

Predictive Models Of Mci Conversion To Alzheimer’S Disease Using Machine Learning And Multimodal Biomarkers

P1-001

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Keywords: Mild cognitive impairment; Alzheimer’s disease; Machine learning; Neuroimaging; Prognosis; Conversion prediction.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS	REFERENCES
Mild cognitive impairment (MCI) represents a critical transitional stage between normal cognition and Alzheimer’s disease (AD). Early identification of individuals at high risk for conversion to AD is essential for timely intervention and optimized clinical management. Recent advances in machine learning (ML) have enabled the integration of multimodal clinical, cognitive, and neuroimaging data to improve prognostic accuracy. This abstract synthesizes recent evidence on ML-based predictive models for MCI-to-AD conversion.	We performed an analytical synthesis of three recent peer-reviewed studies (2019-2024) identified through MEDLINE/PubMed, all using data from the Alzheimer’s Disease Neuroimaging Initiative (ADNI). The selected studies employed: (1) multimodal machine learning models integrating demographic, cognitive, MRI, and PET biomarkers; (2) feature-based Random Forest algorithms using clinical and structural brain variables; and (3) longitudinal analyses of cognitive and MRI trajectories. All studies included MCI populations at baseline, longitudinal follow-up, and conversion to AD as the primary outcome.	Multimodal machine learning approaches demonstrated superior predictive performance compared to single-modality models, highlighting the added value of integrating neuroimaging and cognitive measures. Random Forest models achieved high accuracy while maintaining interpretability, identifying key predictors such as hippocampal volume, medial temporal lobe atrophy, and cognitive test scores. Longitudinal trajectory analyses revealed that structural brain changes often precede measurable cognitive decline, reinforcing their role as early biomarkers of conversion. Across studies, predictive accuracy improved when temporal information and multimodal data were incorporated.	These findings indicate that machine learning-based predictive models are effective tools for identifying individuals with MCI at increased risk of progression to Alzheimer’s disease. Multimodal and longitudinal approaches provide the most robust prognostic performance, while feature-based models offer practical advantages for clinical implementation. Future research should focus on external validation, algorithmic fairness, and translation into real-world clinical workflows.	1. Lee MW, Kim HW, Choe YS, Yang HS, Lee J, Lee H, et al. A multimodal machine learning model for predicting dementia conversion in Alzheimer's disease. Sci Rep. 2024;14(1):12276. doi:10.1038/s41598-024-60134-2 2. Velazquez M, Lee Y; Alzheimer's Disease Neuroimaging Initiative. Random forest model for feature-based Alzheimer's disease conversion prediction from early mild cognitive impairment subjects. PLoS One. 2021;16(4):e0244773. doi:10.1371/journal.pone.0244773. 3. Mofrad SA, Lundervold AJ, Vik A, Selbæk G, Bjornerud A, Hessen E, et al. Cognitive and MRI trajectories for prediction of Alzheimer's disease. Sci Rep. 2021;11:2122. doi:10.1038/s41598-020-78095-7. CONTACT  Email: juliaami97@hotmail.com Phone: +55 (51) 99534-8336 ALZHEIMER’S ASSOCIATION AAIC>26