



Modeling Alzheimer's Progression Using Cognitive Performance Data



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Project Description

Engineering Need

Current treatments for Alzheimer's disease benefit heavily from early diagnosis that allows for a greater prolongation of lifespan; however, current methods of early diagnosis remain costly and inaccessible to the general public.

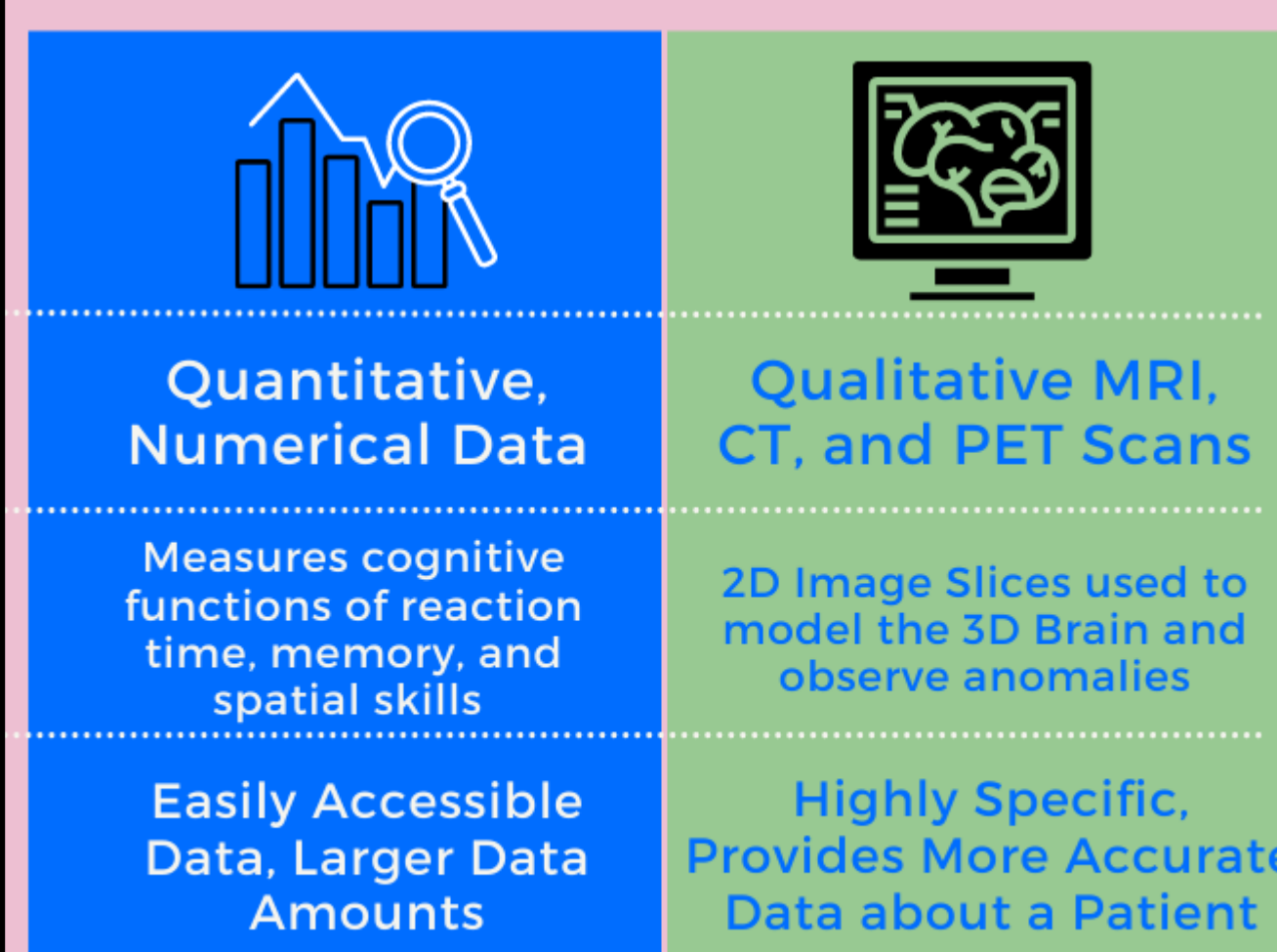
Goal

The goal of this project was to use cognitive performance data to model Alzheimer's progression by creating an LSTM machine learning model that allows a patient to get regular updates about their Alzheimer's status.

Data and Methodology

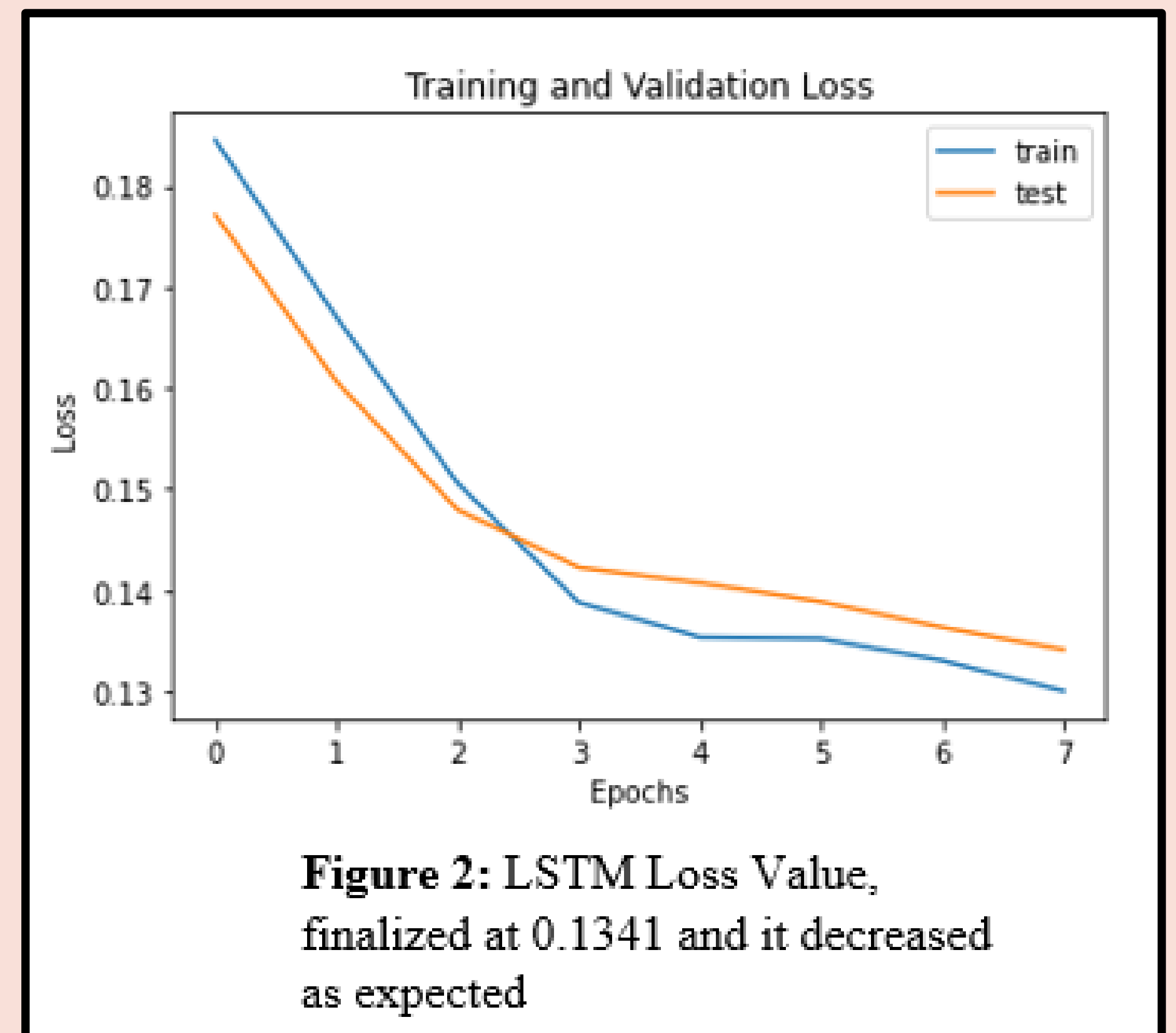
COGNITIVE PERFORMANCE DATA

VERSUS IMAGE DATA



- Acquire data from ADNI database
- Pre-process dataset for needed reaction tests and values
- Create LSTM and kNN Model
- Optimize for greatest accuracy
- Calculate statistical values, such as loss and accuracy

Results



Background and Decision Matrix

WHO

Affect Elderly Above 65

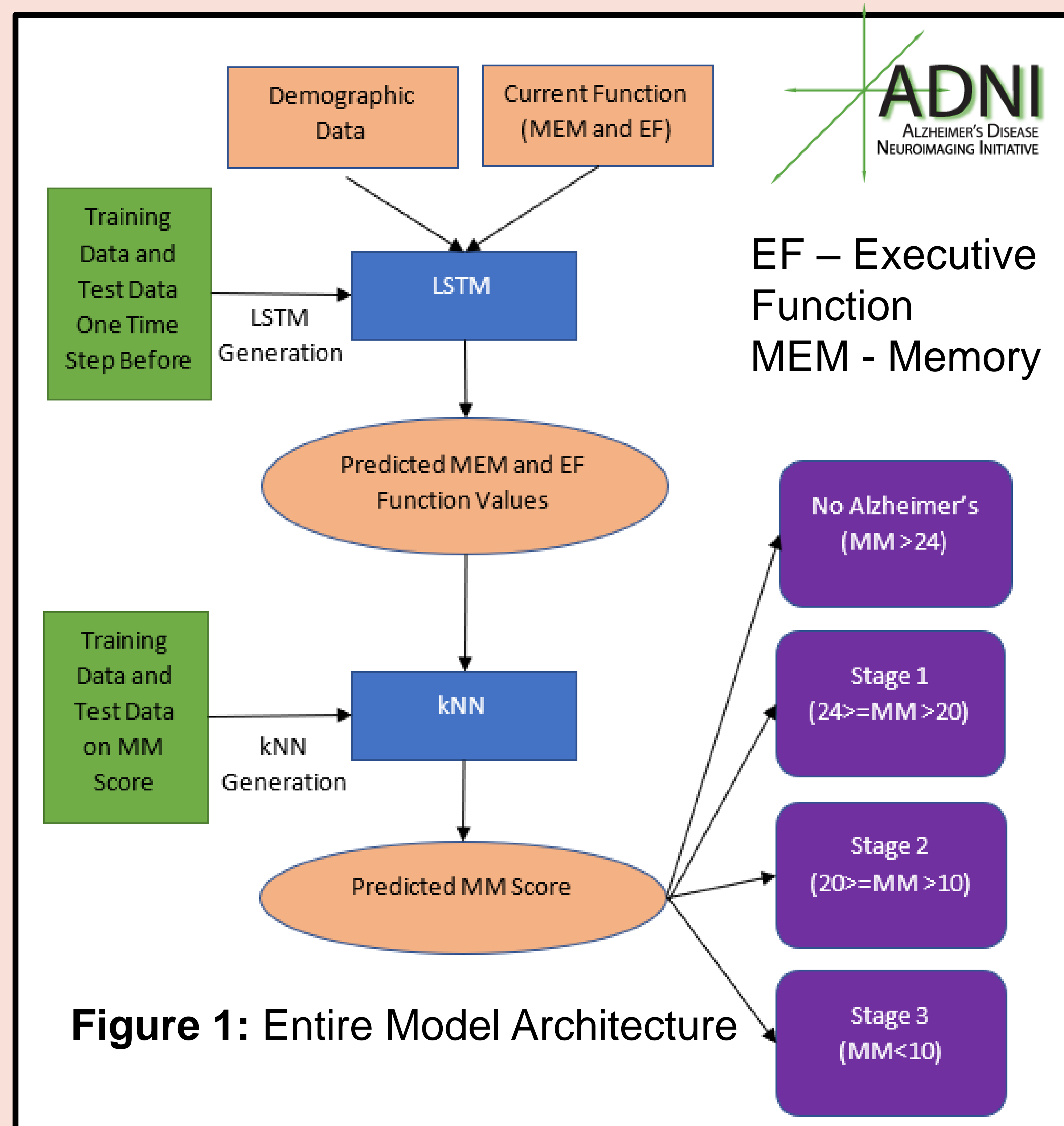
WHAT

Progressive Neurodegenerative Disease

SOLUTIONS

No Current Cures; Treatment Success Depends on Diagnosis Date

LSTM and kNN Model



The model was trained for 8 epochs. The loss for the model was 0.1341 which shows the strength of the model. The accuracy for the LSTM prediction was 79%. The kNN prediction was optimized and gave an accuracy of 70% and a RMSE of 2.27.

Discussion and Extensions

- Allows elderly to keep track of their Alzheimer's status
- Could cut down on major trips to the doctor for simple check-ups
- Allows patients with MCI to monitor their Alzheimer's progression and track for conversion
- Create a GUI to take need cognitive tests online
 - Require less major technical assistance

Table 1: Decision Matrix Comparing Different Machine Learning Methods

Criteria	Max Points	Multi Variate Regression	LSTM + kNN
1. Predicts next value for an inputted time step (required)	10	6	10
2. Prediction Accuracy above 75%	9	4	7
3. Classifies Alzheimer's using MM score with RMSE below 4	8	7	8
Total	27	17	25
Percent	100%	63%	93%