ORIE

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ORIE AWARDED UNPRECEDENTED ACCOLADES AT INFORMS

JIM DAI RECEIVES ACM'S SIGMETRICS ACHIEVEMENT AWARD

Jim Dai

Jim Dai, Leon C. Welch Professor of Engineering in ORIE, is the recipient of the 2018 Sigmetrics Achievement Award. Given annually by the special interest group for computer systems performance evaluation within the Association for Computing Machinery (ACM), the prize recognizes significant, long-lasting contributions by a senior researcher to this field. Dai accepted the award and gave a lecture on "Steady-State Approximations" at the group's June conference in Irvine, Calif.

ORIE Director Shane Henderson is not surprised. "Jim Dai is a leading researcher in stochastic modeling, with important contributions across the spectrum from theory to applications," he said. "He has several 'greatest hits' in his research papers, and many of his papers are required reading for researchers in applied probability."

Dai has been moving the field of stochastic processing networks forward for nearly three decades, since he earned his Ph.D. in mathematics at Stanford University in 1990. His work has helped organizations such as hospitals, airlines, manufacturers, data centers, and ridesharing companies to manage their limited resources—frequently fixed assets—to accommodate fluctuating, uncertain loads.

"How do we design operational strategies so that the maximum load can be served?," Dai summed up his driving question. "Secondly, I've done work on performance analysis, determining how long it will take to finish and deliver a product to customers."

The Sigmetrics award committee considers Dai's key contribution to be "a conceptual breakthrough," according to chair Jean Walrand, professor emeritus in electrical engineering and computer sciences at UC Berkeley.

"Jim Dai's work in analyzing the stability of complex queueing networks makes precise the intuitive result that if a network tends to empty it must be stable," Walrand explained. "The technical device is to consider the network evolution 'zoomed out' so that the detailed fluctuations disappear and only the average drift remains. This 'fluid limit' of the network is usually easy to study and, if it empties out, one concludes that the original network is stable. This deceptively simple-sounding result is in fact a mathematical tour de force that required a remarkable mastery of subtle techniques for Markov processes. This result, which bridges intuition and technical sophistication, is one the most significant achievements in the theory of queuing networks."

For the first decade of his career, Dai focused in particular on applications in semiconductor manufacturing, cooperating with industry leaders such as Intel. More recently, he has shifted his attention to hospitals. In Singapore, for example, he has worked with National University Hospital to reduce boarding time—a vulnerable period during which patients have finished their emergency room treatment but are waiting to be assigned to a ward. Next Dai, originally from Suzhou, China, hopes to help further the use of data science in his home country, where companies have only in the past five years come to recognize the potential of OR tools.

To this end, Dai is spending this year at the Chinese University of Hong Kong, Shenzhen. As Presidential Chair Professor and co-director of the Institute for Data and Decision Analytics (iDDA), he has been helping to grow the university's new branch campus in a former fishing village—now booming with more than 12 million people—on the outskirts of Hong Kong.

Dai, who joined Cornell from the Georgia Institute of Technology in 2012, brings with him the experience of ORIE's own recent transformations: "We've grown in the past five years from a very focused group of disciplines to be very broad, covering many aspects of data science," he explained. "So I'm using my expertise to help build iDDA, which embraces interdisciplinary research and education in data, models, and decisions in the big data era. It's very exciting."

With the same passion and energy, Dai has also been making his mark as editor-in-chief for *Mathematics of Operations Research* (MOR). Earlier this year, the journal added a new thematic area, Learning Theory, only the second time it has done so in 50 years. "I'm creating this area as a reflection of the reality that computer science, OR, statistics, and operations management are emerging and fusing together. MOR, one of the INFORMS journals, is in an excellent position to facilitate this fusion," Dai said.

For Henderson, such professional engagement typifies Dai's best qualities: "Not only is Jim a high-impact researcher, he is also a faculty member with vision and a strong sense of where our field can go," he said. "The set of past winners of the Sigmetrics Achievement Award reads like a 'who's who' of leading lights in the field, and it's no surprise that Jim is joining that exclusive group. He's a gem."

By Olivia M. Hall