VoiceAD: A Crosslingual Speech-Based Classifier for Early Detection of Alzheimer's Disease

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Alzheimer's Disease (AD) causes memory decline beyond normal aging and is the most common cause of dementia. Early detection and intervention can delay the progression of AD and alleviate symptoms. However, high expense, insensitivity, and inconvenience are among various deterrents to traditional diagnosis methods. Dementia impacts more than 55 million people globally, with this number set to double every 20 years. Much of this increase will be in low- and middle-income countries which often lack the resources for early diagnosis. Recently, speech has emerged as an effective digital biomarker for AD detection. However, most studies in this area are limited to English speech due to lack of suitable data in other languages. This study aims to construct a speech-based classifier (VoiceAD) that can be trained on English data and still maintain its performance on other languages. Acoustic features were extracted from English, Spanish, and Greek data from DementiaBank with the eGeMAPS v2.0 feature set. Subsequently, an Extra Trees model was employed for classification. VoiceAD's performance for English and Greek surpassed that of the baseline model and model incorporating only demographic data while the Spanish performance was lower due to task effect. In addition, VoiceAD's satisfactory generalizability and interpretability positions it as a promising candidate for clinical applications. It can be implemented as a free screening tool such as a mobile application to monitor AD risk. VoiceAD's crosslingual applicability can enable its worldwide deployment, especially in settings where traditional methods of diagnosis are less attainable.

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