Feb 16, 2025 6:15 PM PST

Final Project Proposal

Attendees Liam Youm Kevin Nguyen

Attachments Milestone 0: Final Project Proposal

Agenda

Topic	Time	File	Team member
Dataset Description	2-30 min	Dat...	Liam Youm
Model Selection	5 min	None	Liam Youm
Proposal of the estimated accuracy	30 min	File	Liam Youm Kevin Nguyen
A timeline/work plan	30 min	File	Liam Youm Kevin Nguyen
Project repo, branches, and README	20 min	File	Kevin Nguyen

Dataset

For our project, we decided to use the FER-2013 dataset from Kaggle. This dataset is widely used in the field of facial expression recognition and consists of 48×48 pixel grayscale images of faces. The images have been pre-processed using automatic registration, ensuring that each face is more or less centered and occupies approximately the same area in the image, which helps reduce variability during feature extraction.

The dataset is split into two main subsets: a training set and a test set. Both subsets include examples labeled with one of the seven emotion classes: surprise, sad, neutral, happy, fear, disgust, and angry. Specifically, the training set contains 28,709 examples, and the test set contains 3,589 examples.

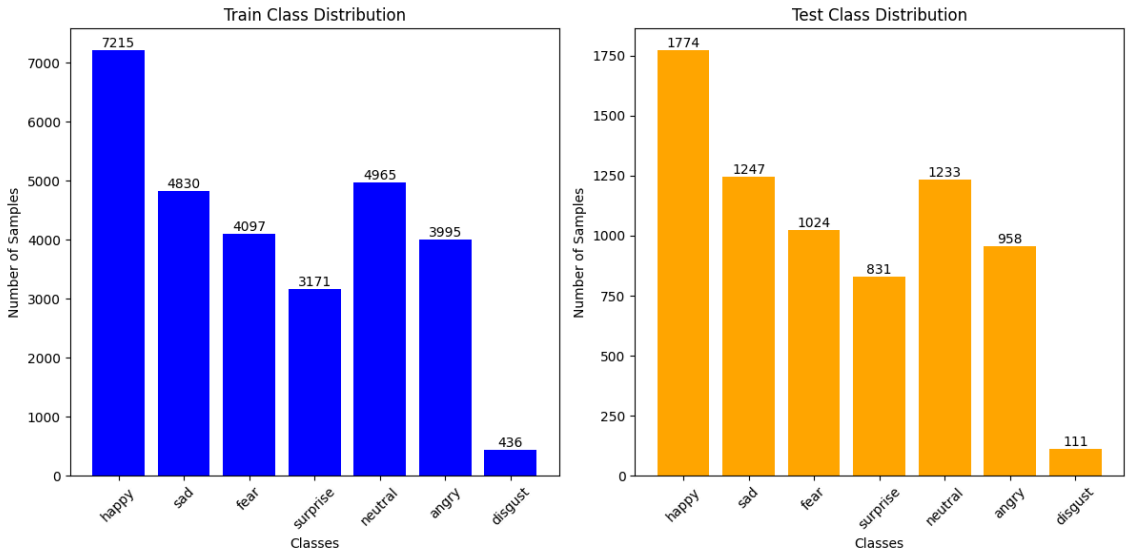
In our project, the input will be these facial images, and the output will be the predicted emotion for each image. The Convolutional Neural Network (CNN) we develop will output confidence scores (probabilities) for each of the seven emotion classes. Since each image belongs exclusively to one of these categories, this task is formulated as a multi-class classification problem.

Model Architecture

Our model will be a CNN. We already have roughly over 32,000 images as inputs and outputs with a likelihood of the class that the image would belong to. The specific model architecture is TBD, and needs to be addressed on later milestones.

Accuracy Prediction

To estimate accuracy, we first decided to establish a baseline. By analyzing the class distribution in the dataset, we determined that **a simple majority classifier** would serve as our baseline metric. Using matplotlib, we visualized the class distribution, which is shown below.



While there is no significant difference between the train and test datasets in terms of distribution, we observed **class imbalance**. Specifically, in the training dataset, the happy class accounts for **25%** of the total data.

This means that if we were to use a simple majority classifier, always predicting the happy class, we would achieve **25% accuracy**. With this in mind, we set our **initial target accuracy** at **40%**, aiming for a **15 percentage point improvement** over the baseline.

However, this is only an initial goal. Through continuous improvements and model optimization, our final objective is to achieve an accuracy of **at least 60%**.

Timeline/Work Plan

For Milestone 1, the data processing step, Liam will perform the Exploratory Data Analysis and optimize the data, while Kevin will process the data and convert it into tensors. Because of the possibility of unexpected difficulties, we will likely work together for this part and check each other's work to verify that the steps have been done correctly.

For Milestone 2, the analysis step, we will primarily work together to implement the data loaders and perform any additional data analysis. However, if specific portions have to be designated to each person, Liam will likely handle the processes related to data analysis and graphing, while Kevin will deal with code implementation. We will make sure that we understand each other's work throughout.

For Milestone 3, the model draft step, Liam will create the neural network class, including the init function and forward functions, while Kevin will create the training and testing loops. We will then review the code and finalize the comments for the code.

For the final submission, we will work together to refine our CNN and fix any bugs. We will likely discuss and reflect on our model, and then collaborate on the Technical Review Document and presentation.

Weekly Meeting Time/Date

We will meet every Sunday via Discord call, working around the middle to late afternoon. We are going to work on this project from Monday to Saturday individually, checking up on each other frequently.

Github Link

https://github.com/Q-bh/cmpm-17-final-project