BRAIN COMPUTER INTERFACE

EMOTION RECOGNITION

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INTRODUCTION

Brain Computer Interface is a computer based system that acquires brain signals, analyzes them and translates them into command that are relayed to an output device that carry out a favored action.
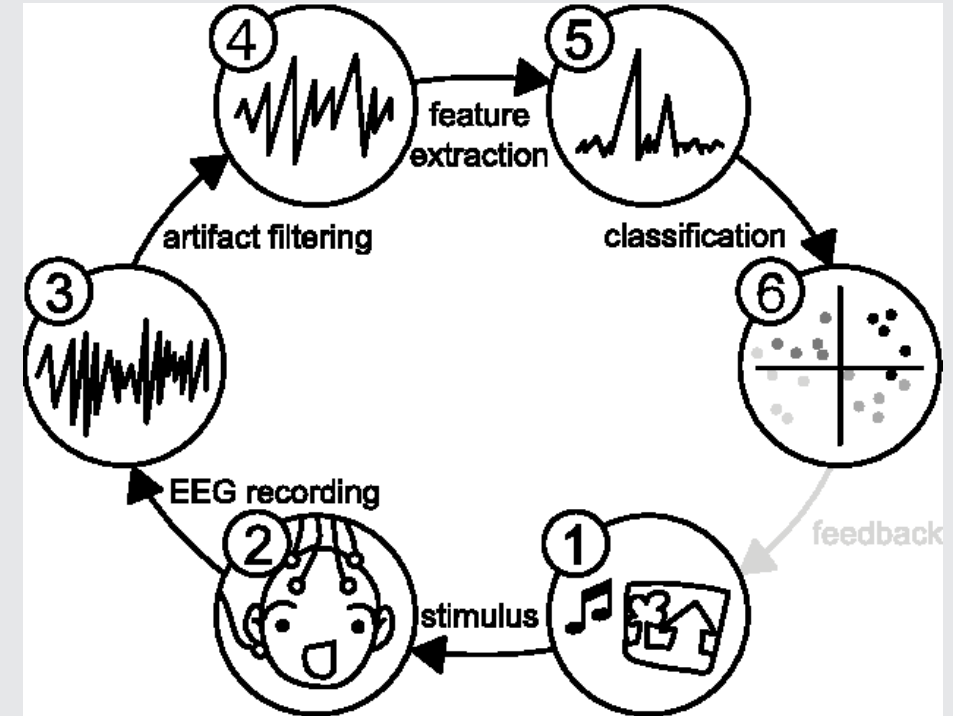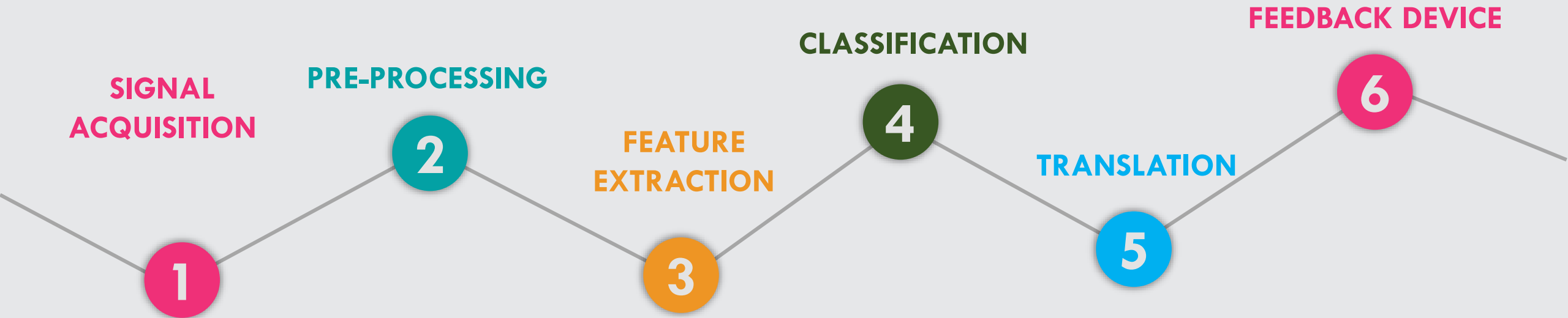
The main objective of this project is to capture user's emotional state to avoid stress related diseases. By identifying user emotions, we can avoid suicides. Help people from mental stress by giving them advice

To build a training model including physiological signals (EEG signals from the dataset) useful for detecting emotions with the help of machine and deep learning.
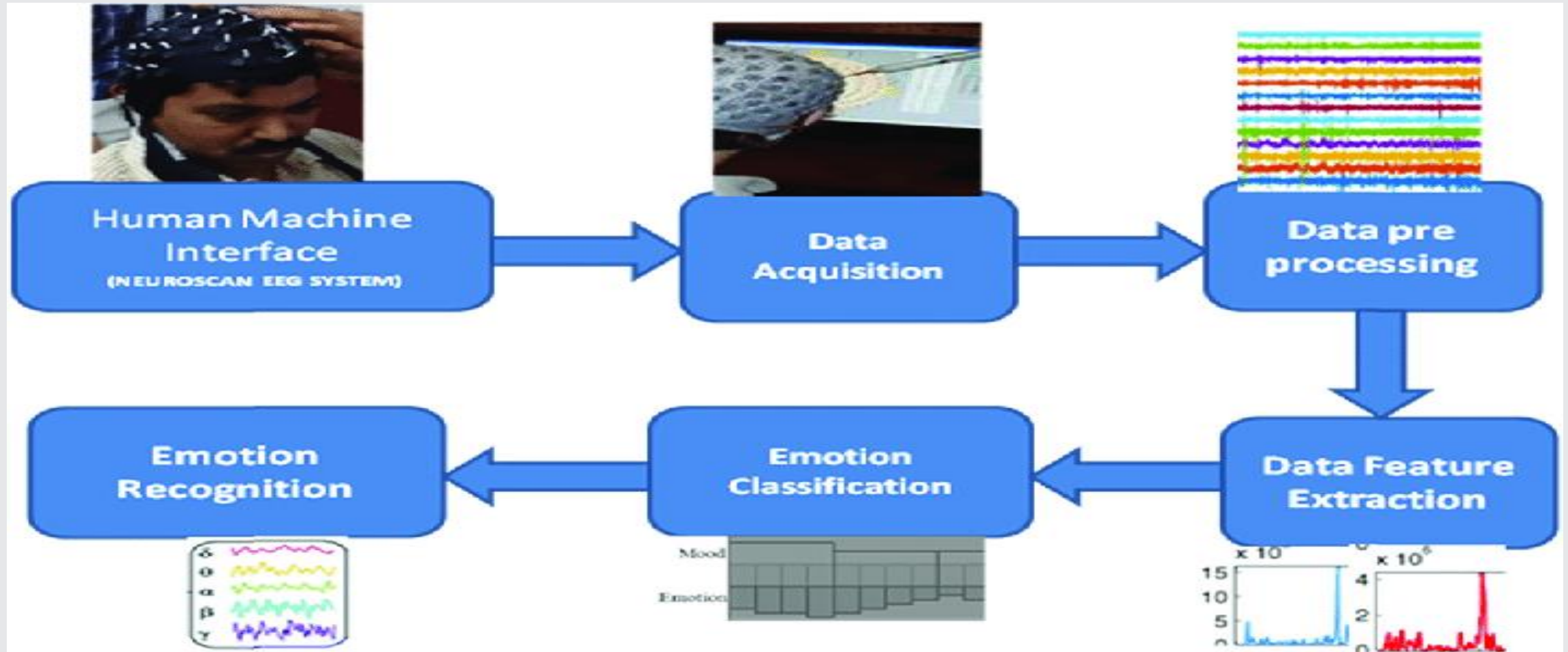
To compare both the algorithms : Recurrent Neural Network and Random Forest classifier
for this purpose.

STEPS TO MAKE BCI

SIGNAL ACQUISITION

1

PRE-PROCESSING

2

FEATURE EXTRACTION

3

CLASSIFICATION

4

TRANSLATION

5

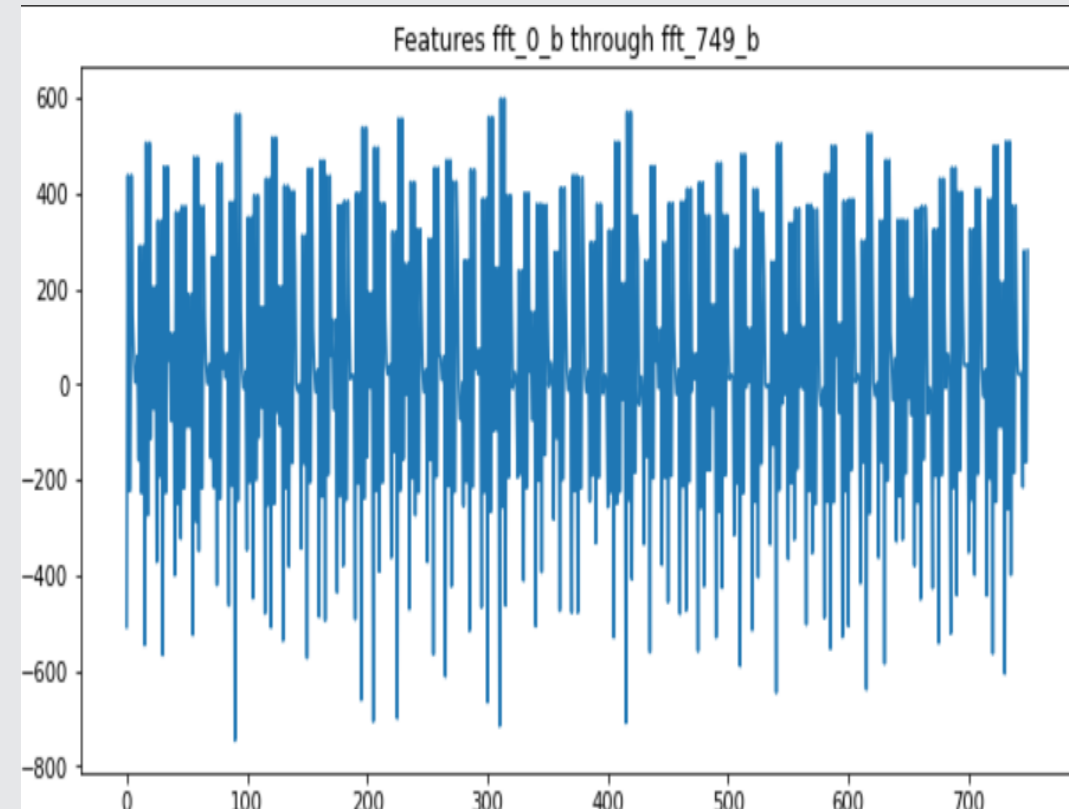**FEEDBACK DEVICE**

6

FLOW DIAGRAM

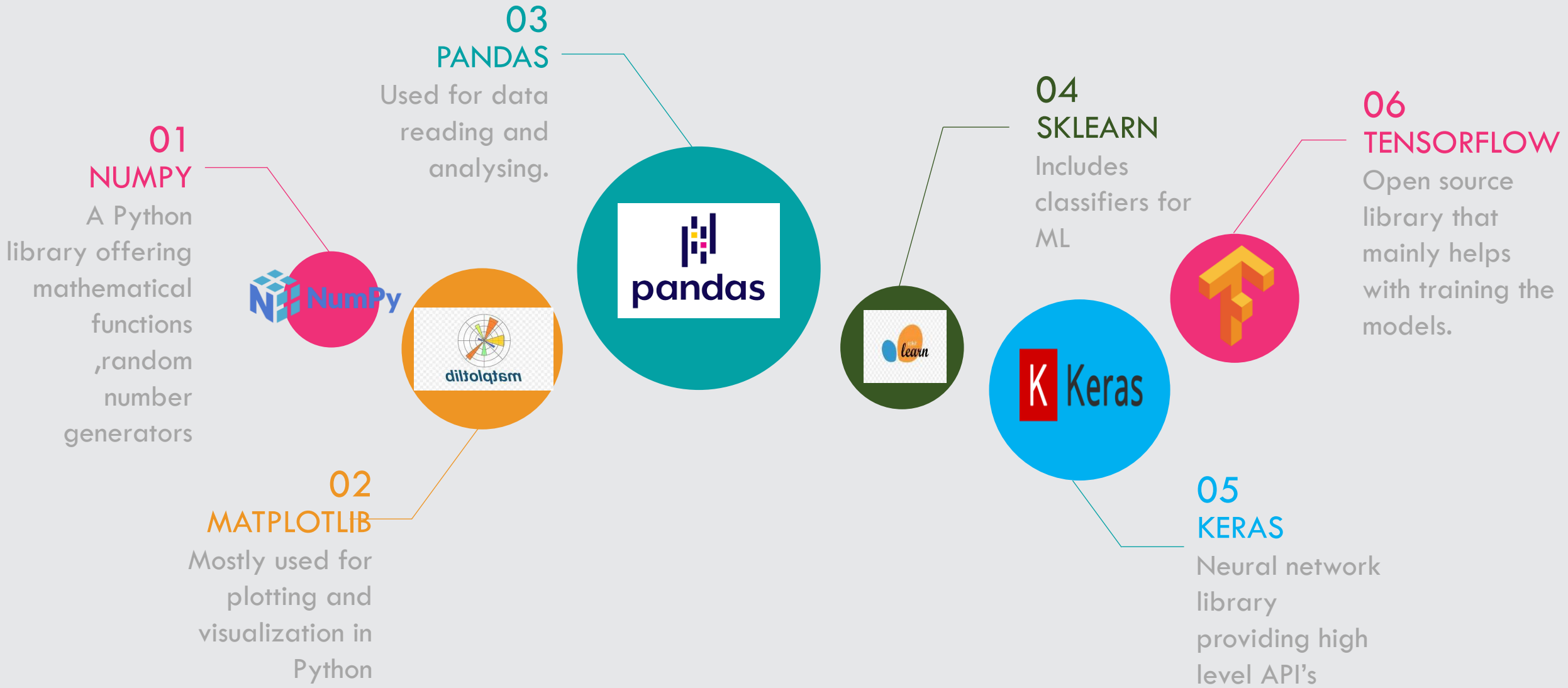# DATA ACQUISITION AND ANALYSIS

The EEG Dataset is acquired from Kaggle.

Details of Dataset: The data was collected from two people (1 male, 1 female) for 3 minutes per state - positive, neutral, negative. We used a *Muse EEG headband* which recorded the TP9, AF7, AF8 and TP10 EEG placements via dry electrodes.

Six minutes of resting neutral data is also recorded, the stimuli used to evoke the emotions are four different movies with distinct scenes that evoke a particular emotion: positive and negative.

DATASET VISUALIZATION PLOTTED VIA MATPLOTLIB.

LIBRARIES USED

03
PANDAS
Used for data reading and analysing.

01
NUMPY
A Python library offering mathematical functions ,random number generators

04
SKLEARN
Includes classifiers for ML

06
TENSORFLOW
Open source library that mainly helps with training the models.

02
MATPLOTLIB
Mostly used for plotting and visualization in Python

05
KERAS
Neural network library providing high level API's

ALGORITHMS

1. ***Random forest Classifier:*** Random Forest is a classifier that contains several decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy.
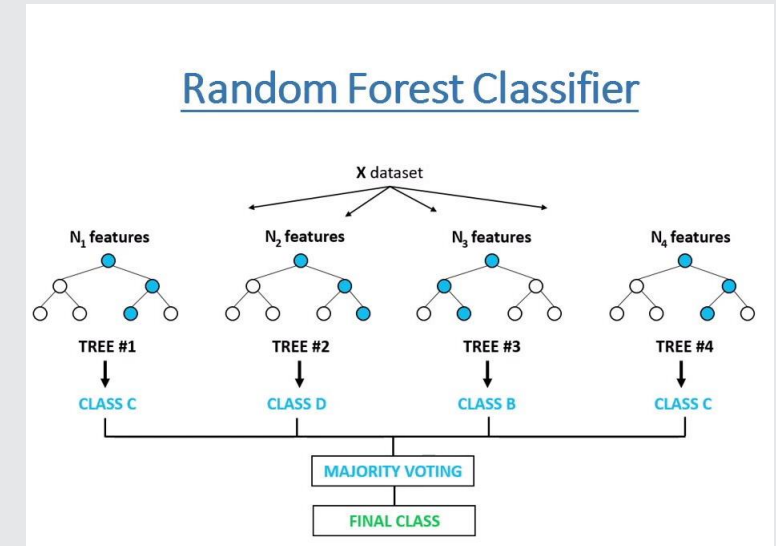
2. ***Recurrent Neural Network:*** RNN is a class of neural network which uses sequential data or time series data.
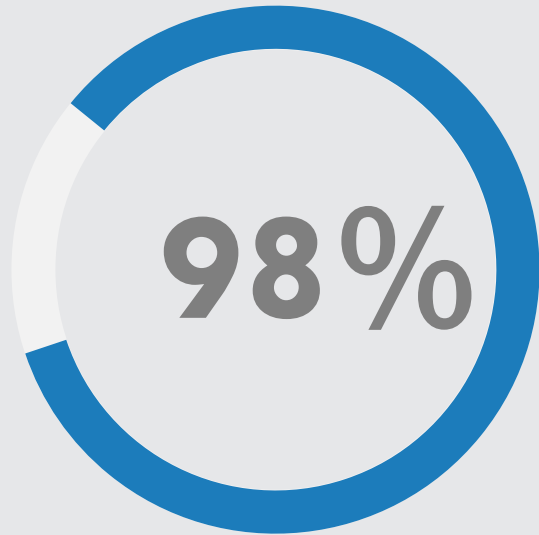   RNNs can process inputs of varied lengths. The more the computation, the more will be the possibility of information to be gathered and in addition the model size does not increase with the input size.
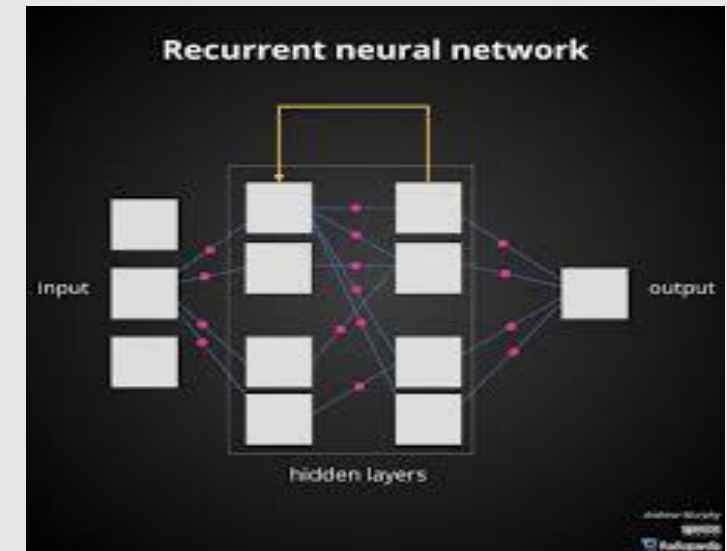
RESULTS

RANDOM FOREST CLASSIFIER

98%

Random Forest gave the accuracy of 98%

RECURRENT NEURAL NETWORK

96%

RNN Model architecture gave an accuracy of 96%.

BCI APPLICATIONS

LIMITATIONS OF BCI

01 SIGNAL ACQUISITION HARDWARE.

02 DIFFICULT TO DECODE THE SIGNALS ACCURATELY

03 LEGAL IMPLICATIONS

04 POSES RISK TO PATIENT HEALTH.

FUTURE WORK

Once deployed the emotion detection system can be used to bridge the gap between human emotions and computational technology. It can be used to prevent depression before there are any clear outward signs of it. It can also help in inventing ways to help people with special needs who face communication, motivation, and emotion regulation challenges.

THANK YOU!