

# RISE OF THE MACHINES

USING ARTIFICIAL INTELLIGENCE TO PREDICT RECESSIONS— IS IT BETTER THAN THE CLASSIC METHODS?

If you've ever gone to the Amazon.com website and viewed something you might like to buy—say, a backpack—you've probably seen the familiar prompt: "Customers who bought this item also bought . . ."

Click on an Under Armour backpack, for instance, and Amazon will present you with a full description of that product—plus a lineup of dozens of backpacks from other companies that you might like better.

This is how Amazon uses its massive stores of data on previous customer purchases to nudge you closer to your own purchase—or, ideally, to buy even more stuff. The company's sophisticated modeling software "knows" that customers like you, who have looked at that Under Armour backpack, often ended up buying something in a similar vein. It is using data on past behavior to predict what you might be most inspired to buy today.

This phenomenon—predictive modeling using computers that "learn"—applies across a huge array of fields. Jeremy Garbellano (right), a recent UO graduate, was especially intrigued with how the concept applies to economic predictions.

Now, thanks to his deep research and analysis as a student, he has landed a job at Amazon as a financial analyst.

For Garbellano, it all started in the late 2000s, as he watched with dismay as friends struggled to find jobs following the collapse of the housing market. It was the beginning of his fascination with boom-and-bust cycles in the economy.

"Many were underemployed or unemployed. Those who did find work were the first to be laid off," said Garbellano, who got his degree in economics in 2016. "It was amazing to me that your job prospects could really depend on whether there's a recession when you graduate."

Garbellano majored in economics because he wanted to understand the 2008–9 financial crisis. Now he's distinguished himself for his analysis of the tools available to experts for predicting the next one.

In identifying or predicting periods of recession and growth, economists have long relied on mathematics and statistics. But Garbellano believes these approaches can be improved with an assist from some of the latest advances in computer science.

Computer scientists are adding new tools to the economic forecasting toolkit. They're writing computer programs that run on artificial intelligence—the idea that a machine can "learn" to produce better and better results for you. It's all based on sophisticated calculations called algorithms that the computer performs to make predictions.

For his honors thesis, Garbellano tested eight of these "machine learning" programs and also compared them to traditional methods such as "logit-probit regressions" and "Markov switching models." He measured the performance of each in

"nowcasting" a recession—that is, determining whether one is happening in a given time window, based on real-time data.

Using the period from 1980 to 2014 for his project, Garbellano assessed how well the various methods identified ups and downs in the economy. For historically relevant data, he used statistics from that period, including payrolls, industrial production metrics and personal income data.

Garbellano found that a machine-learning method called "k-nearest neighbors" was the best for predicting recessions. It's based on charting a number of known data points, such as recent monthly economic upturns and downturns; by add-

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ing another data point—say, the current month's economic activity to date—one can predict whether the month will end as one of growth or decline based on the data point, or points, closest to the one added.

Although he didn't compare the new and old approaches head-to-head, Garbellano found merit in a traditional method called "logistic regression." In fact, he concluded that taking into consideration the results from numerous forecasting approaches—old and new—could be best for trying to predict something as complicated as the next recession.

One thing he didn't predict, however, was getting a job at Amazon.

"Amazon is a company that is awash in data and, in finance, I interact with different data every day," he said. "I have a great set of tools to use data more rigorously than many people who are trained in traditional business programs." —MD

