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Operations Research and Information Engineering

ORIE

GOOGLE'S SEARCH FOR TALENT LEADS TO ORIE

I n Google's quest for OR talent, Cornell is a top search result. At least a dozen ORIE alumni (at both the undergraduate and graduate levels) have joined the famous technology company in California on its mission "to organize the world's information and make it universally accessible and useful."

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While the Cornell grads are at work on a variety of Google's many products—which include cloud computing, advertising, software and hardware—they are heavily concentrated in the Operations Decision Support (ODS) team. "We've had great success hiring talent from Cornell," said Thomas Olavson, director of ODS at Google.

The team of operations researchers and data scientists reports into the "technical infrastructure" (TI) product area, which plans and operates all of the company's compute, network, and storage assets. Focusing on the physical components that make up Google's cloud infrastructure in more than a dozen regional data centers around the world, ODS provides model-based decision support for delivering sufficient capacity to its internal customers—products such as YouTube, Apps or Cloud—and their growing number of end users. "That includes optimizing the supply chain of servers and network hardware, forecasting and planning long-term data center capacity, optimizing server-network deployment lifecycles and deployment plans, and maximizing utilization of our compute capacity through oversubscription and statistical forecasting," Olavson explained. "No one has really managed compute capacity at this scale before. In cloud infrastructure, we're defining a new field of OR as we go, much like supply chain or revenue management was in the early 90s."

Within the team, ORIE grads are tackling these challenges from several different angles. Quantitative analyst Kenneth Chong, Ph.D. '16, for example, specializes

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**— Thomas Olavson
Director of ODS, Google**

in inventory management and projects how many raw materials—such as hard drives, RAMs, and flash drives—to hold at manufacturing hubs in Atlanta, Ga., and Amsterdam, Netherlands, which assemble computers and ship them to data centers. (John Khawam '00, M.Eng. '01 also works with Chong, soon to be joined by James Dong, Ph.D. '18.)

Senior program manager Chris Fry '94, on the other hand, leads the Resource Efficiency Data Science (REDS) team, to which Juan Li, Ph.D. '12, contributes as a data scientist. "We provide analytical support to help design a more efficient 'Google of the future' that enables our computing resources to be shared as efficiently as possible across the company," Fry said. The team develops forecasting and capacity planning models, as well as tools and metrics to support the initiatives. "The biggest challenge is to find solutions that are easily scalable across locations and resource types," Li said.

Her classmate Chao Ding, Ph.D. '12 started out in ODS and forged deep collaborations with engineering teams

ORIE Ph.D. alums Kenneth Chong, Ph.D. '16, and Nick James, Ph.D. '15, outside Google's Mountain View, Calif. headquarters.

Google's employees work hard and play hard. Weici Hu, Ph.D. '17, takes a break to play ping pong.

around efficiency problems related to the core compute system that underlies Google Cloud. "The system manages the scheduling of software applications onto hardware servers, software applications' life cycle events, resource consumption and performance," said Ding, now the data scientist tech lead of the Core Compute Analytics team that eventually grew out of these efforts. (Weici Hu, Ph.D. '17, recently joined the team, as well.) "We are working to improve efficiency and performance of this core compute system through data analytics, predictive modeling, and system simulation. There is a diverse set of interesting problems to work on, so it's hard to get bored."

Ding's sentiment is echoed by his fellow alumni, who—besides Google's legendary perks, such as free gourmet meals throughout the day—appreciate the "atmosphere of creativity and challenge" that company founders Larry Page and Sergey Brin envisioned. "We are working on exciting problems that

represent the future state of computing at one of the most high-tech companies in the world," said Fry. "It's high impact, and it's fascinating." Indeed, project impacts on the order of hundreds of millions of dollars are not unusual.

At the same time, the human scale matters. "People at Google really care about users and doing the right thing," said Edmund Lo, M.Eng. '12, lead program manager for YouTube Privacy. "The culture here fosters respect and understanding of others from multiple perspectives, which I wholly appreciate." His colleagues similarly described a diverse workplace in which friendly individuals are passionate about their work and learn from each other.

And so ORIE alumni fit right in. "Cornell is one of the top OR programs, so grads typically have the very high technical caliber of OR, stats, and coding skills needed to pass the interview process for data scientists at Google," said Olavson. "Also, every Cornell grad I've worked with has a genuine curiosity and desire to learn and explore—a great asset for a data scientist or operations researcher. I've never met a Cornell grad I didn't like."

By Olivia Hall

Juan Li, Ph.D. '12, and Chris Fry '94 relax in one of Google's game rooms in Mountain View.