Geodesic Path Analysis (GPA) of Neural Networks in the Alzheimer's Disease Connectome Project (ADCP)

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Nagesh Adluru[1], Veena A. Nair[1], Vivek Prabhakaran[1], Shi-Jiang Li[2], Andrew L. Alexander[1], Barbara B. Bendlin[1]
[1]University of Wisconsin, Madison, [2]Medical College of Wisconsin, Milwaukee

MAIN TAKEAWAY

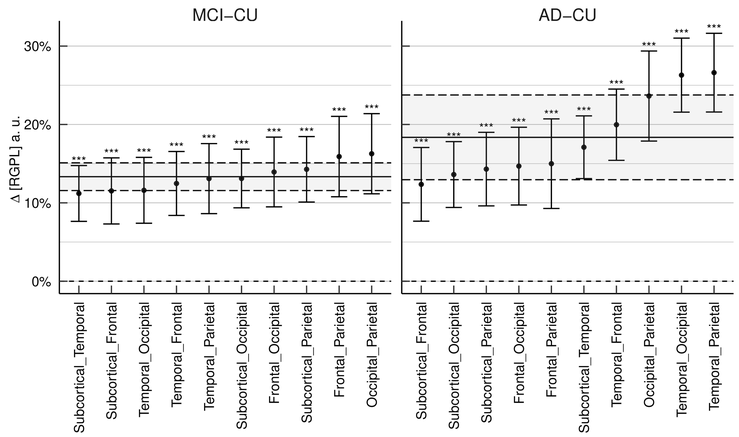
The geodesic path lengths of between all the major lobes in the brain are longer for the AD group compared to both the CU and MCI groups indicating reduced neural network efficiency in AD.

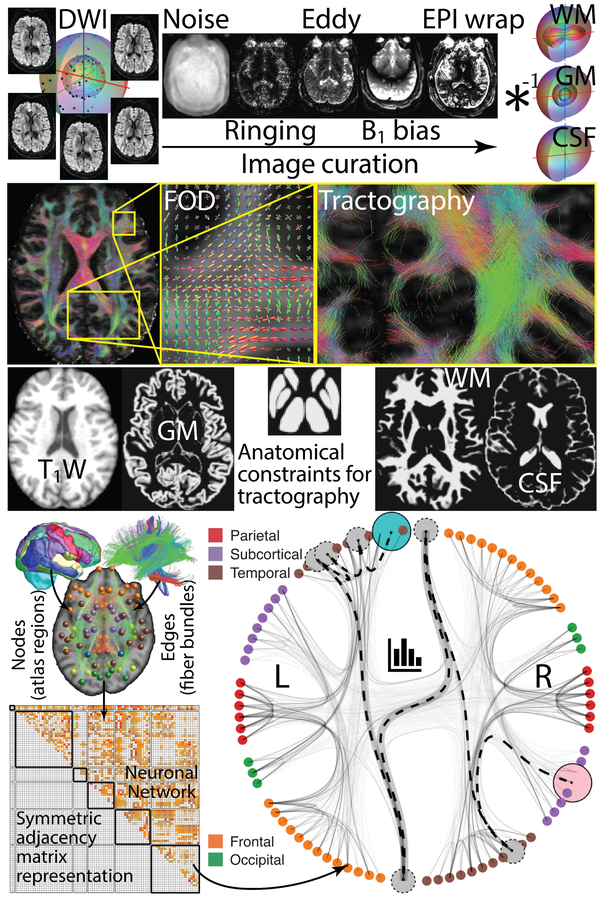
ANALYSIS CODE

https://github.com/nadluru/asnr2021

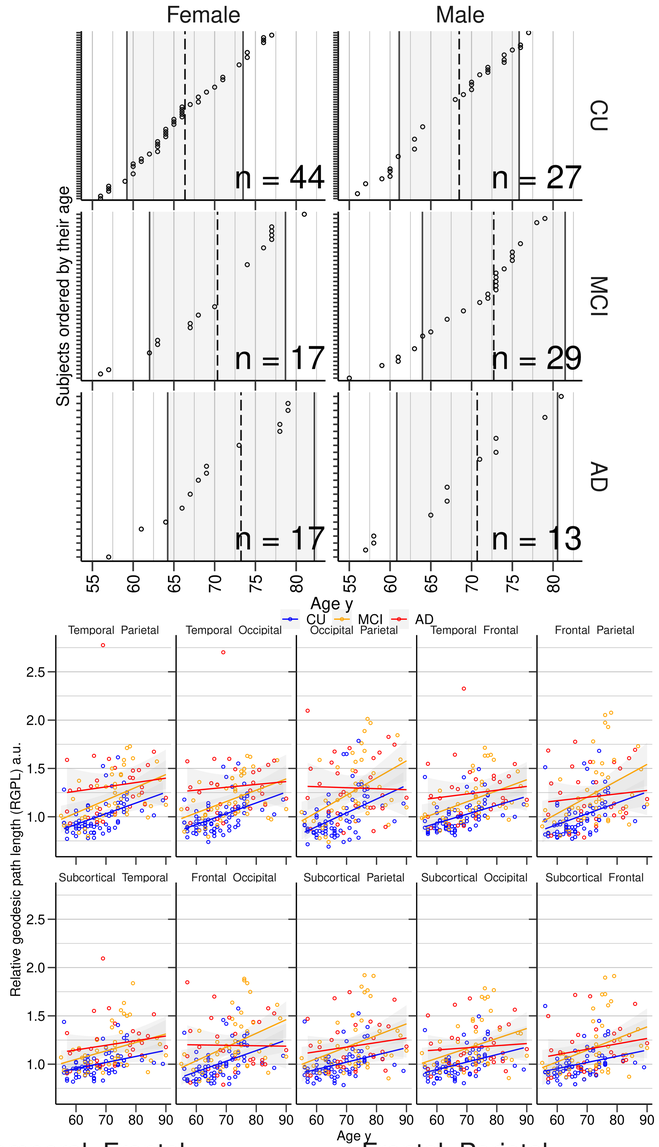
BACKGROUND AND PURPOSE

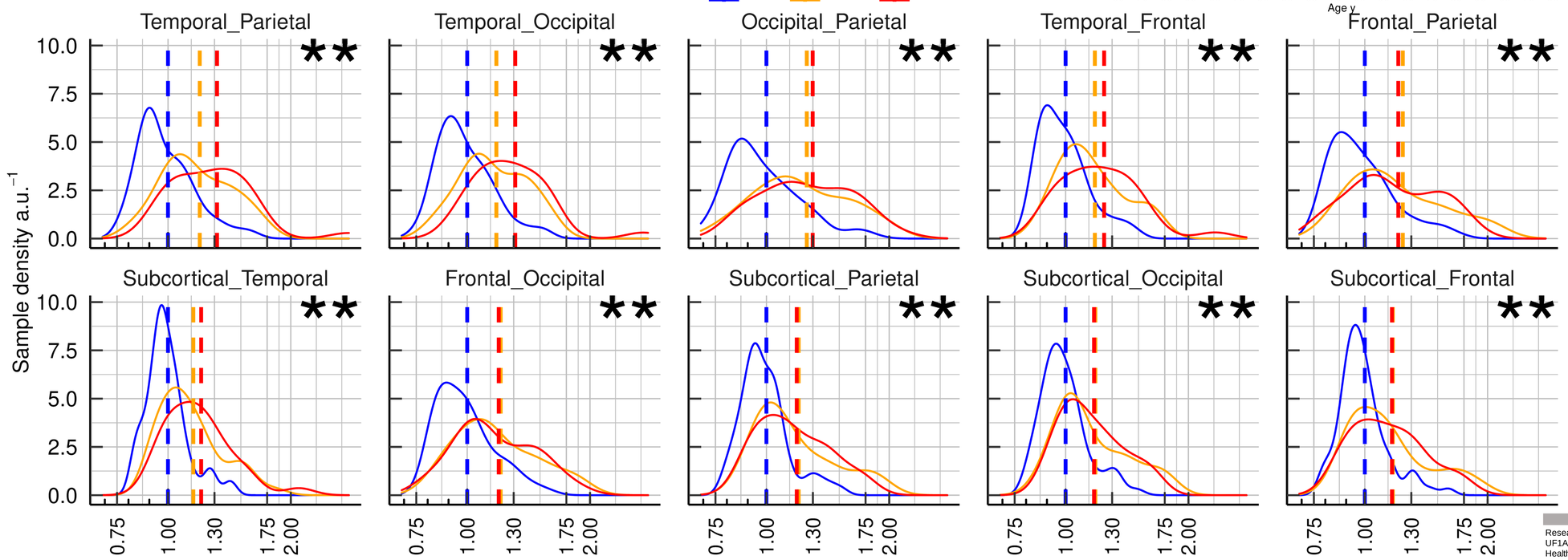
- Neural networks derived from diffusion weighted MRI may shed light on disease progression and pathology propagation in Alzheimer's disease in vivo.
- Geodesic paths are fundamental in understanding key network phenomenon such as the propagation rates of information, infection or pathology.
- For example, the ubiquitous small-worldness property of natural occurring biological and social networks is based on having short path lengths between any pair of entities in the network.
- **The purpose** of this study is to provide preliminary analysis of the geodesic paths of neural networks derived from the Alzheimer's disease connectome project (ADCP).

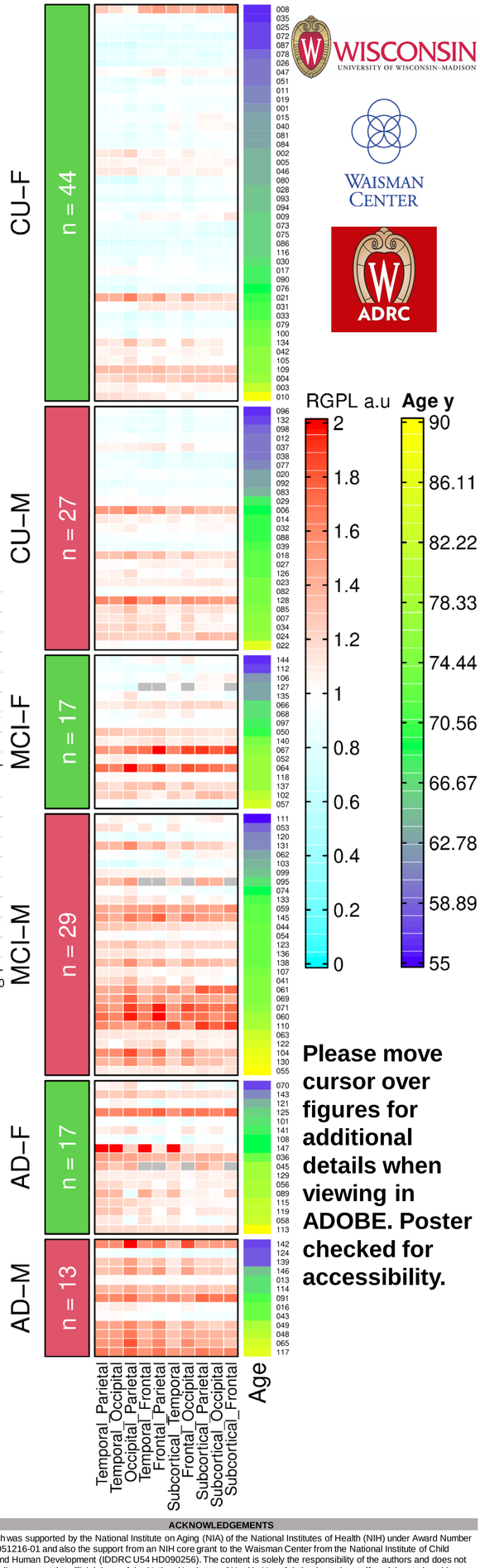




Methods: Connectome imaging protocol based multi-shell diffusion weighted MRI data acquired from n=147 participants were analyzed. Neural networks were extracted from the data using state-of-the-art image processing and tractography algorithms available in FSL, ANTS and MRtrix3. The average geodesic path lengths between frontal, temporal, parietal, occipital, subcortical regions were computed using Dijkstra algorithm.







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