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## AI Detects Early Alzheimer's Disease with Nearly 100% Accuracy



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- **Mild cognitive impairment (MCI) often precedes Alzheimer's disease.**
  - **Functional MRI (fMRI) can capture subtle signs of MCI, but interpretation is difficult.**
  - **KTU researchers developed an AI that identified MCI in a small study (25 subjects).**

Mild cognitive impairment (MCI) is one of the first signs of Alzheimer's disease (AD). Researchers at Lithuania's Kaunas University of Technology (KTU) last month presented an algorithm that can accurately detect and differentiate the stages of mild cognitive impairment (MCI) from functional MRI (fMRI) scans. A clinician may use an AI like the one developed to more easily diagnose a MCI patient and monitor the progression over time. This method is faster than manual analysis, which also requires expert knowledge of AD-associated changes.

Functional fMRI scans were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI), a public-private partnership that provides an fMRI repository for AD research. The dataset consisted of 78,753 images from 138 subjects, but only data from 25 subjects were included in the study. To evaluate the algorithm's performance, the dataset was split into training and validation datasets, with 70% representing 17 subjects consisting of 51,443 images and 30%, eight subjects consisting of 27,310 images, respectively. Subjects were divided into six categories depending on cognitive status, ranging from normal control to Alzheimer's Dementia. Researchers adapted the 18-layered convolutional neural network (ResNet18) to perform seven binary classifications were performed based on the six conditions.

Overall, ResNet18 achieved a classification accuracy of 99.99%, 99.95%, and 99.95% on early MCI vs Alzheimer's Dementia, late MCI vs Alzheimer's Dementia, and MCI vs early MCI classification scenarios, respectively. However, a few subjects were misdiagnosed as having early MCI instead of late EMCI.

The group emphasised several next steps for AI's development. The algorithm's performance in a study with larger and more diverse study groups should be determined. They plan on also investigating whether pre-training the algorithm may achieve better classifications with fewer false negatives, as well as incorporating visualisation techniques in the future.

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