ORIE

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ORIE AWARDED UNPRECEDENTED ACCOLADES AT INFORMS

WITH ROOTS AT CORNELL, LYFT TAPS INTO ORIE'S EXPERTISE

Ridesharing company Lyft not only had its beginnings at Cornell, but several of the university's OR faculty and grads are helping to drive its future. Co-founded by John Zimmer '06 and Logan Green in 2012, the business grew out of Zimride, a platform they had started at Cornell to connect students for long-distance rides. Since then, Lyft's app has made its way onto the smartphones of some 23 million passengers per year, requesting rides in cities across all 50 states. Add to that Lyft's recent acquisition of Motivate, the largest bikesharing provider in North America, and the company offers a veritable playground of OR applications.

"All the core challenges of running this business and making it efficient—such as routing or matching riders to drivers—boil down to different flavors of OR problems that people have been looking at for a long, long time," said Garrett van Ryzin. The Charles H. Dyson Family Professor of Management splits his work between Cornell Tech and Lyft, which he joined after two-year stint with competitor Uber.

And by all accounts, now is the perfect time for OR to focus on this industry. "Ridesharing is at a Goldilocks point," said ORIE Assistant Professor Siddartha Banerjee. "Unlike communications and social networks, it is not too big to preclude one person from having significant impact on the way we think about it overall, but unlike crowd science platforms and non-monetary markets, it is big enough for any improvement we make to lead to significant improvements in everyone's lives."

Banerjee worked with Lyft's data science team to help design early versions of its dynamic pricing algorithm—the analog of Uber's surge pricing—while he was a postdoc at Stanford in 2014. Now he serves as a technical consultant to the Marketplace Labs group, where most of the OR Cornellians involved with the company have been making their mark.

Headed by van Ryzin, the Marketplace Labs team conducts applied research and pilot studies to sound out new ideas on how to improve core functionality around dispatching, shared rides, matching, pricing, and future applications with autonomous vehicles. One project, for example, is exploring the limits of dynamically adjusting ride prices based on supply and demand. "Dynamic pricing is one of the hallmarks of how a lot of ridesharing operates," van Ryzin explained, "but it's also something that consumers really dislike. We're looking at whether there are alternatives we can use to improve the experience."

David Shmoys, on the other hand, has spent the bulk of his time thinking about different ways to match passengers requesting cars with available vehicles. Having gained visibility through his previous work on bikesharing, the Laibe/Acheson Professor of Business Management and Leadership Studies in ORIE and the department of computer science served as a consultant to Lyft during a sabbatical semester at UC Berkeley in 2018. "The effective use of resources, especially in Lyft Line, the multiparty rideshare product, presents challenges beyond what optimization models handle well," Shmoys said. "There's a trade-off between making sure people don't go too much out of their way and making sure the car is used to its capacity. And this is happening in a world of a stream of arriving requests—in many cases geographically dispersed and with all kinds of bursty behavior."

Shmoys will likely spend the second half of his sabbatical next semester working with Lyft's new Bikes and Scooters program. It has been rolled out since September in a handful of cities and expanded in November with the purchase of Motivate. Shmoys will

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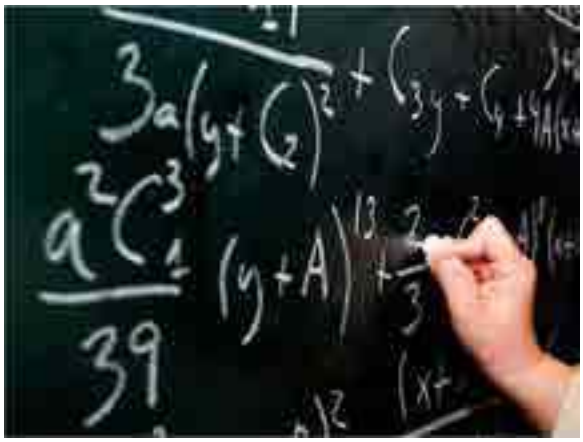
OPERATIONS RESEARCH ADVANCES THROUGH COLLABORATION AT CORNELL



Cornell ORIE has a long and distinguished record of leadership and innovation in the evolving field of data-driven decision making.

In recognition of the rapidly increasing value of operations research in industry, ORIE is establishing the Operations Research Advances through Collaboration Center (ORACL) to accelerate need-driven innovations in OR through sustained forward-looking collaborations with a small number of enterprises.

ORACL is a membership-based center, with participating enterprises making annual gifts to the School of Operations Research and Information Engineering designated for ORACL. Each participating enterprise shall designate an employee to serve on ORACL's advisory board, which proposes and prioritizes ORACL projects. Members also attend two annual workshops—one at the Ithaca campus and one at Cornell Tech in Manhattan—at which ORIE faculty will provide updates on the latest developments of OR sub-fields including machine learning, simulation, and optimization. At these workshops completed and on-going projects will be discussed. Additional interaction of member companies with ORIE faculty and students is encouraged and will be facilitated by ORIE.

Once the ORACL founding member companies are in place and the initial round of projects are selected, ORIE will seek additive funding from the National Science Foundation under the NSF University Cooperative Research Centers (IUCRC) Program.

For more information on ORACL or if you know of a company which might be interested in partnering with us, please contact Brenda Dietrich at OR_collaboration@cornell.edu or 607-255-5388.

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be joining his former advisee Daniel Freund, Ph.D. '18, who is completing a fellowship with Lyft in New York before starting a faculty position at MIT next year.

While Freund wrote his dissertation in applied math on bikesharing, "the fact that Lyft's scooters are free-floating, not station-based, creates a whole range of interesting challenges for the operation of such a system that I didn't really encounter in my work with Citi Bike," he said. Because the company controls its own bikes and scooters, it also becomes responsible for all the maintenance, refueling or recharging, and overnight storage (in the case of scooters, as required by some cities where they are licensed) that Lyft car drivers usually perform.

Van Ryzin expects that "even more OR will be needed" to solve similar fleet management problems as autonomous vehicles transform the transportation industry over the next five to 10 years. (Lyft is currently running a pilot project with a few dozen self-driving cars in Las Vegas.)

While the researchers help move the industry forward, they in turn reap benefits for their academic work. "Mathematical models will always be fundamentally limited in depicting the real world," said Freund. "But the most important research skill I've gained through my industry collaborations is the distinction between real-world complexities that matter—that affect what optimal decision-making should look like—and those that do not—ones that increase complexity, but don't actually change the right course of action."

And then, of course, there is the satisfaction of having made an impact: "To see an idea live not just on a piece of paper but see it on the streets around you is a wonderful feeling," Shmoys said.

By Olivia M. Hall