PROJECT PROPOSAL

COMPUTER VISION

1. **Title:** Driver Behavior Classification and Alert System using Computer Vision

2. **Team Members**

[Farhan Ahmad | 01-136221-054]

[Noor-Ul-Huda | 01-136212-037]

[Hasaan Ejaz | 01-136212-013]

3. **Problem Statement**

Road accidents caused by driver distraction are a significant concern globally. Studies show that distracted driving is one of the leading causes of vehicle collisions, resulting in fatalities, injuries, and economic losses. Traditional methods for monitoring driver behavior rely heavily on manual supervision, which is inefficient and prone to errors. This project aims to leverage computer vision and deep learning techniques to automate the detection of driver distractions, thereby improving road safety and reducing accidents.

4. **Objective**

The primary objective of this project is to design and implement a sophisticated deep learning system that can accurately classify various driver behaviors within the confines of an in-car environment. Specifically, the project aims to achieve the following:

- Develop a convolutional neural network (CNN) architecture utilizing transfer learning techniques to classify driver responses.
- Train the CNN model on a diverse dataset of in-car driver activities, ensuring robustness and generalizability.
- Implement a real-time alert mechanism to notify drivers of unsafe behaviors, thereby enhancing road safety.

5. Proposed Solution/Approach

i) **Convolutional Neural Network Architecture:**

- The project will employ a state-of-the-art CNN architecture, Vanilla, for feature extraction and classification.
- Transfer learning techniques will be utilized to leverage the pre-trained weights of Vanilla, optimizing model performance and reducing training time.

ii) **Dataset Preparation:**

- The primary dataset for training and validation will be the State Farm Distracted Driver Dataset, comprising 22,424 images distributed across ten classes of driver activities.
- Data augmentation techniques, including rotation, flipping, and scaling, will be applied to augment the dataset, enhancing model generalizability.

iii) **Model Training and Evaluation:**

- The CNN model will be trained using a combination of supervised learning and fine-tuning strategies to optimize performance.
- Training will be conducted on GPU-accelerated hardware to expedite convergence and improve efficiency.
- Model evaluation will involve rigorous testing on validation data to assess accuracy, precision, recall, and F1-score metrics.

6. Expected Outcomes:

The anticipated outcomes of this project include:

- Development of a highly accurate deep learning model capable of classifying driver behaviors with precision.
- Implementation of a real-time alert system that effectively notifies drivers of unsafe activities, contributing to enhanced road safety.
- Potential impact on reducing the incidence of vehicle accidents and fatalities through proactive driver monitoring and intervention.

7. Timeline

Tasks	Start Date	End Date
Proposal Submission	Nov 25, 2024	Nov 27, 2024
Data Collection	Nov 30, 2024	Dec 11, 2024
Data preprocessing & augmentation	Dec 12, 2024	Dec 15, 2024
Model selection & initial training	Dec 10, 2024	Dec 20, 2024
Model Development	Dec 20, 2024	Dec 22, 2024
Final Submission	Dec 24, 2024	Dec 25, 2024