DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

Final Project Review

On

*"ON ROAD VISIBILITY IMPROVEMENT USING THERMAL CAMERA AND DETECTION OF OBJECT AND TRACKING(VIDOT)"*

*By*

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# Context

- Abstract

- Introduction

- Problem Statement

- Aim and Objective

- Existing System

- Proposed System

- Literature Survey

- Requirements Specification

- System Architecture

- Software Architecture

- Algorithms

- Flowchart

- Language Used For Implementation

- Software Used For Implementation

- Observation And Result

- Conclusion and Future Scope

# Abstract

- Every year the lives of approximately 1.3 million people die as a result of a road traffic crash.
- Road traffic injuries constitute a major public health and development crisis, and are predicted to increase if road safety is not addressed adequately by Member States. The World Health Organization(WHO) has been concerned with this issue for over four decades.
- In low-income and middle-income countries, the phenomenon of pedestrians and vehicles not being properly visible is frequently a serious problem.
- To avoid these accidents and to help save the lives of both driver and passenger, an automated drivers assistance system (ADAS) is proposed in this system.

# Introduction

- Object detection is a computer vision technique for locating instances of objects in images or videos.
- Object tracking is an application of deep learning where the program takes an initial set of object detections and develops a unique identification for each of the initial detections and then tracks the detected objects as they move around frames in a video.
- A thermal camera is a device that creates an image using infrared (IR) radiation, similar to a normal camera that forms an image using visible light. Instead of the 400–700 nanometre (nm) range of the visible light camera, infrared cameras are sensitive to wavelengths from about 1,000 nm (1 micrometre or μm) to about 14,000 nm (14 μm).
- The above said technologies are being actively used in autonomous vehicles for advanced driver assistance systems. So then why not use them to improve the visibility of a rider/driver while riding/driving during bad weather and lighting situations?

# Problem Statement

- Adverse weather conditions such as heavy rain, thick fog and hail storms make driving riskier as visibility reduces and road surface gets slippery.
- In India alone, 0.13 million people die due to road accidents caused by bad weather and lighting conditions.
- This can be avoided by integrating the latest computer technologies into the vehicle and we have the solution is by developing an automated driver's assistance system called "VIDOT - on-road Visibility Improvement using a thermal camera and Object Detection and Tracking"

# Aim and Objective

- The aim is to improve the way riders/drivers ride/drive during bad weather conditions(fog and rain) and bad lighting conditions(night). The objective of this project is to create an advanced driver assistance system that will help riders/drivers ride/drive safely using the latest computer technologies.

# Existing System

- There are no existing system in the market which is capable of doing what we propose to do.

# Proposed System

- Even with advancements in technology, there is no advanced specific system to help tackle issues such as bad weather conditions and lighting conditions while driving.
- To solve the problem, we have built an automated drivers assistance system using thermal camera, object detection algorithm and object tracking algorithm.
- The system captures the live feed through the camera and displays the processed video on a HUD of the vehicle.
- The system also displays current weather conditions, temperature, and time. Voice commands are used to start and end the software.
- This system helps the driver to understand what's on the road, which improves the cognitive sense of the driver and helps to prevent avoidable mistakes.

# Literature Survey

- You Only Learn One Representation: Unified Network for Multiple Tasks
- Simple Online and Realtime Tracking with a Deep Association Metric
- Thermal Object Detection in Difficult Weather Conditions Using YOLO

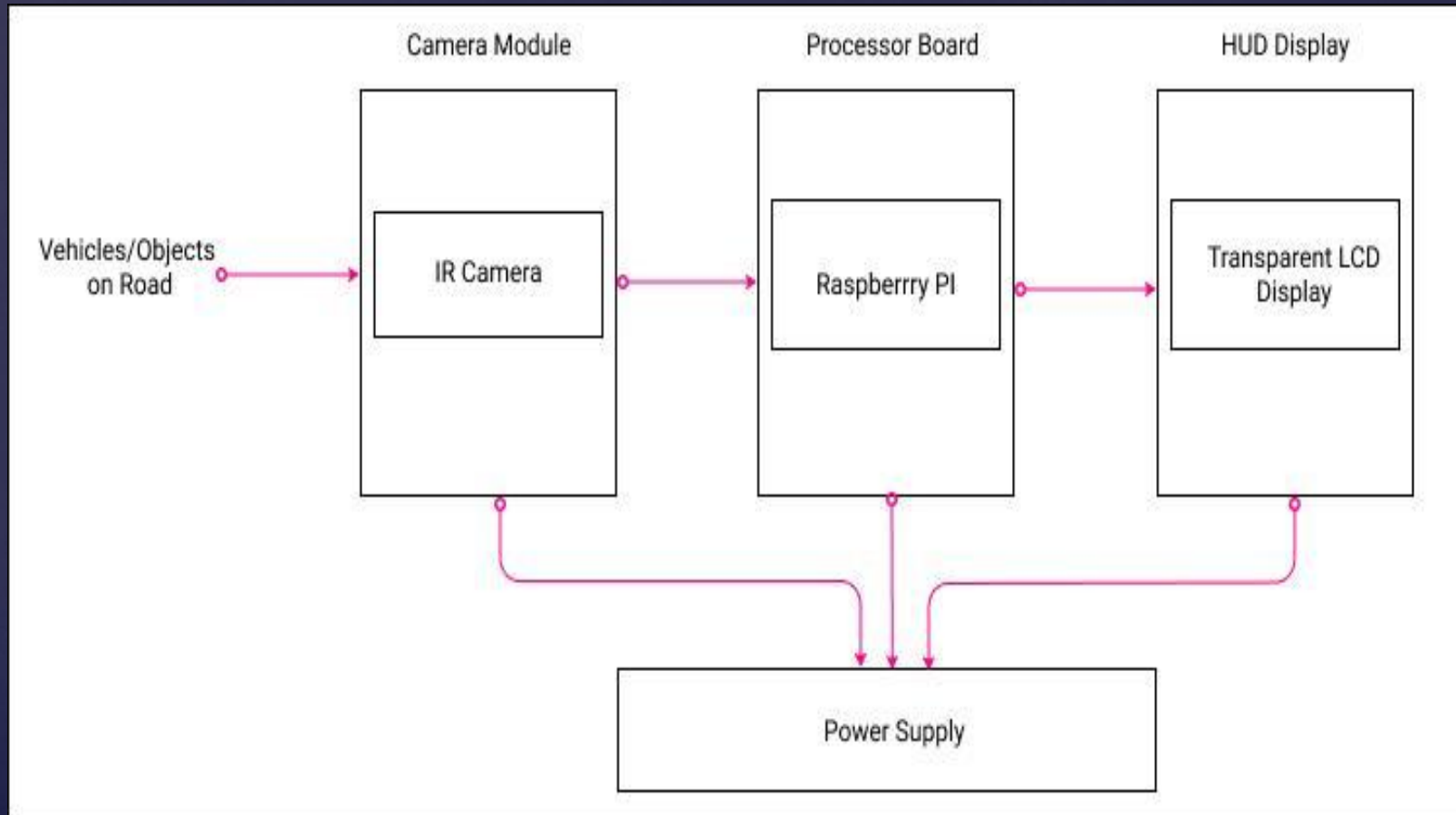# Requirements Specifiation

## Software Requirement

- Operating System: Windows 8/10
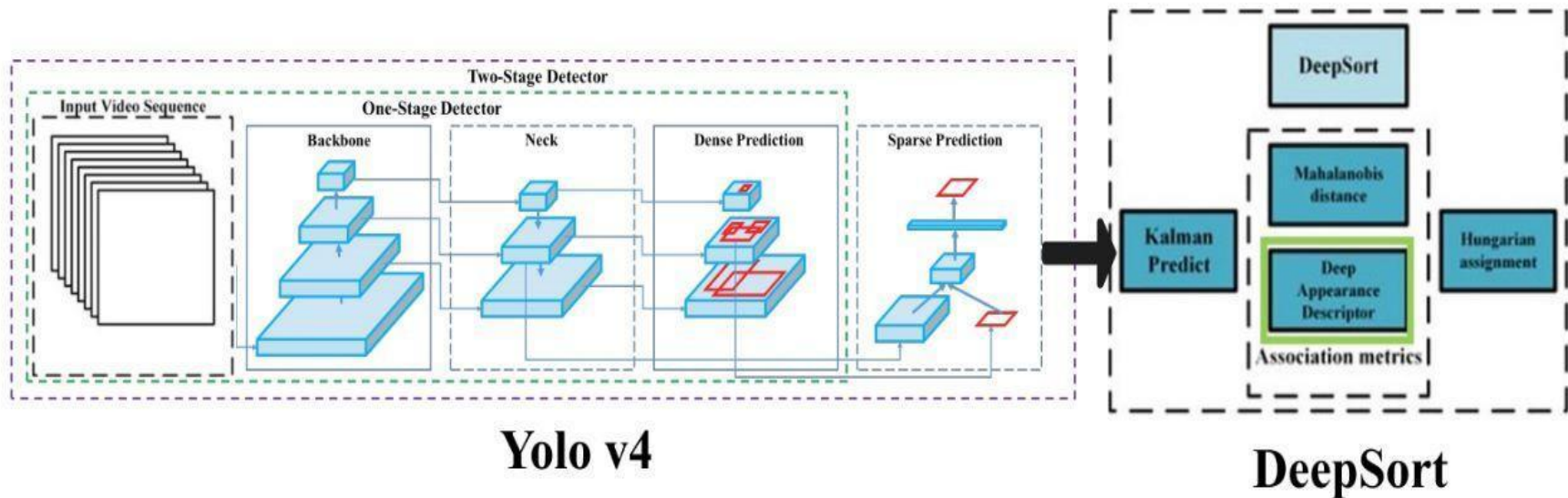- Programming Language: Python
- IDE: Spyder IDE

## Hardware Requirement

- Processor: Intel i5 8th Gen (min)
- Speed: 2.4 GHz (min)
- RAM: 8 GB (min)
- Hard Disk: 50 GB (min)

# System Architecture

# Software Architecture

# Algorithms
## Yolo-v4

- **Object detection** is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos.

- Well-researched domains of object detection include face detection and pedestrian detection. Object detection has applications in many areas of computer vision, including image retrieval and video surveillance.
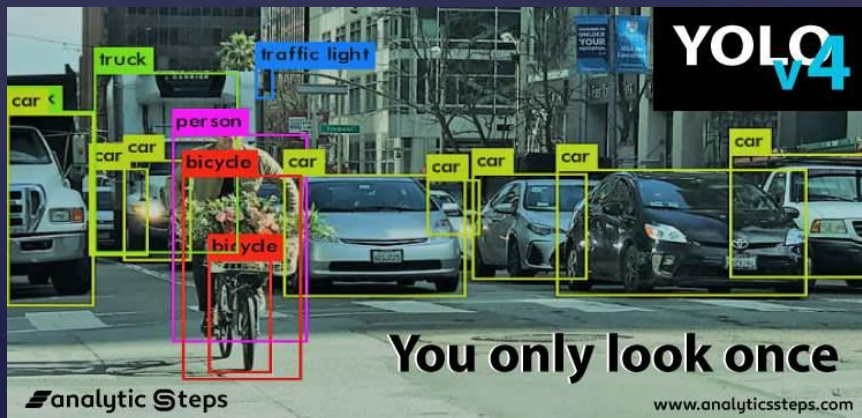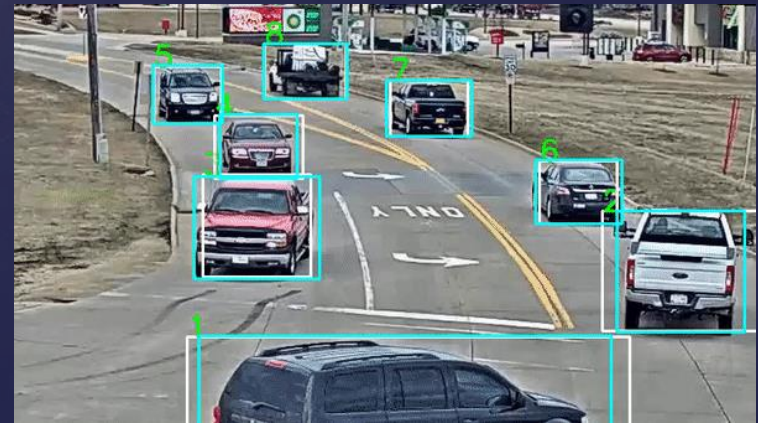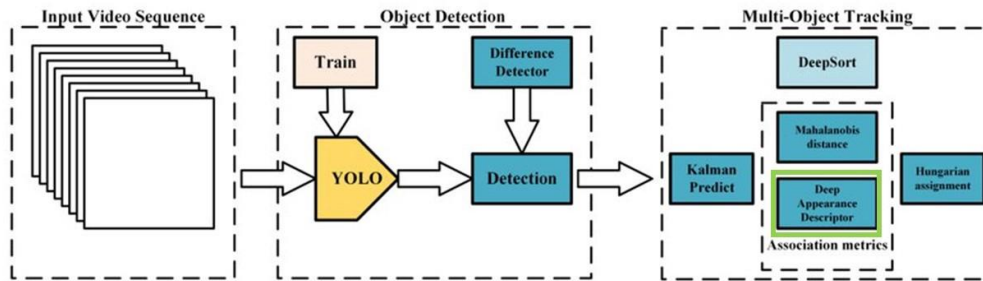
# Deep Sort

- A **track algorithm** is a radar and sonar performance enhancement strategy.
- Tracking algorithms provide the ability to predict future position of multiple moving objects based on the history of the individual positions being reported by sensor systems.

# Algorithm

Yolo v4:
- The original YOLO (You Only Look Once) was written by Joseph Redmon in a custom framework called Darknet.
- YOLOv4 is a two-stage detector with several components to it.

DeepSort:
- Traditionally, tracking has used an algorithm called Sort (Simple Online and Realtime Tracking), which uses the Kalman filter.
- DeepSort uses an AI model that compares similarities between people, thus reducing the issue of switching people's identities.

# Flowchart
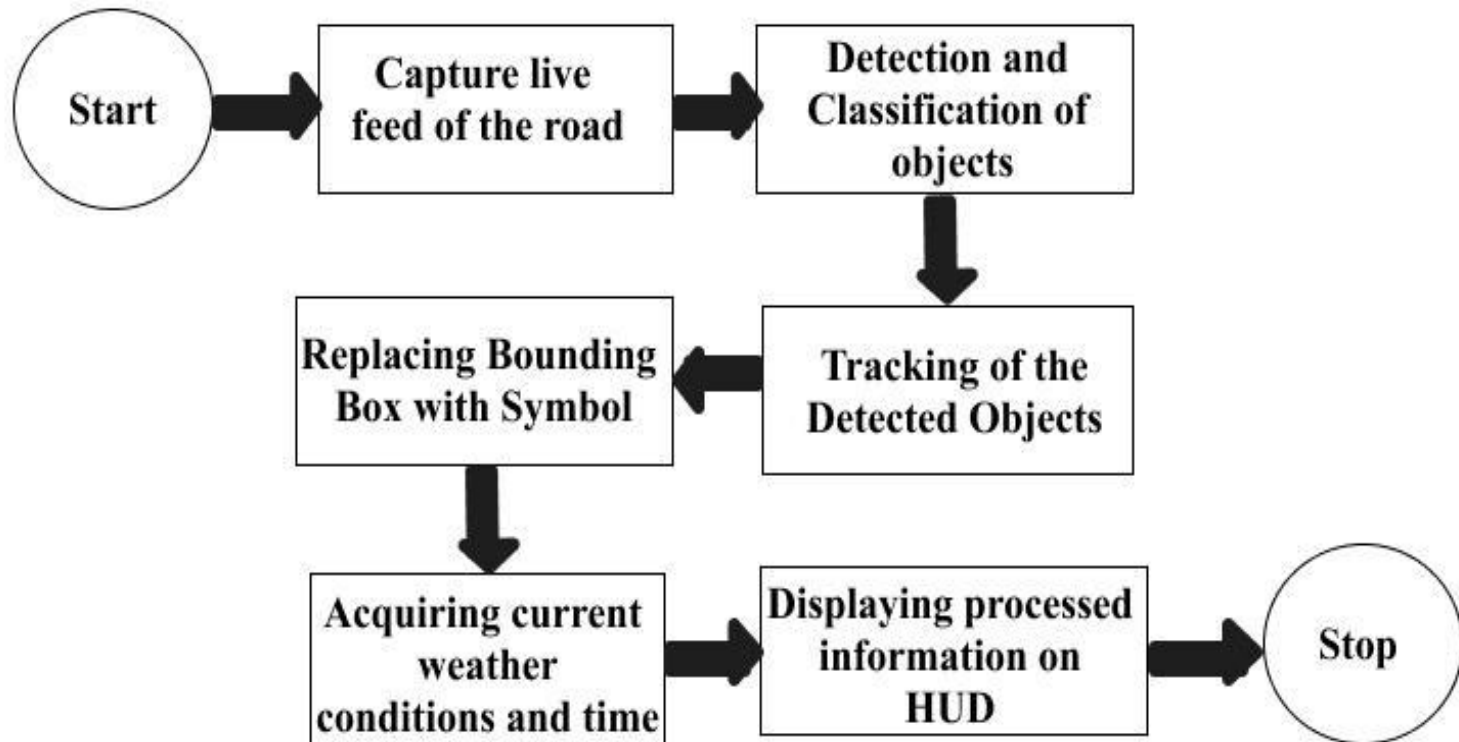
# Language Used For Implementation

Python:
- Python is a high-level, interpreted, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.
- Python is a multi-paradigm programming language.
- Python consistently ranks as one of the most popular programming languages.
- Python strives for a simpler, less-cluttered syntax and grammar while giving developers a choice in their coding methodology.

# Software Used For Implementation

Anaconda (Python distribution):
- Anaconda is a distribution of the Python and R programming languages for scientific computing.
- It is developed and maintained by Anaconda, Inc.,
- The distribution includes data-science packages suitable for Windows, Linux, and macOS.
- It also includes a GUI, Anaconda Navigator, as a graphical alternative to the command-line interface (CLI).

Spyder IDE:
- Spyder is an open-source cross-platform integrated development environment (IDE) for scientific programming in the Python language.
- Spyder integrates with a number of prominent packages in the scientific Python stack, including NumPy, SciPy, Matplotlib, pandas etc.

- It is a free and open-source scientific environment written in Python, for Python, and designed by and for scientists, engineers, and data analysts.
- It is available cross-platform through Anaconda.

Python Modules:
- Opencv
- Numpy
- Tensorflow
- DatetimeDatetime
- Pyowm
- os
- pyttsx3
- Speech_recognition

# Observation And Result

# Observation And Result

# Demo

# Conclusion

- Through this system we have come up with one of the solutions for the safety of drivers.
- We would like to conclude by saying that ours is an unique and innovative method.
- Combining various latest technologies to create an useful safety product, with the successful implementation of this project, we are sure that it'll help reduce most of the accidents that occurs due to weather conditions.

# Future Scope

- Implement this software system on a real world hardware system.
- To take this idea and build a, robust version of our older project, so that it can be used in every vehicle, from low range to high range vehicles.
- Add aditional features such as navigation, bluetooth conectivity etc.

# Thank you