**EXPLANATION**

The project focuses on implementing a Convolutional Neural Network (CNN) to detect distracted drivers based on a dataset obtained from the State Farm Distracted Driver Detection competition on Kaggle. The dataset consists of images captured in cars, showing drivers engaged in various activities such as texting, talking on the phone, operating the radio, drinking, etc.

The project's overall objective is to develop a reliable system capable of accurately classifying driver images into one of ten categories representing different distracted states. These categories include safe driving, texting (right and left), talking on the phone (right and left), operating the radio, drinking, reaching behind, hair and makeup, and talking to a passenger.

Before training the CNN model, data preprocessing steps are carried out. The dataset is divided into training, validation, and test sets. The images are resized to a square shape of 224 x 224 pixels, maintaining all three color channels. Normalization is applied by dividing each pixel value by 255, ensuring that all pixel values are between 0 and 1. Additionally, a mean value of 0.5 is subtracted to ensure the data has a zero mean.

The CNN architecture implemented for this project consists of four convolutional layers with four max pooling layers interspersed between them. The number of filters is increased gradually from 64 to 512 across the convolutional layers. Dropout regularization is applied, and a flattening layer is added before the fully connected layers. The CNN has two fully connected layers, with the last layer having 10 nodes corresponding to the ten classes. The softmax activation function is used for the final layer, while the ReLU activation function is used for the other layers. Xavier initialization is applied to each layer to ensure effective parameter initialization.

Once the CNN model is constructed and trained using the prepared dataset, evaluation is carried out on the validation set. The performance metrics, such as accuracy, precision, recall, and F1-score, are computed to assess the model's effectiveness in detecting distracted drivers.

Overall, the project aims to leverage CNNs and image classification techniques to develop a robust and accurate system for detecting and classifying distracted drivers. By utilizing the provided dataset and implementing appropriate preprocessing and CNN architecture, the project endeavors to contribute to the improvement of road safety by enabling automated detection of distracted driving behaviors.