AN ARCHITECTURE FOR EEG BASED MENTAL STATE RECOGNITION AND MONITORING

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(Specialized in Software Architecture)

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DECLARATION

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Name of the supervisor: Dr. Indika Perera

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ABSTRACT

Humans invent technologies to make today's life easy. Every human expects a healthy long life. A healthy life includes good physical health and stable mental health. There are multiple causes such as busy lifestyle, stress, sadness, anger, fear, etc. can affect the mental health of Human life. There are several approaches to overcoming this mental illness but the challenge is to monitor and measure the efficiency of treatments followed by humans. Therefore, a solution is proposed as a real-time non-invasive BCI system, which helps to predict the mental state and provides progress of improvement. This research work aims to predict human brain states using EEG-based signals and classify the human brain states in real time. The features and classification methods help to categorize the patterns of the brainwave. EEG signals communicate with BCI through the NeuroSky Headset with four sensors inbuilt. We have generated sample data sets for training and testing using the NeuroSky Headset. Systems have been tested with multiple feature extraction methods and feature pattern classification modes to build the prediction solution. The final solution contains a human-facing mobile web app, which reads the EEG signals from the NeuroSky Headset. In addition, the system contains a prediction component, a backend API component, and system managing dashboard components.

Key Words: *Classification, API, Brain waves, Electroencephalogram, Brain Computer Interface, Emotions, Mental State, Machine Learning*

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LIST OF ABBREVIATION

Abbreviation	Description
EEG	Electroencephalogram
BCI	Brain-computer Interface
ANN	Artificial Neural Network
SVM	Support vector machine
SDK	Software Development Kit
TFD	Time Frequently Distribution
FFT	Fast Fourier Transform
EM	Eigenvector Methods
WT	Wavelet Transform
ARM	Auto Regressive Method
CA	Classification Accuracy
LR	Logistic Regression
DBN	Deep Belief Network