

Xavier Velez

Chambers/Jones Award

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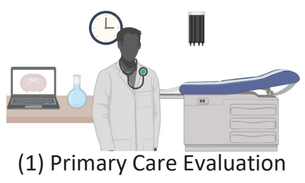
Modeling and Detecting Neurodegenerative Disease Through Changes in Neural Sleep Activity

This work hypothesizes that changes in sleep associated with neurodegenerative disease can be tracked and measured through electroencephalography (EEG). Using a state space architecture, we aim to better detect and understand neurodegenerative disease through clinically interpretable representation learning.

The average time from symptom onset to a dementia diagnosis is ~**3.5 years**



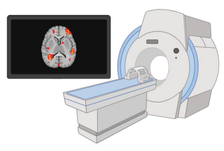
(1) Primary Care Evaluation



(2) Neuropsych Testing



(3) Lab Work



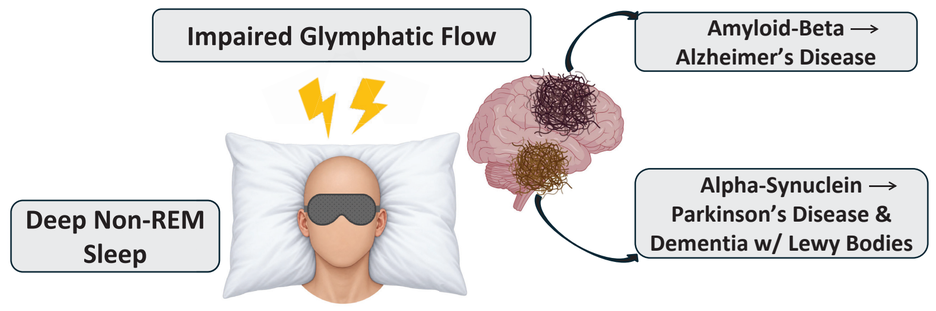
(4) Neuroimaging



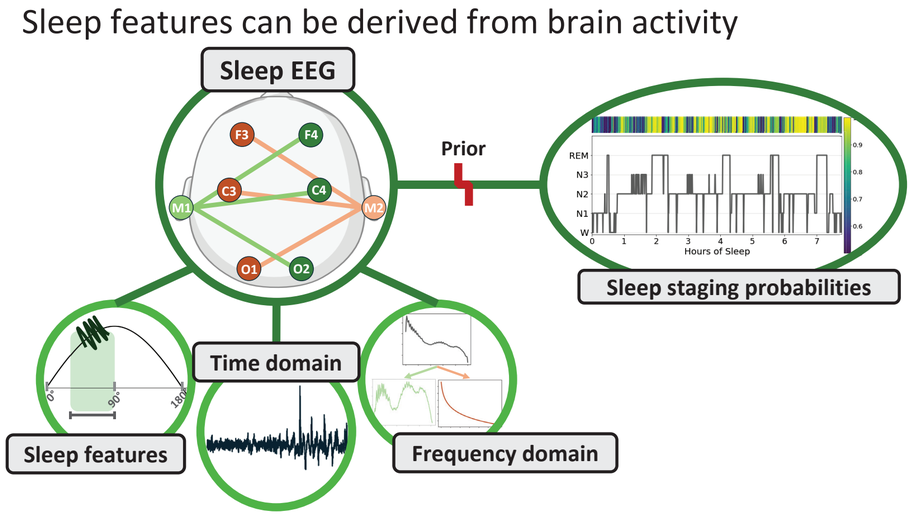
(5) Final Diagnosis

Even with all these procedures, **~17%** of Alzheimer's patients are misdiagnosed

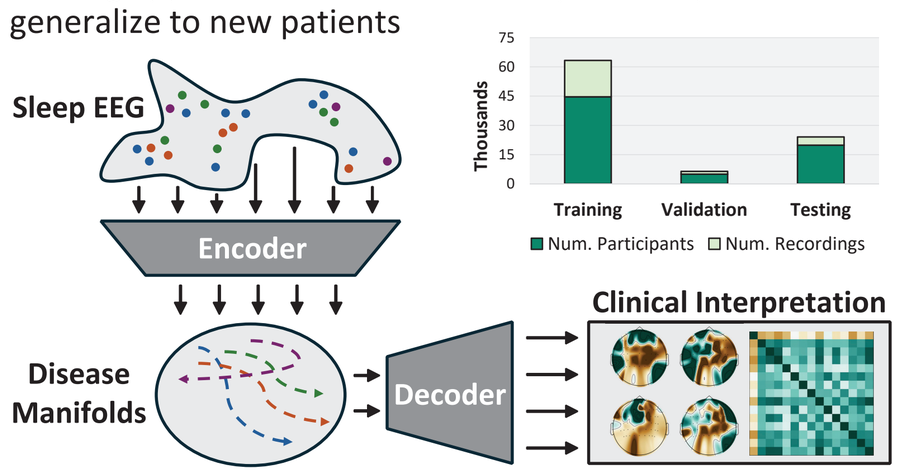
Neurodegeneration disrupts healthy sleep and leads to the accumulation of key proteins



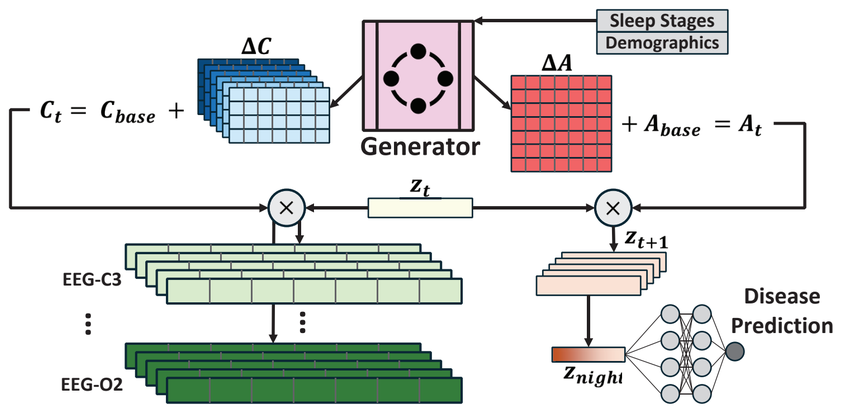
Sleep features can be derived from brain activity



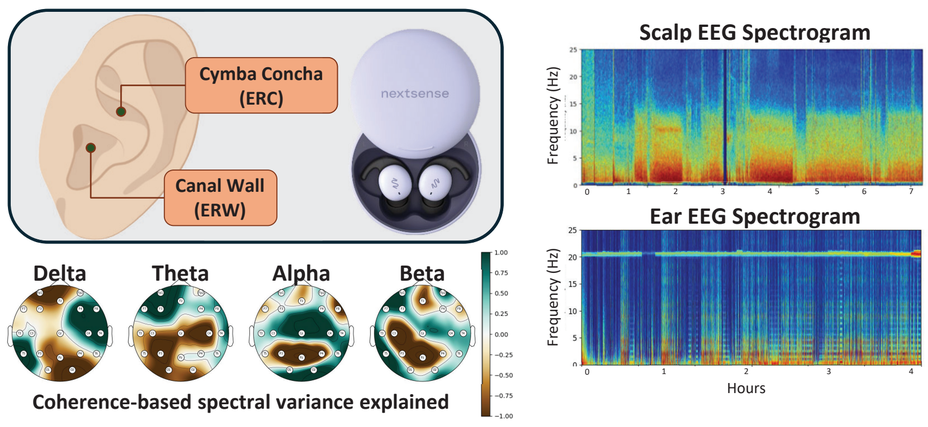
Existing approaches lack clinical interpretability or do not generalize to new patients



Our model leverages known neurodegenerative features to find new disease-driven sleep patterns



Once our model is trained and clinically validated, we can use transfer learning to replace scalp EEG with wearables



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