

Individual Project Report

Distracted Driver Detection

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Abstract

Guardian Angel is an initiative aimed at improved road safety by integrating cutting-edge technology into the driving experience. The project envisions a comprehensive system that monitors various facets of driving behavior to ensure a secure and reliable journey for every driver on road. My contribution to this project focuses on the implementation of the Distracted Driver Detection System, a pivotal component designed to identify and address distracted driving behaviors.

Distracted Driver Detection System

Objective: The primary goal of the Distracted Driver Detection System is to enhance safety on the roads by identifying instances of distracted driving. Leveraging advanced machine learning techniques, the system analyzes real-time images captured from the driver's perspective and alerts users when distracted behaviors are detected.

Key Features:

Multi-Model Approach: Utilizing a convolutional neural network (CNN), the system distinguishes between various distracted driving behaviors, including texting, talking on the phone, and more.

Integration with Guardian Angel Framework: The distracted driver detection component seamlessly integrates into the broader Guardian Angel architecture, contributing to the overall safety decision-making process.

Real-Time Alerting: Upon detection of distracted driving behaviors, the system triggers real-time alerts, providing immediate feedback to the driver through the Guardian Angel app.

Adaptive Strategies: The system incorporates adaptive strategies such as transfer learning with pre-trained models and Leslie Smith's One Cycle Policy, optimizing performance and efficiency.

Alignment with Guardian Angel

In the orchestration of Guardian Angel's mission, the Distracted Driver Detection System assumes a pivotal role, aligning seamlessly with the broader objectives of the project. The essence of Guardian Angel lies in its commitment to creating a holistic safety framework, and my contribution is tailored to fortify this framework by addressing the perils associated with distracted driving.

Fostering Driver Awareness: Distracted driving has emerged as a significant threat on modern roads, contributing to accidents and endangering lives. The alignment with Guardian Angel is evident as the Distracted Driver Detection System acts as a vigilant guardian, fostering driver awareness and mitigating potential risks associated with inattention.

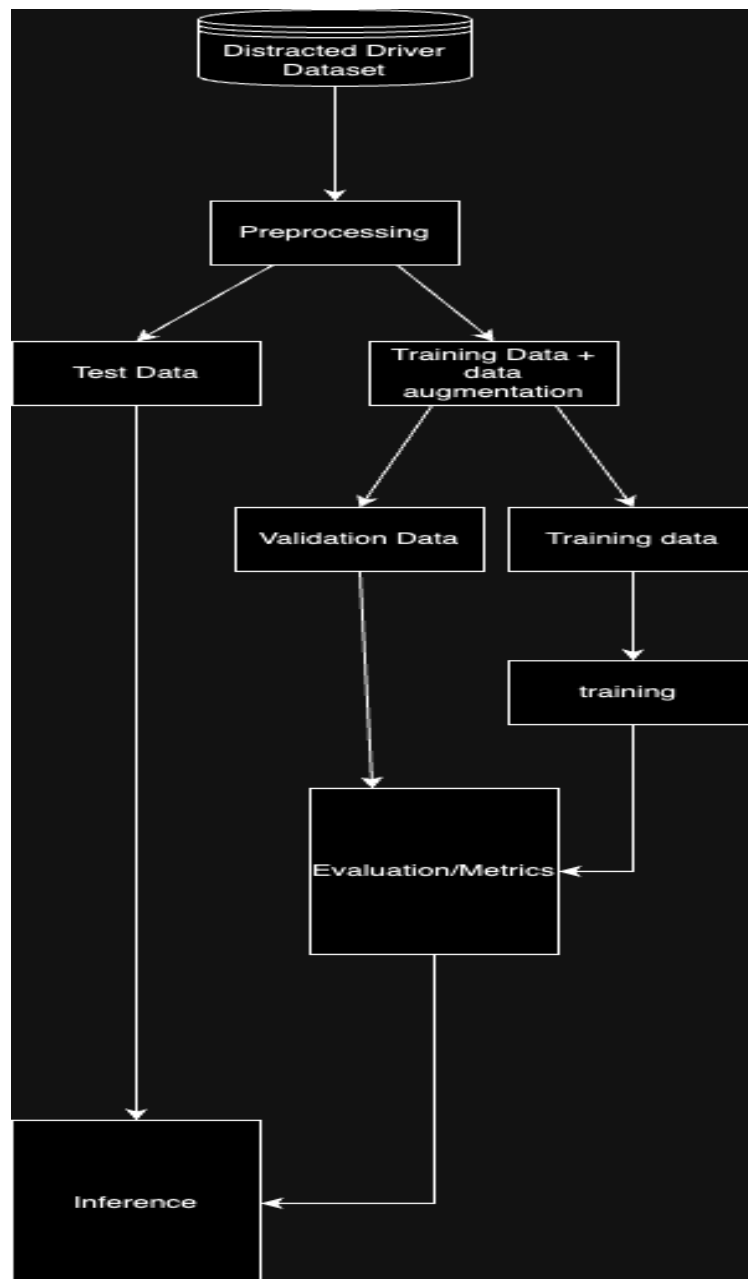
Synergizing with Other Modules: The Distracted Driver Detection System harmonizes with other modules, such as drowsiness detection and road stress analysis. The synergy ensures a collective intelligence that goes beyond isolated warnings, providing a nuanced understanding of the driving environment.

Empowering Decision-Making: Guardian Angel envisions an autonomous system capable of discerning when it's safe to transition control to the human driver. My contribution enhances this vision

by empowering the decision-making process. The Distracted Driver Detection System becomes a critical input, guiding the Guardian Angel in deciding optimal moments for human intervention.

The Impact: Beyond mere detection, this system contributes to the overall narrative of Guardian Angel by weaving a safety tapestry that adapts to the nuances of real-world driving. Through meticulous design, strategic testing, and an understanding of the broader ecosystem, the Distracted Driver Detection System epitomizes a commitment to safety that resonates with the core ethos of Guardian Angel.

Specification



The diagram represents the workflow of a machine learning model for a distracted driver dataset.
Tech Stack: Python, Flask, Fastai, Keras, TensorFlow

Testing Strategies

Data Splitting Strategy:

Initially, a random split was employed for the dataset, achieving high accuracy on the validation set. However, this strategy led to overfitting, resulting in lower accuracy on the testing set. Subsequently, a split based on individual drivers was adopted to ensure no overlap between training and testing data.

Metrics Used: Precision, Recall, and F1 Score became the key metrics guiding our testing symphony. The realization dawned that mere accuracy wasn't a sufficient measure; we needed a nuanced evaluation. Precision ensured that when our model claimed a distracted driver, it was precise in its assertion. Recall assured us that our model didn't overlook true instances of distracted driving. F1 Score, the harmonic mean of precision and recall, became the gold standard for our testing orchestra, capturing the delicate balance between false positives and false negatives.

Navigating Challenges

Transfer Learning Advantage: Using transfer learning with a pre-trained ResNet34 model proved to be advantageous compared to training a raw model from scratch. Transfer learning allowed the model to leverage knowledge from a broader dataset, enhancing its ability to detect distracted driving behaviors.

Leslie Smith's One Cycle Policy: The adoption of Leslie Smith's One Cycle Policy significantly accelerated the training time of the model. By dynamically adjusting the learning rate during training, the model converged faster and achieved better generalization, addressing challenges related to computational efficiency.

Conclusion

In the grand finale of the Guardian Angel project, the Distracted Driver Detection System stands tall, not as a mere component but as a crescendo of safety. From alignment with project ethos to the intricacies of design, testing strategies, and navigating challenges, our contribution is not just a note in the Guardian Angel symphony; it is the heartbeat that defines the rhythm of safety in the future of driving. The Guardian Angel, with our component as its melodic core, is poised to redefine the boundaries of vehicular safety, making every journey a harmonious voyage.