**ECE 579 Intelligent Systems, Winter 2024**

**Project Progress Report**

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

**Students in the project group: Luis Castaneda-Trejo (Team Leader) and Julio C Murillo**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Name** | **Description** | **Responsible** | **Status** |
| 1 | Dataset | Review and preparation of the dataset intended for implementation. | JM | Done |
| 2 | Model Development | Developed Initial codebase for the machine learning model. Implemented initial DNN algorithm. | JM | Done |
| 3 | Scenario Analysis | Conducted a comprehensive study of different scenarios to understand model’s performance. | JM | Done |
| 4 | Deployment target | Research about the best MCU and development board to deploy the developed model. | LCT | Done |
| 5 | Deployment dependencies | Explore options for deployment (PC with LabVIEW and Python vs STM32 MCU) | LCT | Done |
| 6 | User Interface | Created a demo UI to call the model and show initial results | LCT | Done |

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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Name** | **Description** | **Responsible** | **Due Date** |
| 1 | Model Training | Training and refinement of the DNN model to increase performance (P). | JM | 3/1/2024 |
| 2 | Model Integration | Integrate model into item 6 from Table 1. | LCT | 3/15/2024 |
| 3 | Experiment documentation |  |  |  |

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.