# Biophysically-Informed Deep Learning Model for Predicting Individualized Alzheimer's Disease Progression

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## VALUE PROPOSITION

Alzheimer's Disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, memory loss, and structural brain changes. Tau protein neurofibrillary tangles, a hallmark pathology of AD, drive cortical atrophy and functional impairment. Despite the stereotypical patterns of tau spread described by Braak stages, individual variability in tau distribution and progression complicates precise prediction and treatment. Current diagnostic tools are either costly and not widely accessible such as tau-PET imaging, and/or they lack the ability to accurately forecast an individual's disease trajectory, limiting the potential for personalized interventions.

## TECHNOLOGY DESCRIPTION

UCSF researchers have developed a biophysically-informed deep learning model that utilizes a single baseline MRI to accurately predict an individual's Alzheimer's disease progression trajectory through robust predictions of tau seeding, aggregation, and transmission rates. The model further predicts future tau-PET imaging patterns and cognition-sensitive features, providing clinicians with a comprehensive understanding of individual disease progression. This tool has been validated on 650 subjects from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database, demonstrating significant potential for precision diagnostics and treatment planning.

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## OTHER INFORMATION

KEYWORDS

deep learning model, AI, disease prediction, Alzheimer's disease, tau protein, PET imaging, disease progression

CATEGORIZED AS

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  - Software
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