

Industrial Engineering and Management Sciences

Robert R. McCormick School of Engineering and Applied Science
Northwestern University

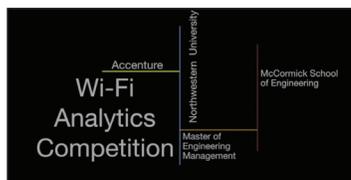
FALL 2013

Graduate Students Use Analytics to Analyze Wi-Fi Data in Accenture Competition

Unless it's not working, you probably don't give much thought to your Wi-Fi connection. But every time your computer or mobile device connects to a network access point, data are generated about your location, movements, and more — data that companies can leverage to spot trends, pinpoint customers' interests, find new revenue streams, and create new businesses.

amount of data generated by Wi-Fi networks in the Wi-Fi Analytics Case Competition.

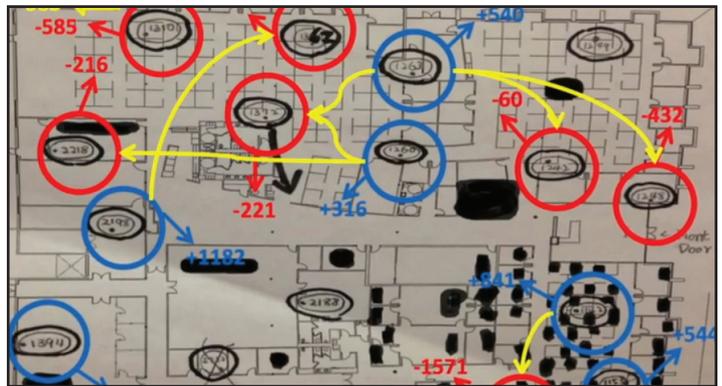
"As Wi-Fi moves beyond hotspots in coffee shops to becoming an essential communication utility, opportunities to monetize actionable business information continue to grow," said Shahid Ahmed (MEM '01), managing director and North American Network Practice lead at Accenture. "We want to encourage innovative ways to make use of these data points without compromising security or privacy. We designed this competition to challenge students' imaginative thinking and help them gain new analytics skills that will benefit us all."



In collaboration with the management consulting and technology services company Accenture, and in conjunction with Microsoft® Corp. and Aruba Networks, students from IEMS's Master of Engineering Management (MEM) and the Master of Science in Analytics (MSiA) programs recently examined new ways for businesses to use the enormous

Ten teams of students analyzed real Wi-Fi usage data for patterns, trends, and user behavior, and on June 7 three teams of finalists presented their projects to a panel of Accenture senior leadership and industry experts.

The winning team proposed a three-prong approach that would enable companies to increase productivity: 1) using wireless data to map employees' movement around the office to determine, for example, if managers are spending enough time with their employees or if receptionists are spending enough time at their desks; 2) analyzing space usage to determine how well the company is utilizing its real estate; and 3) uncovering informal social networks in the office to pinpoint well-connected individuals and departments as well as isolated ones.



The MEM team winners with Accenture executive Shahid Ahmed; above, teams used schematics to describe how they would make use of Wi-Fi usage data.

"We think that this could be a very powerful tool," said team member and MEM student Francisca Valenzuela.

Other proposals included a human resources tool to identify employees with high connectedness who could help with change management, and a strategy for allocating bandwidth to areas with low Wi-Fi signal strength.

According to Mark Werwath, clinical associate professor of industrial engineering and management sciences and MEM's director, new cutting-edge software tools and "big data" technologies are allowing for

consumer and network insights not possible in the past and are enabling businesses to operate in ways not previously imaginable.

"Until now, this space was largely limited to traditional industry research and data specialists," Werwath said. "While exploring and experimenting with the many unique uses of Wi-Fi data, these students are coming up with groundbreaking ideas for creating new business opportunities."

Each finalist received a Microsoft Surface™ tablet, and the winning team won \$1,000.

Inside this issue

Letter from the Chair	2
Department News	3
Letter from the Assistant Chair	4
An Interview with Gordy Hazen	4
IEMS in the Community	5
Studying Networks to Help Women Succeed in Science	10

Follow us:
www.facebook.com/NUIEMS

Letter from the Chair

This past year has been amazingly eventful for IEMS. **Jorge Nocedal** received the 2012 George B. Dantzig Prize — arguably the most prestigious award for achievement in mathematical optimization research — and was also named a Walter P. Murphy Professor here at Northwestern. **Dan Apley** was promoted to full professor. And this fall we welcomed new faculty member **Omid Nohadani**, who adds depth to our optimization and health care engineering groups. Omid was previously on the industrial engineering faculty at Purdue, where he quickly established an outstanding record in teaching and research. We will again have an open faculty position this year; you will find the job ad on page 9 of this newsletter.

Last spring we took steps to strengthen our advisory board under the direction of new board chair **Vicki Sauter**. This included adding new members, putting in place a strong committee structure, and moving our board meeting to the

“This fall we welcomed new faculty member Omid Nohadani, who adds depth to our optimization and health care engineering groups. Omid was previously on the industrial engineering faculty at Purdue, where he quickly established an outstanding record in teaching and research.” *Barry Nelson*

fall (when, not coincidentally, there are also football games). One of the board's first initiatives was to raise money to support undergraduates to stay on campus during the summer and work on research projects with faculty. If you would like to contribute to this effort you can mail checks made out to “Northwestern University” to IEMS with “summer research” in the memo.

Last fall the first class of 30 students matriculated in our **Master of Science in Analytics (MSiA)** program, and they return for their fourth and final quarter this fall to join a new incoming class. MSiA, headed by **Diego Klabjan**, has quickly become a national leader in analytics education that other schools are trying to emulate. The program combines technically rigorous classes with nearly constant work on industry-sponsored projects and a summer internship to produce students with deep knowledge of data analytics and the ability to lead project teams. Student teams from MSiA and our **Master of Engineering Management (MEM)** program successfully competed in an Accenture-sponsored analytics contest that is the lead story of this newsletter.

Within a year, MEM and MSiA will move into new space under construction in what some of you know as the SPAC parking lot, adjacent to Tech. This shared space —

MSiA is a day program, while MEM meets at night — has been specially designed to support professional master's education; it includes classrooms, break-out space, offices, and convenient access to parking (particularly important to the MEM students). MEM and MSiA were chosen because of their success and importance to the McCormick School of Engineering and Applied Science.

The MEM program was founded in 1976 by **Al Rubenstein**, who passed away April 13; he was 90. After returning from military service, Al received a bachelor's degree in



IEMS Chair Barry L. Nelson

industrial engineering from Lehigh in 1949, followed by MS and PhD degrees from Columbia. He was on the faculty of MIT's School of Industrial Management before joining Northwestern in 1959.

Al was a giant in the field of engineering and technology management. He was one of the original members of the board of governors for the IEEE Engineering Management Society; he was editor of the journal *Transactions on Engineering Management* for more than 25 years; and he established two research centers at Northwestern: the Program on Management of Research, Development, and Innovation and the Center for Information and Telecommunication Technology. He retired from Northwestern in 2004. Al was a friend and sage adviser to many of us even after his retirement; he will be greatly missed.

Barry L. Nelson
Walter P. Murphy Professor and Chair

2012-13 Gifts to the Department

IEMS is extremely grateful for the generous donations we continue to receive from our private and corporate donors. Below is a list of donations received from September 1, 2012, through July 31, 2013. Every dollar is used to support the academic, administrative, and research endeavors of our department. Please accept this acknowledgment with our deepest appreciation.

Up to \$99

Sari Victoria Nahmad
Morgan Lindsey Dworkin
Molly Anne Hennessy
Hilary D. Deutchman
Heather Alexandra Herzog
Frances Zeke Loucks
Cristina Lynn Alfonso
Jason Gu
Jason Edward Velkavrh
Daniel Seth Gallegos
Vidya Rao Battu
John S. Rose

\$100 - \$499

Saba T. Jaffery
Linus Schrage
Jason Bryan Cohen
Errol Unikel
Bryan Cowan
Bart M. Wenstrom
Microsoft Corporation
Gerald Morton Hoffman, PhD
Rajeshkumar C. Oza
Daniel L. Kegan, PhD
Coach Matching Gift Program
Apple Inc.

\$500 - \$999

Morris A. Cohen

\$1,000 - \$4,999

Vicki L. Sauter
Joseph S. Martinich
Jeffrey Richard Lefebvre
George L. Nemhauser

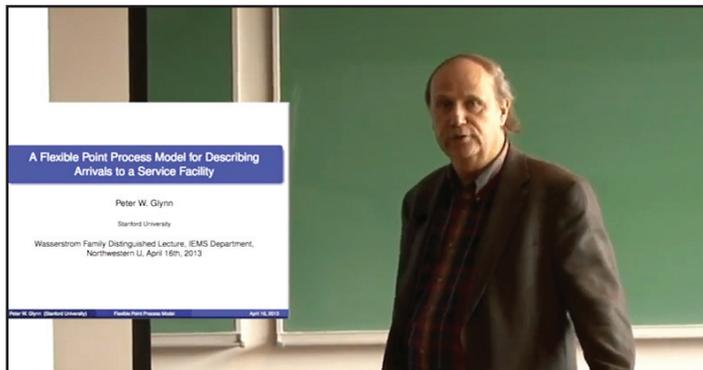
\$5,000 - \$9,999

LogicBlox, Inc
Prosoft Software, Inc.

\$10,000+

KISTEP
Eco Green Analytics
IBM Corporation
Allstate Insurance Company
Chicago Park District
General Motors Corporation
David and Karen Sachs
Nemo Partners SCG, Inc.
Sears Logistics Services, Inc.
TransUnion LLC

Department News



Peter Glynn delivers the 2013 Wasserstrom Distinguished Lecture.

Industrial Engineering Alumnus Endows Professorship

Northwestern alumnus and trustee **David A. Sachs** and his wife, **Karen Richards Sachs**, gifted the University \$5 million to endow a professorship in IEMS. David Sachs is senior partner at Ares Management LLC, an investment management firm he cofounded in 1997. He earned his bachelor's degree in industrial engineering from McCormick in 1981. He has been a member of the McCormick Advisory Council since 2009 and of the advisory board of the Farley Center for Entrepreneurship and Innovation since 2008.

Program Rankings Announced

IEMS maintains high *U.S. News & World Report* rankings: #7 in undergraduate and #3 in graduate.

Faculty Receives Sponsored Awards

IEMS received a number of new sponsored awards last year, including the following: **Daniel Apley** received an NSF award for his project "Enhancing Identifiability of Computer Simulation Models via Design for Calibration." **Noshir Contractor** received an NSF award titled "Collaborative Research: FLASH! Fueling Learning Alliances in Sustainability for Higher Education Using Social Media to Create Knowledge Networks in Sustainability" and an award from the U.S. Army Geospatial Center titled "The Coevolution of Multi-Dimensional Dynamic Networks of Multi-Team Systems Related to Organization Effectiveness: Theory Development and Empirical Tests." **Irina Dolinskaya** and **Karen Smilowitz** received funding from NSF for the project "Advancing Dynamic Relief Response: Integration of New Data Streams and Routing Models." **Seyed Iravani** received NSF funding for "Collaborative Research: The Positive Role of Queues on Consumer Value Perception and Firm Profits: Mathematical Models and Laboratory Experiments." And **Andreas Waechter** received NSF funding for "Collaborative Research: Binary Constrained Convex Quadratic Programs with Complementarity Constraints and Extensions."

Wasserstrom Lecture Available Online

On April 16, **Peter Glynn** of Stanford University presented "A Flexible Point Process Model for Describing Arrivals to a Service Facility" in IEMS's 2013 Wasserstrom Distinguished Lecture Series. To watch the full video, visit www.iems.northwestern.edu/news/peter-glynn-wasserstrom-2013.html.

FACULTY NEWS



In September IEMS welcomed new faculty member **Omid Nohadani**, recently an assistant professor

of industrial engineering at Purdue. Nohadani invents and applies tools from robust optimization to radiotherapy planning, robust statistics, design of ultrafast optics, and nanophotonics. His work is particularly relevant in radiotherapy, where uncertainty can arise about the shape of the tumor, the amount of exposure received, and the tumor location. In his optimization research, Nohadani focuses on problems where the objective function and constraints are outputs of a numerical simulation.



Benjamin Armbruster, along with PhD student Aaron Lucas, co-authored the March 2013 feature article in *AIDS*,

the journal of the International AIDS Society, entitled "The Cost-Effectiveness of Expanded HIV Screening in the United States."



Noshir Contractor received the 2012 Article of the Year Award from the National Communication Association's

Organizational Communication Division for his collaborative publication "From Microactions to Macrostructure and Back: A Structural Approach to the Evolution of Organizational Networks."



Diego Klabjan received a 2012 Watson Solutions Faculty Award from IBM.



Sanjay Mehrotra was the general chair of the Institute for Operations Research and the Management

Sciences Healthcare Conference, which took place in Chicago in June.

Sanjay Mehrotra, Tito Homem-de-Mello, and Jian Hu received the *IIE Transactions* Best Application Paper in Operations Engineering & Analysis Award for their collaborative publication "Risk-Adjusted Budget Allocation Models with Application in Homeland Security."

Jorge Nocedal gave the annual Illinois Distinguished Lecture in Operations Research at the University of Illinois at Urbana-Champaign.



Ajit C. Tamhane was named a fellow of the American Association for the Advancement of Science (AAAS). He was honored

for excellence in statistical research; for substantive collaboration in the chemical engineering discipline; for excellence in communicating statistical science; and for broad administrative accomplishments. AAAS is an international nonprofit organization dedicated to advancing science around the world. It publishes the journal *Science*, as well as newsletters, books, and reports.

continued on page 11

Letter from the Assistant Chair

One of the benefits of the second year on the job is that I have finally been able to move past the “getting acquainted” stage. Having had a year to figure out how things work in IEMS, McCormick, and Northwestern, I have been able to move this year toward developing stronger relationships with students and identifying and addressing



Assistant Chair Jill Hardin Wilson

higher-level needs in the program. Here are just a few highlights from the past year:

Part of my mission as assistant chair is to improve the *esprit de corps* among undergraduate students. One of the significant challenges in doing so is creating a space where students want to spend time. This year brought the renovation of C122, the IEMS Undergraduate Student Lounge. Neutral paint and mismatched furniture were replaced with a colorful and cohesive design, including a large whiteboard and a flat-screen video monitor to facilitate group work, collaboration, and innovation. So far it has been a hit! The student IIE Chapter Executive Board has also worked hard this year to involve more students, including sponsoring a football tailgate event in the fall to foster interaction among students and recent alumni, and fielding intramural teams that provide students an opportunity to get to know each other outside the

classroom. They have many more innovative ideas for the coming academic year.

Advising is undergoing an overhaul, initiated this year with the implementation of a group advising and orientation session for newly declared IEs, and continuing with the addition of four new full-time freshman advisers at the McCormick level. Our goal is to move advising away from mere course selection and toward more meaningful conversations about academic and career interests. Our alumni fill a valuable role as our students explore and evaluate career options and opportunities. If you are interested in mentoring students — in person, or by phone or email — drop me a line at jill.wilson@northwestern.edu.

Beginning this fall senior design returned to a two-course sequence, providing all students with a consistent senior design experience and additional time to work on their client projects. We are also collaborating with faculty and staff at Hong Kong University of Science and Technology and Koç University in Istanbul to facilitate study abroad opportunities for IEs. By establishing equivalencies between our courses and those of our partners abroad in advance, students can pursue study abroad with confidence about how their degree progress will be impacted. Stay tuned to hear about more ideas for collaboration with our international partners that can enhance the value of the study abroad experience for all of our students.

Jill Wilson
*Assistant Department Chair
for Undergraduate Studies*

An Interview with Gordy Hazen



Gordy Hazen

Gordon Hazen — an expert in decision analysis methodology, utility and preference theory, medical decision analysis, and cost-effectiveness analysis of medical treatment decisions — has been a valued member of the Department of Industrial Engineering and Management Sciences since 1972. This year, he begins a two-year phased retirement. We talked to Gordy about his time at McCormick and future plans.

Q: So, after 33 years in the department you're jumping feet-first into the bliss of retirement?

A: Well, not really. I'm going into a phased retirement. That means I get to sleep as late as I want without worrying about classes to teach, administrative responsibilities, or committee meetings to attend.

Q: Will you be sticking to research now?

A: Yes, research and whatever else may interest me. A lot will be catching up on projects that have languished because of other duties, as well as that bike accident I had last summer. Most of the projects involve the medical campus, and in particular Northwestern's transplant center. I also have medical cost-effectiveness software that needs updating. And there is my intro probability textbook, which is now available in electronic form but could use some revision. This is all

fun for me — I don't really plan to ever stop doing this stuff and fully retire.

Q: Now that you've got one foot out the door, any funny IEMS story you can share?

A: Didn't seem funny then, but there was the time when I was still an assistant professor, after I had started to do international folk dancing, that I ran into Al Rubenstein there. He recommended I should dance at least twice a week to get any good at it. Thanks, Al, but really I need to get tenure first!

Best email comeback to my attempt at humor:

Colleague: Remind me to talk to xxx next week.

My reply (1 minute later): Ok, talk to xxx next week.

Colleague reply: Thank you for reminding me.

continued on page 9

IEMS in the Community: Improving the Chicago Marathon

With support from Northwestern's Center for Engineering and Health,  IEMS professors Karen Smilowitz and Sanjay Mehrotra and students Mehmet Basdere and Colleen Ross are partnering with the Bank of America Chicago Marathon and Feinberg School of Medicine professors George Chiampas and Jennifer Chan to expand the capabilities of the Chicago Model, a gold standard for planning and medical coverage for mass participation events.

Mass participation events bring a host of significant planning and implementation challenges, particularly in heavily populated cities. In the early pre-planning phases, many of the factors that can significantly impact a race are unknown, race-day weather conditions being perhaps the best example. Extreme heat forced the cancellation of the 2007 Chicago Marathon in the middle of the race, and the bombings at the 2013 Boston Marathon brought a tragic new dimension to the issue of planning and managing mass participation events, and highlight the extreme challenges.

Following the 2007 Chicago Marathon, the race's directors and medical staff developed a holistic approach to mass participation event planning and management, referred to as the Chicago Model. The Chicago Model brings together all major organizations (e.g., race organizers,



Karen Smilowitz

fire and police departments, emergency management, and Red Cross) to coordinate preparation and response for the event and the surrounding areas impacted by the event. This integrated organizational structure is complemented with a comprehensive medical tracking system that allows users to monitor medical coverage in real time during the event.



Mehmet Basdere

The Northwestern/Chicago Marathon team hopes to expand the Chicago Model by optimizing decision-making for mass participation events using operations research methodologies; improving medical preparedness and response for mass participation events; and developing new robust and dynamic logistics and resource allocation models. These changes will lead to a more adaptive version of the Chicago Model to facilitate rapid response to incidents on the course.

"This has been a unique opportunity to engage faculty and students in an exciting collaboration that brings together research and practice in a new area," said Smilowitz.

First Cohort of MSiA Students Land Top Internships

This past summer the MSiA Class of 2013 spread across the country in various business sectors to fulfill their internship requirement. Their internships were at companies such as Bank of America and Facebook, with assignments such as sports analytics with the Cleveland Cavaliers.

Adam Evans (BS IEMS '12), a current MSiA student, interned at the headquarters of Cars.com in downtown Chicago. Evans' role was to go through millions of anonymous data sets to look for trends in consumer tendencies when shopping online for cars. He analyzed what cars people viewed and then what they subsequently purchased. He provided feedback, such as "Moms take less time-in-market than the average consumer," and "People who look at Fords on Cars.com are five times more likely to buy a Ford." The unique combination of data understanding and the ability to communicate his data analysis proved a valuable skill to the company. (To see an interview with Adam about his Cars.com internship, visit http://youtu.be/Eo9_TVNFg0g.)

In fall 2013 MSiA will graduate its first cohort, Evans among them. The 30 graduates began their 15-month journey in the analytics program with core courses designed to strengthen their industry skills, an eight-month industry practicum project, an internship, and lastly an industry capstone project. MSiA is proud of the students' and the program's successes.



Adam Evans

MSiA's first student cohort landed tremendous summer internships, including:

- Cleveland Cavaliers
- UBS
- Blizzard Entertainment
- Bank of America
- Crispin, Borgusky and Porter
- Cars.com
- Kaiser Permanente
- Roundarch Isobar
- Alpine Data Labs
- Nielsen
- PwC
- Facebook
- CME
- Salesforce.com
- Glyph
- E.A. Sports
- COSENIT S.A. (Corporación de Soluciones Energéticas S. A.)
- FTI Consulting
- Amazon
- Walgreens
- JPL
- Disney
- We Energies
- Deluxe
- Nokia
- CME
- TransUnion
- Redfin

IEMS 2013 Graduation

Hundreds of purple-robed undergraduate, master's, and PhD students graduated from the McCormick School of Engineering and Applied Science on June 20 and 21 as part of a weekend of festivities. At Northwestern University's 155th Commencement exercises at Ryan Field, speaker Mikhail Baryshnikov, a world-renowned dancer and Northwestern parent, focused on the power of the arts in his passionate, and often humorous, graduation address. "Once you figure out what you will do with your life — and eventually you will — work hard at it, just like you've been working here," Baryshnikov said. "Give it your time. Let it consume your thoughts."

In the 2012-13 academic year, IEMS awarded 16 PhDs to Kenan Arifoglu, Gillian M. Chin, Ashley E. Davis, Neda Ebrahim Khanjari, Jared C. Erickson, Steven M. Golbeck, Joon-Ku Im, Yan Jiang, Zhe Li, Aaron M. Lucas, Chan Seng Pun, Qifeng Shao, Ning Zhang, and Mengxiao Zhu. These graduates went on to academic and industry positions at places like Kraft, Massachusetts General Hospital, Twitter, the University of Illinois at Urbana-Champaign, and University College London.



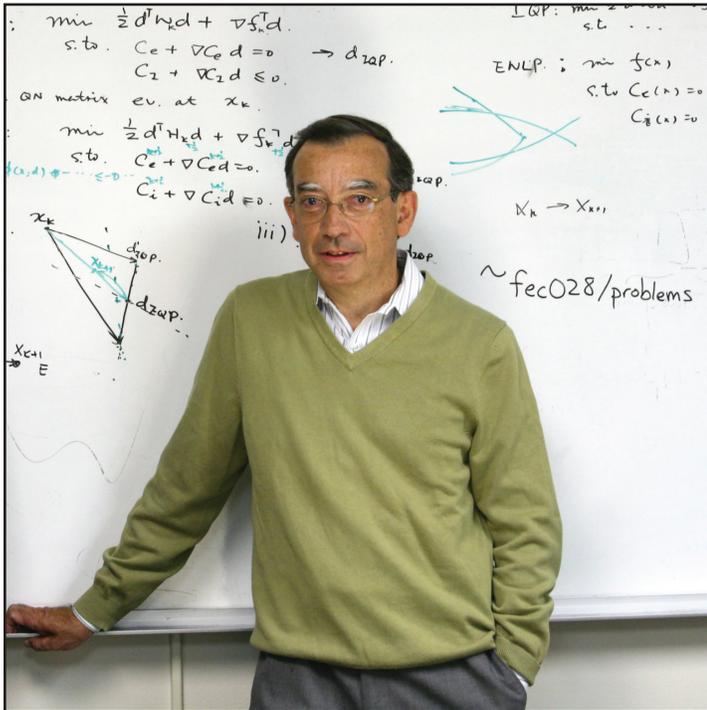
IEMS 2013 Senior Ceremony

On June 22, nearly 70 IEMS undergraduate students and their families celebrated graduation at the IEMS 2013 Senior Ceremony. In tribute to the graduating class, the event highlighted special student awards and achievements, and provided time for students, faculty, and family to connect.



‘Uncharted Terrain’: Optimizing Intelligent Systems

JORGE NOCEDAL TAKES ON RECOMMENDATION ALGORITHMS, VOICE RECOGNITION, IMAGE RECOGNITION IN GOOGLE PARTNERSHIP



Jorge Nocedal

If you’ve purchased something on Amazon, chances are you’ve experienced a recommender system. These systems — which suggest products based on a viewer’s known preferences — are increasingly prevalent and accurate in the Internet and consumer worlds; Netflix recently announced that three-quarters of movies viewed by its customers come from its algorithm-generated recommendations.

Still, intelligent systems like recommender algorithms, search engines, and speech and image recognition programs are far from perfect. (Consider how many times a search engine has failed to get the information you wanted, or how often Siri misses the mark.) Improving them requires optimization, and that’s where Jorge

Nocedal comes in. For more than a decade, Nocedal has advanced the tools of optimization that are fundamental for building intelligent systems — research that has recently led to an exciting partnership with Google.

“In the past people would associate optimization with things like production planning or transportation — finding the best way to manufacture or ship goods,” said Nocedal, Walter P. Murphy Professor of Industrial Engineering and Management Sciences. “What I’m doing is quite different. It’s uncharted terrain at the interface of industrial engineering and computer science.”

Earlier in his career Nocedal worked on weather forecasting algorithms; his research also spanned finance and applications

“In the past people would associate optimization with things like production planning or transportation — finding the best way to manufacture or ship goods. What I’m doing is quite different. It’s uncharted terrain.” *Jorge Nocedal*



of optimization in computer-aided design. In the late 1980s he created a widely used quasi-Newton algorithm for large-scale optimization known as L-BFGS. (“It’s a terrible acronym, an unwanted acronym,” he said.) His papers about L-BFGS received more than 2,000 citations and have attracted the attention of researchers around the world, including at Google, where L-BFGS is used in a variety of data science applications.

Four years ago, Google researchers contacted Nocedal about partnering on Google’s voice recognition systems; while L-BFGS had been working well, a researcher said, the company needed more powerful algorithms. Nocedal learned that Google’s voice recognition algorithms utilize 1 million free parameters and tens of millions of pieces of voice-recorded information — one-millisecond snippets of speech with recognizable sound wave patterns. “The scale of this project is enormous, and everything is done in parallel in the Cloud, adding to the complexity,”

he said. “It is way beyond anything I have done before.”

Since then the collaboration has flourished. Nocedal and his students have worked on optimization algorithms for recommender systems, speech recognition, and image recognition. Google alerts Nocedal of problems or bottlenecks in their research; Nocedal works on it with his students and proposes new ideas, which are published in the scientific literature. He travels often to Silicon Valley. “They continue to give me increasingly difficult problems,” he said. “It stimulates my research at McCormick, and it drives nearly all of my PhD students’ dissertations.”

The most exciting part of this research is its newness, Nocedal said. “These are immensely difficult problems that require a team effort, but solving them will have tremendous impact,” he said. “There are so many unknowns. How far can algorithms take us in building intelligent systems? Will we hit a wall? It is intellectually deep and exciting.”

McCormick

Northwestern Engineering

Applications Invited For a Faculty Position

We invite applications for a full-time, tenure-track faculty appointment at the assistant to full professor level to begin September 2014. Applicants should hold an earned PhD or be near completion of their doctoral studies with demonstrated research potential in the domains of big data analytics, optimization, stochastic modeling or simulation. Industrial experience is desirable; a strong commitment to rigorous and relevant research is essential.

The department offers an undergraduate program, a PhD program, a full-time professional master's degree in analytics, and a part-time professional master's degree in engineering management. Both the undergraduate and graduate programs have been consistently ranked among the top 10 by U.S. News & World Report.

Applications must be submitted electronically to www.iems.northwestern.edu/career/. Materials to be uploaded include a cover letter and curriculum vitae detailing educational background, research, and work experience. Applicants at the assistant professor level should also include a statement of their current and future research program. Candidates should also provide letters of recommendation from three references to be mailed or emailed directly to the address below. To receive full consideration, all materials should be received by December 1, but earlier application is encouraged.

Chair, Faculty Recruiting Committee
Department of Industrial Engineering and Management Sciences
Northwestern University
2145 Sheridan Road, Room C210
Evanston, IL 60208-3119
facultysearch@iems.northwestern.edu

Northwestern University is an Affirmative Action/Equal Opportunity employer. Women and minorities are encouraged to apply. Hiring is contingent upon eligibility to work in the United States. It is the policy of Northwestern University not to discriminate against any individual on the basis of race, color, religion, national origin, sex, sexual orientation, marital status, age, disability, citizenship, veteran status or other protected group status.

Gordy Hazen, *continued*

But you can't beat the IEMS undergrads for supplying funny moments.

Most recently there was the student I won't name who enrolled in my IE 202 class, but was mistakenly attending IE 315. It seems he had to miss the first class of the quarter and couldn't access CAESAR, so he Googled for the IE 202 class location and time and, without realizing it, came up with information from a prior quarter — indicating a room and time for 202 where IE 315 was currently being held. He attended 315 without realizing that Ohad Perry was not me. He nevertheless kept up with IE 202 via exercises and reading quizzes on Blackboard. This went on for three weeks! It was only when the first classroom test was held in 202 that he realized his mistake — he showed up to the IE 315 class only to find there was no test!

But the best story occurred a few years back in IE 202. In each class I distribute a sign-in sheet with 50-plus slots labeled A, B, C, and so on, in order to give me an alphabetical list of students attending that day. One day I noticed the name "Elvis" under one of the E slots. Funny, I thought. The next class period happened to be the day before Thanksgiving, with maybe 10 students attending. Among them were a string of female students sitting together in the second row, including Lauren Gochman, Laura Riegel, Jane Guertin, Stephanie Olsen, and Jaema Berry (and I think others — apologies for forgetting). I mentioned that perhaps no one had noticed our famous visitor the prior class — Elvis! That got a chuckle, which seemed to continue off and on from row two during the entire class period. At the end of the period, I received the attendance sign-in sheet to find not 10 names, but a completely full sheet of celebrity visitors: John F. Kennedy, Usher, Marilyn Monroe, Margaret Thatcher, and more, including Big and the

entire cast of *Sex and the City*. All entered alphabetically! Probably the most creative group effort in any of my years of classes at NU. My only regret is that I failed to keep the sheet. If I still had it, I would frame it.

Q: You've spent your career in decision analysis, utility, and preference modeling; medical decision analysis; and cost-effectiveness analysis of medical treatment decisions. In your mind, what's your greatest research achievement to date?

A: That's really for others to judge in the coming years, and will depend on what more I can do to follow up in the coming years. I'm pretty fond of my stochastic tree work and accompanying software for medical cost-effectiveness. My work on information value as a sensitivity measure has gotten some notice. My two papers resolving the long-standing problem of multiple internal rates of return have gotten some attention and follow-up — ironically, because they fall outside of my research area, and came out of me teaching IE 488. I do like my intro probability book. I'm also pretty fond of the area statement I devised while serving as decision analysis area editor for *Operations Research*.

Q: What big question do you hope future IEs will answer?

A: I want to know whether my Erdős number is finite. I would also like someone to tell me where I put my glasses.

Studying Networks to Help Women Succeed in Science

RESEARCHERS USE FACEBOOK, LINKEDIN, AND INTERVIEW DATA TO CONNECT MENTORS AND MENTEES

For women in science and research, finding a network of colleagues in their specialized area might be difficult: relevant researchers and activists can be spread across generations, cultures, and continents. Finding a mentor within this group proves particularly difficult for young women and minorities.

IEMS's Noshir Contractor discussed his network research this past winter in a presentation titled "Understanding and Enabling Networks Among Women's Groups in Sustainable Development" at the American Association for the Advancement of Science (AAAS) annual meeting in Boston in February. His presentation was



Noshir Contractor

"We wanted to find out, who are the leaders? Who are the brokers? Who brings people together?"

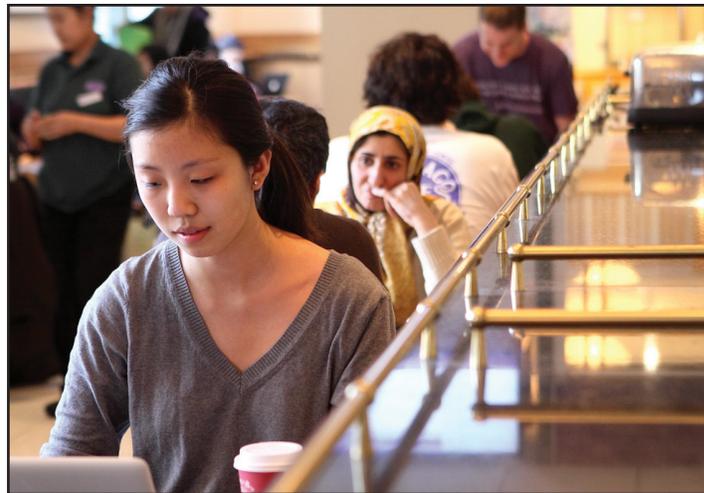
Noshir Contractor

part of the symposium "A Tale of Two Networks: Connecting the African Drylands, Rio de Janeiro, and Women."

Contractor is using his network expertise to help women succeed in research.

He has examined both the determinants that help women persist in networks and the role of social networks among women who work in the specialized area of gender and sustainability. Along with Gillian Bowser, a research scientist at Colorado State University, his team is working to implement a social media recommender system that will enhance cross-cultural mentoring.

Contractor studied members of the National Science Foundation-funded Global Women Scholars Network (GWSN), many of whom have attended the World Congress on Sustainable Development, which meets every 10 years (1992, 2002, and 2012, to date). The GWSN focuses on women who participate in environmental sustainability through research, scholarship, mentoring, and community-based action. GWSN also is interested in how sustainability differentially affects women's roles and participation in science and policy around the world.



Finding a network can be difficult for women in science and research.

The network is unique in that it involves scientists, policymakers, analysts, and activists from all ages and regions of the world. But that makes collaboration and mentoring more difficult — particularly for younger women looking to engage with the old guard. Contractor and his research group attended the most recent conference and conducted one-on-one interviews with attendees to determine their social makeup.

"We wanted to find out, who are the leaders? Who are the brokers? Who brings people together?" Contractor said. Contractor found obvious groupings among people from developed countries and found a need to create an opportunity for younger women and minorities to enter those groupings.

Using that data and data from the GWSN's Facebook and LinkedIn pages, Contractor is building a social media recommender system that would help connect mentors and mentees, specifically for less-established groups. He has previously built similar systems for scientific collaborations; now he is determining how he can alter his algorithms to also work for recommending mentoring relationships.

"Our system will ultimately enhance cross-mentoring of women among academics, policy leaders, and students in the globally scaled knowledge network for sustainability," Contractor said. "It also will help us understand how to promote mentoring among networks in other interdisciplinary career fields."

Department News, *continued***STUDENT NEWS**

Two project teams were chosen by IEMS faculty to receive the Charles Thompson Senior Design Award for best team projects in spring and winter quarters. The students were **Ted Bakanas, Ashley Greenwell, Sari Victoria Nahmad, Cristina Lamas, Taha Kagadawala, Evan Spangenberg,** and **Jessica Williams.**

Seven undergraduate students received IEMS Academic Excellence Awards in the 2013 graduating class: **Gregory Budd, Jia Hui He, Keun Ho Park, Fangzheng Qian, Xiongfian Sail Wu, David Shiyuan Zhou,** and **Benzheng Zhu.**

Undergraduate student **Gregory Budd** was awarded the Arthur P. Hurter Award for Outstanding Industrial Engineering and Management Sciences Graduating Senior at the Senior Ceremony in June. The criteria for the Hurter Award include academic excellence, independent project work, and leadership.

Two undergraduate students received the IEMS Department Award: **Ping Yun Teresa Chen** and **Sari Victoria Nahmad.** The IEMS Department Award recognizes graduating seniors who have excelled in academics, leadership, or made other contributions to the department as nominated by the faculty.

First-year PhD student **Anh Bui** received the Benjamin K. Sachs Graduate Fellowship in the area of statistics for enterprise engineering, an award incentive offered to exceptional applicants that carries a stipend supplement and research funding.

Luis de la Torre and **Timothy Sweda** received Dissertation Year Fellowships from Northwestern's Center for the Commercialization of Innovative Transportation

Technology (CCITT). These highly competitive awards are given to PhD candidates who are in their final year of dissertation completion and are focusing on transportation research.

Edwin Shi and **Sophia Sullivan** were joint recipients of the Outstanding Teaching Assistant Award for 2012-13.

Lingfei Li won the 2012 Nemhauser Dissertation Prize for his thesis, "Stochastic Modeling in Commodity Markets and Optimal Stopping of Symmetric Markov Processes." The Nemhauser award is given annually to the best doctoral dissertation in IEMS.

IEMS students **Ashley Greenwell** (cross country) and **Arthur Omilian** (football) were among 48 Northwestern student-athletes from 14 Wildcats programs to earn Big Ten Distinguished Scholar awards.

2012 BS graduates **Alex Huang, Alex Ma, Sara Schmidt, Nancy Xu,** and **Brandon Zhang** received an honorable mention for the Undergraduate Operations Research Prize from the Institute for Operations Research and the Management Sciences for their senior design project, "Integration of Real Time Data in Urban Search and Rescue." The project was advised by Irina Dolinskaya. Twenty-two nominations from around the world were submitted with one first place and two honorable mentions awarded.

Undergraduate student **Gabrielle Ruiz-Funes** was selected by IEMS students to receive the Senior Leadership Award.

DEPARTMENT HAPPENINGS

Irina Dolinskaya gave birth to a baby boy, Peter Dolinskaya Tavares, on January 29.

In June, **Chris Bray** took a position at Northwestern's Kellogg School of Management as the associate director of academic affairs for their Executive MBA program. While in IEMS, he assisted in the 2012 launch of the MSiA program.



IEMS said goodbye to longtime MEM associate director **Sue Fox**, who retired in July.

Fox brought impeccable professionalism, spirit, and personality to the program, shepherding hundreds of students throughout the years. She will be missed by faculty and students alike.

After two years, graduate coordinator **Dominique Glass** took a position in the human resources department of the Federal Reserve Bank of Chicago. During her time in the department, she expanded and improved the PhD student recruitment weekend. We wish her the best of luck.



Lindsay Montanari joined IEMS during summer quarter as the associate director of the MSiA program.

She holds a BA in English and fine arts from the University of the South and an MS in fundraising management from Columbia University. Most recently she worked at Columbia University's School of Engineering and Applied Science as the associate director of alumni relations.



Elizabeth Rossman joined the Master of Engineering Management (MEM) program as associate director. Rossman brings

with her skills in higher education, student support, and marketing. She holds master's degrees in media studies and writing and pedagogy, and a bachelor's in language, writing, and editing.



Jo Ann Yablonka joined IEMS in July as the PhD program coordinator. She brings with her over a decade of

experience in event planning, office management, and customer service. She holds a degree in business and fashion merchandising from Western Michigan University.



Follow us:
www.facebook.com/NUIEMS

Editor: Sarah Ostman
 Design: Amy Chanson Design

NORTHWESTERN
 UNIVERSITY



McCormick
 Department of Industrial Engineering
 and Management Sciences
 Robert R. McCormick School
 of Engineering and Applied Science
 Northwestern University
 Technological Institute
 2145 Sheridan Road
 Evanston, Illinois 60208-3100

Nonprofit Organization
 U.S. Postage
 PAID
 Northwestern University