II. Winner's announcement

Information included in this section may be shared publicly with challenge results. If you are on a team, please complete the first two questions for each member of the team.

- Please provide your preferred information for use in announcing the winners of the competition:
    - Name (first and last name or first name and last initial):
        - **Mark Sundman (Captain)**
        - **Ying-hui Chou**
        - **Chidi Ugonna**
        - **Yilin Liu**
        - **Nick Miller**
        - **Leah Stetzel**
    - Hometown:
        - **Tucson, AZ (all team members)**
    - A recent picture of yourself or digital avatar (feel free to attach separately):
        - ***Attached***
    - Social handle or URL (optional):

- Who are you (mini-bio) and what do you do professionally?

  Motivated by a deep family history with neurodegenerative disease, Mark has dedicated his career to optimizing the resilience of the aging brain. In pursuit of this aim, he has cultivated an integrative framework to holistically study the aging brain, earning degrees in Exercise Science (BS), Integrative Medicine (MS), and Cognition and Neural Systems (PhD).

  Complementing this broad base of subject matter expertise, he has developed technical proficiency in state-of-the-art neuroimaging and neuromodulation methodologies. In his current role as a post-doctoral scientist at the University of Arizona, his ongoing research combines these technologies to 1) identify neurophysiological indicators of cognitive resilience and 2) develop personalized therapies (i.e., brain stimulation) to reverse cognitive deficits early in the continuum Alzheimer's disease.

- What motivated you to compete in this challenge?

  My unconventional and multidisciplinary background provides a unique perspective when contemplating the complexities of neurodegenerative disease. I am always looking for the 'low-hanging fruit,' so to speak—readily modifiable, upstream factors that can act as powerful 'levers' to improve brain resilience in aging. Obstructive sleep apnea (OSA) has long exemplified this for me as one of many potential vectors for pathological brain aging. OSA not only has strong mechanistic and epidemiological links with pathological brain aging, but it also has the rare combination of a remarkably high clinical omission rate despite being readily addressable. This challenge motivated me to think through population-scale strategies that have the potential to stave off this sizeable and under-addressed 'on-ramp' to Alzheimer's Disease.

- High level summary of your dataset: the data source, target, predictors, sample size and use for early, inclusive prediction of AD/ADRD.

  Ideas for Data Collection Track*
  My proposal provides a new potential use case for routinely collected dental radiography scans. Specifically, we propose implementing machine learning models to automatically segment and extract anatomical features of the pharynx (upper airway) from Cone Beam Computed Topography (CBCT) imaging. Strong evidence for two causal associations currently exist in isolation: 1) upper airway anatomy is a significant predictor of OSA, and 2) OSA is a significant predictor of AD pathology. This proposal seeks to bridge this gap by directly examining the predictive utility of upper airway caliber (***predictor variable***) for an individual's risk of AD, as assessed by the pathological load of plasma-derived AD biomarkers (***target variable***) in cognitively normal older adults.

- What are two or three unique strengths of this dataset or type of data for early, inclusive prediction of AD/ADRD?

  Multiple aspects of OSA synergize to create a unique, highly levered opportunity for disproportionate impact as a preventative target for AD: 1) OSA is highly prevalent (>50 million Americans), 2) there is an alarming rate of clinical omission (>90% cases remain undiagnosed), 3) strong empirical evidence links OSA and AD alongside numerous, intertwined mechanisms of action, and 4) existing evidence demonstrates that OSA can be cost-effectively managed to ameliorate the pathological burden of AD.

  This is a rare instance where the puzzle pieces all seem to align with one critically missing piece: improved OSA screening methodology to address the rate of clinical omission. Highlighting the inclusivity of this approad, our proposal seeks to address this urgent need with a scalable, low-cost, and widely accessible technology. Access and coverage disparities for dental care remain, but notable progress is ongoing with the percentage of Americans covered by dental insurance growing from 55% to 80% in the last decade.

- Did you use any tools or resources for developing your submission (e.g., to find a dataset, or explore the contents of a public dataset)? **No**
- Were there any data types or sources that you explored but didn't fit for this challenge? **No**
- How would you improve or enrich this dataset if you had access to a big research team and an unlimited budget?

  The current proposal leverages CBCT dental radiography (predictor variables) and plasma AD biomarkers (outcome variables). With additional resources, several strategies could be employed to strengthen the proposed dataset. First, incorporating head/neck structural magnetic resonance imaging (MRI) could considerably enrich the dataset. MRI data could enhance predictive models by extracting soft tissue features of the upper airway (e.g., pharyngeal fat pads) and secondary outcome measures (e.g., cortical atrophy).

Second, additional resources could enable a sleep study component to directly assess the presence and severity of OSA. This would allow researchers to analyze the layered associations between 1) CBCT-derived pharyngeal anatomy, 2) OSA severity, and 3) AD outcome measures. This is necessary to both validate the utility of our proposed predictive variable and establish clinically relevant threshold values (i.e., what findings from a dental CBCT airway screen should indicate a sleep study referral?)

Lastly, unlimited resources would enable a longitudinal study design to vastly enrich the dataset. Beyond enabling direct examination of the predictive utility of upper airway caliber over time, researchers could examine the extent to which this supposed risk of AD can be modified by adherence to OSA therapies.