An algorithm may have helped slow the spread of COVID-19 in Greece

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Aprescriptive computer program developed by the USC Marshall School of Business and the Wharton School of Business at the University of Pennsylvania and used by Greece to identify asymptomatic COVID-19

infections in travelers may have slowed the virus's spread through its borders, a new study indicates.

"It was a very high-impact artificial intelligence project, and I believe we saved lives by developing a cutting-edge, novel system for targeted testing during the pandemic," said Kimon Drakopoulos, a USC Marshall assistant professor of data sciences and operations and one of the study's authors.

In July 2020, Greece largely reopened its borders to spare its tourism-dependent economy from the devastating impact of long-term shutdowns amid COVID-19.

Greece collaborated with USC Marshall and Wharton to create "Eva," an artificial intelligence algorithm that uses real-time data to identify high-risk visitors for testing. Evidence shows the algorithm caught nearly twice as many asymptomatic infected travelers as would have been caught if Greece had relied on only travel restrictions and randomized COVID testing.

"Our work with Eva proves that carefully integrating real-time data, artificial intelligence and lean operations offers huge benefits over conventional, widely used approaches to managing the pandemic," said Vishal Gupta, a USC Marshall associate professor of data science and operations and another of the study's authors.

The joint study was published in the journal *Nature*.

One phone call kickstarts COVID testing algorithm in Greece

The Eva project began in summer 2020 when Drakopoulos, curious

about Greece's announcement that it was reopening its borders, sent an email to Prime Minister Kyriakos Mitsotakis asking questions about the country's plan and volunteering his help.

Within a few hours, Drakopoulos received a reply directly from Mitsotakis inviting him to a meeting.

To make it official, USC Marshall and Wharton School researchers—along with AgentRisk founder and CEO Jon Vlachogiannis—formed a partnership with Greece to develop Eva for health monitoring in the tourism-dependent country. The country had a limited supply of COVID tests—an experience shared across the globe at the time due to supply chain issues—yet had to identify likely infected travelers who came through any of the 40 different entries on its borders.

After months of design, development and testing with the Greek COVID-19 scientific task force, the researchers launched Eva.

Eva helped Greek authorities sort through massive amounts of data provided by tourists, such as where they planned to stay and visit, as well as the demographics of each traveler. Researchers then programmed Eva to sift through the information and develop profiles of the travelers who were likely infected but asymptomatic and needed testing.

"At the beginning of the cycle, travelers interested in going to Greece fill out a form online," said Gupta. "They share information like where they've been before, demographic information and their travel itinerary. Based on that information, we—and Eva—were able to recommend who should be tested."

Eva algorithm proves impressive alternative for test-

strapped countries

Throughout the summer of 2020, certain cities and regions were experiencing spikes while others were not. Eva took these demographic differences and the traveler's disclosed information into account and pointed Greek health authorities to the travelers with the highest potential of infection for testing.

To prevent "blind spots", the system also pointed authorities to test travelers for which they had limited data. This was critical for reinforcing Eva's accuracy, which improved over time, the research showed.

With Eva, Greece tested about 17% of the estimated 41,830 households arriving in or passing through the country every day and nearly doubled the number of infections that a typical randomized testing approach would have captured.

"Given that randomized testing requires a large testing supply, Eva offers an impressive alternative," Drakopoulos said, adding that he was inspired to reach out to Greece given his prior data research on epidemics. Some of the main ideas of Eva's underlying model are similar to ones used by digital advertisers to place ads on social media.

More information: Bastani, H. et al. Efficient and targeted COVID-19 border testing via reinforcement learning. *Nature* (2021). doi.org/10.1038/s41586-021-04014-z

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