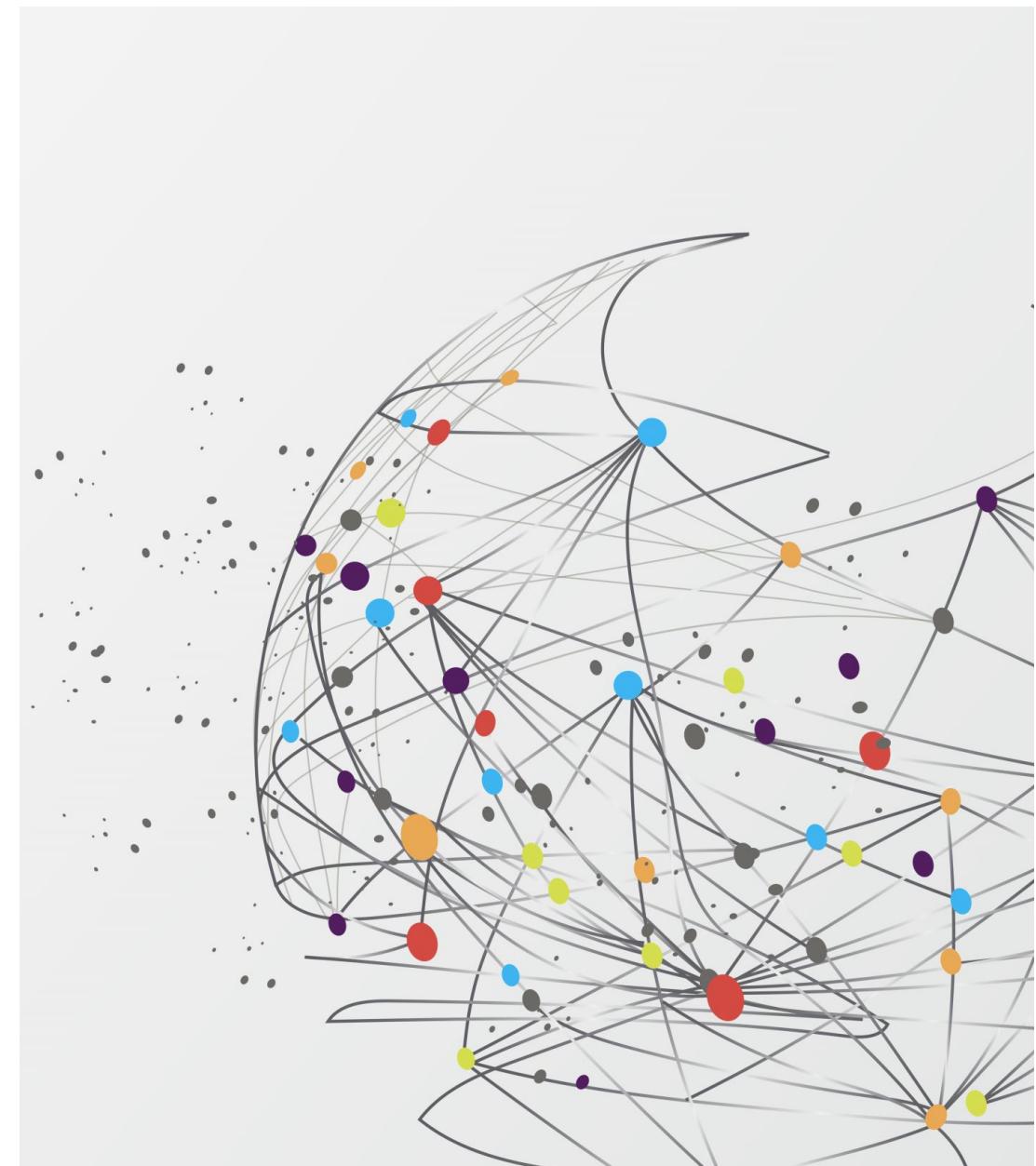


CLASSIFYING ALZHEIMER MRI IMAGES WITH DEEP LEARNING

BY MITCH KRIEGER & JACOB
HEYMAN



OVERVIEW

- Alzheimer Disease effects 47million people globally
 - A major factor is the build up amyloid- β and tau proteins
 - Results in atrophy of limbic areas of the brain
 - Can Lead Progressive dementia



BUSINESS PROBLEM

Most methods are expensive

PET imaging is invasive

PET and MRI Imaging requires expert visual analysis

Human Error

RESEARCH QUESTIONS



What are Key features of four classes of Dementia in our data?



Can We Create a Model to Classify Alzheimer MRI Images?



What Model and Method best reduces false negatives?

DATA

Kaggle Alzheimer MRI Image Dataset

Train and Test image files

Four Classes

- NonDemented
- Very Mild Demented
- Mild Demented
- Moderate Demented

METHODS



FIXING CLASS IMBALANCE WITH IMAGE AUGMENTATION

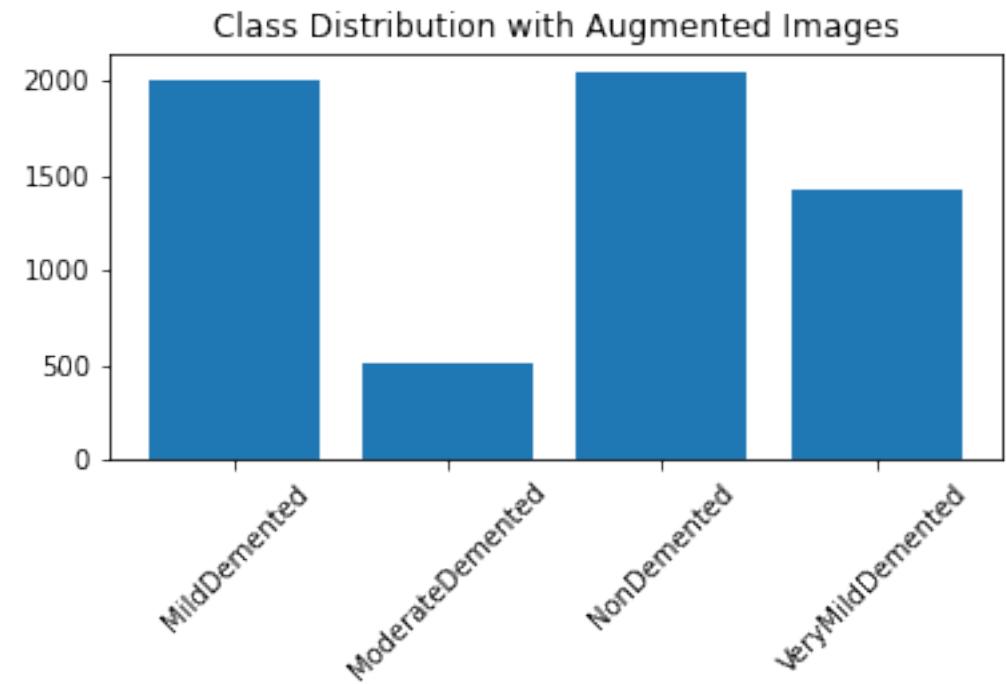
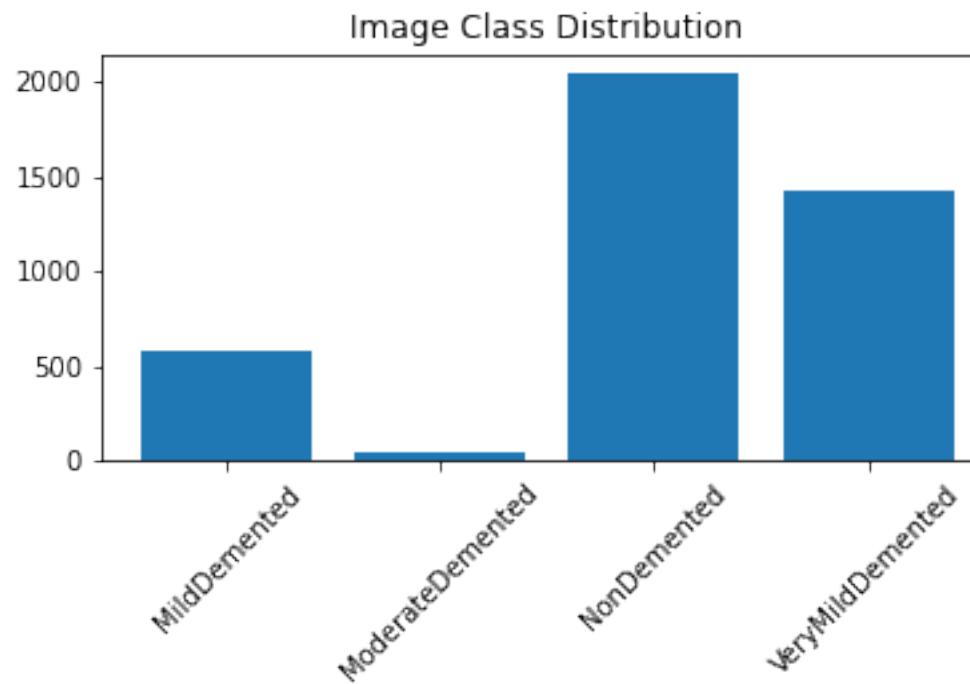
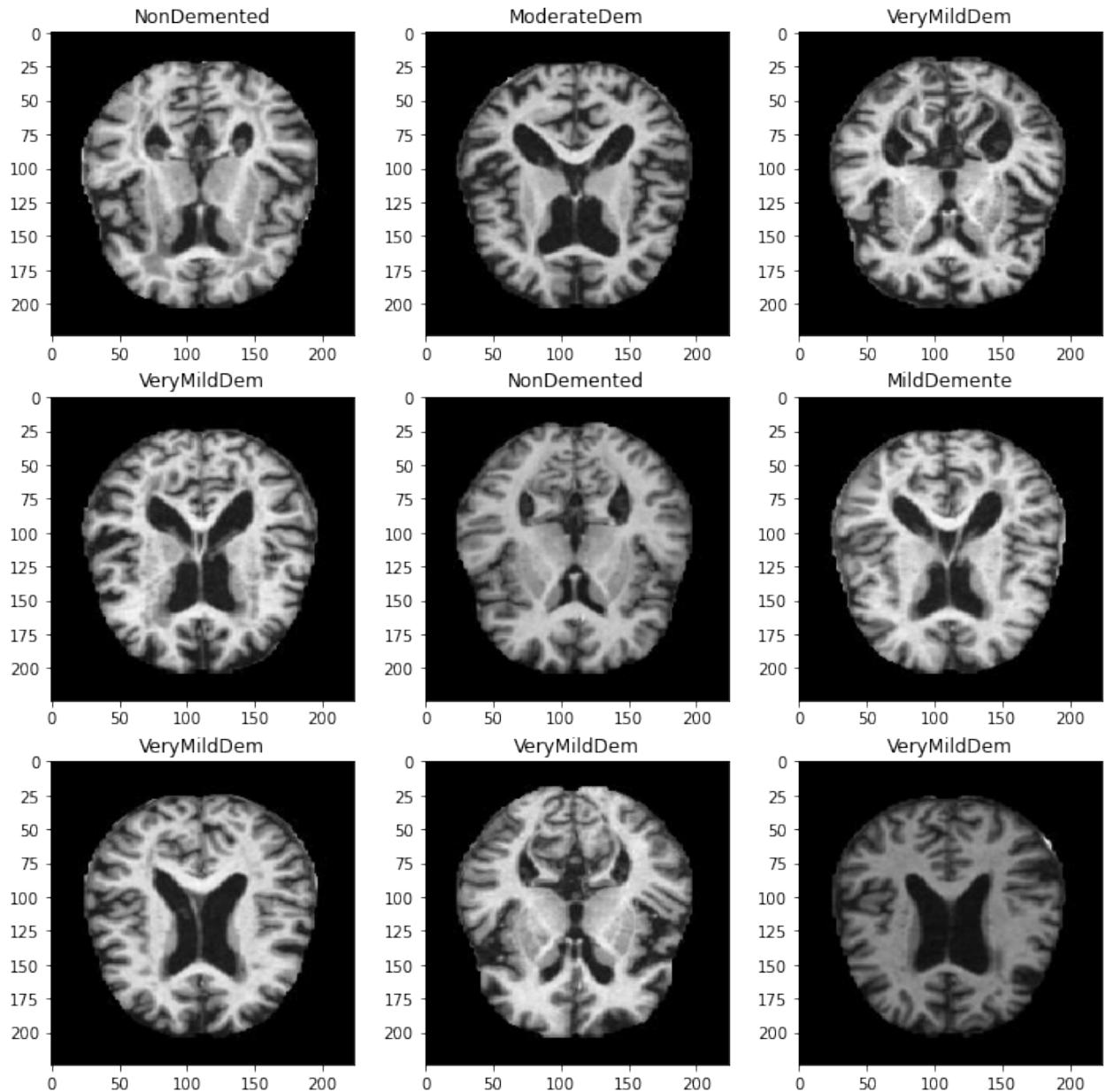


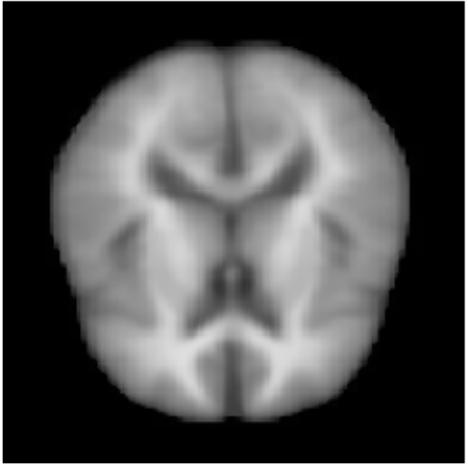
IMAGE SAMPLES

- Images are difficult to differentiate their unique features

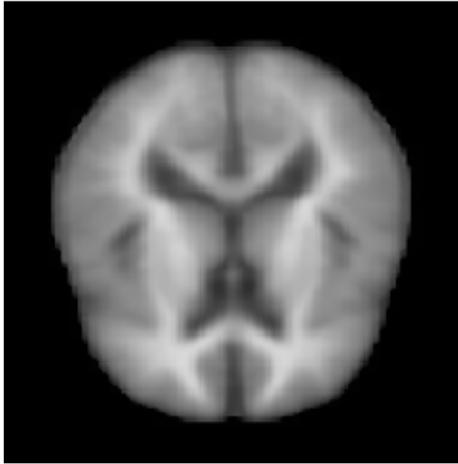


MEAN AND STD IMAGES

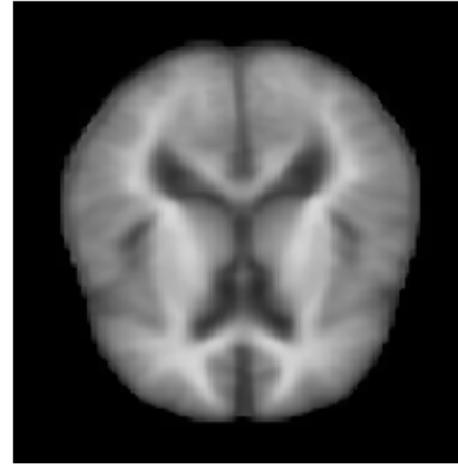
Average NonDemented



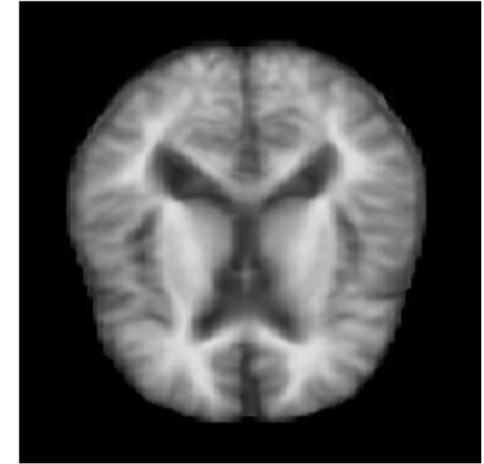
Average VeryMildDemented



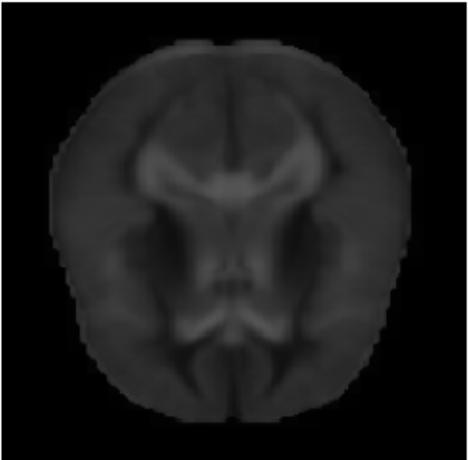
Average MildDemented



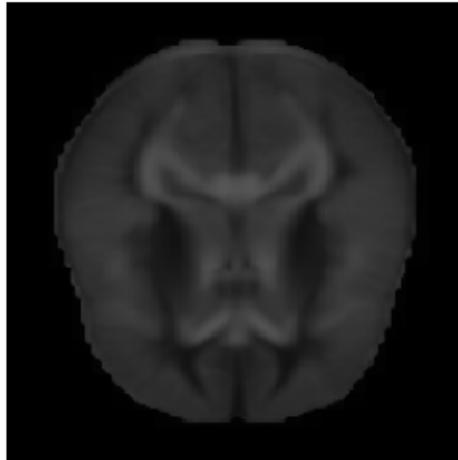
Average ModerateDemented



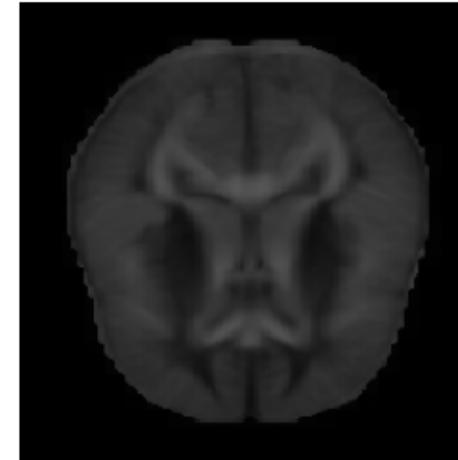
Standard Dev NonDemented



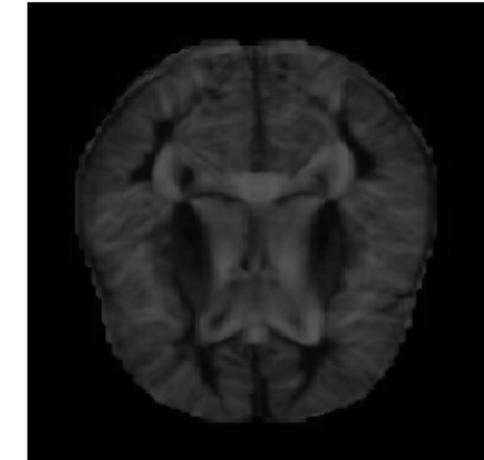
Standard Dev VeryMildDemented



Standard Dev MildDemented

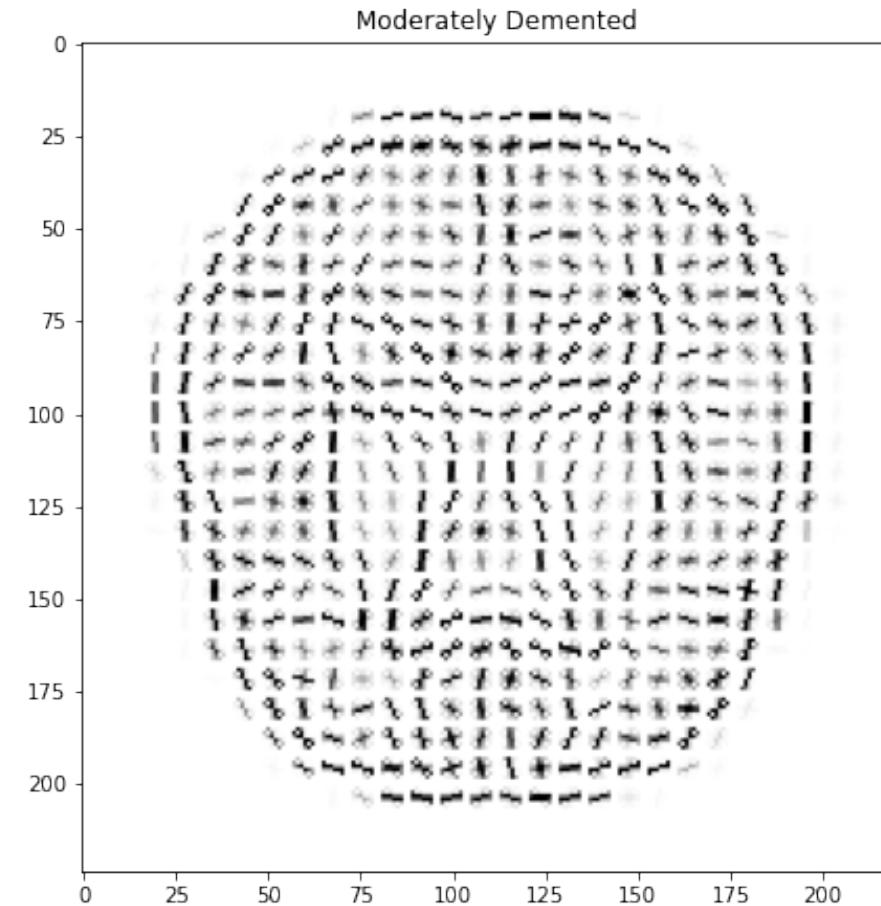
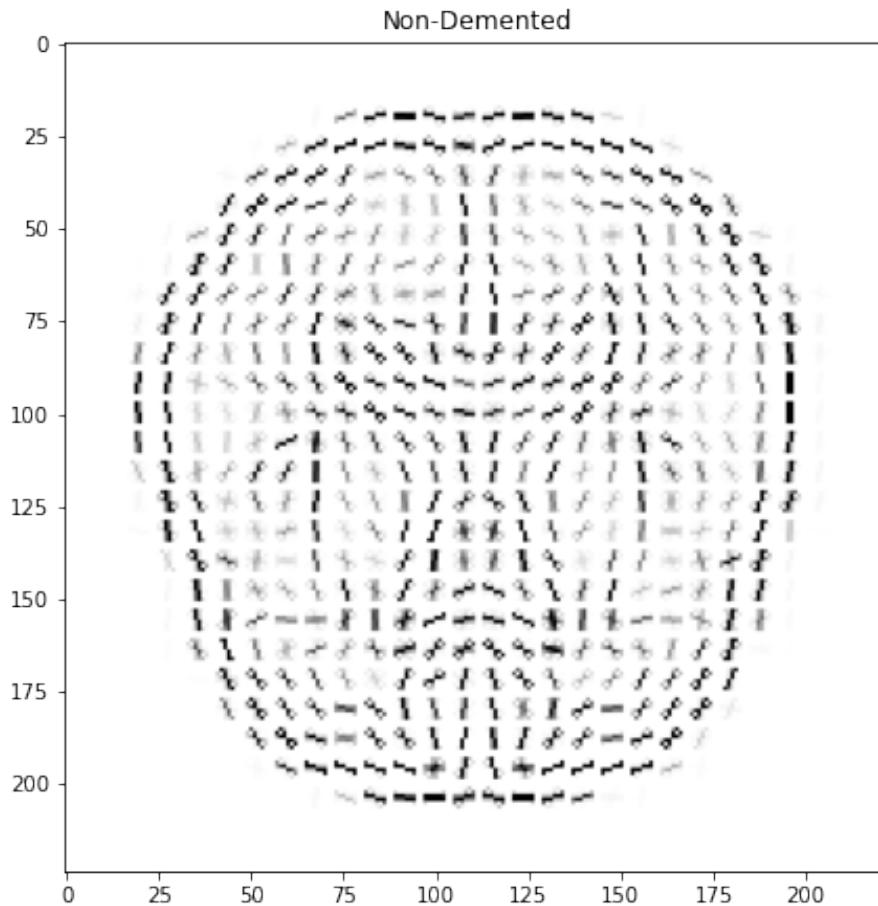


Standard Dev ModerateDemented



HIGHER GRADIENTS IN MODERATELY DEMENTED IMAGES

Histogram of Oriented Gradients



MODELING PROCESS

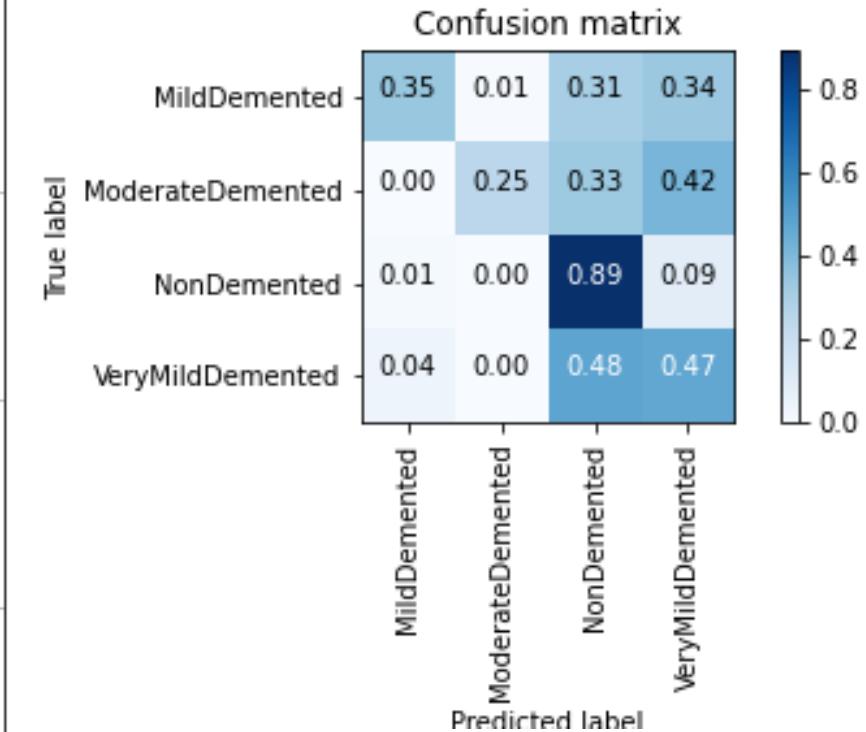
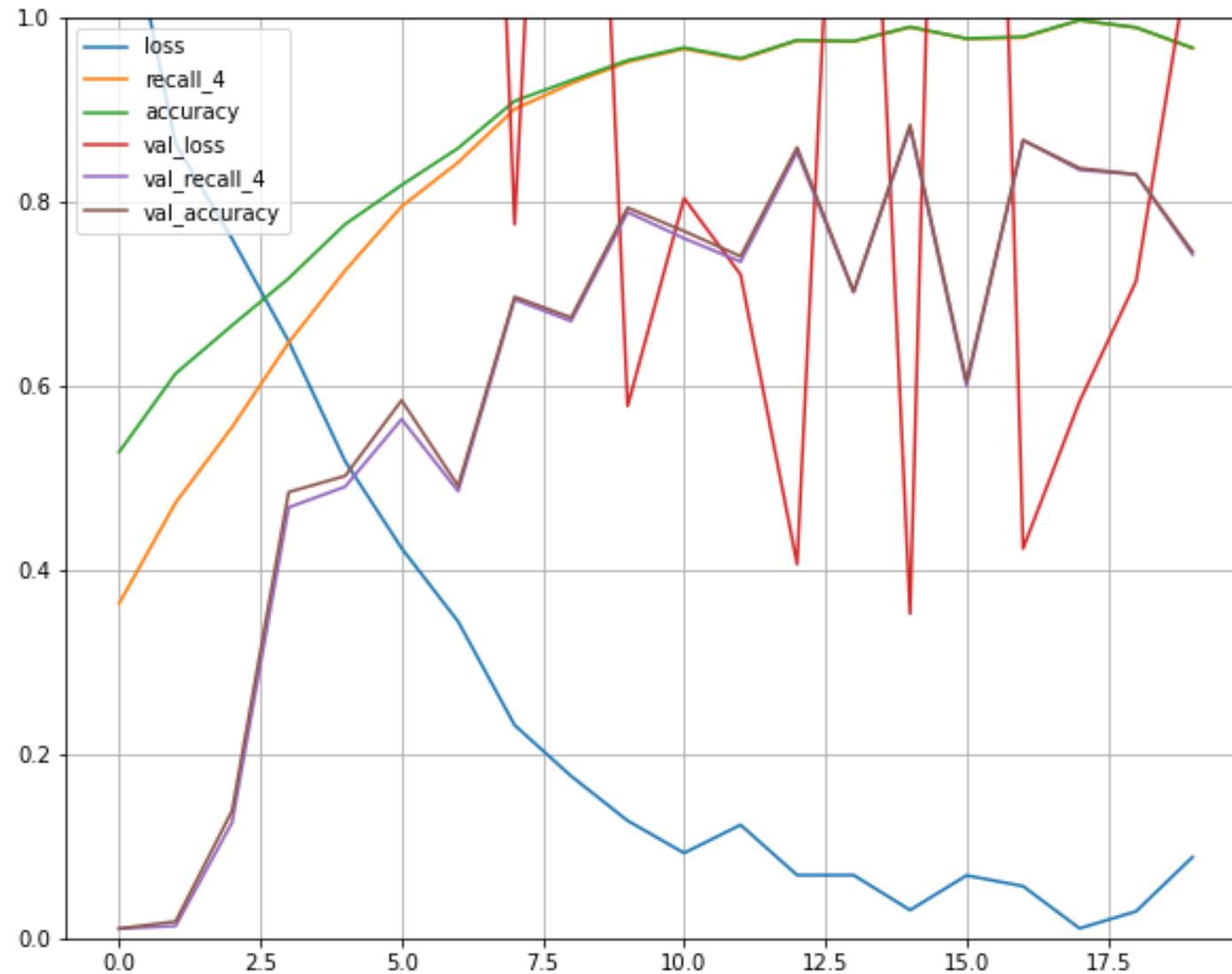
Baseline Models

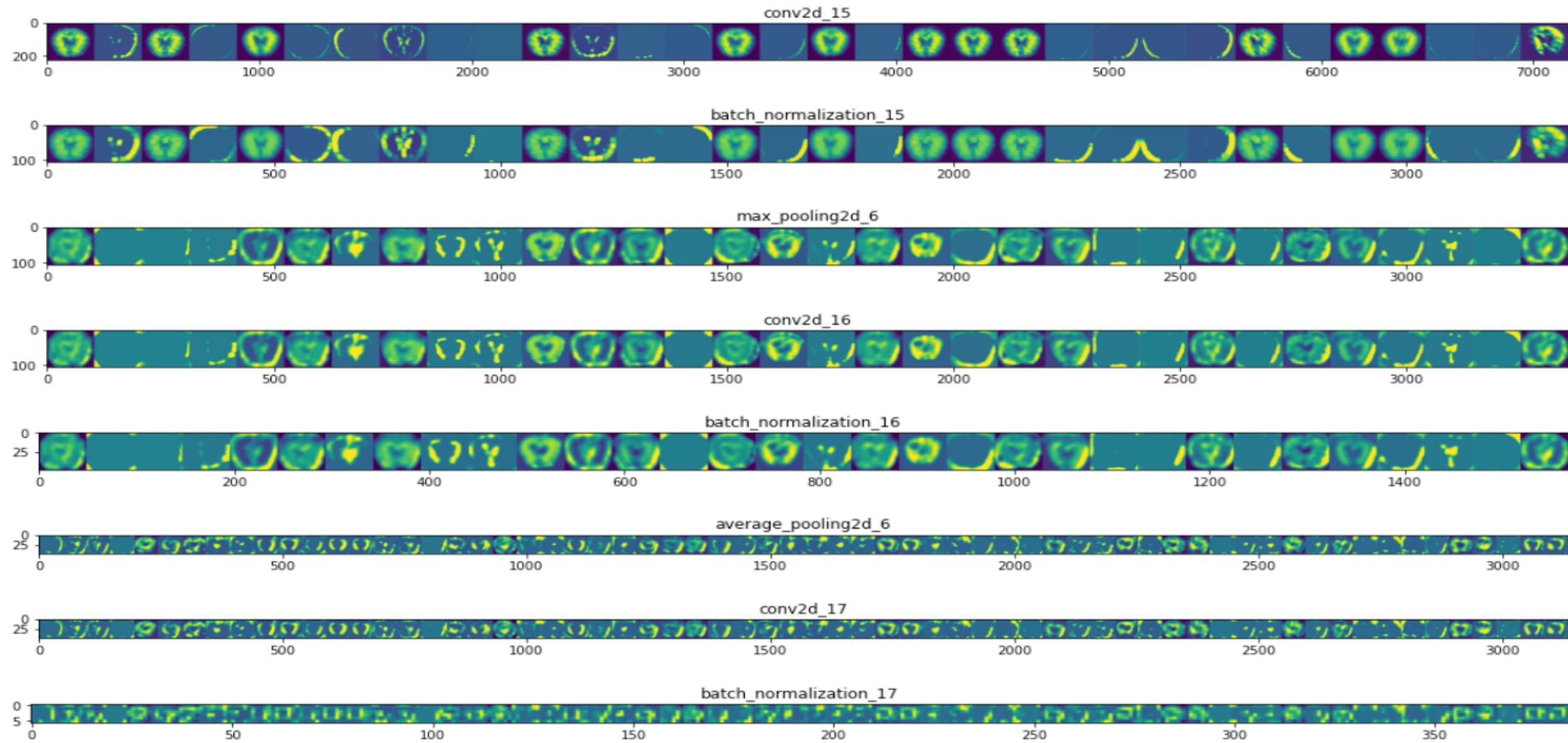
- Simple Neural Network via unrowing
- Simple CNN with 2 Convolutional Layers and MaxPooling

Transfer Learning Models

- AlexNet Architecture
- Fronteirs Research Paper Neural Net

FINAL MODEL EVALUATION





LAYER EVALUATION

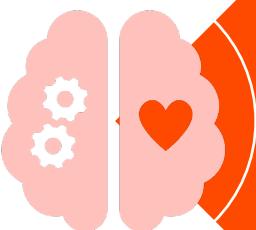
CONCLUSION



Frontier CNN had a recall of
66%



Low accuracy and recall likely
the result to unexpected feature
variance



Potential overlap in classes may
lead to misclassification



Overlap may be caused by
conflation of brain atrophy
progression and dementia

NEXT STEPS

