# Emotion Recognition from EEG Signals

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## 1 Overview

This project shows how brain signals can be used to recognize human emotions using machine learning. It uses EEG (electroencephalogram) data to predict whether a person is feeling **Positive**, **Neutral**, or **Negative**. The goal is to demonstrate how a computer model can learn patterns from brainwave signals and link them to emotional states.

## 2 Purpose

The purpose of this project is to explore how artificial intelligence can interpret EEG data for emotion recognition. It also helps understand the connection between neuroscience and machine learning.

## 3 Why I Did This

I wanted to learn how brain-computer interfaces work and how machines can understand human brain signals. This project helped me practice working with real EEG data, build a machine learning model, and visualize the results.

## 4 How It Works

1. **Load Data:** Real EEG brainwave data is used from a public dataset.
2. **Clean Data:** Missing values are removed to prepare clean data for training.
3. **Train Model:** A Random Forest Classifier is used to learn emotional patterns.
4. **Predict Emotions:** The model predicts emotions based on new EEG readings.
5. **Visualize Results:** Accuracy and the most important EEG features are shown in graphs.

## 5 Tools Used

- Python
- Google Colab
- Pandas
- Scikit-learn
- Matplotlib

## 6 Results

The model achieved about **96.8% accuracy**, which means it correctly predicted emotions in almost all test cases. It also showed which EEG signal patterns had the biggest influence on the predictions.

## 7 What I Learned

- How EEG data represents brain activity and emotions
- How to process and analyze real-world data
- How Random Forest models make predictions
- How AI can be applied to emotion recognition and neuroscience research

## 8 How to Run

1. Open the notebook in Google Colab
2. Upload the EEG dataset file (`data.csv`) from the EEG Brainwave Dataset: Feeling Emotions on Kaggle
3. Run each code cell step by step
4. View the accuracy, predictions, and visualizations

## 9 Dataset

**Name:** EEG Brainwave Dataset: Feeling Emotions
**Source:** Available publicly on Kaggle

## 10 Summary

This project shows how brainwave data can be used to identify emotional states using machine learning. It is a simple example of how computers can interpret human emotions from EEG data.

## 11 Future Improvements

- Add real-time emotion detection using live EEG signals
- Create a visual interface to display predicted emotions
- Experiment with deep learning models for higher accuracy