

# New research predicts landslide boundaries two weeks before they happen

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University of Melbourne researchers have developed a software tool that uses applied mathematics and big data analytics to predict the boundary of where a landslide will occur, two weeks in advance.

Professor Antoinette Tordesillas from the School of Mathematics and Statistics said there are always warning signs in the lead up to a collapse or '[failure](#)', the tricky part is identifying what they are.

"These warnings can be subtle. Identifying them requires fundamental knowledge of failure at the microstructure level—the [movement](#) of individual grains of earth," Professor Tordesillas said.

"Of course, we cannot possibly see the movement of individual grains in a landslide or earthquake that stretches for kilometres, but if we can identify the properties that characterise failure in the small-scale, we can shed light on how failure evolves in time, no matter the size of the area we are observing."

These early clues include patterns of [motion](#) that change over time and become synchronised.

"In the beginning, the movement is highly disordered," said Professor Tordesillas. "But as we get closer to the point of failure—the collapse of a sand castle, crack in the pavement or slip in an open pit mine—motion becomes ordered as different locations suddenly move in similar ways.

"Our model decodes this data on movement and turns it into a network, allowing us to extract the hidden patterns on motion and how they are changing in space and time. The trick is to detect the ordered motions in the network as early as possible, when movements are very subtle."

Professor Robin Batterham from the Department of Chemical and Biomolecular Engineering said the new software focuses on turning algorithms and big data into risk assessment and management actions that can save lives.

"People have gone somewhat overboard on so-called data analytics,

machine learning and so on," said Professor Batterham.

"While we've been doing this sort of stuff for 40 years, this software harnesses the computer power and memory available to look not just at the surface movement, but extract the relevant data patterns. We're able to do things that were just unimaginable in a mathematical sense 30 years ago.

"We can now predict when a rubbish landfill might break in a developing country, when a building will crack or the foundation will move, when a dam could break or a mudslide occur. This [software](#) could really make a difference."

**More information:** Antoinette Tordesillas et al, A data-driven complex systems approach to early prediction of landslides, *Mechanics Research Communications* (2018). [DOI: 10.1016/j.mechrescom.2018.08.008](#)

Provided by University of Melbourne

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