

Optimizing Capacity for Demand

Paul College researcher uses data analytics to solve highly complex problems

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ASSISTANT PROFESSOR OF DECISION SCIENCES MELDA ORMECI MATOGLU STUDIES “DRIFT CONTROL,” WHICH REFERS TO THE DIFFERENCE BETWEEN RATE OF SERVICE AND DEMAND.

Airline scheduling consists of several major planning challenges: building a flight schedule, assigning aircraft to each flight leg, assigning a route to fly, and assembling cockpit and cabin crews to staff it. Any one of these tasks poses a challenge, but integrating them into a monthly, unified system can frustrate the best of planners.

In 2017, assistant professor of decision sciences Melda Ormeci Matoglu and her co-authors rocked the data analytics world with their solution to the unified flight system problem. Ormeci Matoglu's study measured countless permutations and, accounting for all complex aviation rules — ranging from minimum connection times to maximum landings a crewmember can do in a day, to rules governing location and flight patterns — and arrived at a formula for getting planes and crew in the air, keeping them there, and saving money.

Since then, Ormeci Matoglu has turned her eyes from the friendly skies toward the more earthy matters of how companies can manage capacity for minimal cost.

“Many industries face the problem of managing capacity in the face of unpredictably varying demand,” she says. “For example, adjusting the number of manufacturing lines to meet outstanding orders, determining the staffing levels at a call center, or deploying web servers to handle internet traffic.”

The name of the game here is “drift control,” which refers to the difference between rate of service and demand.

“In the airline studies, I looked for good solutions. In the drift control studies, I’m looking for optimal solutions to minimize the long-run average cost of adding capacity versus losing customers who tire of waiting in line, being on hold, or queuing up for server space,” she says.

Rather than reactively hiring and firing staff or investing heavily in more equipment or technology every time demand spikes or dips, managers can use Ormeci Matoglu's formula to automatically switch to higher or lower production rates to meet fluctuation in demand.

Best of all, she says, “Our solution removes the guesswork in terms of the optimal way to manage job lines or interactions, so now managers can use our results, regardless of what industry they’re in.”

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