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Paper Title:	Sequential Binary-class Networks for Enhancing Classification Performance of Alzheimer's Disease Severity Diagnosis
Authors:	Nattavadee Prasertkamontap, Chananthorn Yuktawisarn, Rintara Cheingthong and Yosaya Chaipackdee (Satriwithaya School, Thailand); Suejit Pechprasarn (Rangsit University, Thailand)
Email:	49401@satriwit.ac.th

Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder frequently encountered in the elderly population. Its global prevalence surpasses 1.6%, making AD the most prevalent neurodegeneration condition. Diagnosing AD poses considerable challenges, often resulting in delayed identification, typically manifesting in the advanced stages of mild dementia, thereby compromising the efficacy of future treatment. Here, the publicly available dataset 4-class Alzheimer's MRI images from Kaggle.com have been utilized to show that classification performance can be enhanced by classification through sequential networks, in which a standard artificial neural network for binary class classification is cascaded in series. The 4 levels include non-demented, very mild demented, mild demented, and moderate demented. The classification performance of 9 different network choices is also compared to show that Inception-v3 can perform the best among the trained networks. Three separated Inception-v3 networks are trained using binary classes using the following label pairs (1) demented and non-demented, (2) very mild demented and the other two demented classes combined, and (3) mild demented and moderate demented. These three networks can achieve classification performance metrics higher than 98%. Meanwhile, a single Inception-v3 is employed to classify the 4 labels, the performance is degraded to 54%.