

Project 1: Proposal and Data Selection

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Describe and name your project in 1-2 sentences max

The driver sleeping alert system is designed to send push notifications to a driver's desired platforms (email, phones, etc.) when a driver is falling asleep while driving.

Describe the business problem your project is trying to solve and/or the research questions you will explore

According to the National Highway Traffic Safety Administration, nearly 800 fatalities and over 50,000 injuries have resulted from drowsy-driving crashes yearly. Therefore, incorporating the alert system will improve car safety by preventing accidents. The technology can assist a driver in avoiding legal consequences (license suspension or imprisonment) for operating a motor vehicle drowsy. Additionally, the alert system can lower insurance premiums for many drivers as insurance companies will consider them safe drivers. Due to the low cost of research and development of the alert system, the following technology can be implemented in low-priced cars, providing an important safety feature for drivers amongst different income groups.

Where are you getting your data? Describe the data that you will use to solve the problem

The driver sleeping alert system will not use a conventional dataset presented in a table format. It will instead use a camera to collect real-time data from the driver to detect their fatigue state by monitoring eye closure duration and changes in the head movement, such as tilting to the side. Therefore, processing real-time data will be imperative for the alert system to determine driver's fatigue level to prevent car-crash fatalities by sending push notifications to the user.

What analysis methods will you use to complete this project?

A concrete methodology is essential to create a system to detect whether a driver is falling asleep behind the wheel. Python provides a collection of in-build libraries, including OpenCV and dlib, making it easier to perform image processing and object recognition. Once a face is detected with the openCV, eye coordinates can be estimated by mapping the facial points on a driver's face using a dlib library. The system will lock coordinates on the driver's eyes to monitor for eye closure duration. Suppose the system detects the driver's eyes have been closed for a specific interval (i.e., 2.5 seconds). In that case, the alert will be activated, sending notifications to the user on various platforms such as emails, text messages, phone alerts, etc. Smtplib (a built-in python library) will be utilized to send emails, while an API, or third-party application, will be used to send push notifications to the user's phone.

What are some potential ethical concerns of this topic or analyzing the data?

While the sleeping alerting system can be a helpful safety feature in cars, there are several ethical concerns to consider ensuring the technology is used in a responsible manner. The most critical ethical concern to consider is privacy. Since the camera will monitor the driver's movements, the driver may perceive an invasion of privacy as if their movement is constantly being monitored. Additionally, if the vehicle's computer system becomes compromised, the alert system's camera can be used for surveillance by an attacker with ill intentions. Another ethical concern to bear in mind would be reliability. If the driver becomes too dependent on technology for safety alerts, it could lead the driver to avoid taking personal responsibility for staying alert behind the wheel when the system fails to alert in genuinely dangerous scenarios.

What are some issues and challenges do you think you might face?

There are several issues I may encounter when creating an alert system. For instance, it can be challenging to differentiate between sleepiness and other factors such as medication illness or illness. Another issue will be to evaluate a proper technique to successfully send push notifications to the user's phone, especially when they're using closed operating systems (OS) such as Apple's iOS. Since head movement, such as head tilt, will be factored in to detect a driver's drowsiness, it could be difficult to determine which facial points should be considered to indicate a tilt motion. Lastly, it will be challenging to validate the alert system as there are no definitive signs of whether a driver feels drowsy.

What sources will you use to validate your results and support your project topic?

The driver sleeping alert system will be validated through rigorous experimentation. The system will be tested in real-world scenarios to determine its accuracy. For example, we can place a test subject (myself) at various distances from the camera to assess the performance. There are many other scenarios the system will be tested on, such as different eye sizes, brightness levels, combinations of head movements, etc. In essence, the accuracy of an alert system is crucial for its effectiveness since a faulty system may result in potential safety risks such as accidents, injuries, and fatalities.

Reference

1. "Fatigued Driving." National Safety Council, <https://www.nsc.org/road/safety-topics/fatigued-driver>.