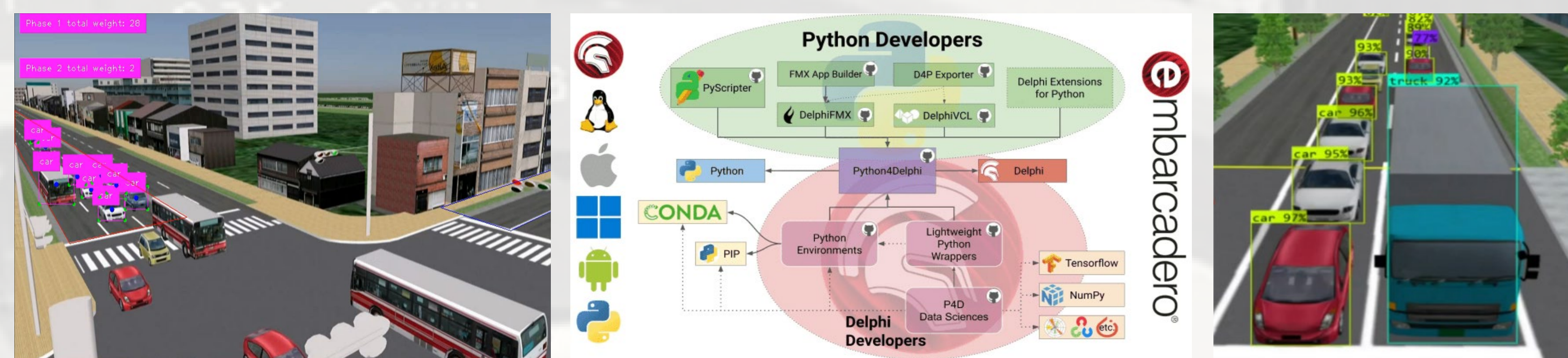




Smart Traffic Control System for the Metaverse

Overview

Our project aims to revolutionize traffic management within the metaverse by developing an AI-powered system that dynamically adjusts traffic signals and provides real-time route guidance to drivers. Utilizing computer vision algorithms to analyze traffic patterns from CCTV cameras, the system will optimize traffic light timings at intersections to minimize congestion and improve flow. Simultaneously, it will leverage vehicle telemetry data and sophisticated routing algorithms to calculate and recommend optimal routes for each vehicle, considering factors like traffic density, road conditions, and individual destinations. This data-driven approach will create a more efficient and responsive traffic system that enhances the overall metaverse experience.



Real-Time Traffic Light Adjustment Using YOLOv8

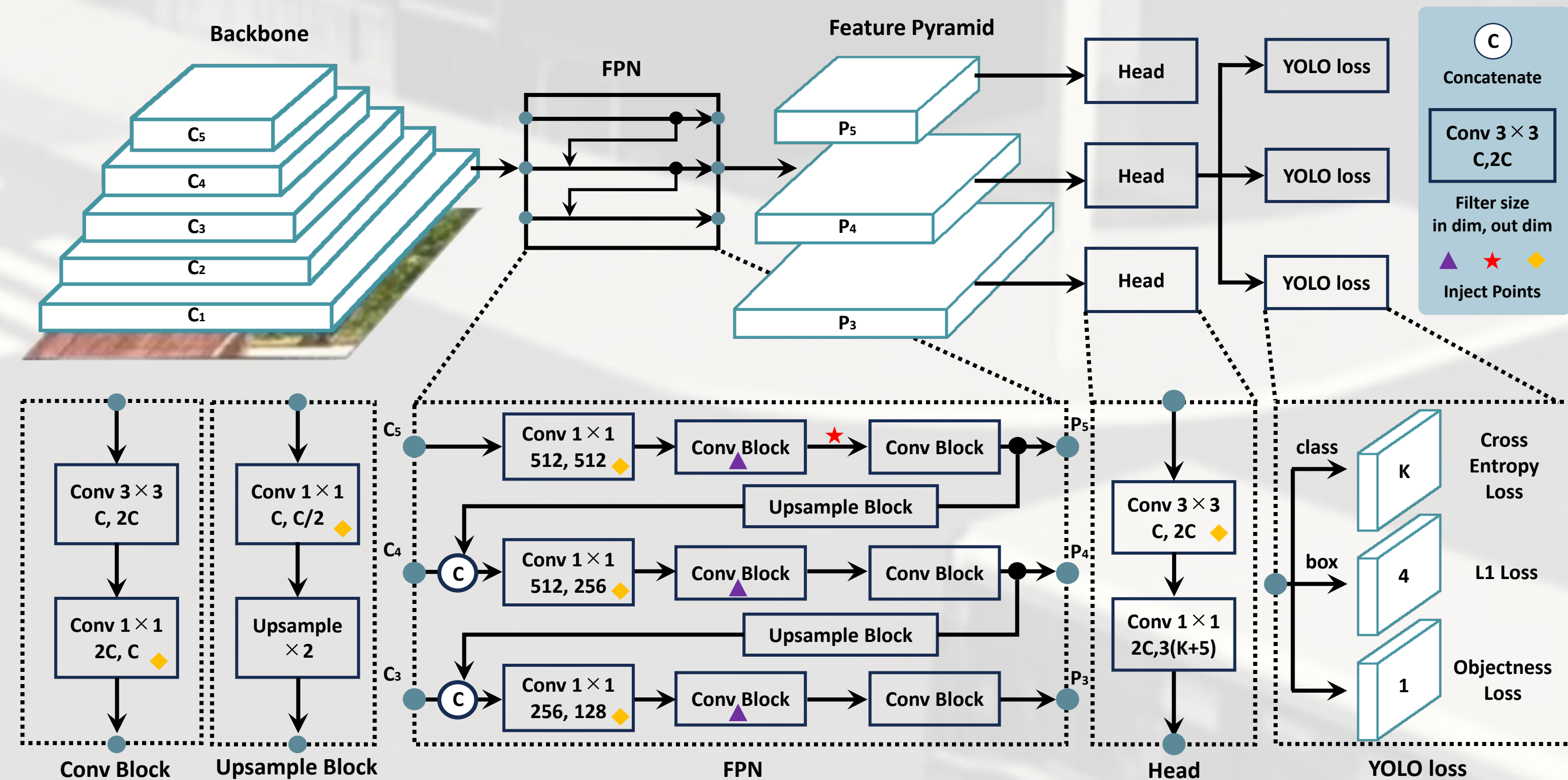
Why YOLOv8 for Traffic Control?

- Detects and classifies vehicles (buses, trucks, cars, motorcycles) in real-time, allowing for dynamic traffic light adjustments.
- It operates efficiently, providing fast inference even with large datasets, ensuring the traffic system adapts instantly to changing conditions.

How YOLOv8 Works in This Project:

- YOLOv8 processes live video streams from CCTV cameras at intersections.
- It identifies the number and type of vehicles at any given time, providing the input needed for traffic light optimization.

YOLOv8 allows us to fine-tune the model on our custom dataset. This is a crucial step, because it can improve the performance of the model dramatically



System Architecture & Algorithm

Data Collection:

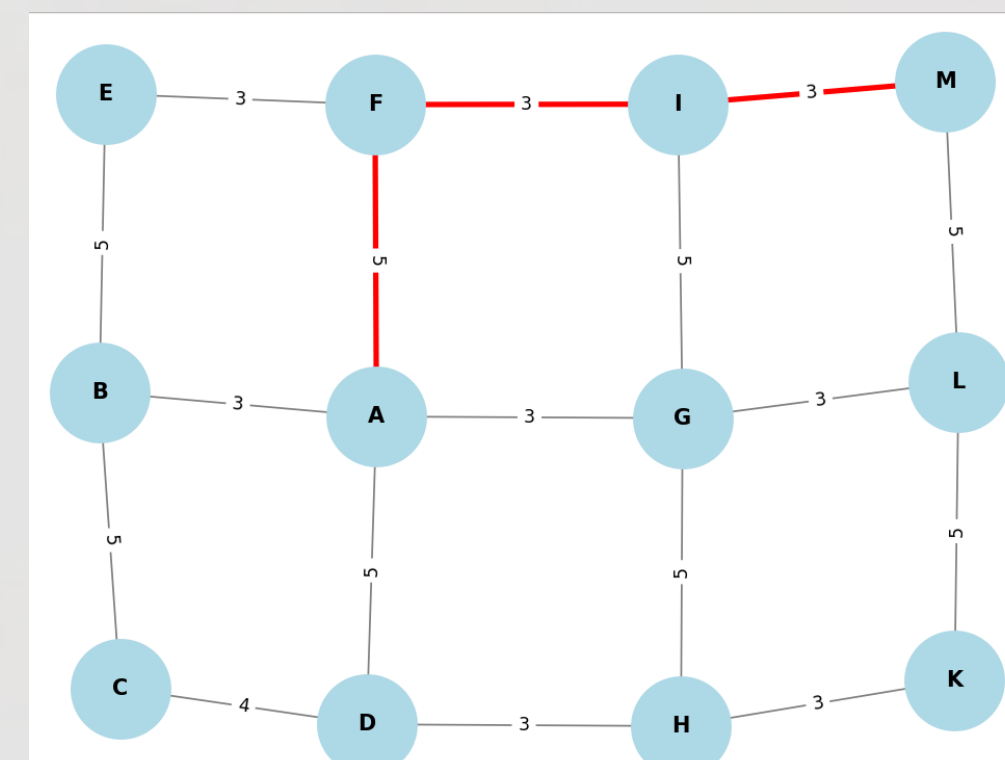
CCTV cameras at intersections capture real-time traffic footage. Vehicles continuously transmit their location, speed, and destination. In this project we suppose put camera at each side of the intersection to capture the information of the road density.

Intersection-Level AI:

Computer vision models (e.g., YOLO) analyze video feeds, detecting vehicles, estimating queues, and classifying types. This data feeds into real-time signal control algorithms

Area-Level AI:

Aggregates intersection data and vehicle destinations. Graph-based algorithms (e.g., Dijkstra, A*) calculate optimal routes for each vehicle, considering traffic conditions, road types, and speed limits.



Future tasks and ideas

1. We will use Python4Delphi to automatically change traffic phase while running YOLOv8 using Python
2. We will handle more complex traffic intersection
3. We handle communication between intersections to main server to automate traffic
4. We will experiment with better algorithms to calculate priority of traffic phases