Cutting-edge algorithm improves intracranial EEG accuracy to improve future patient care

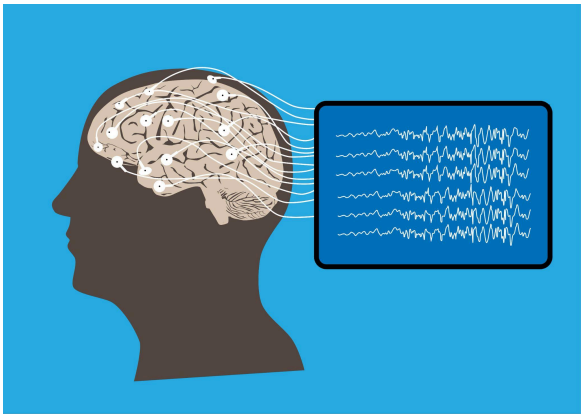

Photo credit: Getty Images.

MINNEAPOLIS/ST. PAUL (08/27/2024) — Published in the Journal of Neural Engineering, a research team led by the University of Minnesota Medical School evaluated the reliability of human experts in comparison to an automated algorithm in assessing the quality of intracranial electroencephalography (iEEG) data. This research hopes to pave the way for more accurate and efficient seizure detection and localization, ultimately improving outcomes for epilepsy patients.

iEEG is a procedure that measures brain activity by placing electrodes directly on or inside the brain. This detailed information is crucial for diagnosing and treating conditions like epilepsy, where pinpointing the exact source of seizures is essential for effective treatment.

For this study, the research team enlisted 16 experts, including EEG technologists and fellowship-trained neurologists, to rate 1,440 iEEG channels as “good” or “bad.” In this study, good meant recording brain activity and bad meant not recording brain activity. Their evaluations were compared to themselves, each other and against the Automated Bad Channel Detection (ABCD) algorithm, which was developed by the Herman Darrow Human Neuroscience Lab at the University of Minnesota.

The ABCD algorithm demonstrated higher accuracy (95.2%) and better overall performance compared to human raters, particularly in identifying channels with high-frequency noise.

"Our findings highlight potential biases and limitations in human-based EEG assessments. The ABCD algorithm's performance suggests a future where automated methods can aid clinicians in improving the accuracy and efficiency of seizure detection, ultimately enhancing patient

care," said Alexander Herman, MD, PhD, an assistant professor at the U of M Medical School and attending psychiatrist with M Health Fairview.

This research underscores the potential of automated solutions to enhance the reliability and efficiency of iEEG data interpretation — critical for seizure localization and improved patient outcomes.

"This research demonstrates the potential of automated algorithms to outperform human experts in identifying bad EEG channels. By reducing the workload and variability in assessments, we can focus more on clinical decision-making and patient care," said David Darrow, MD, MPH, an assistant professor at the U of M Medical School and neurosurgeon with M Health Fairview

Future research should aim to refine these automated methods further and explore their application in real-time clinical settings.

Funding was provided by the Institute for Translational Neuroscience and MnDRIVE Brain Conditions.

###

About the University of Minnesota Medical School
The University of Minnesota Medical School is at the forefront of learning and discovery, transforming medical care and educating the next generation of physicians. Our graduates and faculty produce high-impact biomedical research and advance the practice of medicine. We acknowledge that the U of M Medical School is located on traditional, ancestral and contemporary lands of the Dakota and the Ojibwe, and scores of other Indigenous people, and we affirm our commitment to tribal communities and their sovereignty as we seek to improve and strengthen our relations with tribal nations. For more information about the U of M Medical School, please visit med.umn.edu.