Facial Expression Recognition Project Proposal

By Ceci, Kloe, and Aastha

Face the Data: Machine Learning to Decode Human Emotions

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1. Introduction & Problem Statement

Facial expression recognition (FER) aims to automatically identify human emotions, such as happiness, sadness, anger, surprise, fear, disgust, and neutral, from images. Accurate facial expression recognition has broad applications in areas like human, computer interaction, driver monitoring systems, mental health assessment, and market research. The primary goal of this project is to build a robust pipeline that processes face images and accurately classifies them into one of the seven basic emotion labels. A key performance benchmark for this project is achieving a classification accuracy of at least 70%.

2. Data Sources

To train and evaluate the facial expression recognition pipeline, we will utilize the FER2013 dataset, which is publicly available on Kaggle. This dataset consists of 35,887 grayscale images of size 48x48 pixels, each labeled with one of seven basic emotions: Angry, Disgust, Fear, Happy, Sad, Surprise, and Neutral. All data preprocessing, augmentation, experimentation, and performance evaluations will be consistently based on this dataset to ensure uniformity and reliability in results. The dataset can be accessed here: FER2013 on Kaggle.

3. High-Level Methods, Techniques, and Technologies

The FER pipeline will include several key components, starting with data preprocessing steps such as image normalization and standardization. To enhance model robustness, data augmentation techniques will be applied, including random scaling, translation, and adjustments to brightness and contrast. For model architecture, we plan to experiment with both a basic Convolutional Neural Network (CNN) and a VGG-style model. Training strategies will include optimization techniques like early stopping to prevent overfitting and methods for addressing class imbalance. The technical stack includes TensorFlow, Keras, OpenCV, Scikit-learn, and Matplotlib, which will support model development, evaluation, and visualization.

4. Primary Deliverables

The key deliverables of this project include a GitHub repository containing the full implementation, a Jupyter Notebook documenting the workflow, trained model files, and a performance evaluation report detailing metrics and insights. Additionally, a project demonstration video will showcase the functionality and results of the facial expression recognition system.