Crowdsourcing algorithms to predict epileptic seizures

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Epilepsy is highly different among individuals. Results showed different algorithms performed best for different patients, supporting the use of patient-specific algorithms and long-term monitoring. Credit: Pixabay

A study by University of Melbourne researchers reveals clinically relevant epileptic seizure prediction is possible in a wider range of

patients than previously thought, thanks to the crowdsourcing of more than 10 000 algorithms worldwide.

In 2016 researchers ran the Melbourne University AES-MathWorks-NIH Seizure Prediction Challenge on the online data science competition platform Kaggle.com.

The contest focused on seizure prediction using long-term electrical brain activity recordings from humans obtained in 2013 from the world-first clinical trial of the implantable NeuroVista Seizure Advisory System. Researchers rigorously evaluated the top algorithms and these findings are detailed in research published today in *Brain*.

University of Melbourne Dr. Levin Kuhlmann, from the Graeme Clarke Institute and St Vincent's Hospital Melbourne, said the contest was a huge success, with more than 646 participants, 478 teams and more than 10 000 algorithms submitted from around the world.

"Epilepsy affects 65 million people worldwide," Dr. Kuhlmann said. "We wanted to draw on the intelligence from the best international data scientists to achieve advances in epileptic seizure prediction performance for patients whose seizures were the hardest to predict."

Contestants developed algorithms to distinguish between 10-minute inter-seizure verses pre-seizure data clips and the top algorithms were tested on the patients with the lowest seizure prediction performance based on previous studies.

"Our evaluation revealed on average a 90 per cent improvement in seizure prediction performance, compared to previous results," Dr. Kuhlmann said.

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different algorithms performed best for different patients, supporting the use of patient-specific algorithms and long-term monitoring."

Building on this success, researchers have developed Epilepsyecosystem.org, an online ecosystem for algorithm and data sharing to further develop and improve seizure prediction.

"Accurate seizure prediction will transform epilepsy management by offering early warnings to patients or triggering interventions," Dr. Kuhlmann said.

"Our results highlight the benefit of crowdsourcing an army of algorithms that can be trained for each patient and the best algorithm chosen for prospective, real-time seizure prediction.

"It's about bringing together the world's best data scientists and pooling the greatest algorithms to advance epilepsy research. The hope is to make seizures less like earthquakes, which can strike without warning, and more like hurricanes, where you have enough advance warning to seek safety."

More information: Levin Kuhlmann et al. Epilepsyecosystem.org: crowd-sourcing reproducible seizure prediction with long-term human intracranial EEG, *Brain* (2018). DOI: 10.1093/brain/awy210

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