ECE 579 Intelligent Systems, Winter 2024

Project Progress Report

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**Project title: Facial Expression Recognition System for Personalized Vehicle Settings.**

**Students in the project group: Luis Castaneda-Trejo (Team Leader)**

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**You must include the following items in your progress report.**

1. What has been completed, who did what parts?

* Dataset Preparation and Review: Conducted a review and preparation of the dataset intended for implementation, including data cleaning and normalization for the modeling process.
* Model Development: Developed the initial codebase for the machine learning model, Implemented Deep Neural Network algorithm to get the best fit for our dataset.
* Scenario Analysis and Model Tuning: Conducted a comprehensive study of different scenarios to understand how various factors affect the model's performance.

1. What needs to be done, Whose responsibilities?

* Focused on continuing the training and refinement of our DNN model to enhance its accuracy.
* Developing the model's integration framework into the user interface.
* Documenting all experiments conducted during the model's development.
* In the process of preparing the final documentation and project report.

1. Time schedule for completing the project.
2. **Project Description**: A paragraph that describes the project you propose to do. (e.g. In this project, we will develop a computer vision algorithm for moving vehicle detection, … )
   1. A system flowchart that illustrates the entire system.
   2. **Data Description:** The FER-2013 dataset, consists of grayscale images of faces, each labeled with one of seven emotion categories: anger, disgust, fear, happiness, sadness, surprise, and neutral. The dataset contains 35,887 grayscale samples of human faces, each sized at 48x48 pixels. The dataset is free and available on Kaggle as part of the "Challenges in Representation Learning: Facial Expression Recognition Challenge."
   3. **Proposed/Modified Method**: Our project employs a deep neural network (DNN), designed with multiple hidden layers to learn features at different levels of abstraction, utilizing the non-linear activation function ReLU (Rectified Linear Unit). The model training uses an Adam optimization algorithm. The performance is evaluated using relevant metrics such as accuracy, precision using mean absolute error, mean squared error.
   4. **Experiment Design/ Case Study**:
      * Data Augmentation Experiments: rotating, flipping, scaling, cropping images.
      * Architecture Experiments:
      * Hyperparameter Tuning: modify learning rates, dropout rates, batch sizes, and numbers of layers and neurons.
      * Real-world Usability Tests: Conduct experiments in real-world conditions.
      * Data Modification: eliminating one of the emotions from dataset due to imbalance.