Physiological Feature Selection Methods for Emotion Recognition

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- Features
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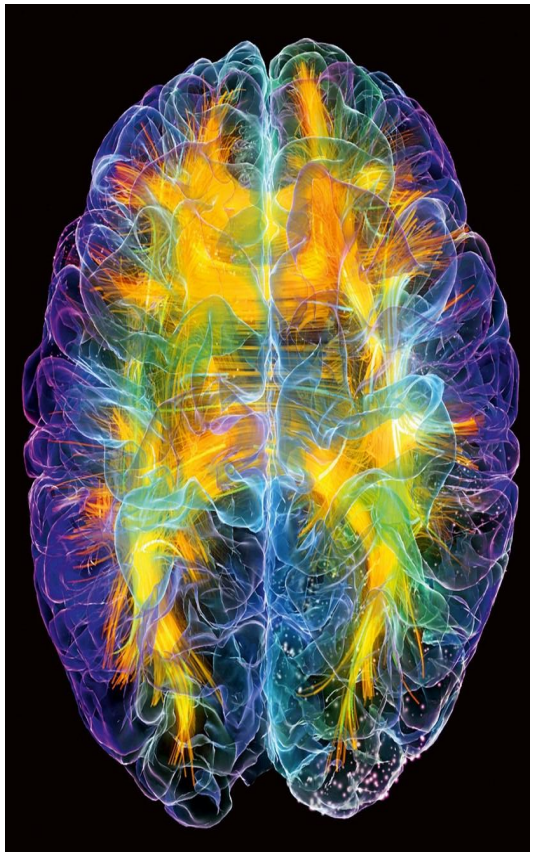
Emotion Recognition

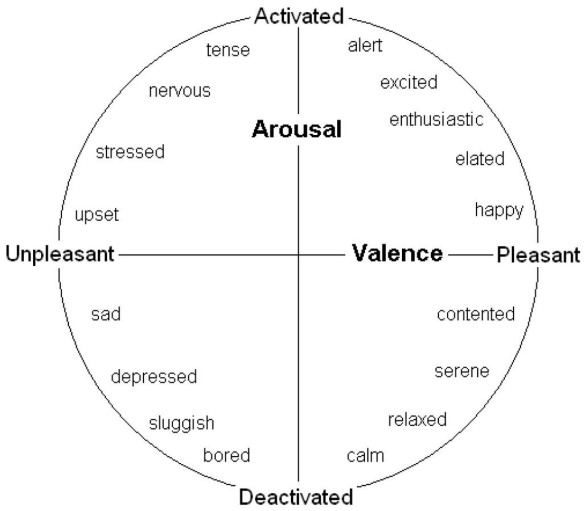
Expression

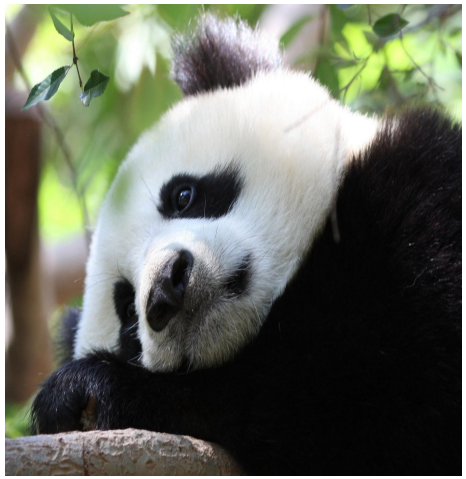
Physiological



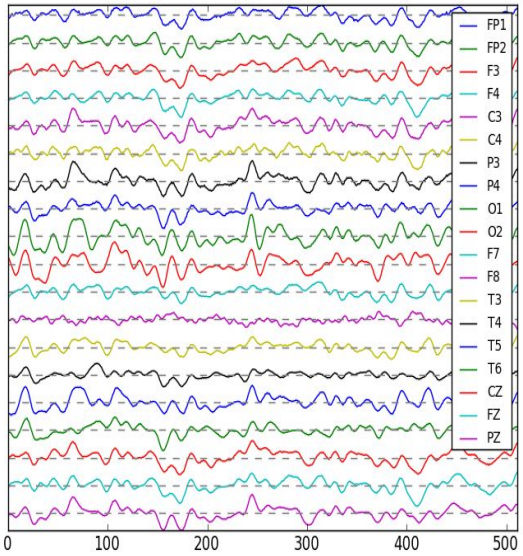
Emotion in the brain

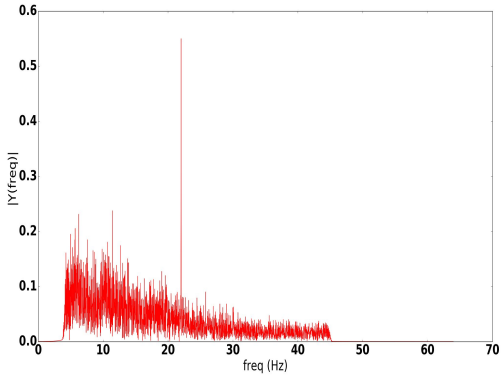
Emotion Classification

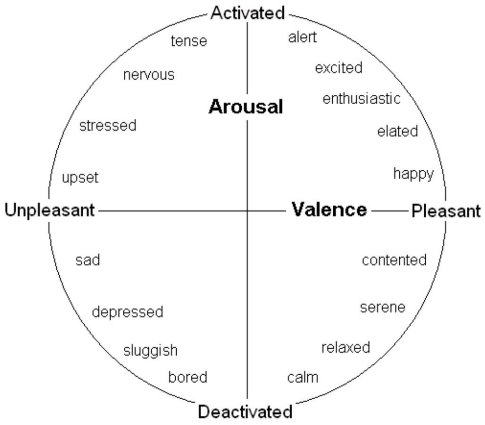




Classification with Machine Learning





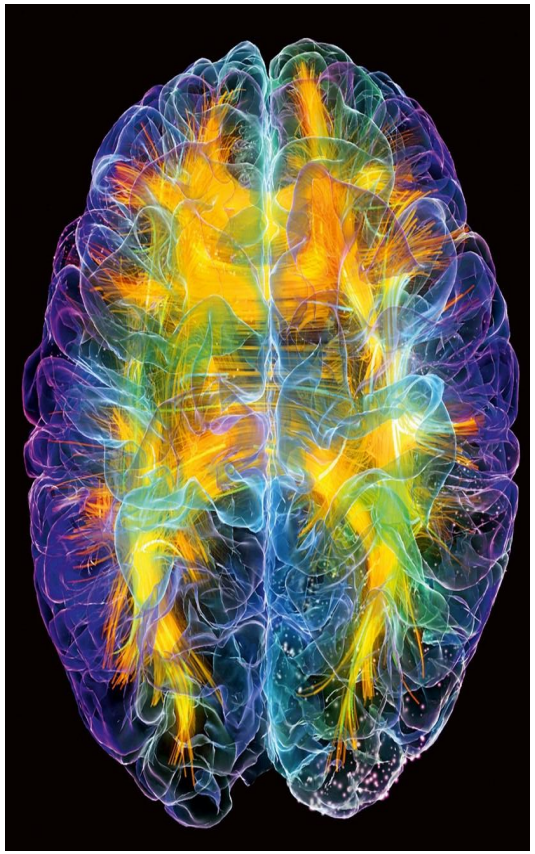


Input: brain waves

Feature Extraction and Machine Learning

Output: valence/arousal

Features



EEG

Non - EEG

EEG features

Power of a specific channel
(PSD, DE)

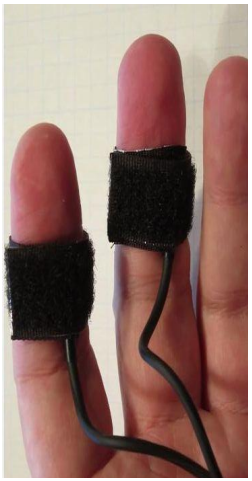
(A)symmetry features
- Left vs. Right
- Front vs.Back

Fractions of different
wavebands

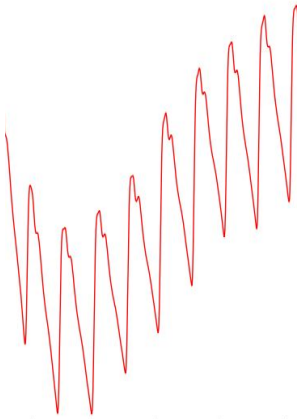
Non - EEG Features

Heart Rate

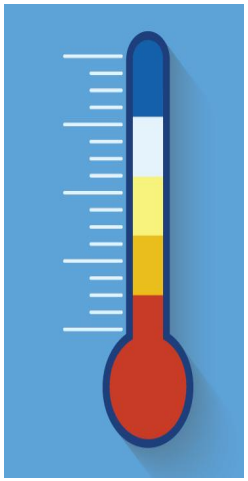
Respiration Rate



Galvanic Skin Response



Plethysmograph (blood pressure)

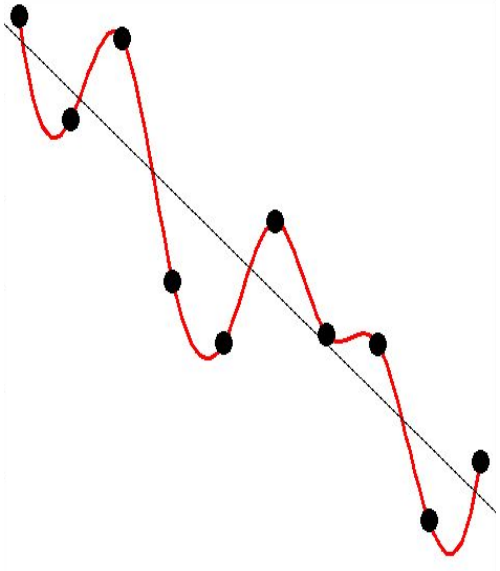


Skin Temperature

Not all features are good features

Disagreement on Features

Personal Differences



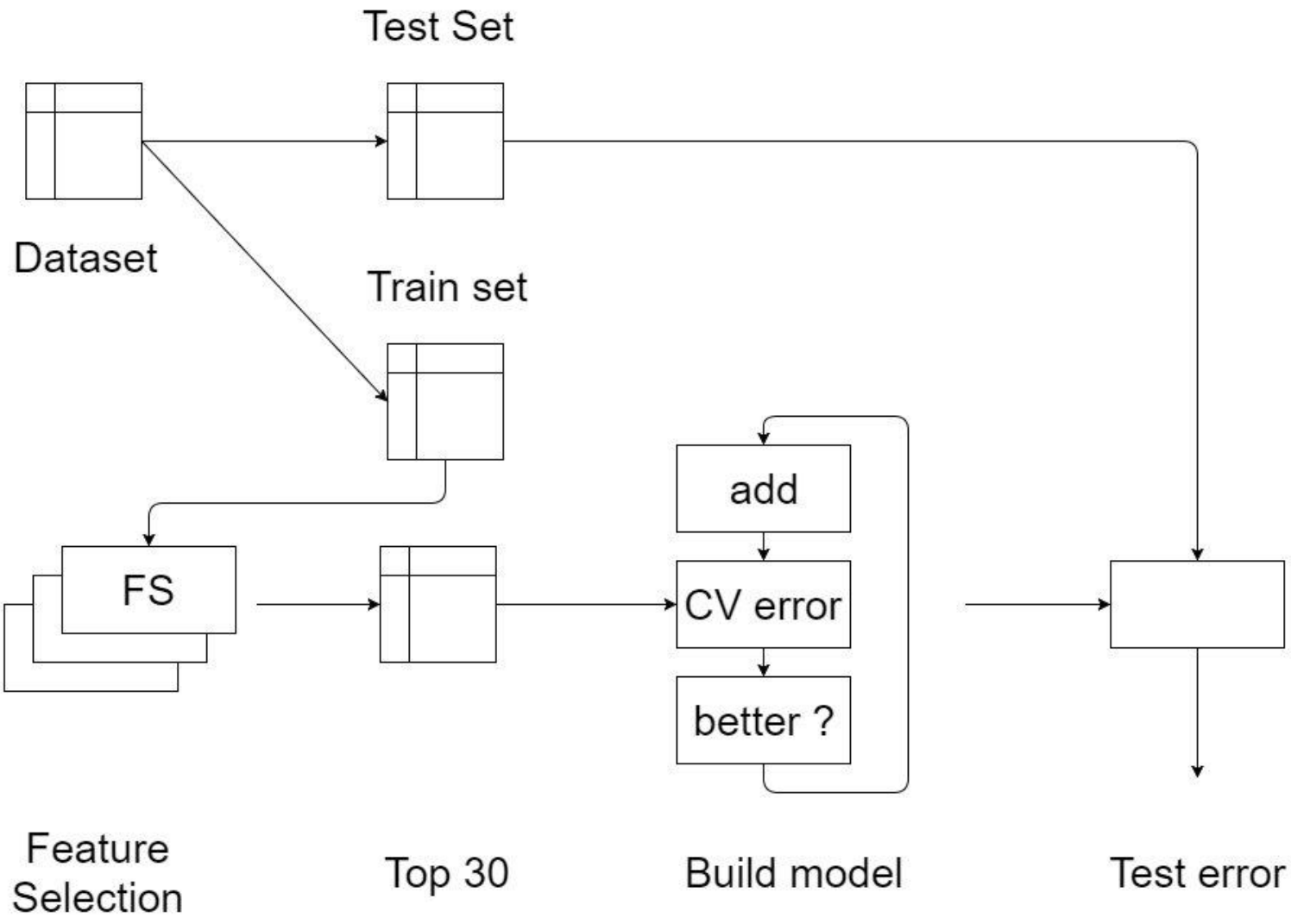
Overfitting

Problem statement

Find good features

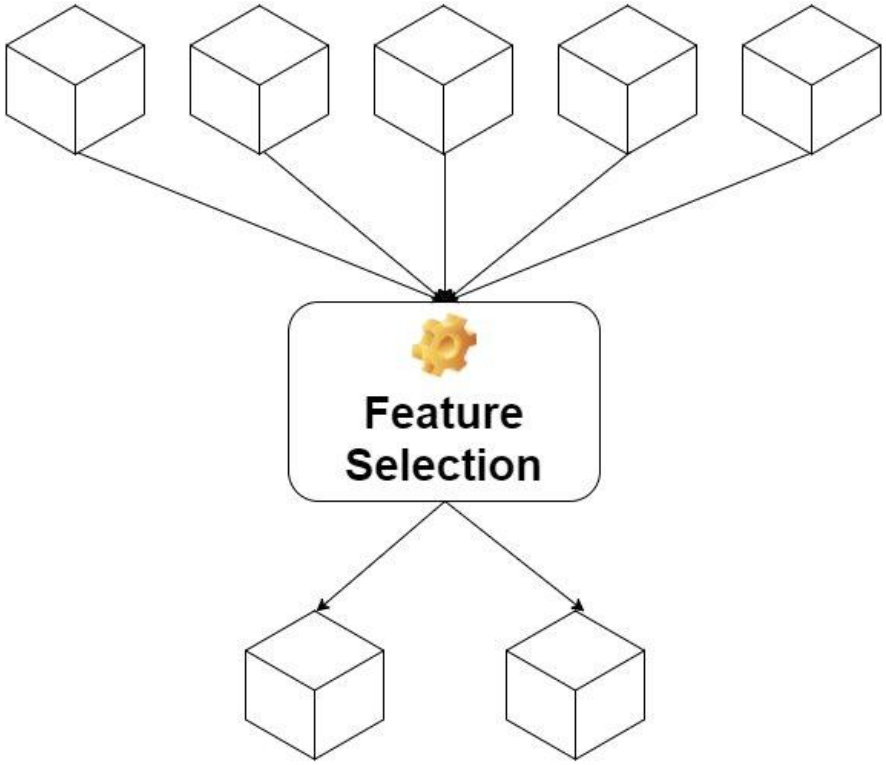
Added value of physiological features

Solution


Test Set
Dataset
Train set
FS
add
CV error
better ?
Feature Selection
Top 30
Build model
Test error

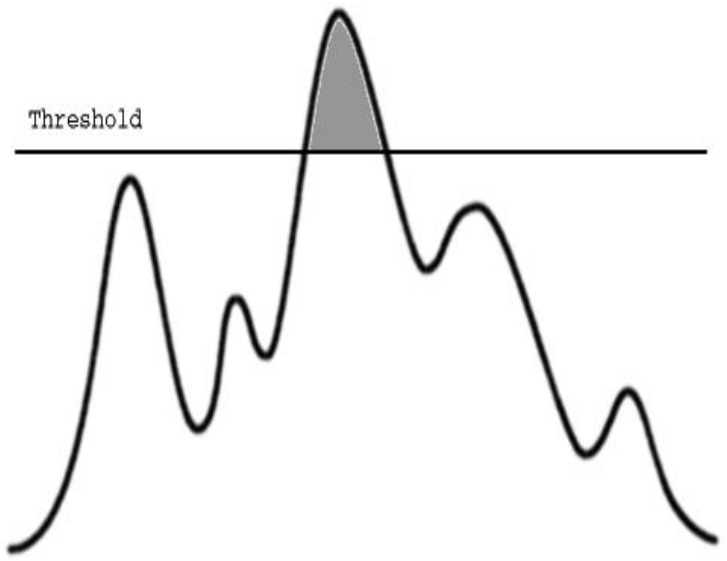
Feature Selection: General Flow

IN:
EEG and non-EEG features



OUT:
Subset of features that can predict emotion

Feature Selection Methods

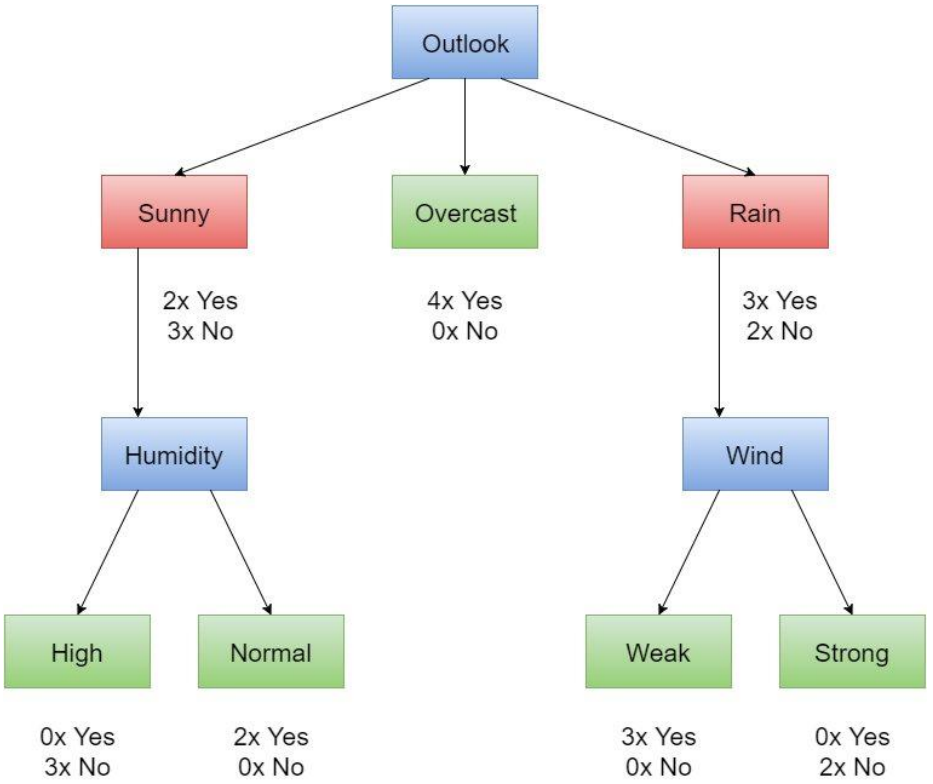


Filter Method

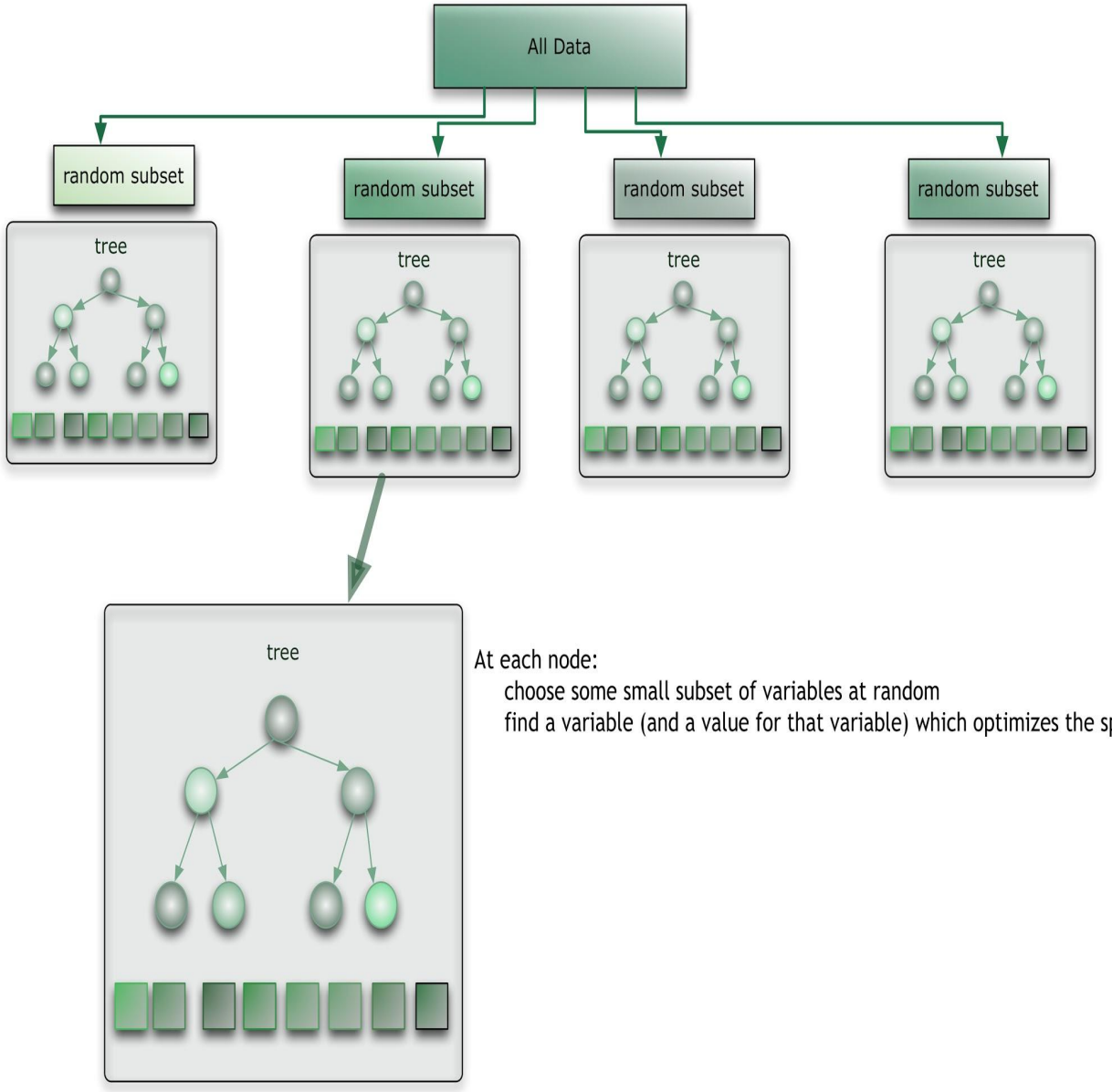
Wrapper Method

FS: Embedded - Random forests

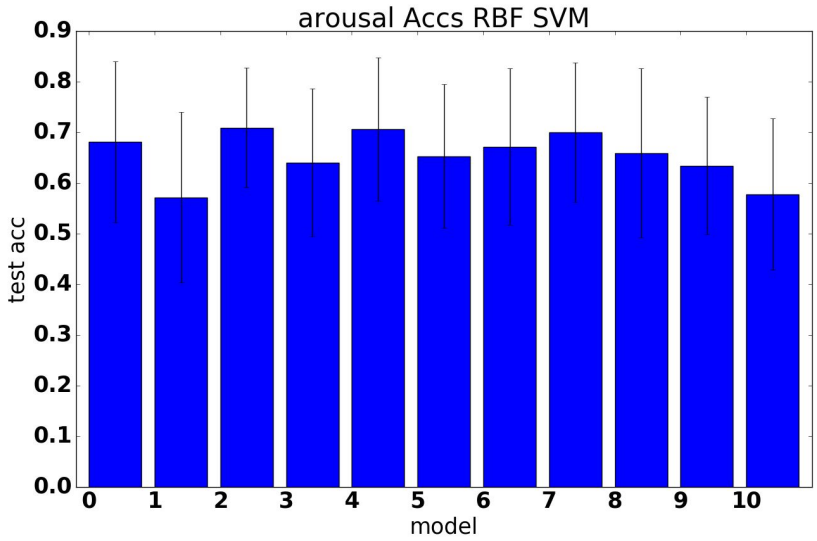
Day	Outlook	Humidity	Wind	Play tennis
1	sunny	high	weak	no
2	sunny	high	strong	no
3	overcast	high	weak	yes
4	rain	high	weak	yes
5	rain	normal	weak	yes
6	rain	normal	strong	no
7	overcast	normal	strong	yes
8	sunny	high	weak	no
9	sunny	normal	weak	yes
10	rain	normal	weak	yes
11	sunny	normal	strong	yes
12	overcast	high	strong	yes
13	overcast	normal	weak	yes
14	rain	high	strong	no

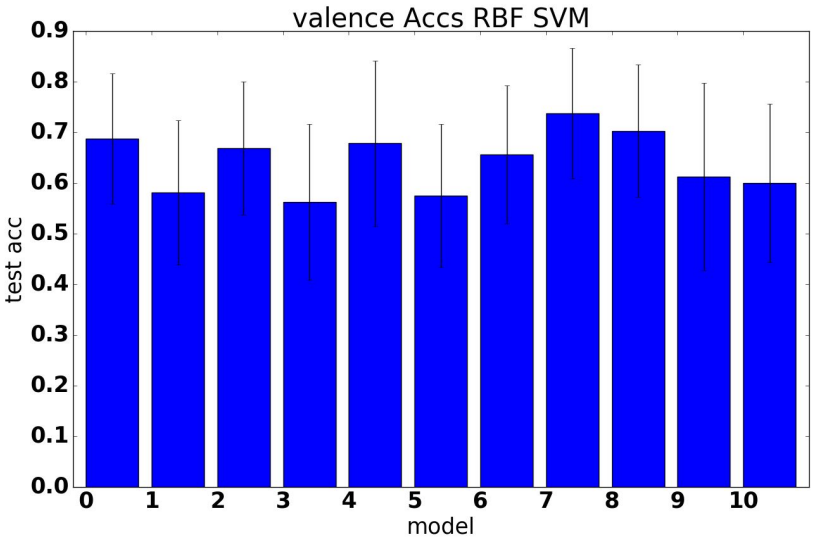


FS: Embedded - Random Forests



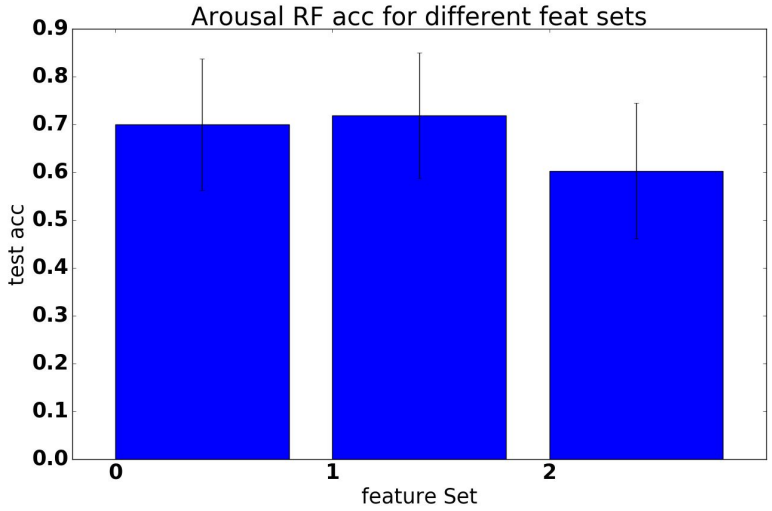
Results

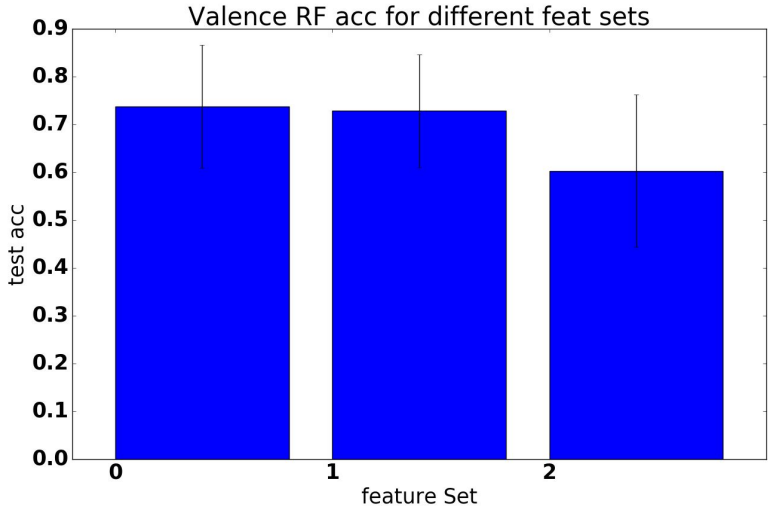




0	1	2	3	4	5	6	7	8	9
Pearson	MI	dCorr	LR	L1	L2	SVM	RF	LDA	PCA

Results: non-EEG / EEG / ALL (RF)





0	1	2
ALL	EEG	non-EEG

Next steps

Stability of the feature selection methods

Find features that work for all persons

Questions