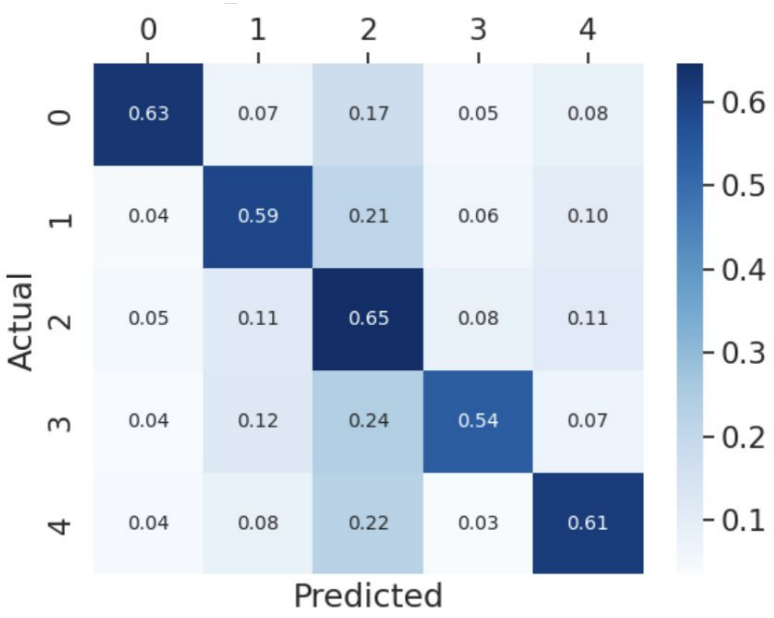
0: Wake
1: S1
2: S2
3: S3
4: REM

Confusion Matrix after 50 Epochs



- 2 Conv1D Layers trained on 800,000 data points
- Training Accuracy = 0.65
- Testing Accuracy = 0.61

Sleep Stages Predicted From Heart Rate and Movement Data

By Anita Podrug and Ariel Fuchs

Motivation

- Health and Wellbeing
- Memory Consolidation
- Blood flow increases to muscles
- Sleep trackers

The 4 Stages of Sleep

NREM Stage 1

- transition period between wakefulness and sleep
- lasts around 5 to 10 minutes

NREM Stage 2

- body temperature drops and heart rate begins to slow
- brain begins to produce sleep spindles
- lasts approximately 20 minutes

NREM Stage 3

- muscles relax
- blood pressure and breathing rate drop
- deepest sleep occurs

REM Sleep

- brain becomes more active
- body becomes relaxed and immobilized
- dreams occur
- eyes move rapidly

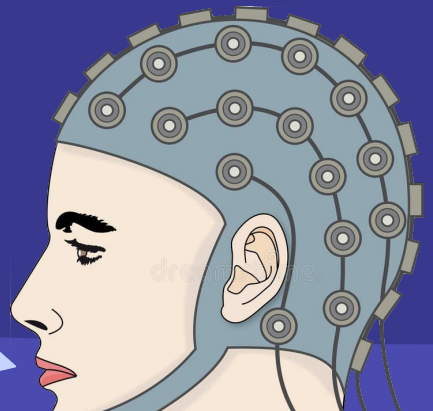
DATA SET

187 Columns

1 Million Rows

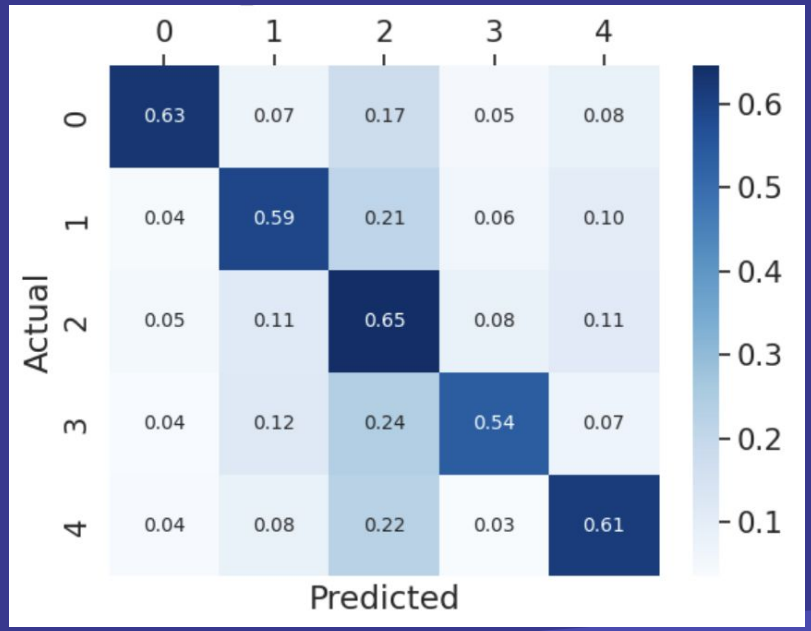
Heart Rate	Accelerometer	Gyroscope	FFT Heart Rate	FFT Accelerometer	FFT Gyroscope
Bpm	X,Y,Z m/s^2	X,Y,Z deg/s	60 columns	60 Columns	60 Columns

Electroencephalogram measures the electrical activity of the brain when awake and asleep. Gives the ground truth data.



MODEL

Confusion Matrix after 50 Epochs

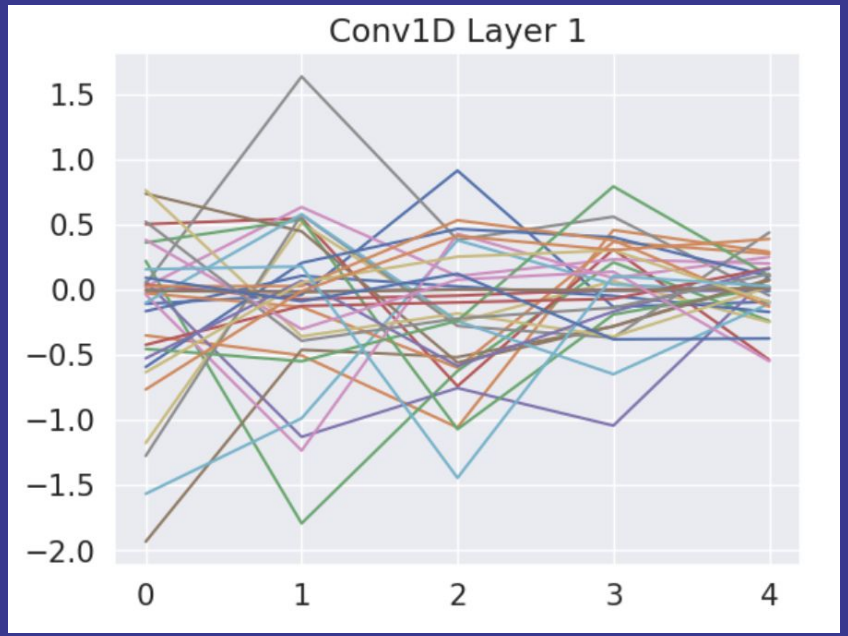


0: Wake
1: S1
2: S2
3: S3
4: REM

- 2 Conv1D Layers trained on 800,000 data points
- Training Accuracy = 0.65
- Testing Accuracy = 0.61

FILTERS

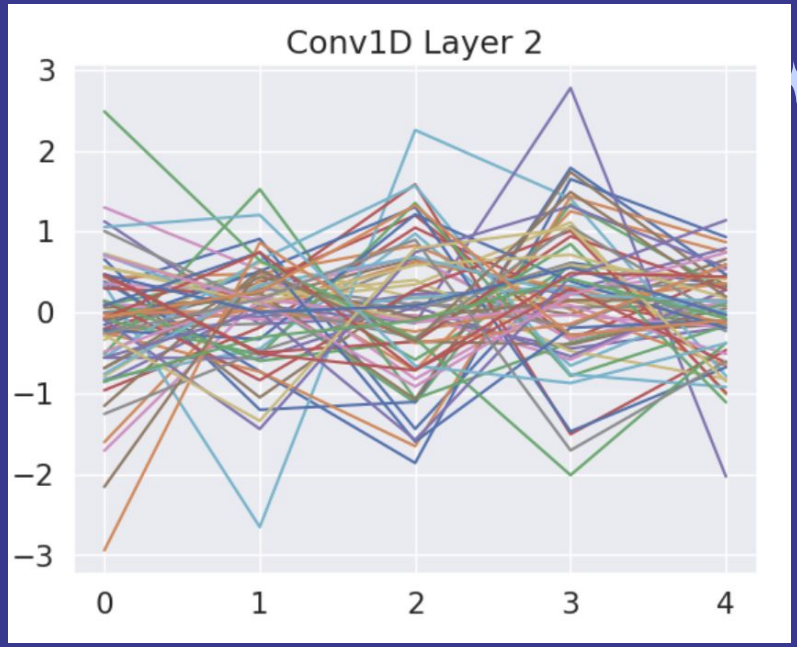
Layer 1 (32 Filters)



Weights

Kernel

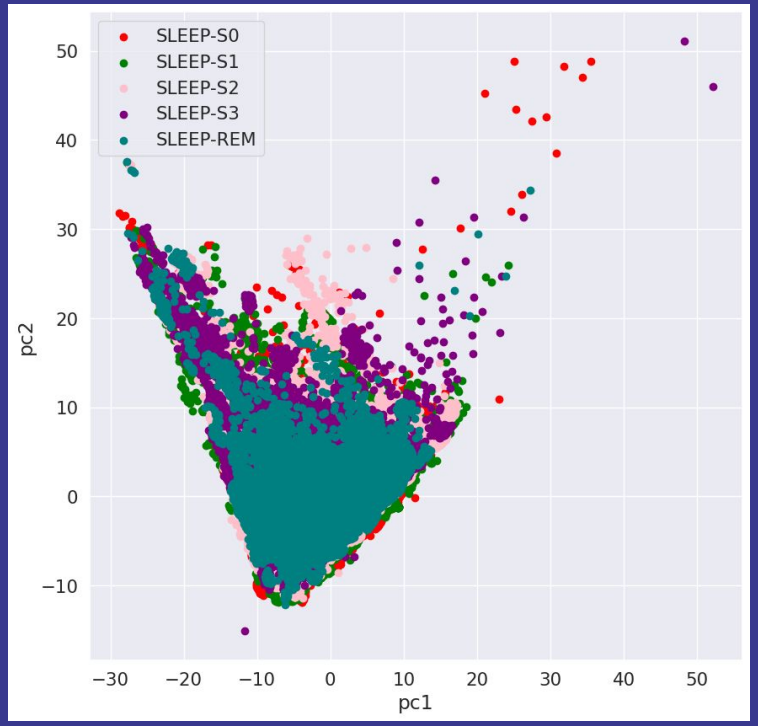
Layer 2 (64 Filters)

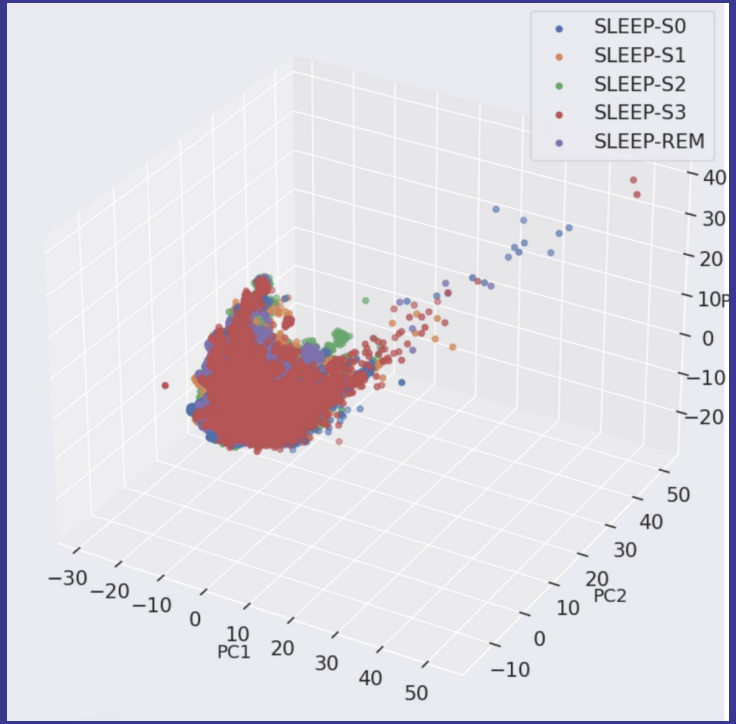


Kernel

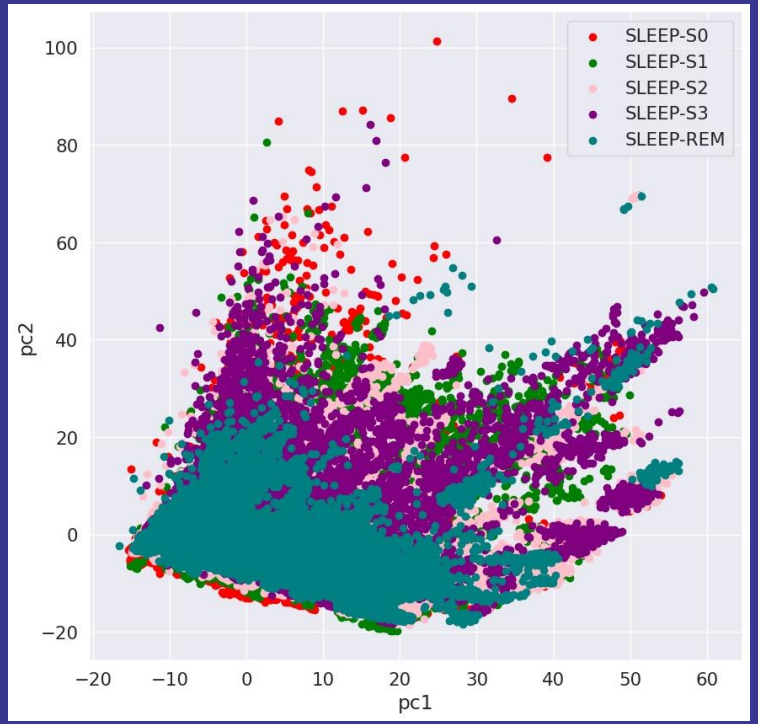
LEARNING/OPTIMIZATION

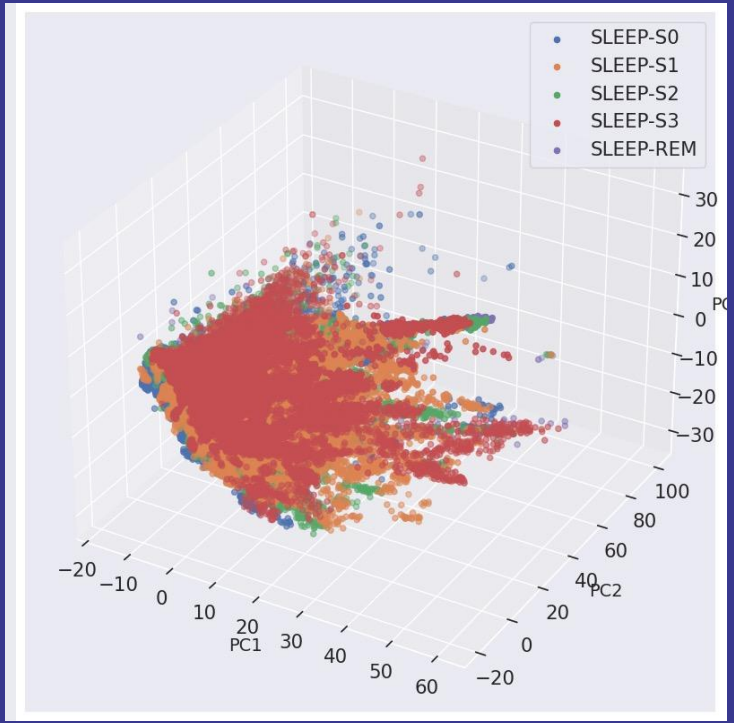
PCA 2D AND 3D + IMAGE OF DIAGRAM (20 EPOCHS)

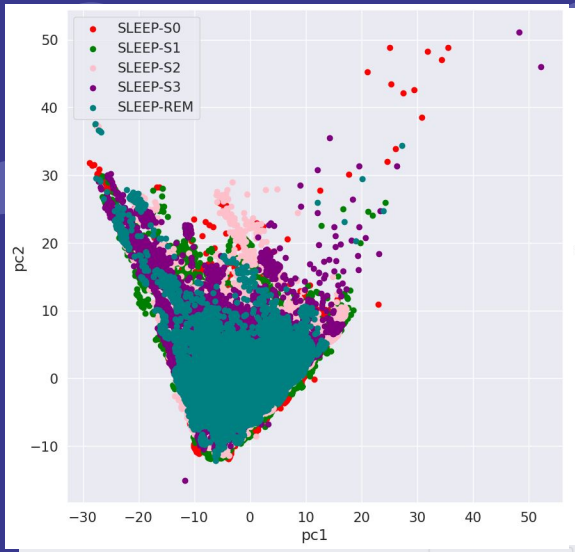


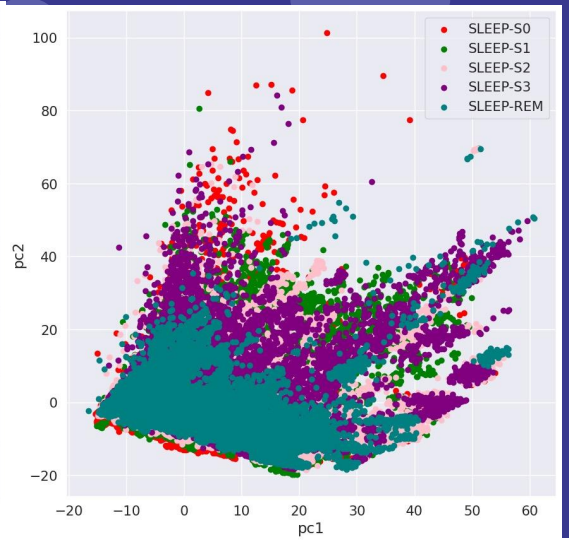


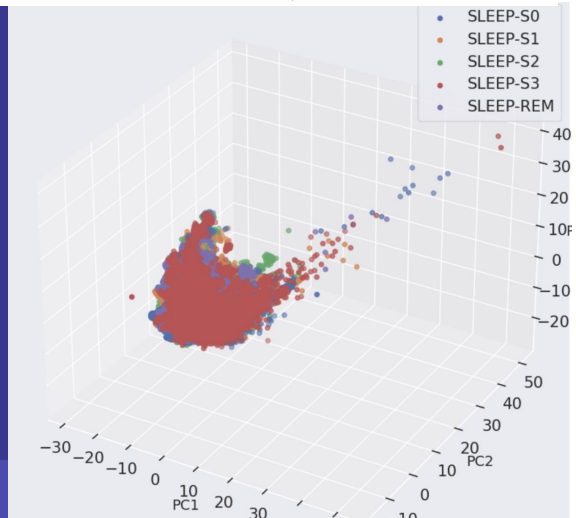
PCA 2D AND 3D + IMAGE OF DIAGRAM (50 EPOCHS)

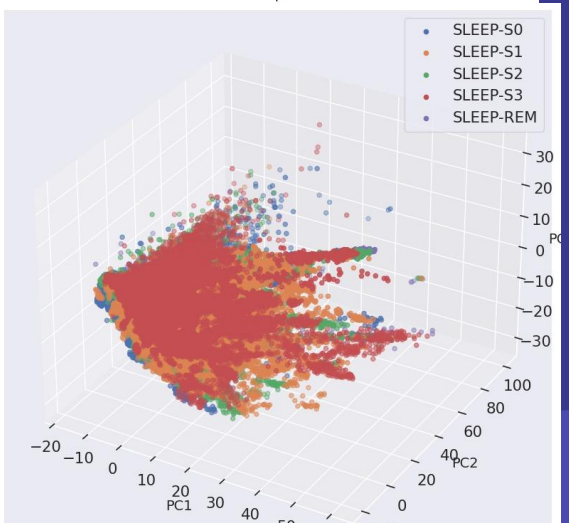





SLEEP-S0
SLEEP-S1
SLEEP-S2
SLEEP-S3
SLEEP-REM
pc1
pc2


SLEEP-S0
SLEEP-S1
SLEEP-S2
SLEEP-S3
SLEEP-REM
pc1
pc2


SLEEP-S0
SLEEP-S1
SLEEP-S2
SLEEP-S3
SLEEP-REM
PC1
PC2


SLEEP-S0
SLEEP-S1
SLEEP-S2
SLEEP-S3
SLEEP-REM
PC1
PC2