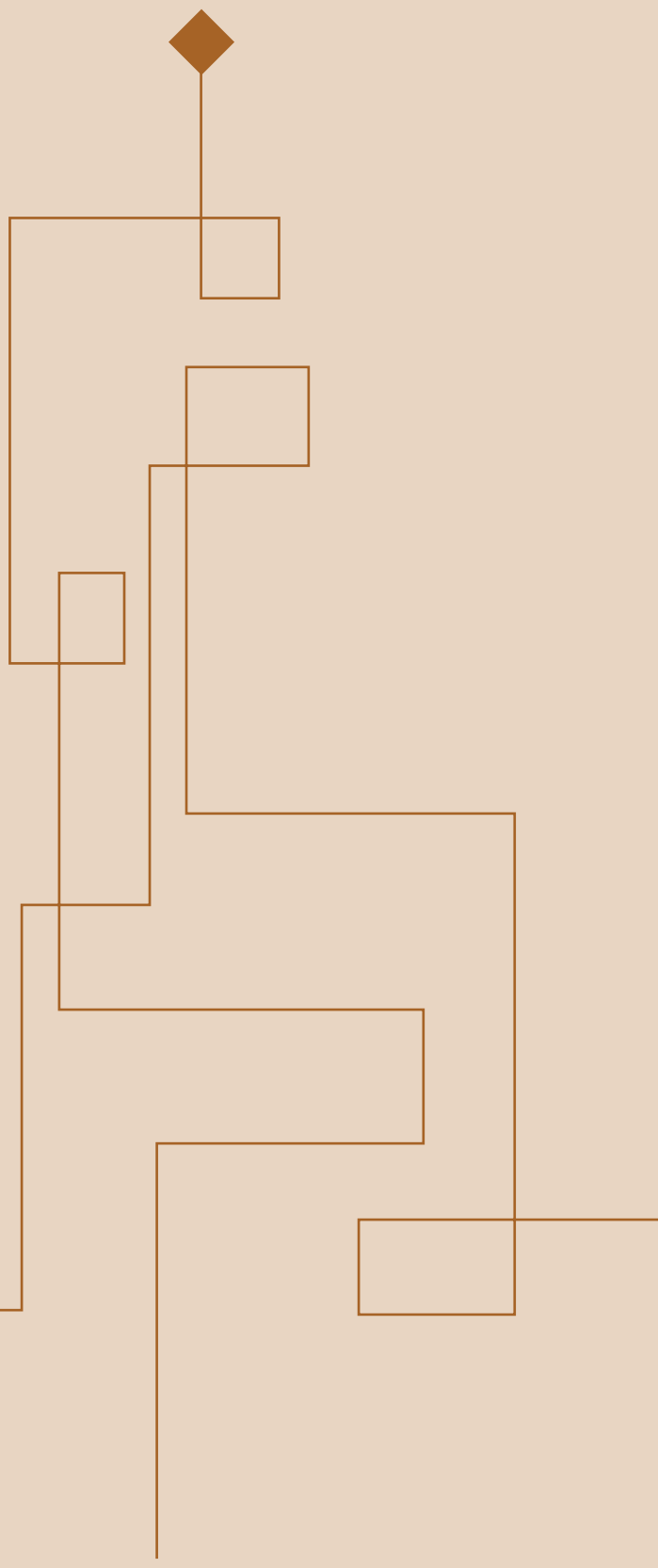
“The Quantum Computing Revolution and Optimization: Challenges and Opportunities”, Defense Advanced Research Projects Agency (DARPA), \$2,128,658. One of the main motivations behind research in quantum computing (QC) is its potential to substantially increase our capability to solve complex combinatorial optimization (COPT) problems for which no classical empirical or theoretical efficient solution algorithms exist. This award will set up a team of accomplished researchers in the areas of COPT (and in general Operations Research) and QC to collaborate in devising hybrid QC+COPT theoretical methodologies and testing environments that would evidence the anticipated solution speed-ups by near future noisy intermediate-scale quantum devices (NISQ), when comparing with classical solution approaches (i.e., using classical computing hardware and algorithmic techniques).

Martin Takáč, Co-PI

“Fatigue Life Estimation of Bridges with Smart Mobile Sensing”, Center for Integrated Asset Management for Multi-Modal Transportation Infrastructure Systems (CIAMTIS), \$65,273. This award will be used to research fatigue analysis. Bridge structures experience significant vibrations and repeated stress variations during their life cycle. These conditions are the basis for fatigue analysis to identify fatigue cracking which can be used to accurately establish the remaining fatigue life of the structures (i.e. the number of stress cycles before the fatigue failure).

Martin Takáč, PI

“Efficient Distributed Hessian Free Algorithm for Large-scale Empirical Risk Minimization via Accumulating Sample Strategy”, National Science Foundation Extreme Science and Engineering Discovery Environment (NSF:XSEDE), \$4,103.



2018-2019 *seminar series*

ISE hosted a series of seminars and lectures from a variety of high-profile speakers.

Fall 2018

DECEMBER 4, 2018

Andreas Wächter, Northwestern University
“Nonlinear Programming Formulations of Chance-Constraints”

NOVEMBER 27, 2018

INFORMS Chapter Distinguished Speaker Series
Gerard Cornuejols, Carnegie Mellon University
“Packing and Covering”

NOVEMBER 13, 2018

Mert Gürbüzbalaban, Rutgers University
“Momentum Acceleration Under Random Gradient Noise: From Convex to Non-Convex Optimization”

OCTOBER 30, 2018

Michael Katehakis, Rutgers University
“Reinforcement Learning: Connections Between MDPs and MAB Problems”

OCTOBER 2, 2018

Michael L. Overton, Courant Institute of Mathematical Sciences, NYU
“Nonsmooth, Nonconvex Optimization: Algorithms and Examples”

Spring 2019

MAY 7, 2019

Alec Koppel, U.S. Army Research Laboratory
“Policy Search for Reinforcement Learning in Continuous Spaces: Improved Limits and Reduced Variance”

APRIL 9, 2019

Aida Khajavirad (Rutgers & NYU)
“Novel Polyhedral Relaxations for Mixed-Integer Polynomial Optimization Problems”

APRIL 2, 2018

INFORMS Chapter Distinguished Speaker Series
Stefan Wild, Argonne National Laboratory
“Exploiting Structure in Derivative-Free Nonlinear Optimization to Advance Science and Engineering”

MARCH 26, 2019

Clément Royer, University of Wisconsin-Madison
“Nonconvex Optimization via Newton-CG Methods with Complexity Guarantees”

MARCH 19, 2019

William K. Klimack, Chevron
“Decision Analysis at Chevron”

MARCH 5, 2019

James Luedtke, University of Wisconsin-Madison
“Optimizing Truck Dispatching Decisions in Open-pit Mining using Integer Programming”

FEBRUARY 12, 2019

J. Cole Smith, Clemson University
“The Maximum Semicontinuous Flow Problem”

JANUARY 29, 2019

Giacomo Nannicini, IBM T.J. Watson Research Center
“Fully Polynomial-Time Approximation Schemes for Stochastic Dynamic Programs: Theory and Applications”



MOPTA 2019

The 2019 Modeling and Optimization: Theory and Applications (MOPTA) conference was held at the Rauch Business Center on August 14-16, 2019. MOPTA brings together a diverse group of people from both discrete and continuous optimization, working on both theoretical and applied aspects. The conference's goal is to present a diverse set of exciting new developments from different optimization areas while at the same time providing a setting which will allow increased interaction among the participants.

The plenary speakers at this year's conference included:

- **Dr. Natalia Alexandrov**, NASA Langley Research Center, "An Optimization Perspective on Trustworthiness and Trust in Autonomous Systems".
- **Tamer Basar**, Director, Center for Advanced Study Swanlund Endowed Chair CAS Professor of Electrical and Computer Engineering Professor, Coordinated Science Laboratory & Information Trust Institute University of Illinois at Urbana-Champaign, "Risk-Sensitive Designs, Robustness, and Stochastic Games".
- **Antonio Conejo**, The Ohio State University, "Operational Equilibria of Electric and Natural Gas Systems with Limited Information Interchange".
- **Alexander Shapiro**, Georgia Institute of Technology, "Distributionally robust and risk averse multistage stochastic programming".
- **Giacomo Nannicini**, IBM T. J. Watson Research Center, "A Snapshot of Quantum Algorithms for Optimization".
- **Boris Mordukhovich**, Wayne State University, "Criticality of Lagrange Multipliers in Conic Programming with Applications to SQP".
- **Martin Grötschel**, Berlin-Brandenburg Academy of Sciences and Humanities (BBAW), "Digital Humanities: Challenges for Optimization?".

The eleventh AIMMS/MOPTA Optimization Modeling Competition was also held during the conference. Teams of graduate students participated and solved an automated design of assortment problem. The teams were asked to generate a variety of solutions for packing rectangular items in a rectangular container without overlap, in such a way that (i) the value of the assortment, measured by the cumulated surface occupied by the items, is maximized, and (ii) the assortments suggested to the user differ sufficiently to be seen as diverse, according to metrics to be developed. The teams had to form a mathematical model of the problem, implement it in AIMMS, solve it, create a graphical user interface, and write a 15-page report on the project. Several teams from five countries registered to the competition. The panel of judges (Boris Defourny and Tamás Terlaky from Lehigh University, Mohan Chiriki from AIMMS) selected the winners:

- **Winner:** Team "ZIB", Mathematical Optimization, Zuse Institute Berlin: Kai Hoppmann, Felix Prause, advised by Thorsten Koch.
- **Finalist:** Team "UCL", Chemical Engineering, University College London: Deemah M. Aljuhani, advised by Lazaros G. Papageorgiou.
- **Finalist:** Team "Gomory Paper Cuts", Mathematical Sciences, Rensselaer Polytechnic Institute: April Sagan, Dan Kosmas, Jesica Bauer, advised by John Mitchell.



AIMMS Winner Team ZIB



AIMMS Finalist Team Gomory Paper Cuts



AIMMS Finalist Team UCL



Graduate students held a Social on August 14



Plenary Speaker Dr. Natalia Alexandrov



Enterprise Systems Center Awarded Manufacturing Initiative Grant

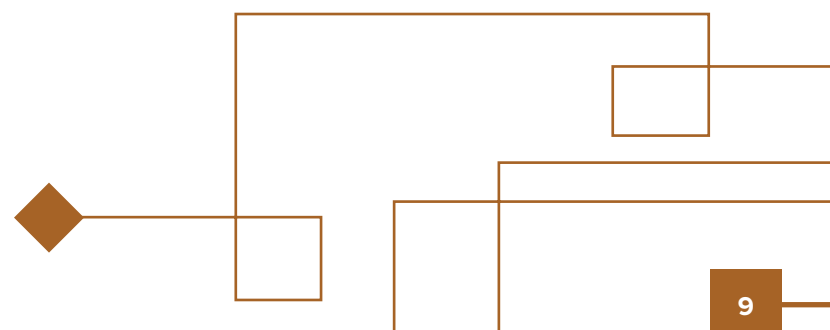
The award was announced by the Pennsylvania Manufacturing Fellows Initiative within the Department of Community and Economic Development. The Enterprise Systems Center (ESC) was awarded based on criteria including manufacturing innovation, job creation, student involvement, experiential learning, and potential for retention as an eventual full-time employee of a Pennsylvania company. The specific project recognized in this award builds on two businesses, specifically a foundry and a metal manufacturing company. As a result of the work done, their market positions will be improved by having an enhanced ability to provide high quality and reliable pump products and related assemblies. An overall goal is to double their combined sales volume for the products involved.

At least eight undergraduate and four graduate students will be directly utilized in this project. In addition, it is estimated that 60 students will benefit from case studies planned for development based on project data, associated analysis, and system design challenges. This will provide students with problem solving challenges beyond those typically found at the “end of the chapter”.

Working closely with student teams, Lehigh project leaders with more than 45 years experience in each of the various manufacturing domain areas will be involved. Project leaders include: Dr. Emory Zimmers, ISE Professor, Director of the Enterprise Systems Center (ESC) and Fellow of the Society of Manufacturing Engineers; Doug Sunday, who will provide expertise in manufacturing systems analysis and plant design; Robert Gustafson, ESC Managing Director, has taught the MBA course Executing the Business Plan for 15 years, and has owned and managed multiple manufacturing companies; John Fox, Assistant Professor of Civil & Environmental Engineering, who will provide expertise in the foundry components of the project; and, Bill Maroun, Composites Lab Technician, who will utilize his skills in various types of CNC programming and machining.

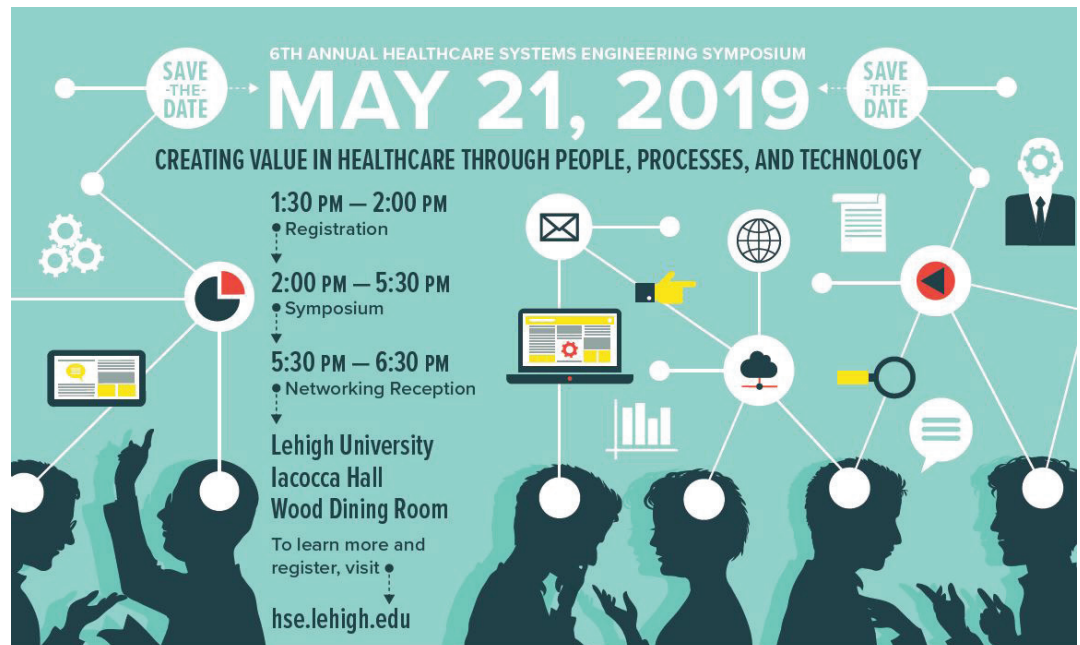
Project work with the foundry component includes support of the design and installation of a mold conveyor system. This is intended to increase efficiency of material flow through the facility and reduce mold damage due to use of other types of material handling. Dr. Zimmers states, “The new system will use state-of-the-art techniques. Students in Industrial and Systems Engineering will have the opportunity to see some of the classroom theory implemented with this type of experiential learning.”

The execution of this grant award will facilitate experiential learning for students working with companies looking for solutions to real-world industry problems. Industrial and Systems Engineering students as well as students from other departments will utilize their expertise in areas such as systems engineering, operations research, analytics, mechanical design, and metallurgical design for hands-on learning and leadership development opportunities. Dr. Zimmers states that, “Because of the high-energy level of the management of the two businesses involved, students will also be participating in a strong entrepreneurial dynamic which is an integral part of the management philosophy of both businesses involved. This type of interdisciplinary program is important for students seeking to prepare themselves for long-term career success by gaining real-world experience during their graduate and undergraduate time at Lehigh.”



Key players tackled topic of ‘value’ in healthcare

Symposium co-sponsored by Healthcare Systems Engineering program, Lehigh Valley Business Coalition on Healthcare explored people, processes, and tech behind the buzzword



The concept of “value” is pretty straightforward if you’re talking about, say, a used car.

But in a healthcare context, it’s a buzzword that means a lot of things to a lot of different people.

Patients might define value in terms of out-of-pocket costs. Doctors may view it in terms of reimbursement rates and treatment success. Insurers often take metrics like member satisfaction and long-term outcomes into account. And employers want to see workers present and productive as a result of their investment in benefits.

“The way the healthcare finance system works in the United States is broken in the sense that it tends to not encourage the type of behavior you would want to see,” says Ana Alexandrescu, director of the Healthcare Systems Engineering (HSE) program at Lehigh University. “For example, we pay providers for treating sick people, so the incentive, if you want to make money, is to have more and more sick people and treat the heck out of them.”

But as healthcare transitions to a “value-based” model, Alexandrescu says, the question becomes, “How do you build a financing mechanism that doesn’t bankrupt an entire industry and starts shifting the focus from treating sick people to making and keeping people healthy?”

That issue was at the heart of the sixth annual Healthcare Systems Engineering Symposium held in conjunction with the Lehigh Valley Business Coalition on Healthcare (LVBCH), a nonprofit coalition of employers striving to provide access to quality affordable healthcare for their employees. The May 21 event, “Creating Value in Healthcare Through People, Processes, and Technology,” took place at Iacocca Hall on Lehigh’s Mountaintop Campus and brought together representatives from key players in the regional healthcare space, area employers, and Lehigh faculty and alumni.

“The goal is to offer up all of these varied perspectives and get people talking about how you conceptualize value,” Alexandrescu explains, “because something of value in a system like healthcare that has all these different viewpoints must be of value for everybody involved.”

The afternoon event began with a series of presentations from Alexandrescu, who is also a professor of practice in Lehigh’s HSE program; Allison Hess, associate vice president of health and wellness for Geisinger; and John Grimm, corporate vice president of research and development at B.Braun Medical.

A panel discussion moderated by Anne Baum, vice president, Lehigh Valley for Capital BlueCross, featured Tom Sibson (BAYADA Home Health Care), Kay Ellen Werhun (Lehigh Valley Health Network), James Balshi (St. Luke’s University Health Network), Tami Hutchison (Remedy Partners), and Jeff Stauffer (Stauffer Glove and Safety).

Lehigh’s Healthcare Systems Engineering master’s degree and certificate programs attract students from a variety of educational and industry backgrounds—including engineering, science, medicine, business, and mathematics—and teach them the technical skills necessary to analyze healthcare systems, identify inefficiencies, and propose solutions or new processes to improve the overall quality and efficiency of healthcare. Through project-based learning, students collaborate with industry partners institutions to gain hands-on experience in addressing real-world problems.

“We’re giving students the tools to make good decisions based on data,” Alexandrescu says, “and preparing them to take on positions of influence in healthcare.”

Lehigh's Industrial and Systems Engineering Department was honored to host two esteemed guests as part of the 2019 Spencer C. Schantz Distinguished Lecture Series.

On Wednesday, April 24, 2019, Dr. R. Tyrrell Rockafellar presented an engaging and timely lecture entitled “Risk and Reliability in Optimization Under Uncertainty” to a packed crowd in Mohler Laboratory Room 451. Dr. Rockafellar spoke about the role for so-called “measures of risk,” which offer fresh ways of dealing with reliability constraints. Dr. Rockafellar is Professor Emeritus of Mathematics at the University of Washington Seattle. In addition to being a winner of the Dantzig Prize given jointly by SIAM and the Mathematical Programming Society (1983), Dr. Rockafellar has gained international recognition for his work through honorary doctorates bestowed by universities in a number of countries. INFORMS awarded him and Roger Wets the 1997 Lancaster Prize for their book *Variational Analysis*, and in 1999 he was further honored by INFORMS with John von Neumann Theory Prize for his fundamental contributions to the methodology of optimization. He has authored over 250 publications, including one of the all-time most highly cited books in mathematics, *Convex Analysis*.

On Thursday, May 2, 2019, Stacey Cunningham, a 1996 graduate of Lehigh ISE, presented a public lecture entitled “Engineering the 21st Century” in Neville Auditorium. Speaking both about her own journey from Lehigh to the New York Stock Exchange, and the stock exchange’s journey through the evolution of technology, Ms. Cunningham closed with a lively Q&A with members of the audience. Stacey Cunningham is the 67th President and the first woman to lead the NYSE Group in its 226 year history. She is a respected equities industry veteran having held senior positions in global exchanges throughout her career. She spearheaded the roll-out of NYSE’s state-of-the-art trading platform NYSE Pillar, one of the most ambitious technology programs ever completed by a global exchange. Before joining NYSE, Ms. Cunningham held several senior positions at Nasdaq.

Following her lecture, Ms. Cunningham received the 2019 Distinguished Alumni Award for Excellence in Industry at the annual ISE Banquet. In her remarks, Cunningham recognized the role her education at Lehigh played in the success of her career, and expressed her gratitude for the recognition.



ISE DEPARTMENT ANNUAL BANQUET



*HSE Student of the Year
Brigette Seurig*



*IBE Junior of the Year
Sean Conway*



*IBE Senior of the Year
Jon Glickman*



*ISE Master's Faculty of the Year
Eugene Perevalov*



*ISE PhD Faculty of the Year
Frank E Curtis*



*ISE Senior of the Year
Francisco Gutierrez*



*Master's - Management Science
Rashmi Yallapu Varaha*



*Master's Student of the Year - ISE
Kyle Kristiansen*



*MIT Supply Chain Excellence Award
Katherine Shreero*

celebrate

Lehigh's Industrial and Systems Engineering Department celebrated an academic year full of accomplishments at its annual banquet and awards ceremony on Thursday, May 2, 2019.



*IBE Sophomore of the Year
Abbey Goldenberg*



*ISE Advisory Council members
Lisa Farnin, Karyn Librader, and Rich Wasch*



*ISE Junior of the Year
Shrivats Agarwal*



*ISE Sophomore of the Year
ZongLe (Archer) Zhao*



*ISE Undergraduate Faculty Member of the Year
Bob Storer*



*Master's - Analytical Finance
Siyi Qin*



*MIT Supply Chain Excellence Award
Troy Egar*



*MIT Supply Chain Excellence Award Honorable
Mentions: Noreen Byrne and Kyle Ginsberg*



*PhD Student of the Year
Reza Nezari*

VERMA TO GRADUATES:

Face the world with humanity, heart, grace and respect

*The former ambassador to India
and ISE graduate shared life lessons
gleaned from three decades on the
world stage.*

May 20, 2019



In a stirring speech delivered to members of the Class of 2019 and their families in Goodman Stadium, former U.S. Ambassador to India Richard Verma '90 urged the young graduates to maximize the unprecedented opportunities they have been given to face a problem-plagued world with "the humility and responsibility that comes with power."

The young graduates entered Lehigh "as perhaps one of the smartest classes we've ever had, shattering all records in your SAT scores, GPA and class ranking," said Verma, a leading expert on trade and diplomacy and now a vice chair and partner with The Asia Group. "It's a pretty safe bet to assume I would never have been admitted here...And you enter the work world with an unlimited set of options, with what feels like new innovations and inventions at every turn."

But, he added, "we have also left you with a range of real challenges. The U.S. is no longer a dominant and unchallenged world power. We face new and real competition from rising powers. We have either been unable or unwilling to stop the planet from warming. And we've seen a rise in authoritarian, nationalist and populist regimes across the globe, and we are facing real and polarizing division right here at home."

Verma harkened back to his early days at Lehigh, when "just a kid from Johnstown, Pa." arrived as a freshman in 1986, moved into M & M, was part of the Air Force ROTC, played ice hockey, pledged a fraternity, studied abroad, majored in industrial engineering and ended up double-minoring in international relations and beer pong. "That beer pong minor has not benefited me as much as I'd hoped," he noted.

But Verma's adjustment to Lehigh paled in comparison to that of his father's, who came to the United States from India in 1963 "with only a few dollars and a bus ticket." His story, Verma said, "was a very American story, an immigrant story." His parents eventually became U.S. citizens, and worked hard to maintain their Indian roots and cultural traditions. "Don't ever forget that

diversity is our strength," he said. "It gives us unique advantages in the world."

Verma said when he traveled the world as a diplomat, he was always heartened by the number of soldiers, sailors, airmen and Marine and Foreign Service officers who were not born in the U.S. and who didn't even speak English as their first language. "Yet," he said, "they decided to devote their life to serving the country that welcomed them. This is a vision of America that must endure. It's a vision that allows me – an immigrant, a naturalized citizen and a veteran – to stand before you today."

Monday's commencement address was not Verma's first. Twenty nine years ago, Verma spoke as president of his senior class, when the global mood and hierarchy was far different. The U.S., he said, "stood at the top of the world's pecking order – unchallenged, unmatched and uncontested." Changes around the world, as well as on the Lehigh campus, continued to come at a dizzying pace in the nearly three decades that passed since that day, and Verma said he wanted to share his lessons learned from a journey that included working in dozens of nations.

First, Verma said he wanted to acknowledge the special and unique role the Americans play in the world. "I've seen your government do heroic things overseas – provide critical aid after disasters, defend democracies under siege, help rebuild war-torn societies. At our Embassy and consulates in India, I saw every agency of our U.S. government hard at work, often in difficult conditions, promoting U.S. interests and building deeper ties with key partners in health, clean energy, defense, trade and so much more."

And government workers are not alone, he said. "Ordinary Americans – teachers, retirees, health professionals and students like you are working in schools, in medical clinics and development projects – and they are having a big impact."

Drawing on the heroic sacrifice made by 18- to 28-year-old "soldiers of democracy" in the infamous D-Day battle of

Normandy, he asked graduates not to forget about the good we have done and continue to do in different corners of the planet. "You will have the opportunity to chart America's course in this century," he said. "I hope you will draw upon the best of our traditions, the big hearts of our people, with the humility and responsibility that comes with power."

Secondly, we are much better working together with friends and allies than working alone. Today's challenges, Verma said, are far too complex to be solved by any one country, and solutions can only be forged by treating friends and partners with respect.

"This will require empathy and understanding and perhaps reminding ourselves that history did not start yesterday, and that map we studied growing up in grade school with the U.S. at the center and all the other countries on the edges is not actually how the world works," he said. "We can't cut ourselves off from the rest of the world. Isolation and retrenchment are not options."

And as the graduates set out to do more globally, they cannot ignore how internal divisions are hampering U.S. efforts overseas. "Our country seems more and more polarized," he said. "We are divided by seemingly everything these days: political camps, social and economic groupings, geography, even by those who went to college and those who haven't. And it seems like the rift is only getting wider, with political leaders seeking to incite and exploit our divisions, blaming others and degrading national discourse."

Members of the Class of 2019 have the world at their fingertips, and carry the potential to stamp out diseases like TB and malaria, put an astronaut on Mars, create an energy surplus for the first time in history, and work toward a more just and inclusive society.

"Don't get sidetracked," he said. "Reject the noise. Stand up for what you believe in, and do so with the humanity, heart, grace and respect for others both here at home and abroad."

Finally, Verma urged graduates to consider more than professional advancement, fame, notoriety or material acquisition when taking measure of success in life. "What I've learned is that the most meaningful barometer of success will be whether you were there for others when they needed a hand. Did you speak up for those whose voices not being heard? Did you stand up against unfairness and injustice or the way someone was being treated? What did you do to contribute to your community, your school, your church or family, to the environment or to a worthy cause?"

This advice doesn't apply only to those who seek public service, Verma said. "The great Eleanor Roosevelt used to say that the real battle for social justice and equality are 'in the small spaces, close to home – so close and so small that they cannot be seen on any maps or the world.'"

"So when the joy and celebration of this passes, when the clicks, likes, friends and posts from our social media feeds are quiet, when this stadium stands empty, when you are alone, asking yourself years from now: Did I make a difference? Am I living a good life? Have I served others? Was I there when my family, my friends or my community needed me? I know that answer will be yes. That's what Lehigh prepared you to do."



NO SHORTCUT TO SUCCESS

The ceremony for Lehigh's 151st commencement was officially opened by Kevin L. Clayton '84 '13P, chairman of the Board of Trustees, who turned the stage over to Lehigh President John D. Simon to welcome the graduating students and their guests, along with the trustees and members of the Class of 1969, who will be celebrating their 50th anniversary next month.

Simon introduced Mohammad Shahabsafa '19G, the first of three student speakers, who said he was reminded of his first presentation as an undergraduate. "I was so nervous, my legs were shaking," he said. "Now I'm here, 10 years later, speaking in front of thousands of my Lehigh family. By the way, my legs are not shaking today."

Shahabsafa shared his personal story of coming to the United States from Iran six years ago, arriving at JFK Airport with his wife and four suitcases – their only possessions in the world. "It was a hard decision to give up all that we had with the hope of building a better future," he said. "I knew it was going to be tough, but I didn't know how tough."

He described his first year at Lehigh as the hardest of his life, as he found himself overwhelmed by a new language, culture and environment. "I asked myself, 'What the hell have I done?' However, too much was at stake, and we had to continue on," he recalled.

When his original research plan didn't work out, he initially feared failure. "But after a while," he said, "I started looking at it differently. I learned that research is not always predictable and that challenges open up new opportunities. I began researching what ultimately formed my dissertation. It has brought me accomplishments that I never even dreamed of when starting my Ph.D."

His most important lesson came through his advisor, Professor Tamas Terlak, who once told him that progress is not obtained by a "one-night idea," but rather through constant hard work. "There is no shortcut," Shahabsafa said. "Hard work is the key to making progress and being successful."

As he concludes what he describes as an incredible journey and prepares to receive his doctorate in industrial engineering, Shahabsafa also credited Lehigh's invaluable resources and entrepreneurial spirit with helping him co-found a startup company, which he's certain will lead to even greater opportunity.

In closing, he shared a poem from Saadi, from 700 years ago:

Going down the path of desert is better than sitting idly

For if I cannot accomplish my ultimate goal, I will try as hard as I can

- Linda Harbrecht



Van Hoesen Family Best Publication Competition

Through a generous gift from the Van Hoesen family, the fifth annual Van Hoesen Family Best Publication prize was awarded to ISE Ph.D. student Rui Shi for his paper “A Stochastic Trust Region Algorithm Based on Careful Step Normalization”. The competition is open to all Lehigh ISE department students. The 2019 Selection Committee was comprised of Professors Ralphs (Committee Chair), Takáč, and Scheinberg.

Lawrence E White Fellowship

The Lawrence E. White Fellowship is made available through the generosity of Lehigh and department alumnus, Lawrence E. White ('64, '65, '69), for full tuition toward 30 credits of master's degree study in the Management Science and Engineering Program. The department was pleased to announce that Andre Verduzco (B.S. '19) was chosen as the 2019 Fellowship recipient. Andre will begin his Master's studies in the Fall of 2019.



Elizabeth V. Stout Dissertation Award

At the Doctoral Degree Hooding Ceremony on May 19, 2019, four graduates were presented with the Elizabeth V. Stout Dissertation Award, which recognizes doctoral dissertations that were judged to have made unusually significant and original contributions in their fields. The award was endowed by the late Robert Stout, former dean of the graduate school and professor emeritus of materials science and engineering, in memory of his wife. Included in this year's recipients was Lam Minh Nguyen, who received a Ph.D. in industrial and systems engineering, for “A Service System with On-Demand Agents, Stochastic Gradient Algorithms and the SARAH Algorithm.”

Mohler Laboratory Gets a New Addition

The newest addition to Mohler's Manufacturing, Automation, and Robotics lab is a mobile robot donated by Omron for our students. It will be used in ISE 324 and other classes. “Buddy,” as he was named, will be ready to meet the students in the lab during the fall semester.

Omron has also donated several state-of-the-art PLC's and related software to the lab. They are already being used, and students will be able to use the equipment for Manufacturing Automation projects in classes and independent projects.



Advisory Council



Ralph Bohnenberger has been elected as the new ISE Advisory Council Chair for the 2019-2020 academic year. Ralph graduated from Lehigh in 1989 with a Bachelors in Industrial Engineering. He currently works at New York – Presbyterian. Most recently, Ralph has completed his MBA in Information Services and Operations Management and the Zicklin School of Business at Baruch College in New York City. Ralph is also a member of Alpha Iota Delta, the Decision Management honor society.



The ISE Advisory Council also welcomes new member Lisa Farnin. Lisa is recently retired after a long career with IBM and Ford Motor Company. She has experience in the areas of systems integration, consulting, sales & marketing, supply chain logistics, and corporate citizenship. Lisa has been recognized locally and nationally for her leadership in team building, negotiating, problem solving, and service. Lisa has a B.S. in Industrial Engineering from Lehigh and an M.S. in Computer Science from Villanova University.



— IN MEMORIAM — LEE IACOCCA '45

Lido Anthony Iacocca '45—better known as Lee Iacocca—a dedicated philanthropist, visionary automaker, influential business leader, and Industrial and Systems Engineering department alum, died at his home in Bel Air, California on July 2. He was 94 years old.

Iacocca's long relationship with Lehigh began when he entered the university in 1942. Iacocca graduated in 1945 with a Bachelor of Science degree in industrial engineering. After graduation, he remained loyal to Lehigh throughout a spectacularly successful business career that brought him international recognition and acclaim and allowed him to donate millions of dollars to various institutions and charitable foundations around the world.

In 2010, Iacocca was awarded the Distinguished Alumni Award by Lehigh's Department of Industrial and Systems Engineering.

ISE PhD graduates obtain prestigious positions in academia

Three alumnae of ISE's Ph.D. program are entering the academic field in prestigious positions at several high-profile universities.

- **Ali Mohammad Nezhad, Ph.D. '18**, will be part of the faculty at Purdue University as the Golomb Visiting Assistant Professor in the Department of Mathematics.
- **Mark (Miao) Bai, Ph.D. '17**, spent a year performing postdoctoral research at the Mayo Clinic and has now started an Assistant Professor position at the University of Connecticut's Operations and Info Management Department.
- **Kamil Ciftci, Ph.D. candidate**, has obtained an Assistant Professor position in the Information Systems and Decision Sciences Department at California State University, Fresno.

The department congratulates these students and is proud to have Lehigh represented in the academic field.



JOSH BAILEY
CLASS OF 2021

Major: ISE

What did you do this summer?

I interned with PwC in their Advisory line of service (consulting). I was assigned to a client within my first week, and worked on that project for the entirety of my internship. I got a chance to learn a great deal about how a consulting project is run, as well as the structure of PwC itself. Additionally, I was exposed to numerous new technologies that I was able to become familiar with over the course of the summer.

What led you to choose ISE as a major?

I chose ISE as a major because of its versatility. Lehigh ISEs end up working in extremely diverse positions, from traditional engineering jobs to things like consulting. I wasn't entirely sure what I wanted to do post-graduation, but I knew that having a foundation in engineering would keep doors open for me. ISE specifically has provided me with many transferable skills that I could apply to any number of fields.

What are you interested in doing after graduation?

I would like to stay in consulting. I had a terrific experience this summer, and consulting is definitely a role I can see myself in. The diversity of the projects, quality of the people, and opportunity to travel all really appeal to me. I can say with certainty that ISE prepared me well for this field.

student check-in



LIYUAN "LEON" CAO

Ph.D.

What did you do this summer?

I was doing an internship at Robert Bosch LLC in Silicon Valley. They hope to achieve better results in a project by tuning the hyperparameters of a machine learning method they have been using. I have a background in derivative free optimization and one of its applications is hyperparameter tuning, so I was able to produce a result beyond their expectations. However, along the tortuous path, I learned the gaps between my research and its industrial applications. Moreover, this working experience taught me that other than working on my research, I also need to practice skills such as communication and software engineering for my future success.

What led you to choose the Lehigh ISE Ph.D. program?

I majored in mechanical engineering in college and found the knowledge they taught was too empirical. After joining the Lehigh ISE master's program, I found what is taught here has the best mix of theory and application. I fell in love with operations research and decided to do a Ph.D. in it. The Lehigh ISE department has the nicest professors I know and is a strong department, so I chose to stay.

Which faculty members are you working with and on what type of research?

I am working with Prof. Vicente on derivative free optimization. It is the study of algorithms for optimizing black box functions. We develop algorithms to make optimization more efficient. We also develop theories to unveil properties of algorithms. Most of our work are mathematics. There are also a lot of writing and coding.



SEAN CONWAY
CLASS OF 2020

IBE Program, Major: ISE

What did you do this summer?

This past summer, I completed the second rotation of my co-op in Swiftwater, PA at Sanofi Pasteur (a vaccine company) as a part of their Manufacturing Excellence team. Much of my work during this rotation involved working with Sanofi's filling department to monitor lost time during their Northern Hemisphere flu campaign. I was primarily responsible for maintaining a database of these losses, developing VBA code to support the backend, and providing daily and weekly loss reports to filling managers, directors, and sometimes site leadership. I also worked with a startup company through Ben Franklin TechVentures, called Optamo. They've developed software that uses optimization to assign convicts to prisons, allowing them to have access to the treatment that they need. I had worked with them in a prior semester for my IBE capstone project, and during the summer, I supported their effort to search for new clients with market research on the criminal justice systems of nearby states. Because I had to balance this with my work at Sanofi, time management skills were critical, and I became better at getting a high volume of work completed in only a few hours.

What led you to join the Integrated Business and Engineering (IBE) program? How has it benefited you?

I initially joined IBE for the program's versatility, and for its reputation. On one hand, I was trading stocks since middle school, yet I also enjoyed the mathematics of engineering. IBE was a "happy medium" between the two, allowing me to do both business and engineering without sacrificing depth in either program. IBE has put me in a position to speak intelligently and coherently to business and technical leaders. The program is highly presentation-focused and there's a major focus on explaining technical concepts to non-technical people. The program has also put me into contact with many brilliant and motivated students-I wouldn't have it any other way!

What are planning to do after graduation?

After I graduate from undergraduate, I'm planning on pursuing a Master's degree in Industrial and Systems Engineering here at Lehigh. I'm planning on focusing on optimization and machine learning for most of my coursework. Once I graduate from my Master's degree, I'm planning on moving into an operations research/analytics type of role. I'm still targeting the pharmaceutical industry for this, since many of the techniques and technologies from IE/OR/CS have yet to be applied in this domain.



SINCHAN GHOSH

M.S. ISE

What did you do this summer?

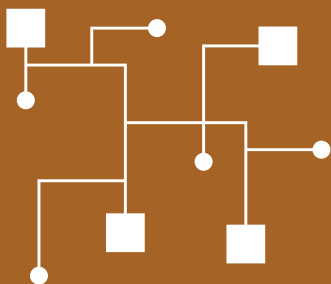
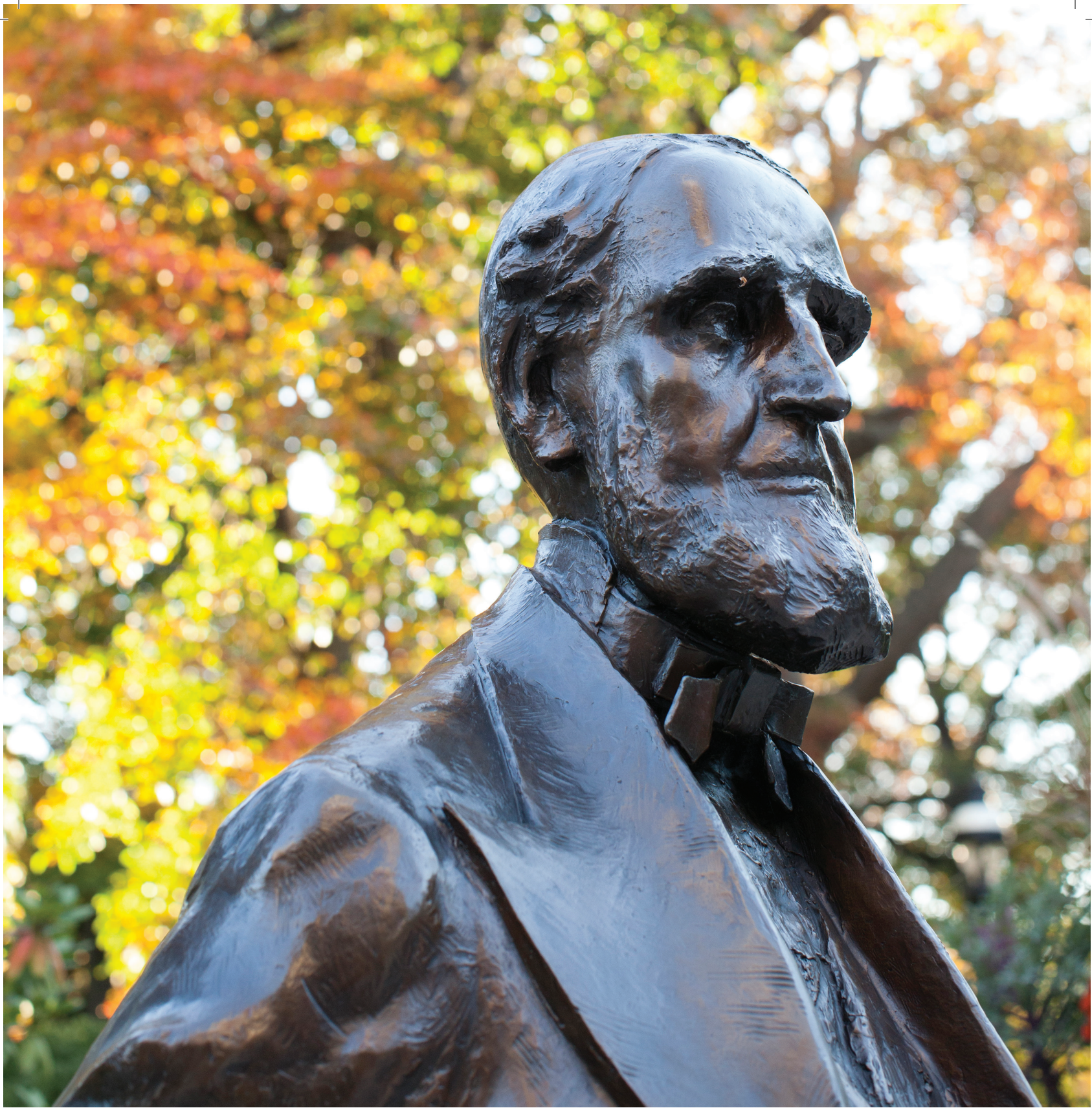
I have done an internship at B.Braun Medical Inc. as a Supply Chain Analyst. I got the opportunity to work in the central supply chain department and helped with the S&OP monthly operations from the Supply Planning. My coursework (especially ISE 362, ISE 426, GBUS 453) helped me a lot in doing well at the internship.

What led you to choose the Lehigh ISE master's program?

Lehigh ISE provides a wide array of courses and gives you the option to select according to your interests. Also, the Enterprise Systems Center (ESC) of the ISE department provides students the opportunity to work as student consultants in real-time industrial projects under the exemplary guidance of Mentors and help apply the concepts learned in courses to the projects. I think this is something that no other university provides.

What are you interested in doing after graduation?

I would like to be a consultant after my graduation, as I believe this is the only field which allows you to learn and practice simultaneously and at the same time make a difference in the industry.



LEHIGH
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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