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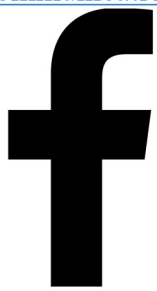
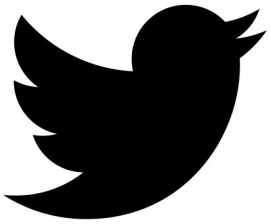
-  Facebook
-  Twitter

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Feature

Aug 30, 2024

Geologists test the use of AI in predicting Earthquakes

By: Victoria Artale

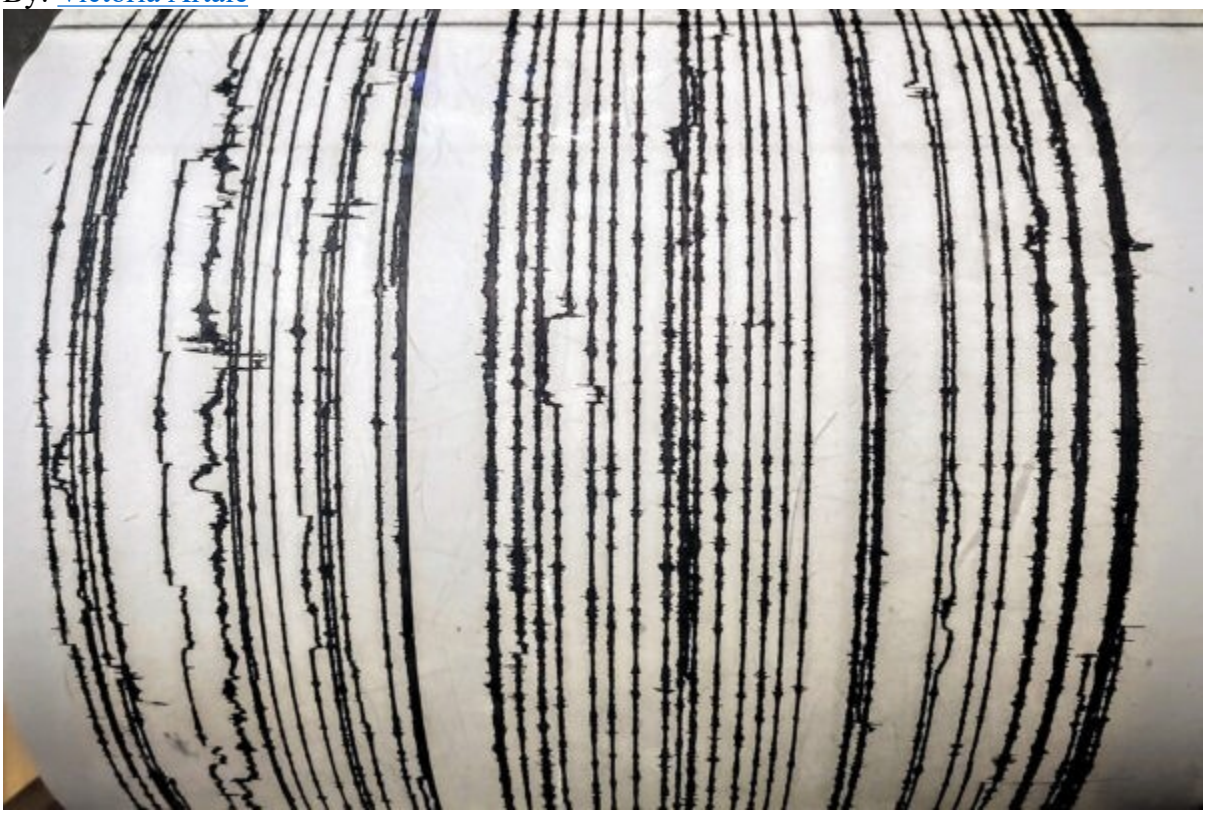


Photo by Allison Cherry/iStock.com

As the world continues to reckon with the future of artificial intelligence, researchers and educators at The University of Texas at Austin are exploring the possibilities for the technology. Recently, UT geologists have been using AI to predict earthquakes … and it rocks.

The union of AI and geology has shown promising potential to limit the impact of earthquakes on lives and economies. An AI algorithm created by UT researchers correctly predicted 70% of earthquakes a week before they happened during a seven-month trial in China.

The trial was part of a “forecast competition,” says Yangkang Chen, a Bureau of Economic Geology seismologist and the technology’s lead developer. The bureau is the oldest research unit at UT. Chen and his colleagues — several from the bureau and others from outside the U.S. — led the competition for 29 weeks during the international event and placed second within the last week of the competition. The researchers learned from their second-place success and placed first in the next year’s competition, and they published their results last fall.

“We deeply reflected on the factors that led to our success the first time. Subsequently, we assembled a large team composed of several colleagues from my current institute, the Bureau of Economic Geology, as well as several other collaborators outside the U.S.,” Chen says. “We conducted thorough and detailed analyses, interpreted the results, performed additional sensitivity tests, and ultimately produced a more solid piece of work regarding this geology project. The entire team participated in the second year’s competition, resulting in our achieving first place.”

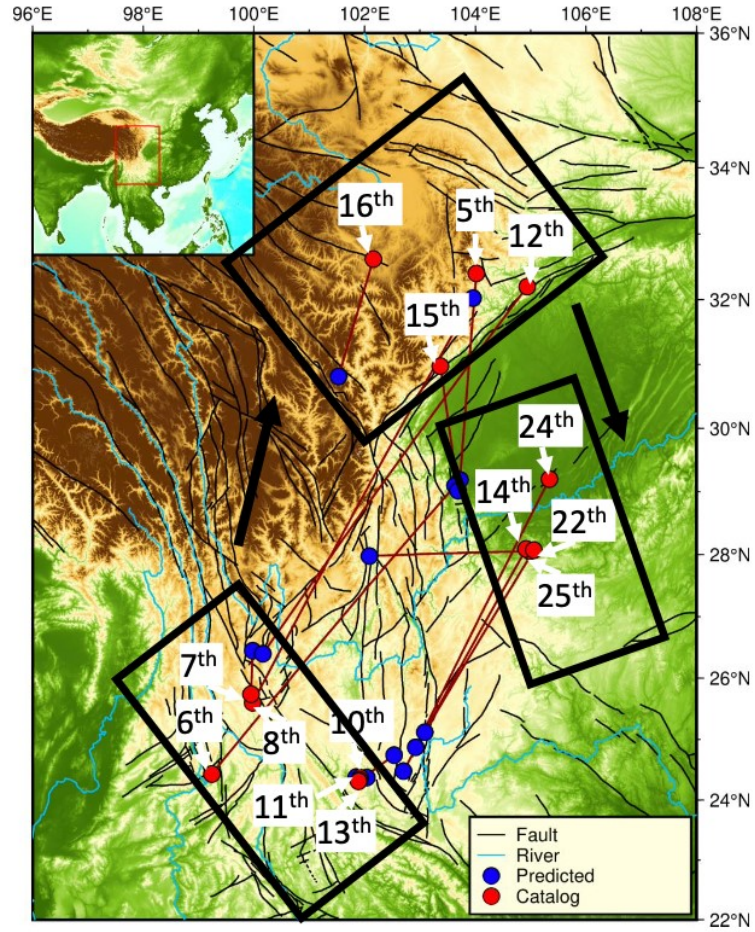
Professor Sergey Fomel, senior research scientist Alexandros Savvaidis and seismologist Yangkang Chen collaborated on the AI algorithm project. Photos by Leila Saidane

The AI was trained to find bumps in real-time data using information from previous years. After being trained, the AI provided its forecast by discerning signs of impending earthquakes amid the ambient

rumblings within the Earth. With that, the AI was able to predict 14 earthquakes. The algorithm was also able to almost exactly predict the strength of an earthquake. In the end, it missed one earthquake and gave eight false warnings. The research group doesn't know whether the same technology will work in other locations, and it will take years of study to confirm if people can rely on the technology. However, researchers look forward to future trials.

Senior research scientist Alexandros Savvaidis leads the bureau's Texas Seismological Network program (TexNet), the state's seismic network. He says the program has benefited from the support of the state and other researchers.

"Recently, our funding was doubled, which is good because the state believes we have been doing well," Savvaidis says. "Our work is highly cited, and a couple of our publications have received awards as well."



This map shows the location in China of the AI-predicted earthquakes (blue dots) joined by a red line to where each actual earthquake happened (red dots). Yangkang Chen/ Jackson School of Geosciences

With earthquakes being a constant threat for many, especially those living near the boundaries between tectonic plates, Chen says, the research is attempting to solve a vital problem.

"The most intriguing thing to me is that this earthquake forecasting problem, which was considered to be very complicated and intractable for decades or even for centuries, was addressed through this project, competition, and large dataset experiments," Chen says. "We found that this long-thought intractable problem may not be as difficult as we thought. It is actually solvable using our artificial intelligence framework."

Savvaidis says the project involves many groups of people working alongside AI, including geomodelers, seismologists and geophysicists, as well as those who maintain the network and analyze the data daily.

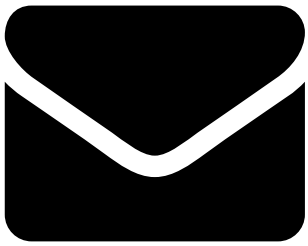
Senior research scientist Alexandros Savvaidis leads the Texas Seismological Network program (TexNet) at the Bureau of Economic Geology.

Scott Tinker, director emeritus of the bureau, says the future of AI in geology will continue to require many human hands and minds.

“It’s a very integrated science that is made up of mathematicians and geophysicists and physicists, geologists who understand the rocks and fluid systems, and others, and there’s a very multidisciplinary integrated team that is proud of that effort,” Tinker says. “I see it evolving. AI is evolving quickly, and I think our understanding will continue to evolve.”

Tinker acknowledges the challenges of adapting AI into the lives of researchers. But he also sees positives, including the ability to quickly manage large amounts of data.

“There are pros and cons with anything in science,” Tinker says. “Science is a process — it’s not an answer. We are always questioning and testing, evolving science and our scientific understanding. It’s never settled.”



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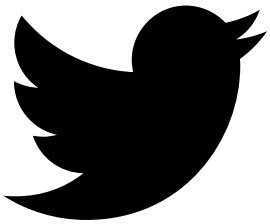

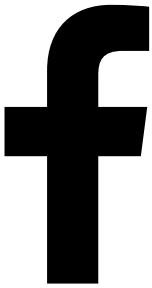

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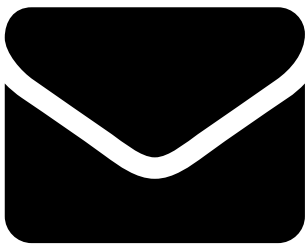

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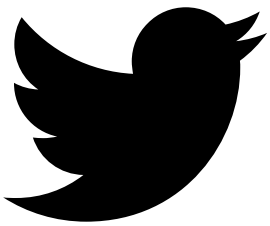

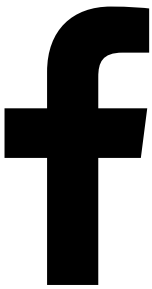

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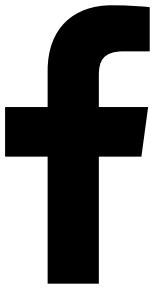
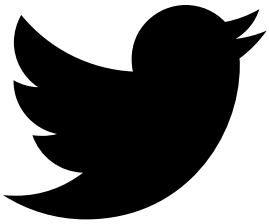
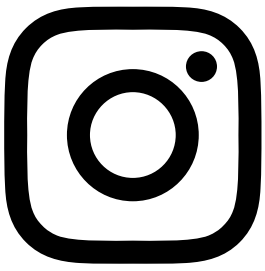
- 
- 
- 

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