A self-administered mobile app to detect Alzheimer's disease using speech data
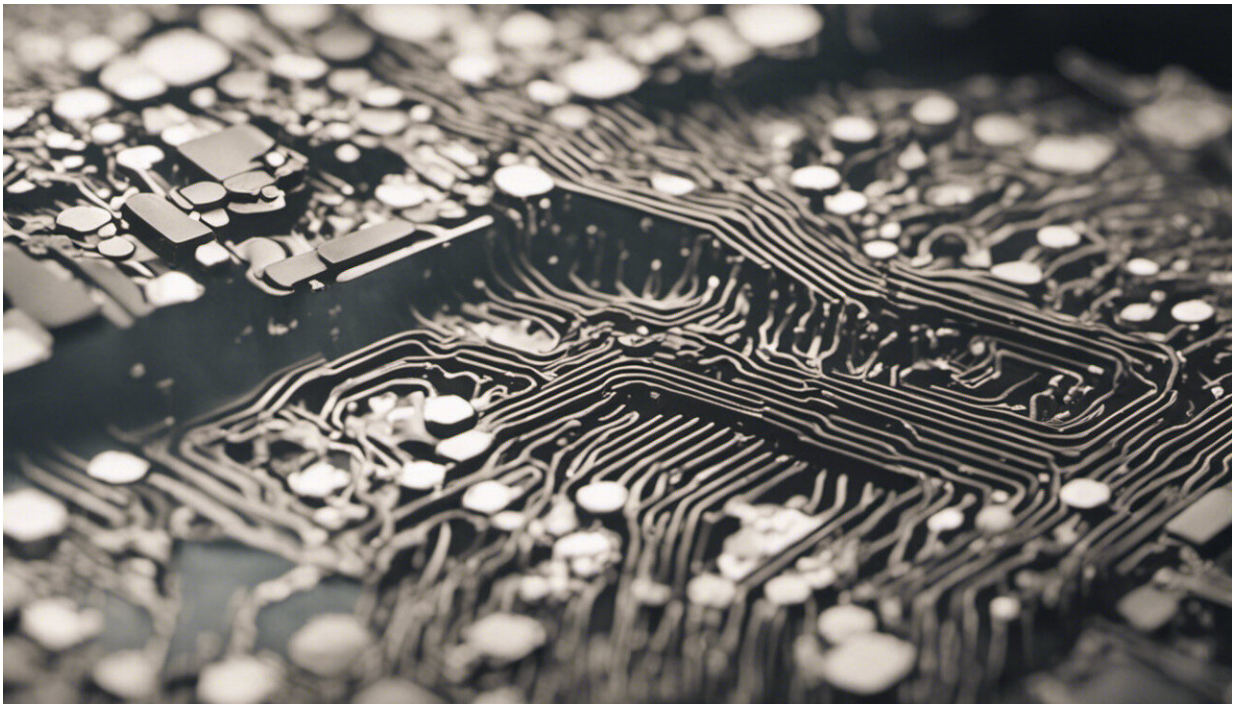
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Credit: AI-generated image (disclaimer)

Alzheimer's disease (AD) is the most common form of dementia. It is important to start intervention from an early stage, e.g., the mild cognitive impairment (MCI) stage, to prevent or delay the progression of AD. For the early detection of AD and MCI, there is a growing need to develop user-friendly, self-administered screening tools for use in

everyday life.

Speech is a promising data source that can be used for developing such screening tools. Language impairments have been observed in the early stages of AD, and linguistic features characterizing these impairments have been used for the automatic detection of AD. However, the accuracy of automatic speech recognition used for converting human voice to text is generally of poorer quality in the case of elderly people than for people from other age groups, posing a challenge for developing an automatic tool.

Therefore, researchers from the University of Tsukuba developed a prototype of a self-administered mobile application to help in the early detection of AD and MCI. Using this application, researchers collected and analyzed speech data of five cognitive tasks from 114 participants, including AD patients, MCI patients, and cognitively normal participants. The tasks were based on neuropsychological assessments used for dementia screening and included picture description and verbal fluency tasks.

The results demonstrate that the degree of language impairments assessed by linguistic features, particularly those related to the semantic aspects (e.g., informativeness and vocabulary richness), could be reliably estimated at poor speech recognition accuracy. Moreover, by combining these linguistic features with acoustic and prosodic features of the participant's voice, machine learning models could reliably detect MCI and AD, showing 88% and 91% accuracy, respectively. The findings are published in the journal *Computer Speech & Language*.

This appears to be the first study to show the feasibility of an automatic, self-administered screening tool for detecting AD and MCI by reliably capturing language impairments even from the speech data obtained under poor automatic speech recognition accuracy conditions. The

proposed tool may help increase the access to screening tools for the early detection of AD.

More information: Yasunori Yamada et al, A mobile application using automatic speech analysis for classifying Alzheimer's disease and mild cognitive impairment, *Computer Speech & Language* (2023). DOI: 10.1016/j.csl.2023.101514

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