When the Earth shook, phones saved lives

Subhead: During Venezuela's June earthquake, Android alerts sent people to safety before the worst shaking arrived. Mostafa Mousavi of EPS, who works with Google on the alert program, explains how phones can become earthquake sensors and save lives.

After two powerful earthquakes struck Venezuela last month, videos began circulating online that showed mobile phones blaring, people looking down, then rushing outside before the worst shaking arrived. The warnings came from Android Earthquake Alerts, a system that turns the world's most widely used smartphones into a distributed earthquake-detection network.

Mostafa Mousavi joined EPS last year from Google, where he continues working as a senior research scientist on the alert program. As he and colleagues described in a July 2025 paper for *Science*, the system uses accelerometers built into Android phones – the same sensors that detect when a screen rotates – to pick up the first earthquake waves, compare signals across many devices at once, and alert people who may be in the path of stronger shaking.

Mousavi is careful about what the system can and cannot do. It does not predict earthquakes. It works only after an earthquake has begun, using the fact that phone and internet signals move faster than seismic waves. That may buy people only a few seconds to get outside, or sometimes a minute or more. But during an earthquake, he explained in this edited interview, those seconds matter – especially if people already know what the alert means and what to do next.

If earthquakes can't be predicted, how can a phone warn people before the shaking starts?

Usually when we talk about earthquakes and saving lives, the ideal would be to have a system that tells us when, where and how big the next earthquake will be days or weeks before it happens, so you have time to evacuate. But that is prediction, and at least for now we cannot do that – and we are not even sure if it is physically possible. What we can do is create long-term hazard maps for planning, building codes, and insurance. And on a much shorter timescale, we can do early warnings.

Early warning works only after the earthquake has already started. A rupture takes time to grow along a fault. The first waves move faster but are usually less destructive. That gives us a narrow window to detect those first waves, estimate the size and location of the earthquake, calculate where the stronger shaking is happening, and send alerts before those stronger waves arrive. That might be a few seconds, sometimes a minute or two.

Traditional systems do this with expensive, dedicated sensors, which is why only a small number of countries have them. Android Earthquake Alerts uses sensors already inside people's phones and uses many phones shaking at the same time in the same telltale way to detect an earthquake. Any one phone is less precise than a seismograph – and for privacy the location information is anonymized and very approximate – so the hard part is doing this quickly with noisy, lower-accuracy data, at the scale of hundreds of thousands or even billions of phones. But if you can solve those engineering problems, you can build an early warning system with much broader coverage, much faster and at a fraction of the cost.

When you saw the videos from Venezuela of people acting on life-saving alerts, what went through your mind?

The feeling is definitely very rewarding. Saving lives is one of the ultimate goals for anybody working in earthquake seismology or earthquake engineering. Earthquake early warning studies typically estimate useful warning time by calculating how long before the arrival of destructive seismic waves an alert would have reached people.

In this case, we do have estimates of the warning time, but the most straightforward evidence was the videos posted to social media. You could see the alert arrive, and then 20 or 30 seconds later the shaking starts.

How do you measure whether an earthquake alert was useful?

We usually rely on a built-in feedback survey in the system, but of course it is only for people who actually received the alert, and we are also interested in what happened beyond that.

One thing we look at is what people share on social media. We have recently published a paper utilizing AI to extract and analyze the social media reaction to the system during and after a magnitude 6.2 earthquake in Turkey last year. This provides an independent source of data to study not only public perceptions of the Android Earthquake Alerts system, but also post-alert behaviors during earthquakes. This study provides actionable insights for optimizing alert design, emphasizing the need for multimodal alerts with clear, concise visual and auditory information. It also underscores the importance of public education campaigns to shape user expectations, clarify appropriate behavioral responses, and foster trust by demonstrating the tangible benefits of early warning.

In the case of Venezuela, there were thousands of comments from people talking about how happy they were with the alerts, and hundreds of videos. In some cases, you can hear the alert sound clearly – allowing us to pinpoint the specific type of alert they received. You can see what people did after they received the alerts and when the shaking arrived. For us, that is some of the most robust evidence that the system worked as expected.