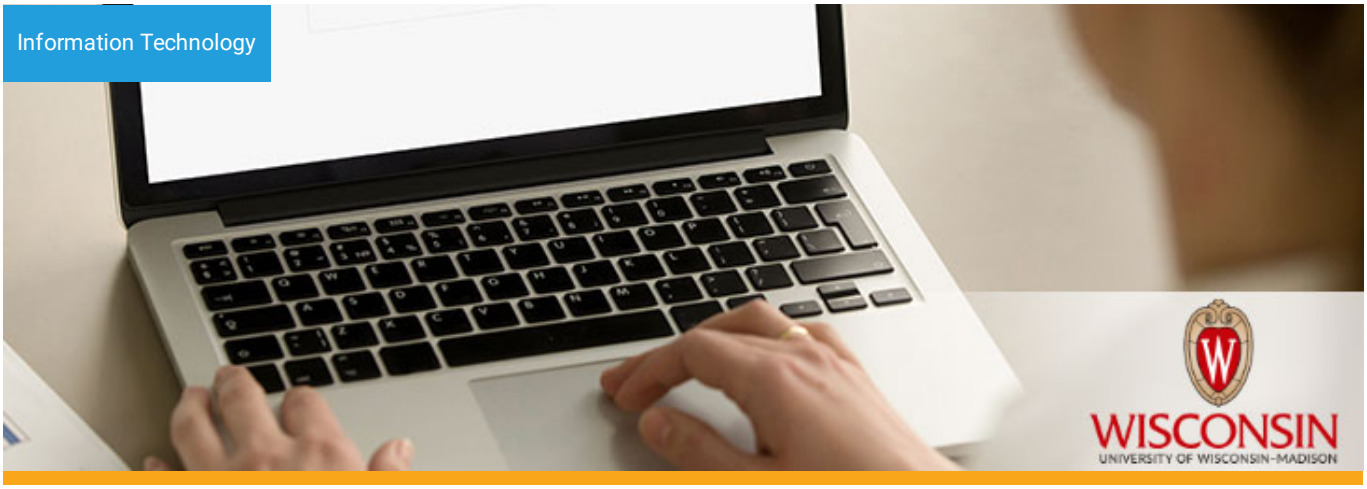
Information Technology



Detecting Seismic S Waves with Unprecedented Accuracy

View U.S. Patent No. 10,317,549 in PDF format.

WARF: P140387US01

Inventors: Clifford Thurber, Christopher Rawles

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing geophysical software that outperforms all known methods for identifying S-wave arrivals and other features of interest in seismic data.

Overview

Seismic events produce two types of seismic waves, referred to as P waves and S waves. P waves are relatively easy to detect (or “pick”) with software. S waves travel more slowly and arrive in the "noise" following the P wave, and thus are much harder to pick. The process is slow and costly, often performed manually by experts analyzing data.

Although challenging, S-wave picking is extremely useful for pinpointing earthquake locations and monitoring potentially hazardous microseismic activity caused by humans, including hydraulic fracturing (fracking), wastewater injection and reservoir engineering.

To help avoid inducing large man-made earthquakes, new monitoring technology is needed that works in real time, all the time.

The Invention

UW–Madison researchers have developed an automatic and extremely accurate method for detecting features of interest in seismic data, including S waves and P waves. Unlike currently available (and error-prone) phase detection methods, the new software identifies potential picks in a single pass through the data without needing to estimate parameters or build a model. Seismic features are identified based on their similarity to a reference set of examples.

The software utilizes a k-nearest neighbors approach. This approach is based on a nonparametric time series classification method.

Applications

- Wide relevance in the energy industry, where the dramatic surge in fracking activity and associated wastewater injection compels real-time monitoring

Key Benefits

- Outperforms all known methods
- Fast, accurate and scalable
- Real-time processing
- No need to compute parameters

Stage of Development

Testing indicates a success rate approaching 90 percent at the 10 sample or smaller level of accuracy. This is markedly superior to any other published method (typical success rates lurk around 65 percent or worse at this level). Subsample precision can then be obtained for similar events using waveform correlation.

Tech Fields

- Clean Technology : Monitoring, remediation & waste reduction
- Information Technology : Computing methods, software & machine learning

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867