

## All in the Family

You may not have known about your cousin's early onset Alzheimer's, but your second cousin, once removed did. Family history is only as good as the person providing it, but building the tools in this challenge will make it better by connecting family history data from seemingly unrelated individuals into super-family structures and calculating the confidence for each connection.

### Long Description

Most self-reported family histories are incomplete at best and are often riddled with misinformation. This causes healthcare providers to use only what is reported on the most recent family history survey by the patient in their clinical assessment. What if there was a way to not only capture family history data from a patient, but to find family histories captured from known and unknown relatives to increase the completeness and reduce the misinformation? In this challenge, participants are asked to create a system that can combine family history data from multiple individuals into a super-family history using only de-identified information. The super-family history should include a confidence measure of how likely the connections between overlapping family histories are true. Additionally, the product should predict a resolution of conflicting data from multiple overlapping family histories including the same individual. Participants will be supplied de-identified data files for multiple individuals with family relationships and disease associations identified for each individual within the family. To complete the entire challenge, participants should consider creating a functional product that contains both parts; UI/UX and Optimization/Prioritization. However, participants may also choose to focus on only one of the sub-challenges.

#### 1. UI/UX

This challenge requires an engaging and simple to use UI/UX for both patients submitting their own family history and the physician that will be viewing both an individual patient family history, but also a super-family history of which their patient represents a part. The UI/UX should take into consideration the ability to distinguish between a patient entered family history and what the system has calculated as the super-family history. In addition, tools to select and display specific diseases contained within the family history ought to be included. The UI/UX should include a form for entering basic family structure information (number of different types of relatives, ancestral origins), a family tree mode for building a family history from the patient perspective (drag and drop functionality to add more people to the family tree and a UI that can add information about a person in the family such as age of death, disease state, etc.), a provider view that conforms to the standards of medical pedigrees, a notation section for both patient and providers to add additional notes to the family history, and a view that supports a confidence calculation for the super-family history construction.

#### 2. Optimization/Prioritization

Family histories are complex and often contain partial, incomplete, or incorrect information. In order to optimize and prioritize the construction of a super-family history, participants are asked to create a system that can not only create a

super-family history from deidentified records, but also resolve inconsistent data within the family histories, resolve missing or additional family members, and accommodate special cases like adoption and twinning. The optimized system should include the ability to render super-family histories in real time and be responsive to changes within a family history provided by one or more individuals contained within the super-family structure.