Emotion Recognition Using EEG signals

CPG-48

Under guidance of
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&
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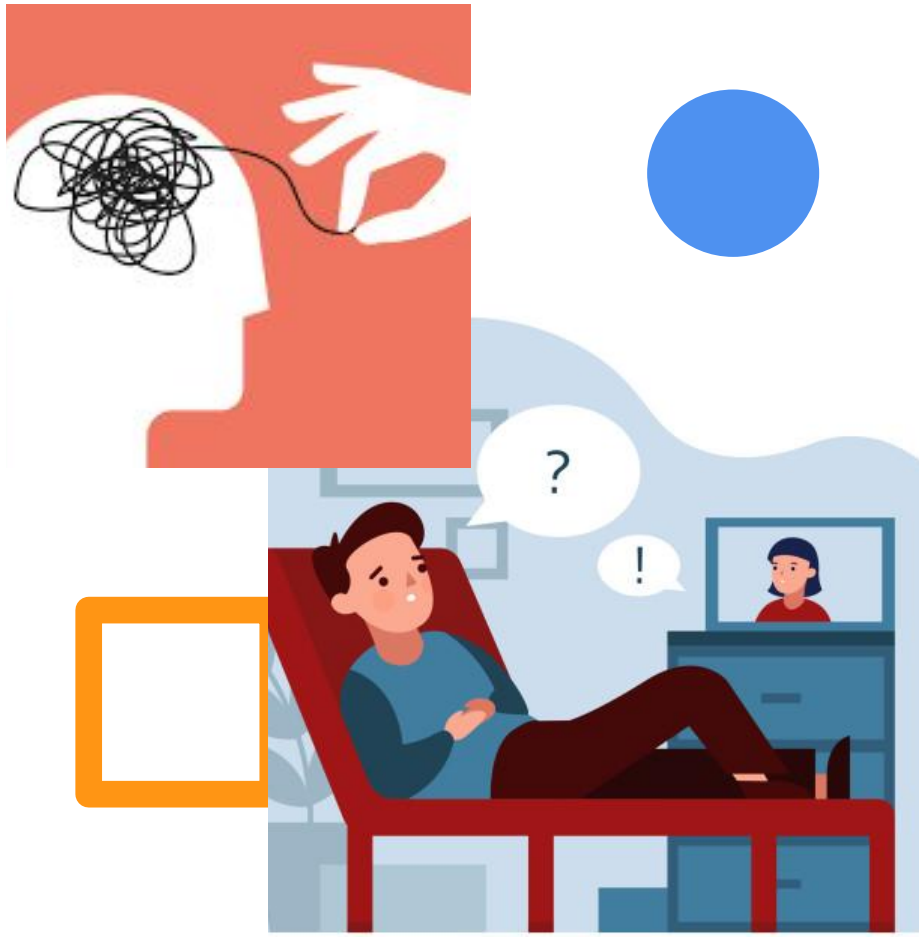
BACKGROUND OF PROJECT

- Several EEG-based BCI applications have proven to be popular, such as word speller programmes and wheelchair controls. In addition to this , BCI can be used to manipulate computers through our minds as well as perceive our mental states. One of these implementations is emotion interpretation.

- Using machine learning/ deep learning and EEG signals, we propose a new interpretable emotion detection technique with an activation function in this project. We used machine learning/ deep learning methods to abstract features from EEG signals and classified emotions. This detected emotion can be used in several ways to monitor a patient's emotional state.



Scope and Utility

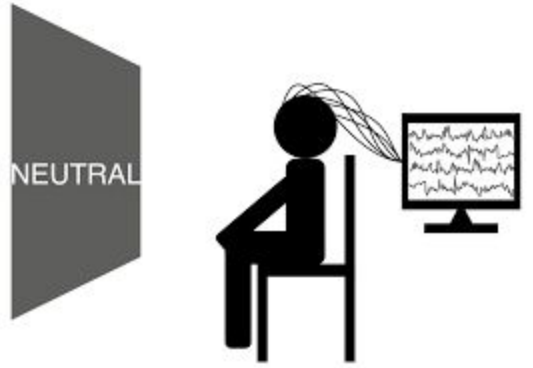
Evaluation

Security and Safety

Entertainment and Gaming

Device Control

User-state Monitoring



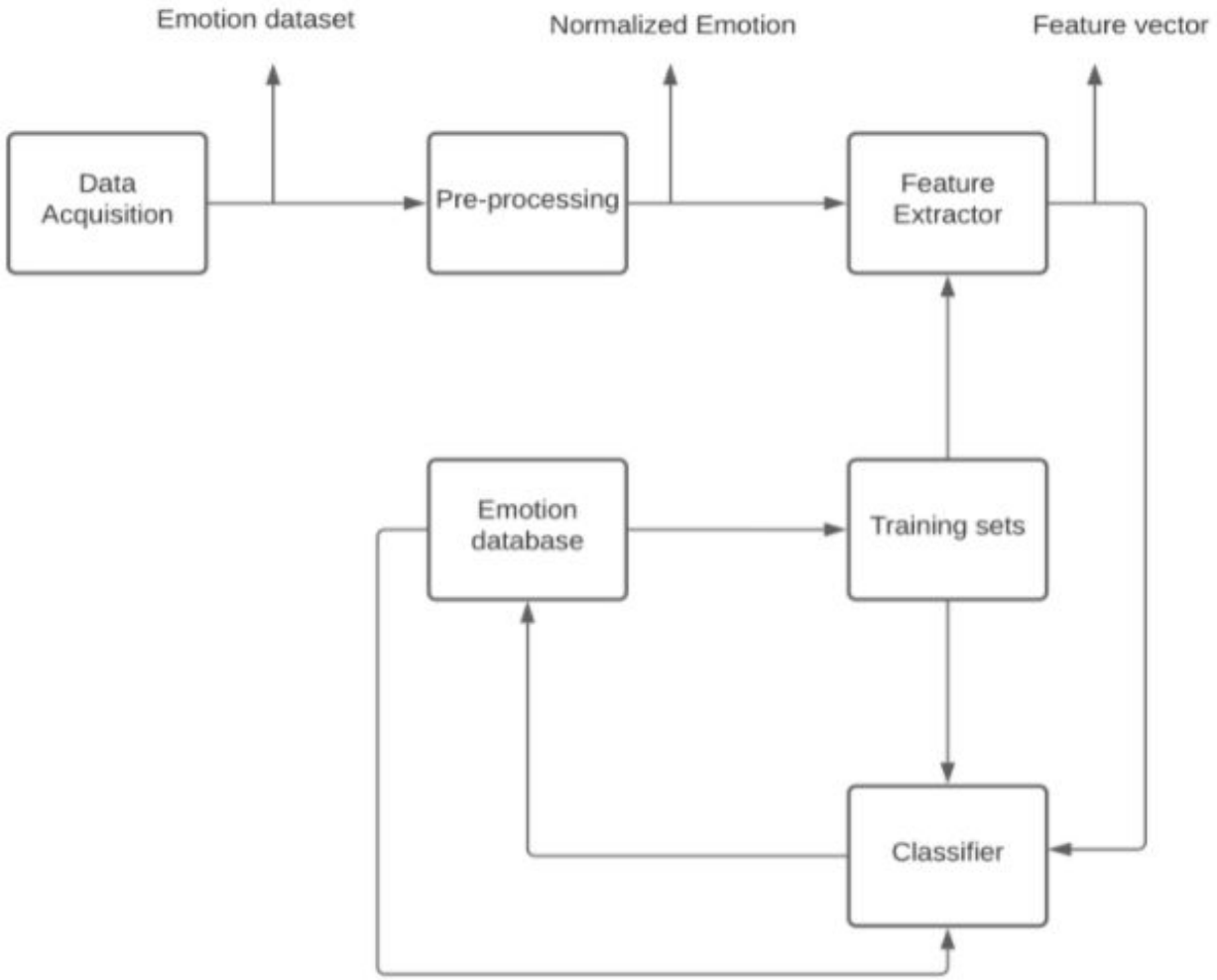
Objectives

- To study existing tools and techniques available for EEG measurement.
- To develop a ML model for classification of emotion from EEG data.
- To design an IOT system to change room lighting based on the emotions.
- To implement all modules as an integrated system.

Literature Survey

- Interpretable Emotion Recognition Using EEG Signals (BY CHUNMEI QING, RUI QIAO, XIANGMIN XU AND YONGQIANG CHENG)
- Emotion Recognition from EEG Using Higher Order Crossings (By Panagiotis C. Petrantonakis; Leontios J. Hadjileontiadis)

PROJECT ARCHITECTURE



TOOLS AND TECHNOLOGIES USED

Knowledge

- GUI Designing
- Machine Learning
- Deep Learning
- IoT
- Backend Designing

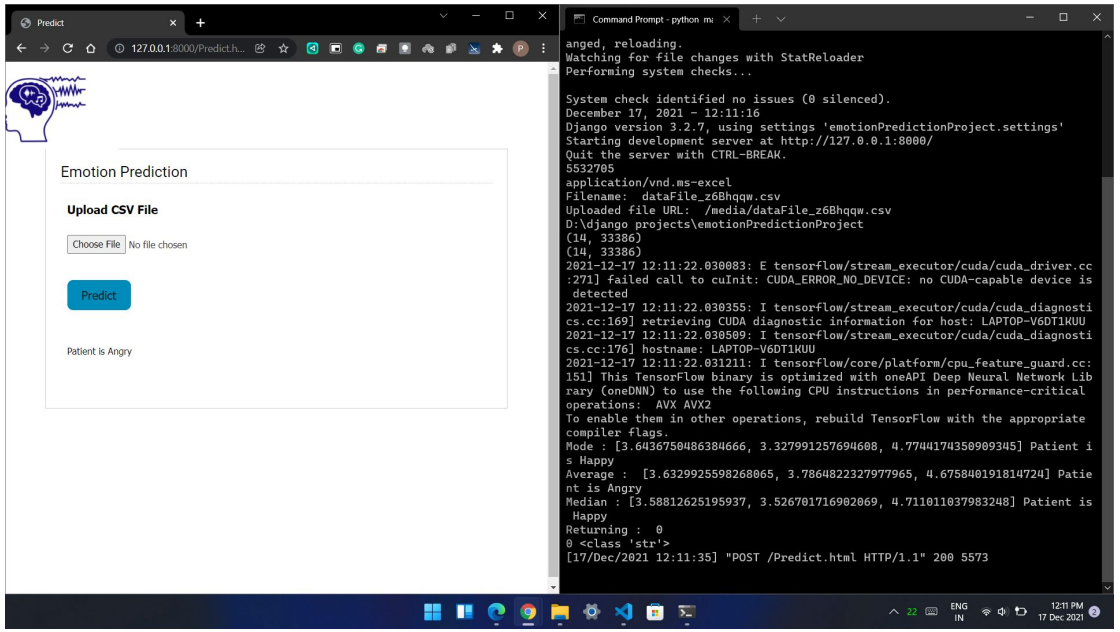
Softwares/Frameworks

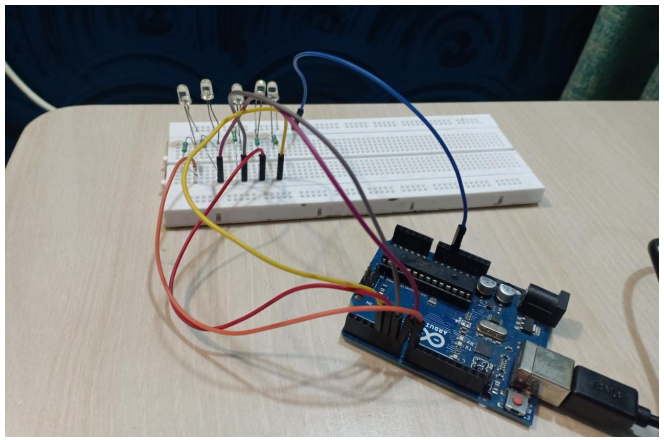
- keras
- tensorflow
- gpu
- numpy
- pandas
- scipy
- py eeg
- sklearn
- matplotlib

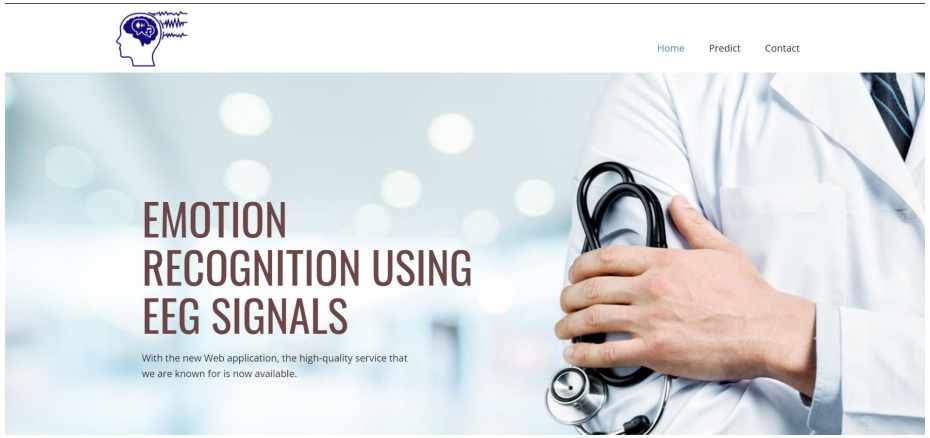
Hardware

- Emotiv EPOCHX EEG headset
- Ardunio ATmega 328P

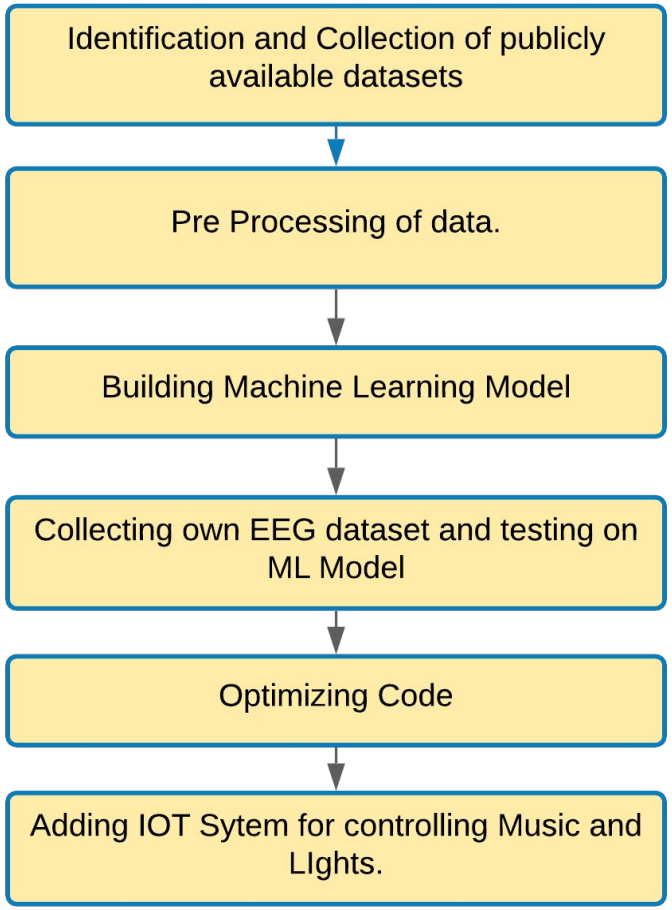
SNAPSHOTS OF PROJECT



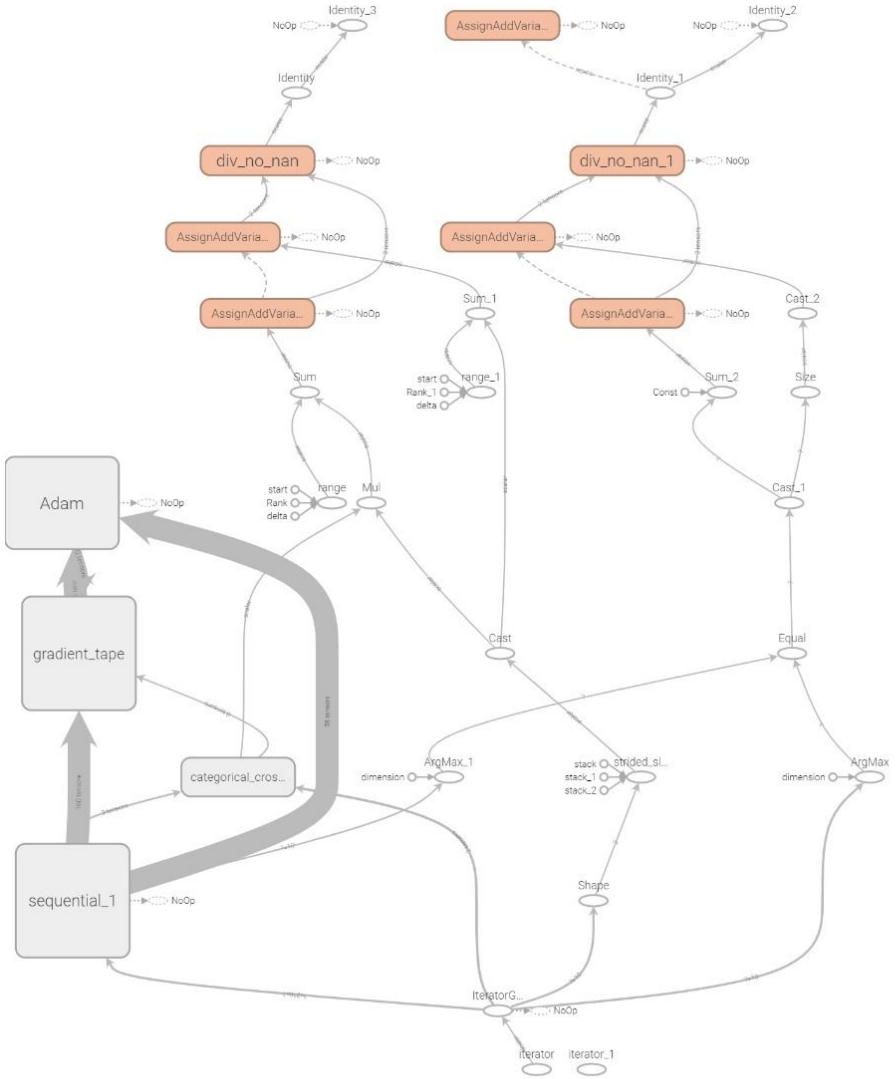




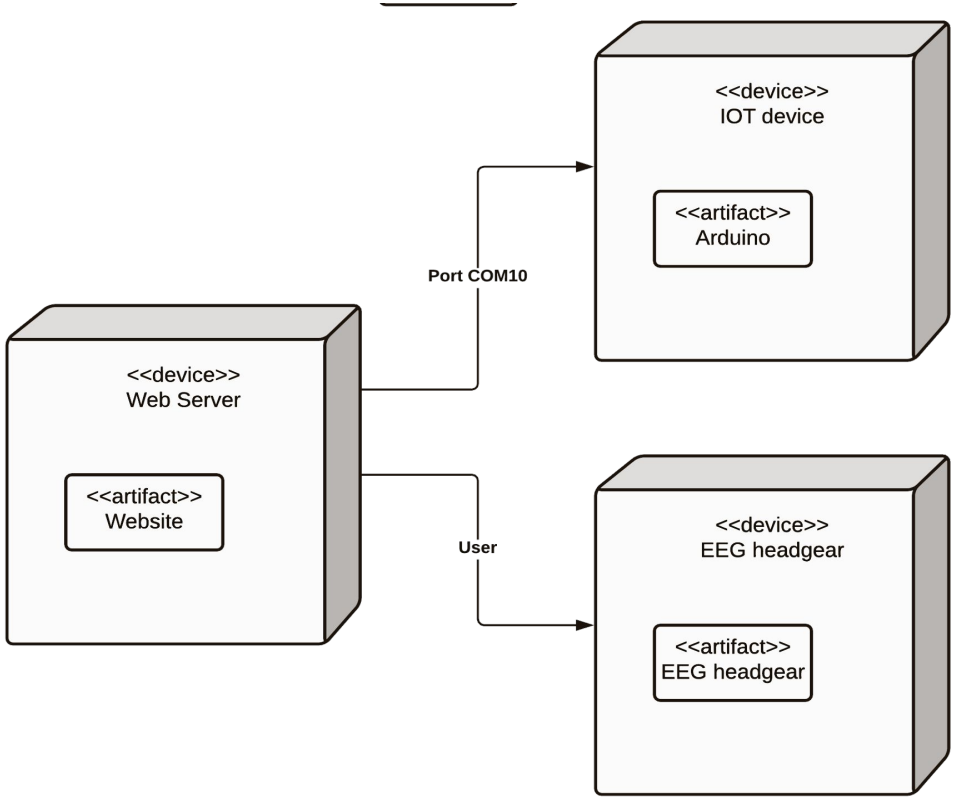
METHODOLOGY



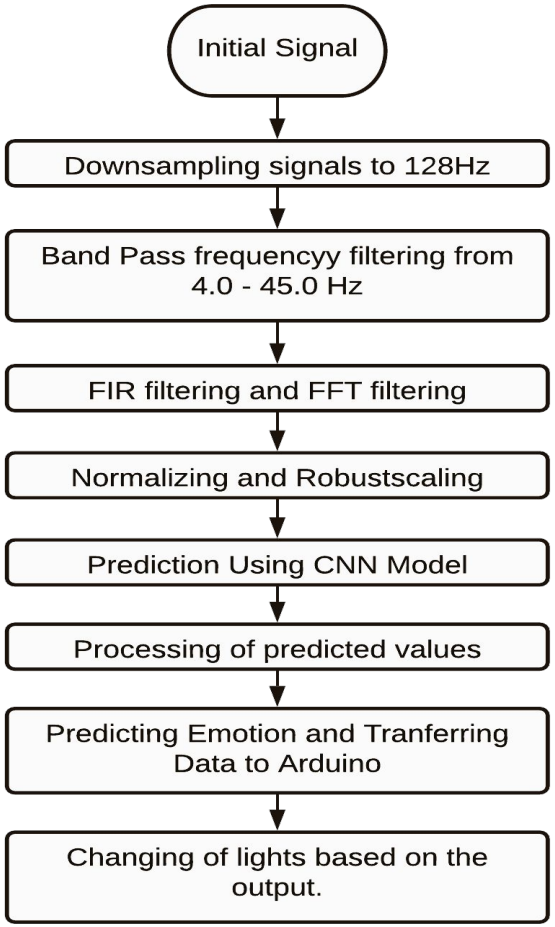
CNN ARCHITECTURE USED



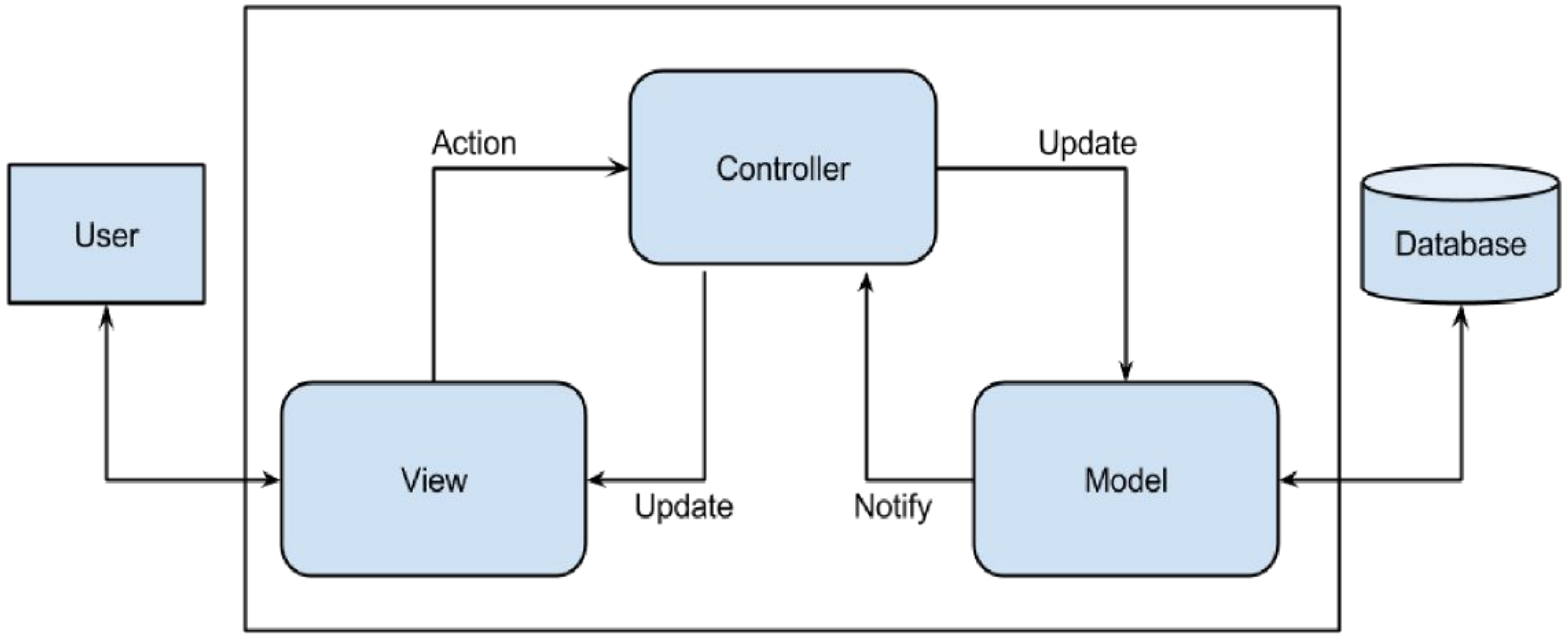
DEPLOYMENT DIAGRAM



FLOWCHART

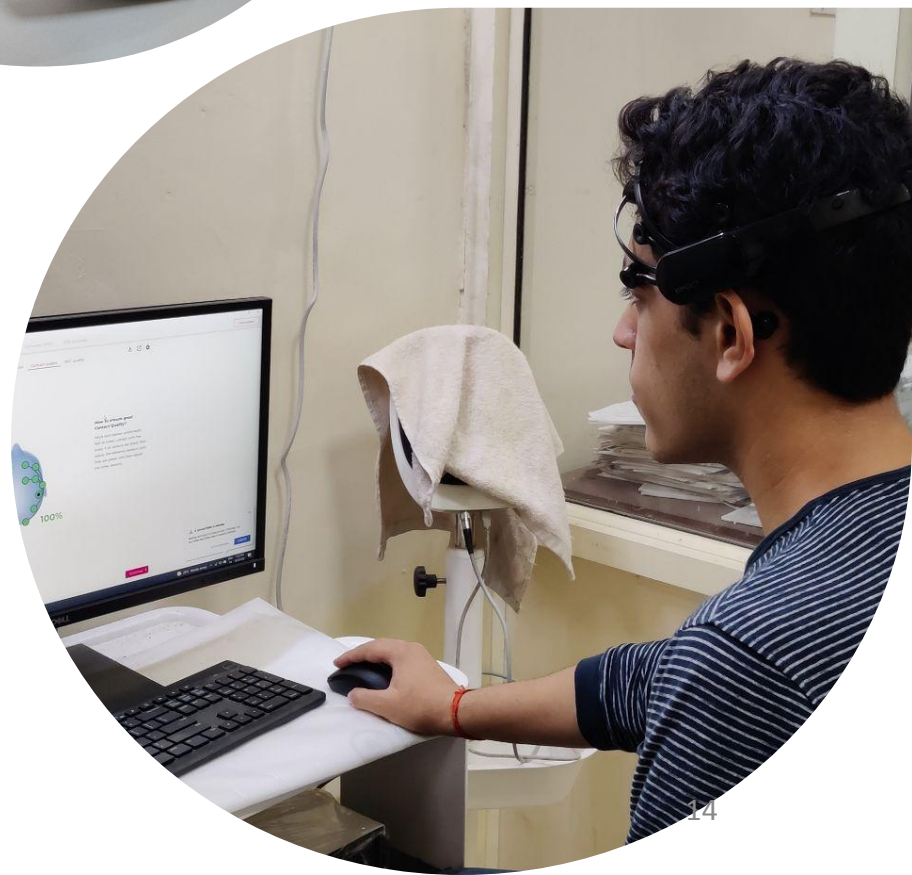


MODEL VIEW CONTROLLER



PROPOSED SOLUTION

- Using machine learning/ deep learning and EEG signals, we propose a new interpretable emotion detection technique with an activation function in this project. We used machine learning/ deep learning methods to abstract features from EEG signals and classified emotions. In the project, various high-level machine learning algorithms are implemented and integrated and the output is generated from the same making a user-visible with the outputs in the form of a graph which makes it easier for them to see and interpret their emotions.
- The proposed software takes the raw set of data from the dataset and processes it. After the computational means, the output is displayed on the screen.



KEY HIGHLIGHTS

Real time

Real-time application generating a change in lighting condition based on the emotion perceived.

User Friendly

User friendly GUI that analyzes and showcases the results directly

Time Effective

WIll reduce effort hours for finding the emotion of the person and classification of moods

Non-invasive

Non- invasive method for brain signal processing and are used in real-world scenarios.

PROFESSIONAL AND TECHNICAL LEARNING

- We learned about GUI Development.
- We got an opportunity to learn different machine learning algorithms and model training.
- We also learned about analyzing different types of signals and about CNN.
- Got an idea about different types of hardware used in data collection of EEG signals.
- We learnt about writing skills for technical reports, various diagrams and emails.

INDIVIDUAL ROLES

01	**Vishesh Gupta**	• Hardware Implementation • GUI Designing • Documentation
02	**Prakhar Jindal**	• Hardware Implementation • Model Development • Documentation and Testing
03	**Divyam Jain**	• Model Development • Research and Documentation • Testing
04	**Abhiraam Khanna**	• Research and Documentation • Testing
05	**Navia Sehgal**	• Research and Documentation • Testing

LEARNING OUTCOMES

- Was able to analyse and breakdown problems into manageable steps and understand use of different libraries
- Able to select appropriate computer technologies and techniques for a given situation
- Was able to integrate previous and current learning and use it to solve technology based projects

REFERENCES

1. **Interpretable Emotion Recognition Using EEG Signals (BY CHUNMEI QING, RUI QIAO, XIANGMIN XU AND YONGQIANG CHENG)**
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Thank you