ECE 579 Intelligent Systems, Winter 2024

Project Initiative Report

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

**Students in the project group: Julio Murillo Amezcua and Luis Castaneda-Trejo.**

**Project Description**: In this project, we will design and develop a facial expression recognition system using Phyton and TensorFlow. This system will be situated directly in front of the vehicle's steering wheel, where it will analyze the driver's facial expressions to predict their emotional state that could potentially lead to unsafe driving behaviors such as over speed limit. Depending on the recognized expression, the system will adjust the maximum speed limit parameter by sending a custom CAN message to the vehicle’s CAN bus and in scenarios where the emotional state is significantly a concern, notify the user’s emergency contacts. The model User Interface will be developed in NI LabVIEW. For CAN communication, the system will use an NI USB-8506 and the simulated vehicle network will be done using Vector CANoe.

**Data Description:**

Our project will use FER+, that is an extension and enhancement of FER2013. It uses the same images as FER2013 but with improved and more reliable labeling. The extended FER2013 is one of the most used datasets available for facial expression recognition, containing 35,887 facial images of grayscale images of human faces sourced from internet. Each image is a 48x48 pixel grayscale photograph. FER+ includes seven categorical expressions (**Neutral, Happy, Sad, Surprise, Fear, Disgust, Anger**) and is publicly accessible, making it a good choice for our project. The dataset is available for download from the GitHub Repository: <https://github.com/Microsoft/FERPlus>

Additionally, we plan to review and analyze other datasets to ensure we select the most suitable. These datasets will be explored from a comprehensive list available on the site Papers with Code (<https://paperswithcode.com/datasets?task=facial-expression-recognition&page=1>), allowing us to compare and consider other options for our project.

**Activities by group member:**

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| Group Member | Task | Completion Date | Deliverable |
| LCastaneda | User Interface for I/O controls. | 2/8/2024 |  |
| LCastaneda | Vehicle message handling | 2/29/2024 |  |
| LCastaneda | Vehicle network integration in CANoe. | 2/29/2024 |  |
| JMurillo | Model training | 3/15/2024 |  |
| JMurillo | Model integration | 3/29/2024 |  |
| All | Testing | 4/10/2024 |  |

\*Additional activities might be added or changed based on the workload of the participants.