

Automatic Classification of Human Sleep

Zhiyan Wang

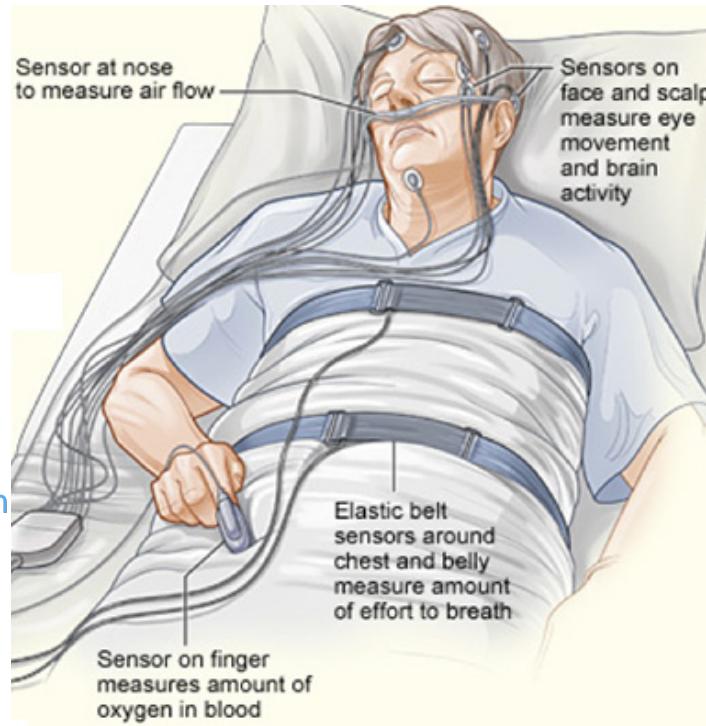
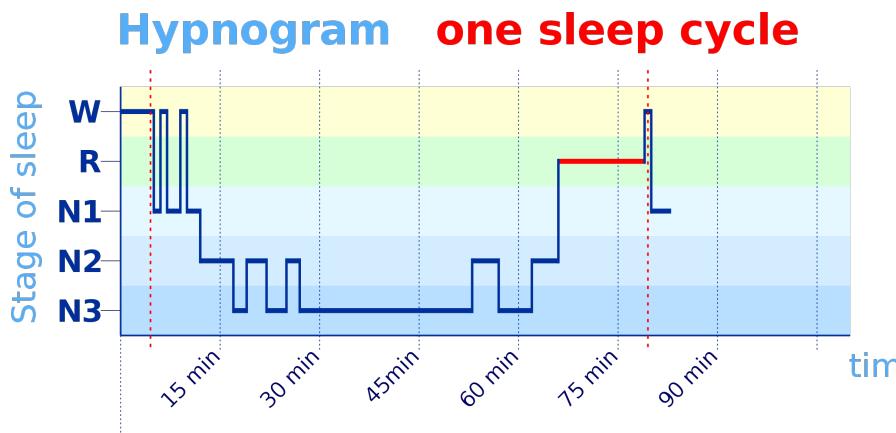
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https://github.com/zhiyanwang27/decoding_sleep

Human Sleep 101

- Human Sleep Cycle
 - REM sleep
 - NREM sleep
 - N1, N2, N3
- Human Sleep Measurement



Characteristics of Human Sleep

Awake
Beta waves



Stage N2 sleep
Sleep spindles



Drowsy, relaxed
Alpha waves



Stage N3 sleep
Delta waves



Stage N1 sleep
Theta waves



REM sleep
Fast, random



Characteristics of Human Sleep

BY EYE ! ! !

-inaccurate

-training

-boring

Classification by
machine learning!

Awake
Beta waves

Drowsy, relaxed
Alpha waves

Stage N1 sleep
Theta waves

Stage N2 sleep

Slow delta theta

Stage N3 sleep

Delta waves

REM sleep

Faster theta

Objectives

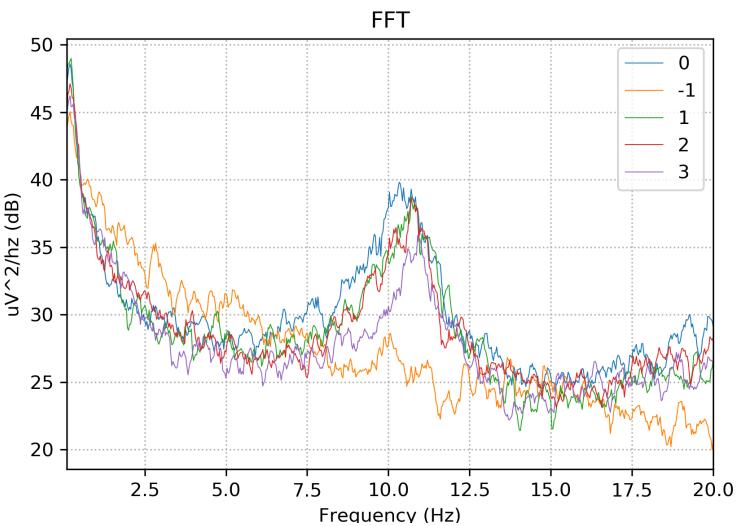
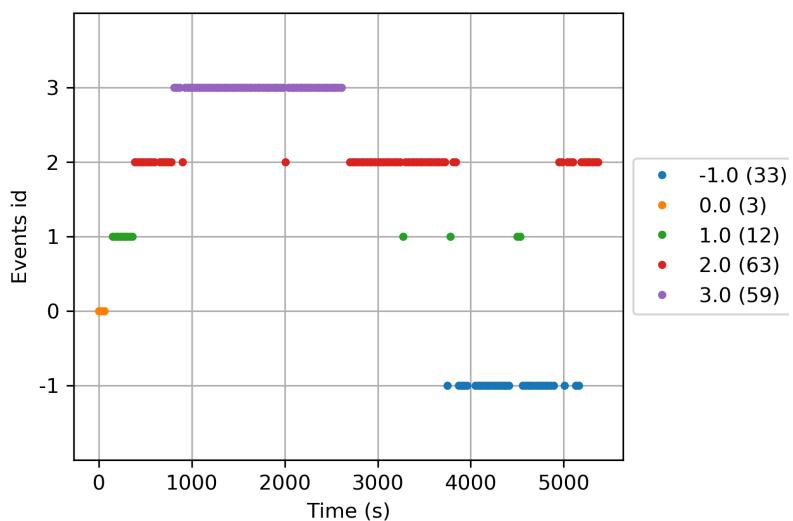
- Classification
 - Wake vs Sleep
 - Different sleep stages
- Sleep related learning
 - Nap2 -- learning before sleep
 - Nap3 – No learning before sleep
 - Differs in certain frequencies

Objectives

- Classification
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Preprocessing

- Create tabular format file
 - MNE-Python toolbox for EEG
 - 30s epoch – FFT – change dim
 -

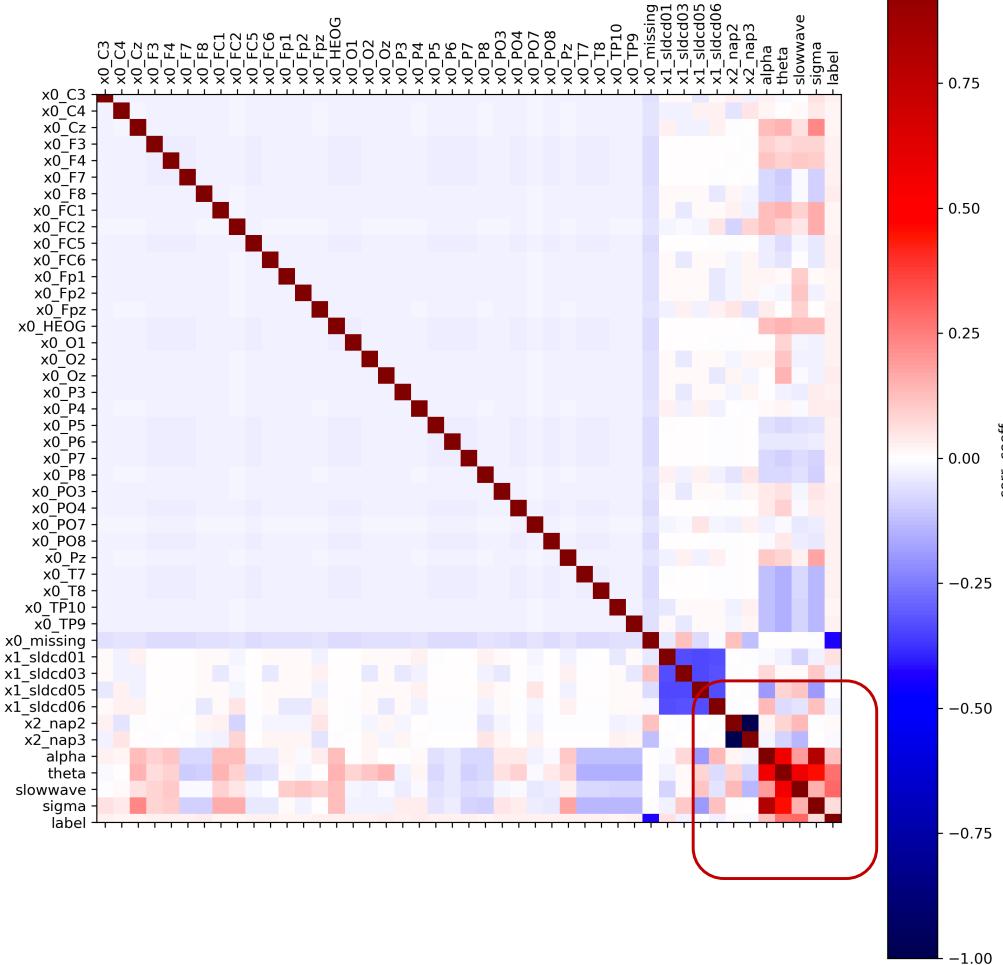


alpha	sigma	slowwave	theta	stage	sub	electrodes	Nap

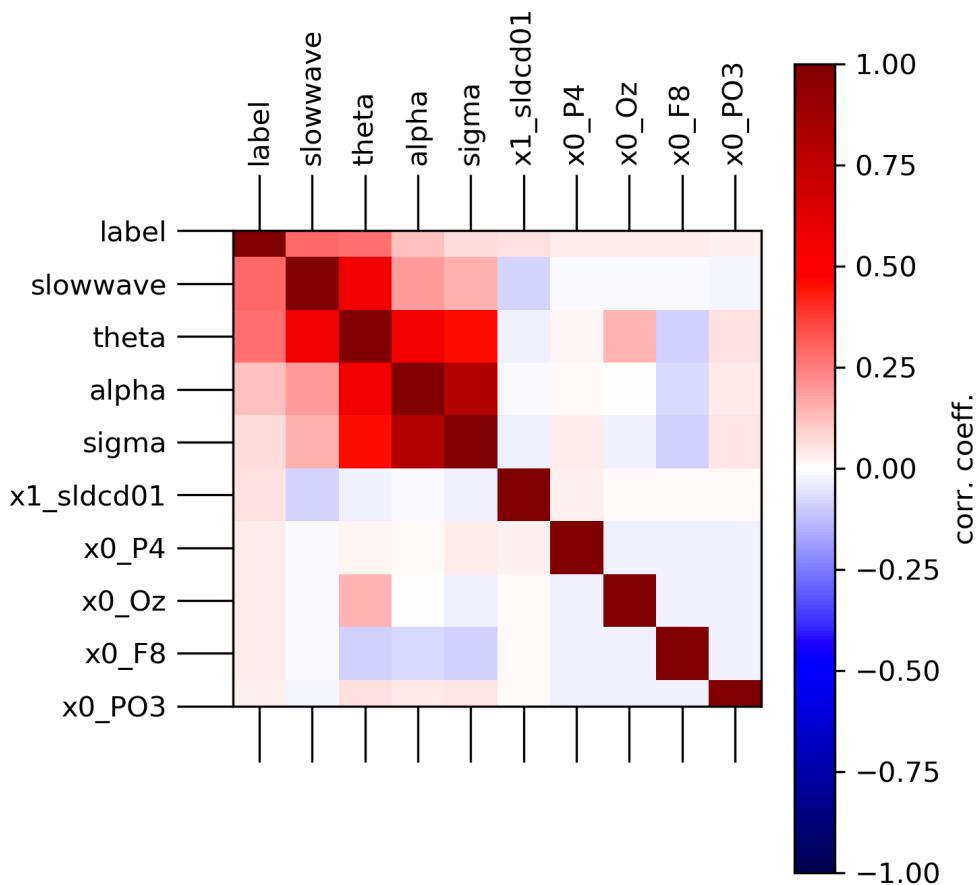
Preprocessing

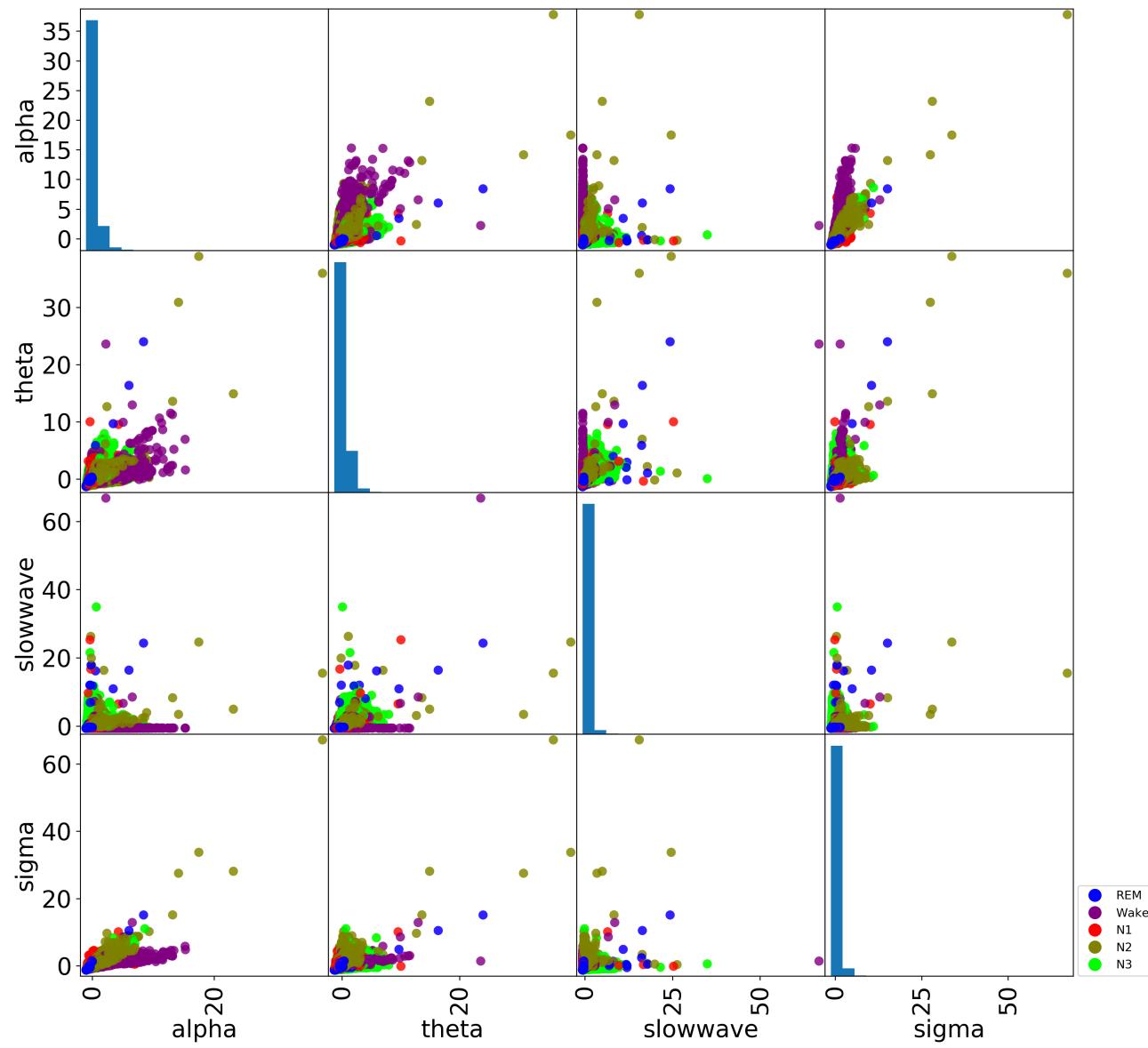
- Missing data
 - Some electrodes are bad during recording. Marked as NaN and preprocessed as missing values
- Feature Encoders
 - Scalar encoder for continuous features
 - One-hot encoder for categorical features.
- Label Encoder
 - REM, W, N1, N2, N3
 - 0, 1, 2, 3, 4
- 45441 entries * 45 features

Correlation Matrix

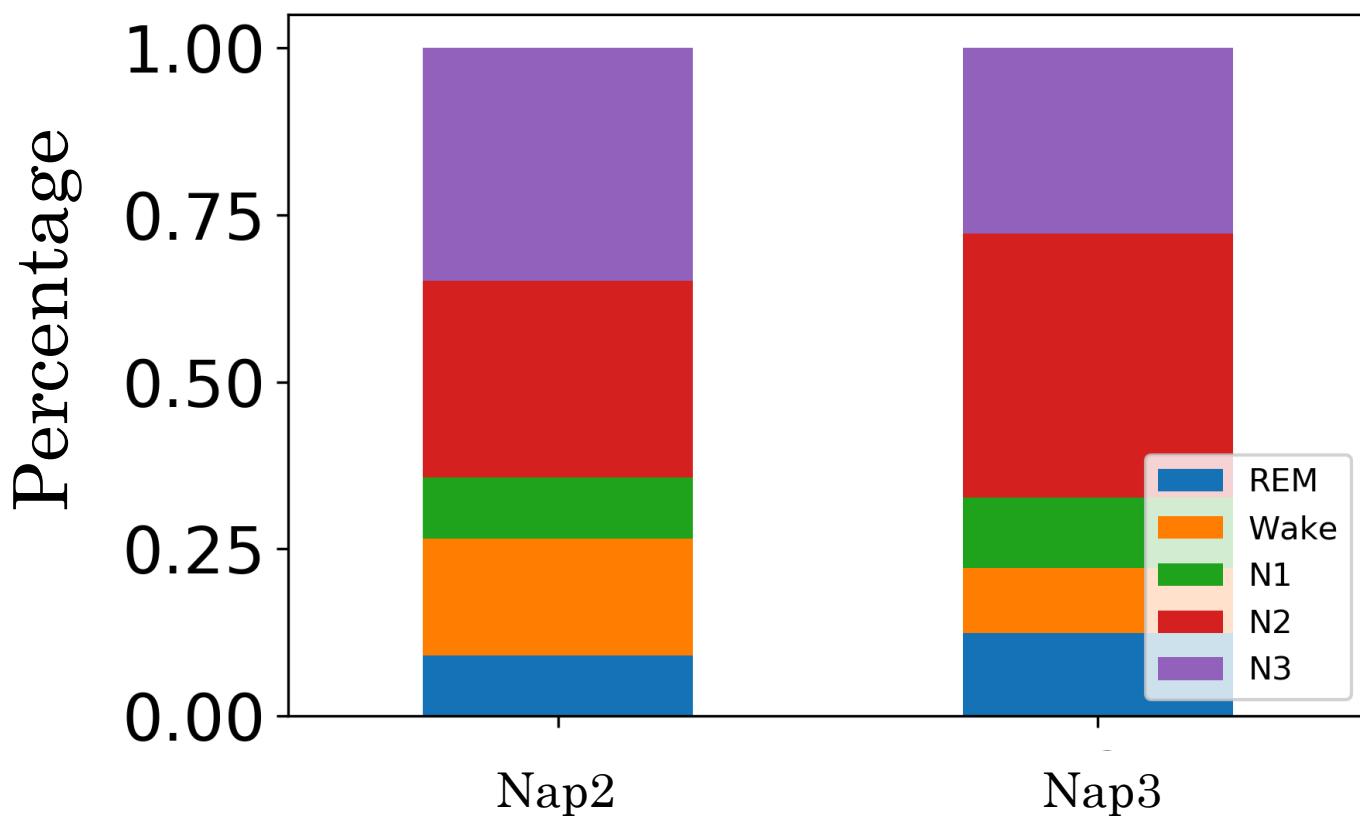


Correlation Matrix

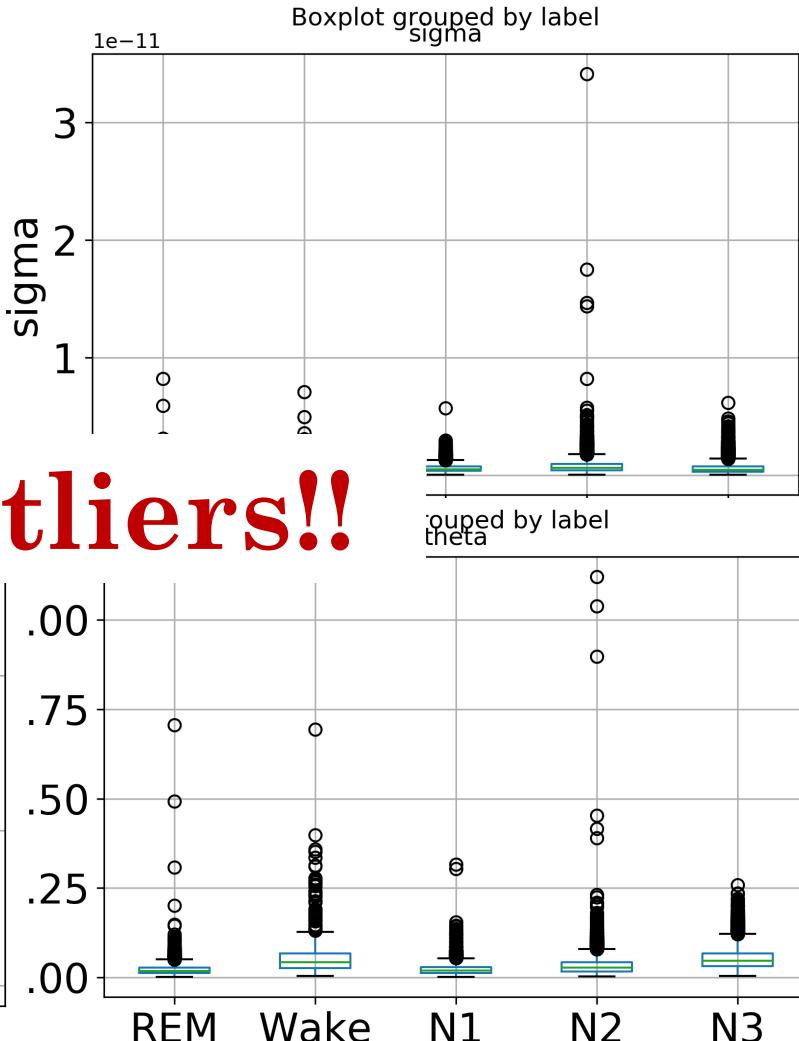
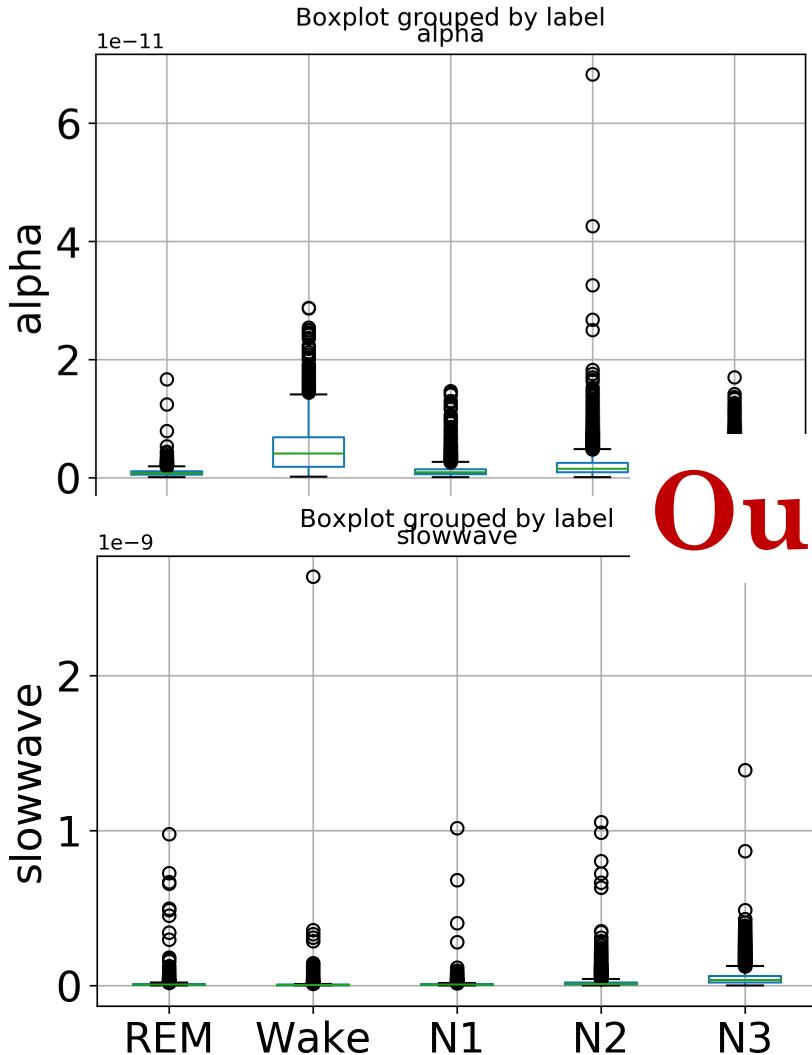




Sleep Stage percentage



Different frequency and sleep stages



Outliers!!

Thanks !
Q & A