

# ProtoBrainMaps: Prototypical Brain Maps for Alzheimer's Disease Progression Modeling

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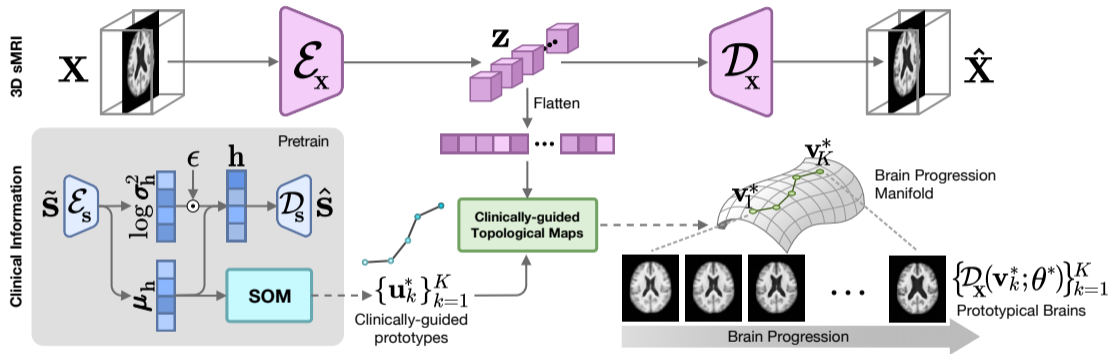
# Introduction

- Alzheimer's disease (AD) is an irreversible and progressive neurodegenerative disorder
  - ▶ urged the identification at the earliest possible stage and time
- The sMRI of the brain plays an essential role as it provides macroscopic visual information
  - ▶ could be further exploited to extract the potential informative biomarkers
- The brain's morphological changes are quite subtle and bound to entangled between normal aging and neurodegenerative diseases

## Contributions

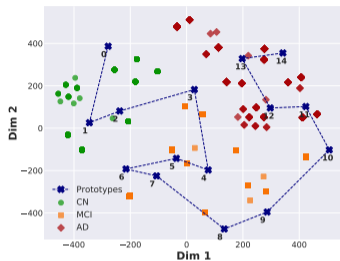
- We propose an interpretable network called Prototypical Brain Maps (ProtoBrainMaps) for modeling the AD progressions through the established prototypes
- ProtoBrainMaps capable to synthesize a set of well-interpolated prototypical brains, each with visually distinct morphological traits, mimicking the AD progression.

# ProtoBrainMaps

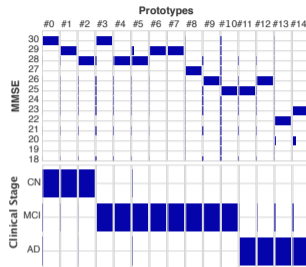


$$\mathcal{L}_{\text{CTM}} = \sum_{n=1}^N \sum_{k=1}^K \gamma_{\tau}^{(n)} \odot \omega_{\mathbf{z}, \mathbf{V}}^{(n)} \odot \|\mathbf{z}^{(n)} - \mathbf{v}_k\|_2^2$$

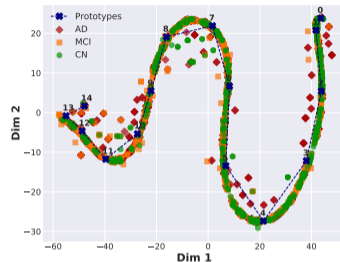
# Preliminary Experimental Results on ADNI



Clinical Information

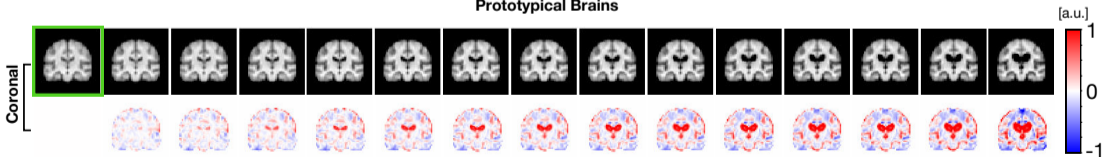


Decoded Clinical Information



sMRI

## Prototypical Brains



Decoded 3D Prototypical Brains