MIT Model Predicts COGNITIVE DECLINE DUE TO ALZHEIMER'S

Trend Watch: From Precision Medicine to Precision Diagnosis, AI Provides More Exact Approach

A new model developed at MIT can help predict if patients at risk for Alzheimer's disease will experience clinically significant cognitive decline due to the disease by predicting their cognition test scores up to two years in the future. Researchers hope the system can find the right patients to enroll in trials to speed discovery of drug treatments.

The model could be used to improve the selection of candidate drugs and participant cohorts for clinical trials, which have been notoriously unsuccessful thus far. Studies suggest greater success in bringing drugs to market could come down to recruiting candidates who are in the disease's early stages. In a paper presented at the Machine Learning for Health Care conference, MIT Media Lab researchers describe a machine-learning model that can help clinicians zero in on that specific cohort of participants.

Experiments indicate accurate predictions can be made looking ahead six, 12, 18, and 24 months. Clinicians could thus use the model to help select at-risk participants for clinical trials, who are likely to demonstrate rapid cognitive decline, possibly even before other clinical symptoms emerge. Treating such patients early on may help clinicians better track which antidementia medicines are and aren't working.

"Accurate prediction of cognitive decline from six to 24 months is critical to designing clinical trials," says Oggi Rudovic, a Media Lab researcher. "Being able to accurately predict future cognitive changes can reduce the number of visits the participant has to make, which can be expensive and time-consuming. Apart from helping develop a useful drug, the goal is to help reduce the costs of clinical trials to make them more affordable and done on larger scales."

In other AI news, MIT computer scientists are hoping to accelerate the use of artificial intelligence to improve medical decision-making, by automating a key step that's usually done by hand. Machine-learning models can be trained to find patterns in patient data to aid in sepsis care, design safer chemotherapy regimens, and predict a patient's risk of having breast cancer or dying in the ICU, for example.

MIT researchers recently demonstrated a model that automatically learns features predictive of vocal cord disorders. The features come from a dataset of about 100 subjects, each with about a week's worth of voice-monitoring data and several billion samples — in other words, a small number of subjects and a large amount of data per subject. The dataset contain signals captured from a little accelerometer sensor mounted on subjects' necks. The model can be adapted to learn patterns of any disease or condition.

Earlier this year, IBM pledged to donate an $11.6 million computer cluster to MIT modeled after the architecture of Summit, the supercomputer it built at Oak Ridge National Laboratory for the U.S. Department of Energy. The donated cluster will allow researchers to run more elaborate AI models to tackle a range of problems, from developing a better hearing aid to designing a longer-lived lithium-ion battery.

"We're excited to see a range of AI projects at MIT get a computing boost, and we can't wait to see what magic awaits," says John E. Kelly III, executive VP of IBM, who announced the gift in February at MIT's launch celebration of the MIT Schwarzman College of Computing.

AI Improves Efficiency and Accuracy OF DIGITAL BREAST TOMOSYNTHESIS

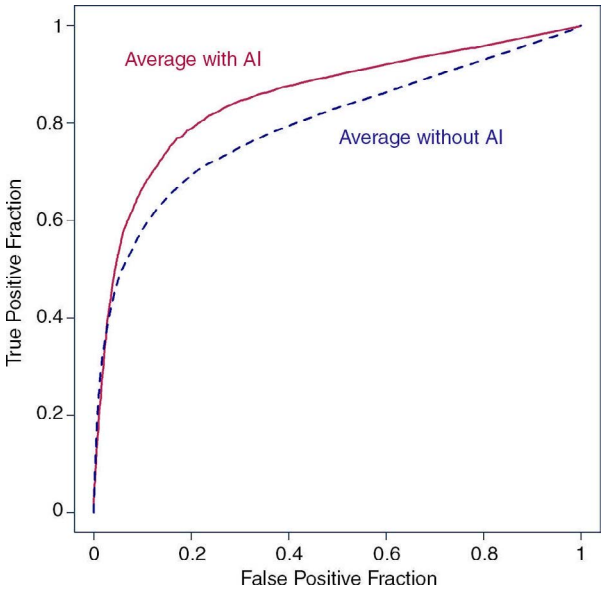
AI helps improve the efficiency and accuracy of an advanced imaging technology used to screen for breast cancer, according to a recent study published in the journal Radiology: Artificial Intelligence. Digital breast tomosynthesis (DBT) is an advanced method for cancer detection in which an X-ray arm sweeps over the breast, taking multiple images in a matter of seconds.

Research has shown that DBT improves cancer detection and reduces false-positive recalls compared with screening with digital mammography (DM). But the DBT exam can take almost twice as long to interpret as DM. This increased time is likely to be more consequential as DBT becomes standard-of-care.

For the study, researchers developed a deep learning system, a type of AI that can mine vast amounts of data to find subtle patterns beyond human recognition. They trained the AI system on large DBT data sets to identify suspicious findings in the DBT images.

After developing and training the system, the researchers tested its performance by having 24 radiologists, including 13 breast subspecialists, each read 260 DBT examinations with and without AI assistance. The examinations included 65 cancer cases.

Use of AI was associated with improved accuracy and shorter reading times. Sensitivity increased from 77% without AI to 85% with it. Specificity increased from 62.7% without AI to 69.6% with it. The recall rate for non-cancers, or the rate at which women were called back for follow-up examinations, decreased from 38% without AI to just 30.9% with it. On average, reading time decreased from just over 64 seconds without AI to only 30.4 seconds with it.



Average of empirical receiver operating characteristic plots with and without AI. True-positive fraction = case-level sensitivity, false-positive fraction = 1 – specificity.

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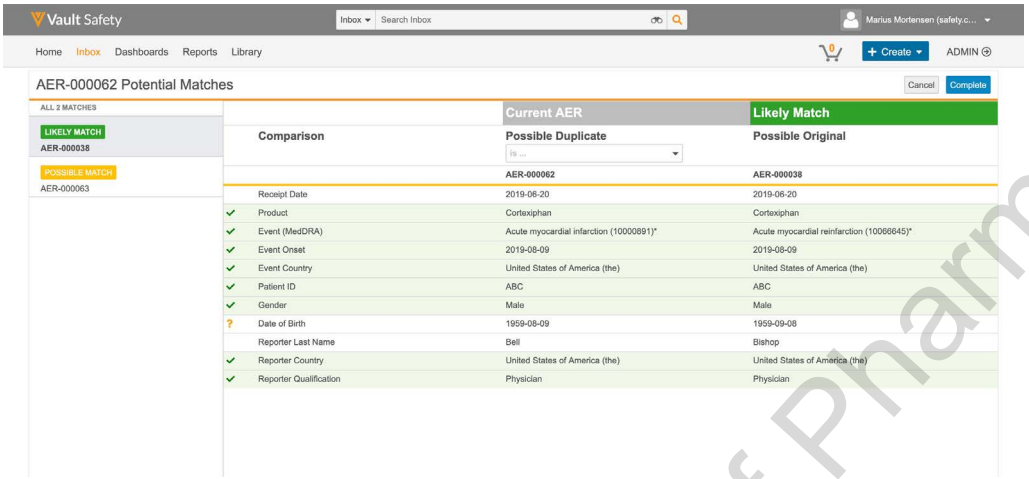
Veeva Brings AI TO DRUG SAFETY

Veeva Systems has created Veeva Vault Safety.AI, a new AI application that automates case intake to reduce the time and effort of manual data entry for more efficient case processing. Safety.AI reduces manual data entry during case intake by automatically converting text into the required fields in a drug safety case, including patient information, adverse events, medical history, products, and reporter information. This enables pharmacovigilance organizations to reduce the time to enter and verify a case, as well as better scale operations as case volume increases.

Safety.AI is planned for launch in April 2020. Together with Vault Safety and Vault SafetyDocs, Veeva offers an integrated suite of cloud applications on a common platform to manage the drug safety lifecycle, from case intake and adverse event



STUDY: Deep Learning Identifies Aspects of Psychotherapy Content

Ieso Digital Health, an Internet-enabled cognitive behavioral therapy (ie-CBT) has published the results of new research that applied deep learning to large-scale clinical data to understand what aspects of psychotherapy content are associated with clinical outcomes.

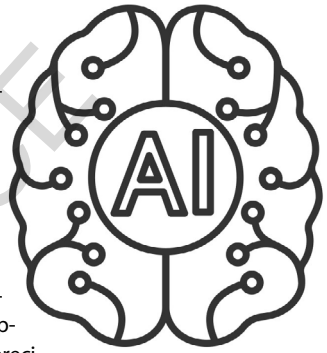
Unlike other medical treatments, psychotherapy is comprised of a series of one-to-one discussions, which means there is a lack of systematic methods for measuring the treatment delivered. However, with ie-CBT, a patient communicates with a therapist using real-time instant messaging which means conversations can be captured as transcripts.

With unique access to 90,000 hours of anonymized recorded therapy transcripts from its platform, Ieso has trained a deep learning model to automatically recognize the content of the language used by therapists during patient CBT sessions. The Ieso research team then used this model to measure the treatment delivered to determine which features are associated with an improvement in patient symptoms.

It would have been impossible for humans to analyze such a large data set. The research provided valuable insights into the relationship between therapy content and clinical outcomes that have previously been unavailable. The findings showed that when treatment contained a greater quantity of CBT change methods, patients are more likely to show an improvement in symptoms. Patients were less likely to improve when sessions had increased quantity of 'non-therapy' content (i.e. conversations not related to treatment).

The paper, Quantifying the Association Between Psychotherapy Content and Clinical Outcomes Using Deep Learning, is published in JAMA Psychiatry.

Infosys and UIUC Partner TO ADVANCE PRECISION MEDICINE



A new strategic partnership between the University of Illinois Urbana-Champaign (UIUC) and Infosys will combine advanced machine learning tools with advanced biocomputing and genomic applications to improve precision medicine and preventive care.

The organizations will develop new technologies and systems in precision medicine, allowing caregivers to predict patients' diseases and control healthcare costs. The Infosys-UIUC collaboration will combine the former's artificial intelligence capabilities with the latter's expertise in computing systems and genomics. The partnership aims to enhance the predictability of treatment outcomes for potential diseases.

"The future of precision medicine, which allows tailoring diagnosis and treatment to each patient to optimize outcome, is dependent on the ability to jointly analyze large datasets of heterogeneous biological (e.g., genomic, metabolic, neuroimaging) and clinical measures while incorporating key clinical domain knowledge," says Professor Ravishankar K. Iyer of the University of Illinois and CoPI of the Center for Computational Biotechnology and Genomic Medicine (CCBGM).

Through this partnership, Infosys will become a member of the CCBGM, a collaborative effort between UIUC and the Mayo Clinic Center for Individualized Medicine. CCBGM receives its funding through the National Science Foundation's Industry/University Cooperative Research Centers program.

The goal of CCBGM is to leverage the power of data analytics, AI, machine learning, and high-performance computation to advance healthcare innovation. The alliance between UIUC and Infosys will add to the efforts of academic institutions seeking to advance healthcare and improve patient outcomes.

"The partnership between Infosys and UIUC along with our membership in CCBGM opens up a lot of potential for Infosys' work in the healthcare industry," says Venky Ananth, senior VP, head of healthcare at Infosys. "Not only do we have an opportunity to develop technologies and solutions that can improve and enhance patient care and management, but we also get a chance to collaborate with some of the finest minds on the new frontiers of healthcare innovation."