Performance Analysis of Deep Learning Models in Driver Behavior Recognition

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Problem Statement

- Road transportation forms the backbone of our nation by providing affordable means of transporting goods and supporting migration of people
- Long hours of driving lead to tiredness and fatigue in drivers
- Fatigue causes short episodes of sleepiness, during which drivers fail to respond to stimuli and become momentarily unconscious
- According to the World Health Organization, nearly 1.25 million people die yearly due to road accidents, with driver fatigue being a major contributing factor

Alarm System

- A single web app based graphical user interface (GUI) to create an alarm system using python libraries
- Makes
  use of models trained on detecting dro wsy behavior of a driver
- Captures an image, preprocesses and sends it to the deep learning models for prediction
- Sounds
  an alarm if driver is predicted drowsy for 3 consecutive seconds (threshold)

Methodology

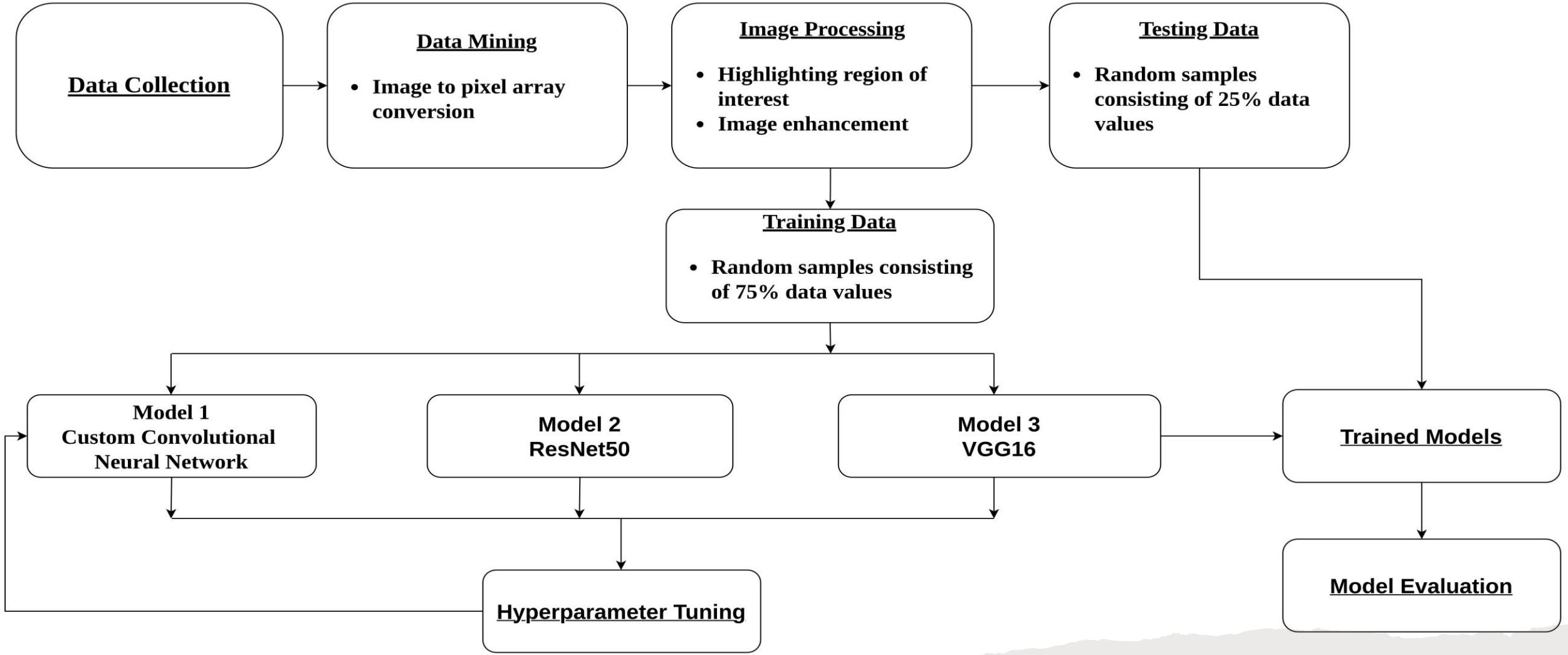
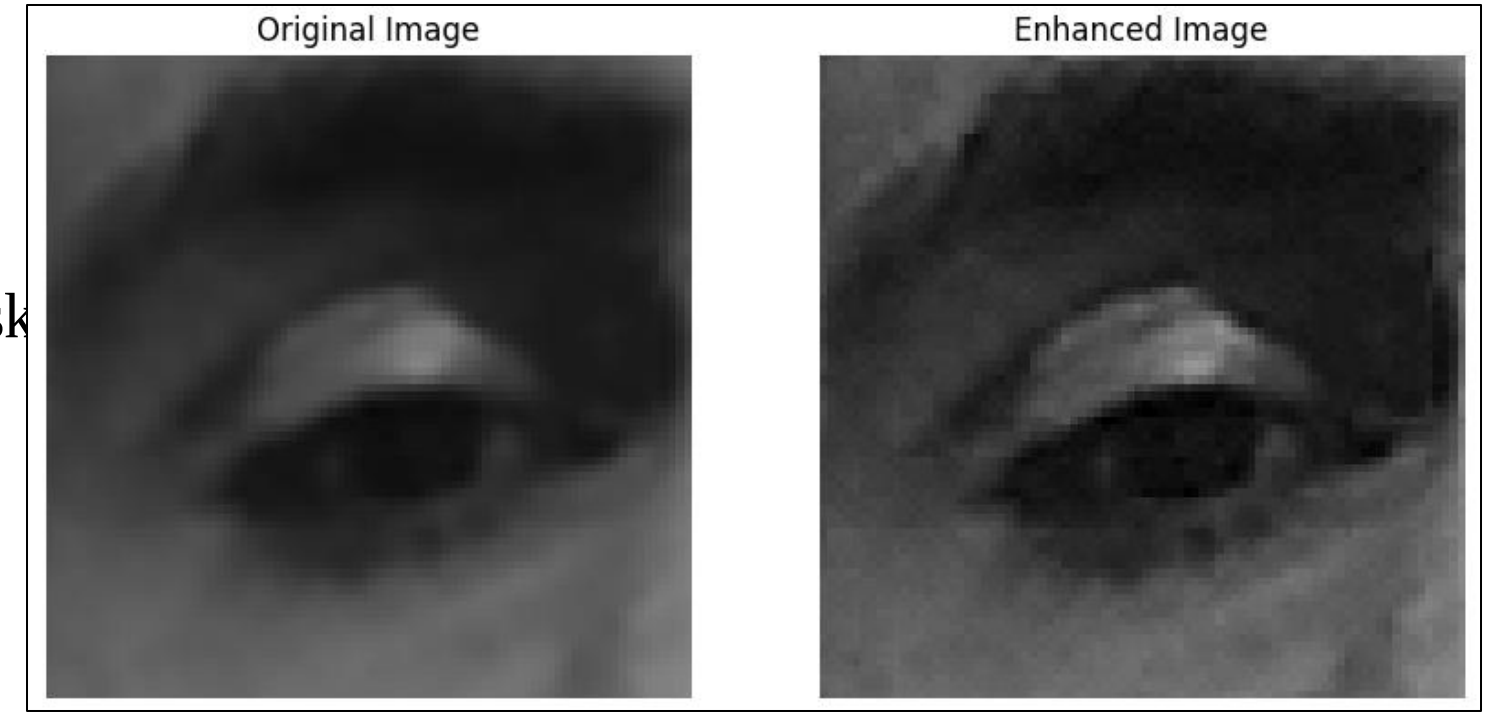


Image Processing

- Image processing is a crucial aspect of any computer vision task
- Enables us to extract meaningful insights from an image
- In our project, we have applied image to highlight region of interest and enhancing the image by applying sharpening kernel filter.

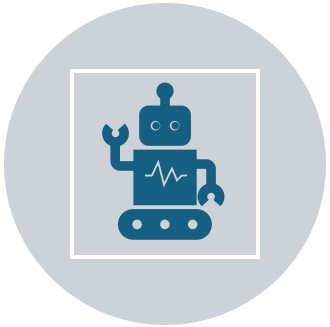


Deep Learning

Deep learning uses neural networks with multiple layers to automatically learn hierarchical representations of data, capturing complex patterns and features.

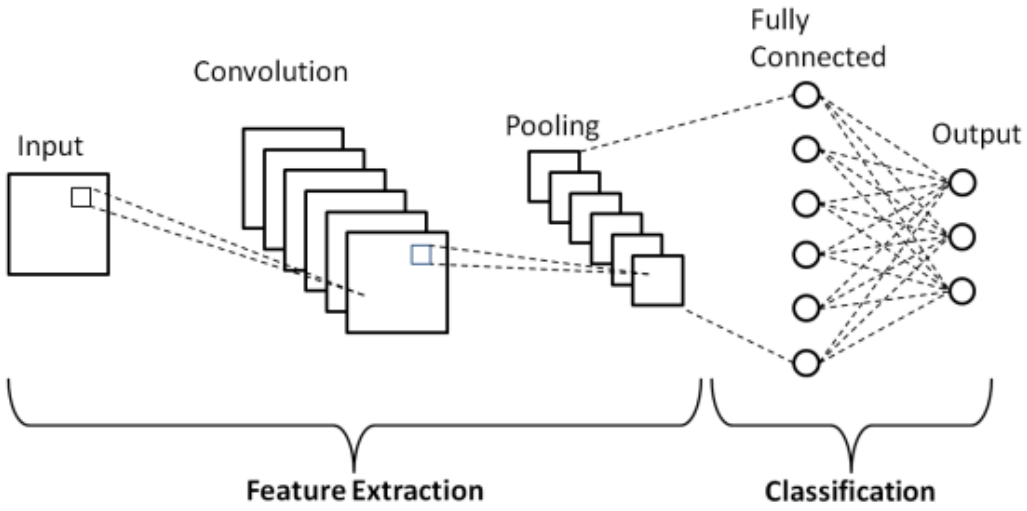
Deep learning enables direct learning from raw data to outputs, bypassing manual feature extraction, which simplifies the model development process.

Deep learning models can scale with large datasets, benefiting from increased data size to improve accuracy and handle complex tasks efficiently.



Deep learning has revolutionized fields such as computer vision, natural language processing, and robotics, achieving state-of-the-art performance in tasks like image recognition and language translation.

Convolutional Neural Network (CNN)



- CNNs are a class of deep learning models specially designed to work on grid-like structure data such as images
- Can automatically learn spatial heirarchy of features present in an image, capturing hidden patterns in input images
- Applicable on a wide range of computer vision tasks as they are prone to variations and can perform with high efficiency

Driver Distraction Dataset

- The State Farm Distracted Driver Dataset was formed by Anna Montoya, Dan Holman, SF_data_science, Taylor Smith and Wendy Ken in 2016
- This dataset contains more than 20000 images of drivers classified into ten classes which are safe driving, texting - right, talking on the phone - right, texting -right, talking on the phone - left, operating the radio, drinking, reaching behind, hair and makeup and talking to the passenger
- This dataset is pivotal in classifying distracted behavior in drivers and development of advanced driver-assistance systems (ADAS)

Driver Drowsiness Dataset

The Driver Drowsiness Dataset (DDD) is an extracted and cropped faces of drivers from the videos of the real-life scenarios of drivers exhibiting drowsiness

The obtained dataset (DDD) has been used for training and testing CNN architecture for drowsiness detection in drivers

DDD contains more than 40,000 extracted cropped face images of drivers from videos. These images are divided into two classes drowsy or non-drowsy

Thank You