Conception Phase–Portfolio Part 1

Project: Computer Science (CSEMCSPCSP01)

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GitHub Repository: https://github.com/MANOJ-M-01/Emotion-Recognition-CSEMCSPCSP01

Problem Statement

Facial emotion recognition (FER) is a basic task in affective computing, allowing systems to understand human emotional states via visual cues in case of real-time. Passive emotion monitoring is a non-invasive, scalable method of mental health screening, customer sentiment analysis, and adaptive human-computer interfaces; it has 280 million people around the world who are affected by depression (WHO, 2023). Conventional techniques use a subjective survey or the observation of an expert; it is time-consuming, expensive, and may be biased. The existing deep learning systems are very resource-intensive in computational resources and large data sets, prohibiting their use on the edge or low-resource systems. Moreover, the imbalance of the classes (in such cases, walkthroughs, or treatments are below 2 percent of samples) and the low-resolution input (48x48 pixels) strongly impair the model performance and generalization.

Proposed Solution

This project learns a simple, interpretable, and entirely reproducible machine learning pipeline to recognize emotions on the faces of a person by showing the FER-2013 dataset (35,887 gray-scale 48x48 images, 7 classes), which consists of 35,887 images altogether. In Python using scikit-learn, three classical classification algorithms, including the base Logistic Regression, the random forest, and gradient boosting, will be created. The pipeline includes: Data preparation: stratified train-test split, normalized pixels, conducted exploratory data analysis (EDA): observed some samples, analyzed distributions of samples, trained models, and compared using metrics of accuracy, macro F1 score, and ROC-AUC. Robust evaluation, 5-fold stratified cross-validation. Conducted unit testing (pytest) and model saving (joblib).

All the code will be modular, stored in the GitHub repository, and described in a Jupyter Notebook (emotion recognition. ipynb). The solution is focused on reproducibility, low cost of computation, and interpretability, which makes it applicable to be integrated into a mobile or web-based decision-support system. The plans are to extend with data augmentation, HOG feature extraction, as well as real-time webcam inference.