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Artificial Intelligence-Assisted Prediction of Early Cognitive Decline in Patients at Risk of Alzheimer's Disease

Elena Rossi

University of Milan, Italy

Early identification of individuals at risk of Alzheimer's disease remains a major challenge, particularly during the preclinical and mild cognitive impairment stages when therapeutic intervention may have greater potential to preserve cognitive function. This study evaluated the potential of an artificial intelligence-based multimodal model for predicting early cognitive decline using clinical, neuropsychological, and neuroimaging parameters. Data from individuals with subjective cognitive complaints, mild cognitive impairment, and cognitively healthy controls were analyzed using a machine-learning framework incorporating demographic characteristics, cognitive assessment scores, and structural neuroimaging features. Multiple classification algorithms were evaluated according to their ability to distinguish individuals with early cognitive impairment from cognitively healthy participants. The integrated model demonstrated improved predictive performance compared with individual clinical or neuroimaging parameters alone. Cognitive performance measures and structural changes in medial temporal and cortical regions contributed substantially to model classification. The findings indicate that combining clinical and neuroimaging variables within an artificial intelligence framework may improve the early recognition of individuals at increased risk of cognitive decline. Such approaches could support personalized neurological assessment, facilitate earlier clinical intervention, and contribute to improved patient stratification in future Alzheimer's disease research.

Biography

Dr. Elena Rossi is a researcher and clinician specializing in neurology, cognitive neuroscience, and neurodegenerative disorders. Her research interests include Alzheimer's disease, early cognitive impairment, artificial intelligence in neurological diagnosis, and data-driven approaches for improving neurological assessment and clinical decision-making.

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