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AI can help us better predict severe storms in a changing climate

By Daniel T Cross on July 11, 2019

Best Practices   Climate Change   Wind

It's difficult to make predictions, especially about the future, the popular quip goes. The same also applies to the weather. Because weather is influenced by a variety of factors, making accurate predictions about it can be a challenge.

That's particularly true in the face of climate change, which is wreaking havoc thick and fast with traditional weather patterns, including bringing tropical-style heatwaves to temperate climates.

For their weather forecasts meteorologists rely on computer models and various up-to-date data such as air temperatures and air speeds. They also track the formation and movement of clouds to see how and where downpours or storms might develop.

Yet that's often easier said than done. To aid meteorologists in forecasting possible severe storms, a team of researchers from Penn State University in the U.S., the University of Almería in Spain and AccuWeather Inc. has devised a computer model that, they say, can help forecasters spot developing storms faster and more accurately.

They have done this by relying on a form of artificial intelligence known as machine learning classifiers. The program detects rotational movements in clouds from satellite images that might have otherwise gone unnoticed, the scientists explain. "The very best forecasting incorporates as much data as possible," says Steve Wistar, senior forensic meteorologist at AccuWeather. "There's so much to take in, as the atmosphere is infinitely complex. By using the models and the data we have [in front of us], we're taking a snapshot of the most complete look of the atmosphere."

To finetune their system, the researchers perused more than 50,000 weather satellite images taken over the years of the United States so as to track so-called comma-shaped clouds. These clouds are specific distribution patterns that are strongly associated with the cyclone formulation and can trigger thunderstorms, blizzards and gusty winds.

The researchers then taught computers to detect and identify such clouds in satellite images. This computer-aided process can help meteorologists pinpoint the clouds in reams of real-live data so they can monitor them more closely and predict severe weather events with greater speed and accuracy.

Their new AI-assisted method can detect comma-shaped clouds with 99% accuracy at an average of 40 seconds per prediction, the researchers say. By being able to predict nearly two-thirds of severe weather events, it can outperform other severe-weather detection methods.

"[O]ur method can detect some comma-shaped clouds before they are fully formed, and our detections are sometimes earlier than human eye recognition," says Rachel Zheng, a doctoral student at Penn State's College of Information Sciences and Technology who worked on the project.

Needless to say, forecasting severe storms faster and more accurately can help people better prepare for them. "The calling of our business is to save lives and protect property," Wistar says. "The more advanced notice to people that would be affected by a storm, the better we're providing that service."