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750K Lives Were Lost to Earthquakes in The Last 20 Years. Now AI is Helping Us Spot the Warnings

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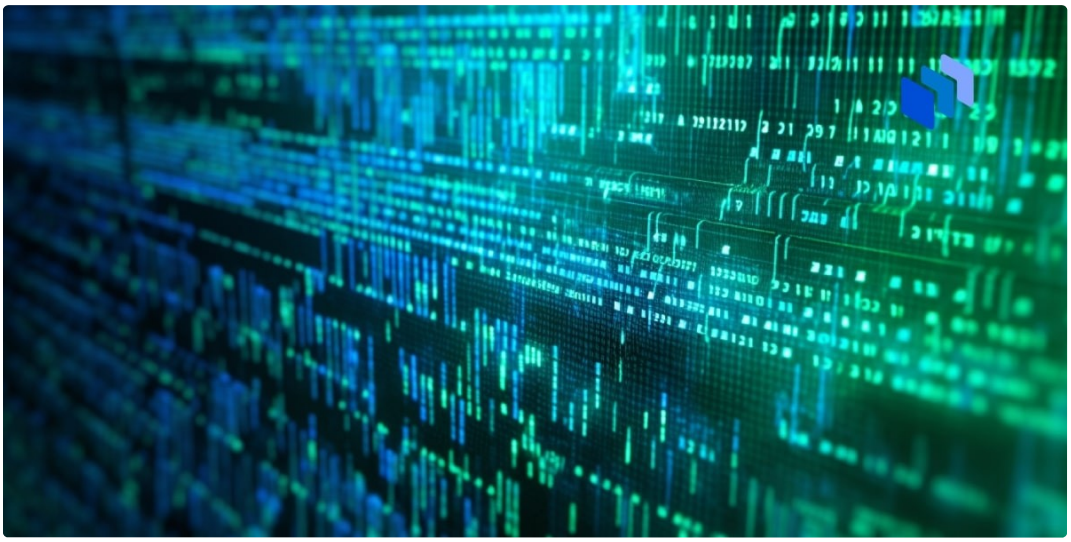
KEY TAKEAWAYS

AI has achieved an impressive 70% accuracy in predicting earthquakes, up to a week ahead of when they hit. This achievement resulted from a collaborative effort between AI and human earthquake experts, utilizing advanced sensory technology and extensive training. With 750,000 lives lost between 1998 and 2017, AI may lead to a serious reduction of casualties over future decades.



Earthquakes have long been one of the most unpredictable and devastating natural disasters known to humanity, claiming countless lives and causing staggering economic losses.

According to the World Health Organization, earthquakes were responsible for nearly 750,000 deaths between 1998 and 2017, more than half of all natural disaster-related fatalities.

This widespread destruction left more than 125 million people affected – injured, homeless, displaced, or evacuated – during the emergency phases of these disasters. The financial toll is equally staggering, with a report revealing that earthquakes cost the global economy an average of $45 billion annually between 2000 and 2019.

While we can't prevent natural earthquakes, we can significantly reduce their impact by preparing for them. A crucial aspect of this preparedness deals with our ability to predict when, where, and with what magnitude an earthquake will strike. However, unfortunately, this essential goal of earthquake prediction has remained an elusive dream for seismologists for decades, primarily due to the sudden and unpredictable nature of these geological events.

AI and Earthquake Prediction: A Life Saver?

Artificial Intelligence (AI) has recently provided a glimmer of hope in achieving this insurmountable goal. The breakthrough occurred when a team of researchers from The University of Texas at Austin developed an AI

system that achieved an impressive 70% accuracy in forecasting earthquakes up to a week before they occur.

This AI system underwent a seven-month trial in China, during which it accurately predicted 14 earthquakes with remarkable proximity to their expected locations and nearly exact magnitudes.

It's worth noting that the system did miss one earthquake and issued eight false alarms during the trial.

Nonetheless, it outperformed over 600 other competing systems, securing the top position in an international competition held in China. The results of this groundbreaking trial have been published in the Bulletin of the Seismological Society of America.

Under the Hood: How AI Leads the Breakthrough

The key to this groundbreaking development is the collaboration between AI and human experts in earthquake physics. The experts have employed their knowledge of earthquake physics to build an effective sensory apparatus (a feature detection system), enabling AI to effectively perceive earthquake activity. The AI algorithm was then extensively trained using five years' worth of seismic data to teach it how to use the sensory apparatus for predicting earthquakes.

After this training, the AI becomes like a vigilant observer, capable of detecting subtle signs of earthquakes amidst regular seismic activity.

It's like we've taught the AI the language of earthquakes, enabling it to understand the signals. The AI constantly pays attention to the sounds and vibrations beneath the Earth's surface, distinguishing important information from the background noise.

Where We Are vs Where We Were

The impact of this development is seen as a breakthrough in earthquake prediction by researchers and seismologists. Sergey Fomel, a professor at UT's Bureau of Economic Geology, referred to earthquake prediction as the "holy grail" and marked this achievement as a significant step towards solving a problem once considered impossible.

Alexandros Savvaidis, a senior research scientist leading the Texas Seismological Network Program (TexNet) at the bureau, emphasizes the value of achieving even a 70 percent accuracy rate. He believes that this level of accuracy has the potential to significantly reduce economic and human losses and greatly improve global earthquake preparedness.

While this AI system may not be immediately applicable worldwide, researchers believe it can substantially enhance earthquake prediction in regions with established seismic monitoring networks, such as California, Italy, Japan, Greece, Turkey, and Texas.

In the next phase, researchers plan to test their system in Texas, where the occurrence of minor to moderate-magnitude earthquakes is relatively high. The presence of 300 seismic stations and over six years of continuous records in the bureau's TexNet makes it an ideal location to validate the effectiveness of this method.

The Challenges to Address in Earthquake Prediction

Although the earthquake prediction system offers a glimmer of hope, there are still challenges and future directions to explore. One significant challenge is enhancing its accuracy beyond 70% while reducing false alarms. The AI system relies on training data to make predictions, and a fundamental limitation is the lack of data from various locations worldwide.

To overcome this limitation, researchers aim to integrate the system with physics-based models, which can be crucial in areas with sparse data or regions like Cascadia, where the last major earthquake occurred long before seismographs were available. This integration can help improve the system's performance and make it more reliable in areas with limited historical seismic data.

The Bottom Line

Artificial Intelligence is offering new hope in the challenging quest for earthquake prediction. While there are still challenges to address and improvements to be made, this development is a notable breakthrough in a field where predicting earthquakes was once considered nearly impossible.

This AI system, in collaboration with human experts, holds the potential to enhance earthquake preparedness, reduce economic and human losses, and make strides in regions with established seismic monitoring networks.

What needs to happen next is integrating the AI system with physics-based models to address data limitations and improve accuracy, marking a significant step in earthquake prediction technology.

Either way, the earthquakes of the next 20 years may look very different.

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