NIT - Calicut - CVLA Research Group

RESEARCH REVIEW PRESENTATION

DYNAMIC TSC (TRAFFIC SIGNAL CONTROLLER)

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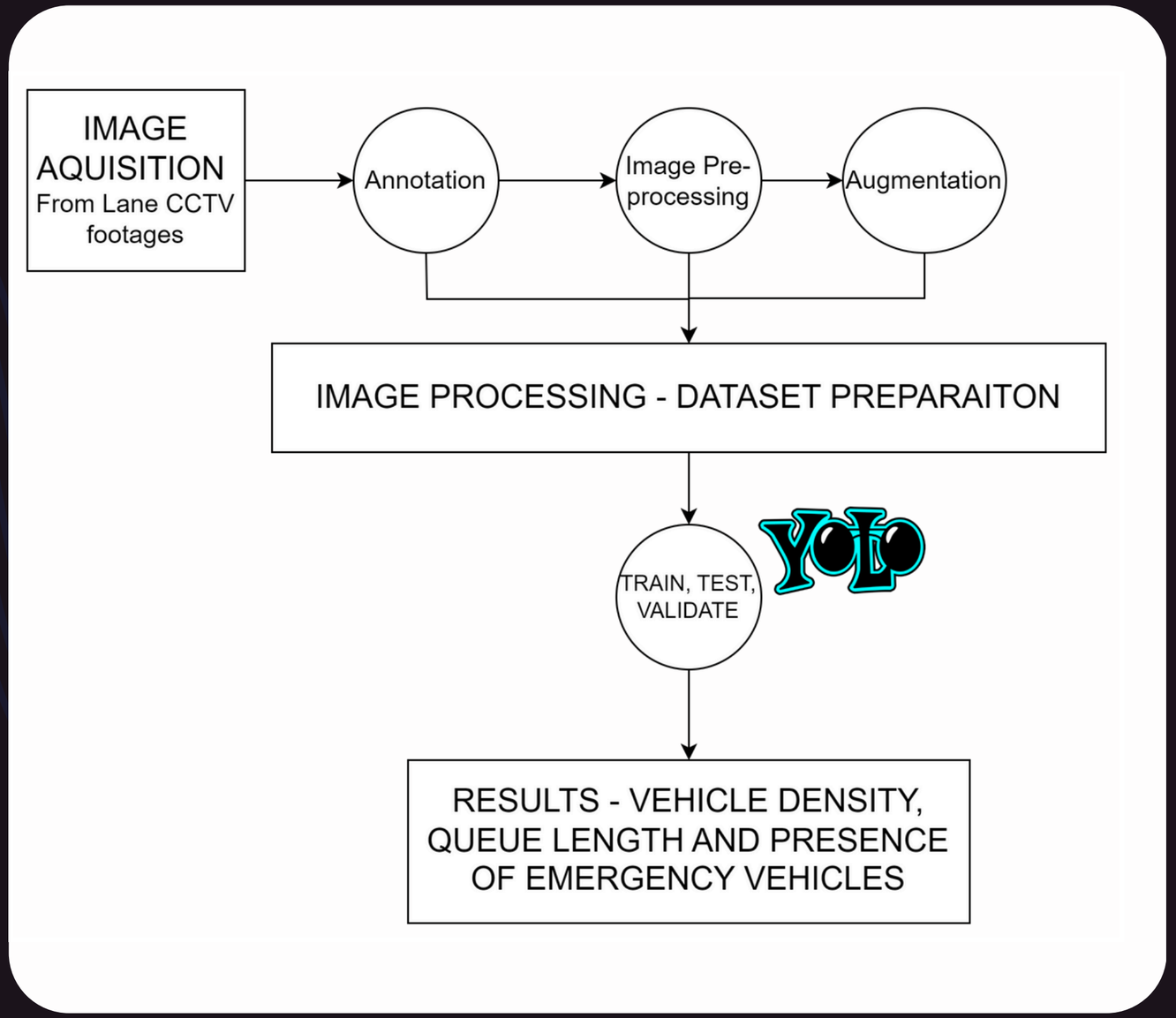
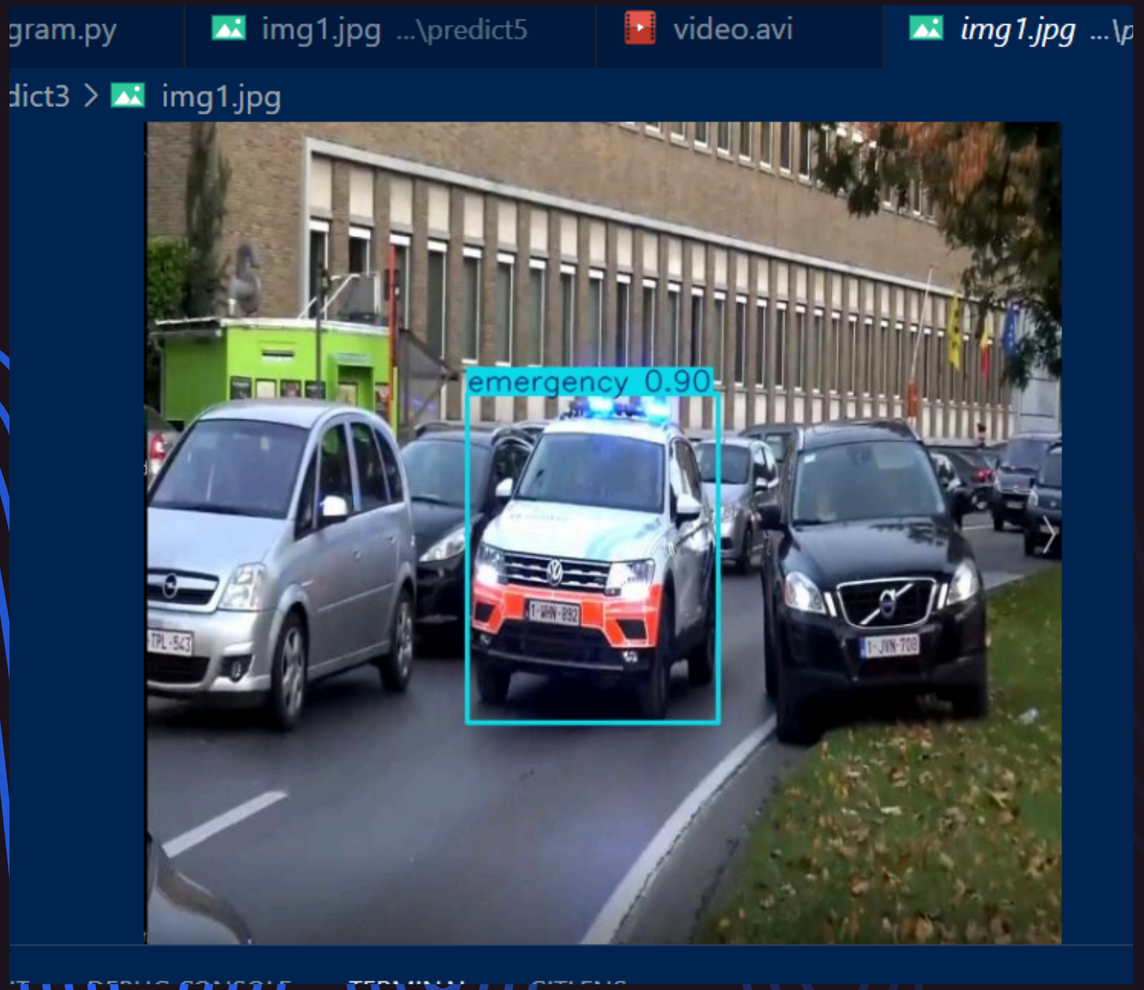
Progress done so far:

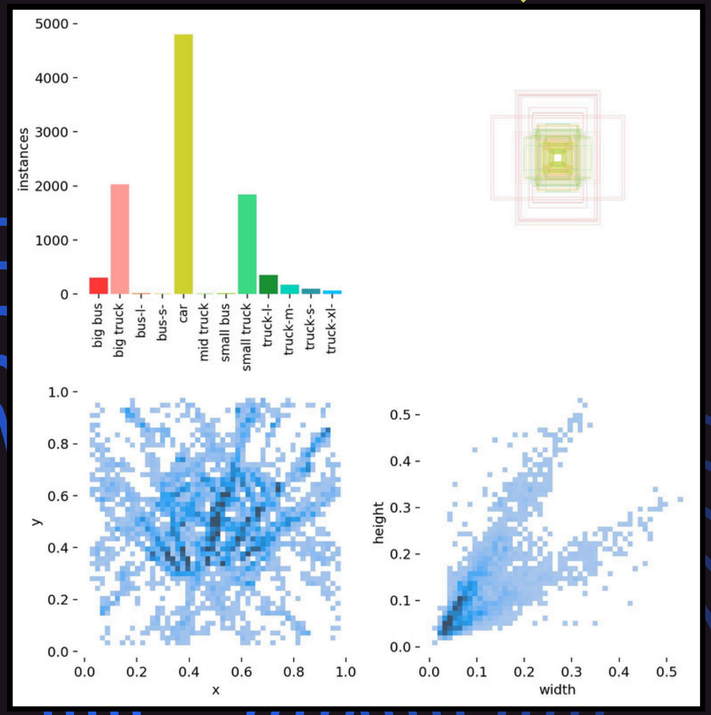
- Prepared Datasets for training YOLOv9 model
- Trained YOLOv9 model on Google Colab
- Performed detection on static images
- Vehicle detection with F1 Score approx. 0.8
- Vehicle Counting and lane detection from YOLO model
- Vehicle density calculation.

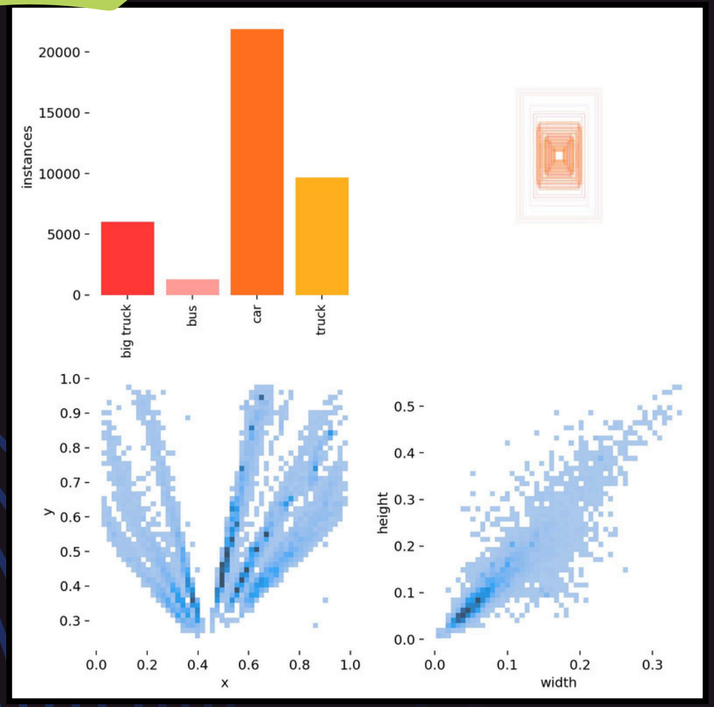


Results of training YoloV9 EV Model:



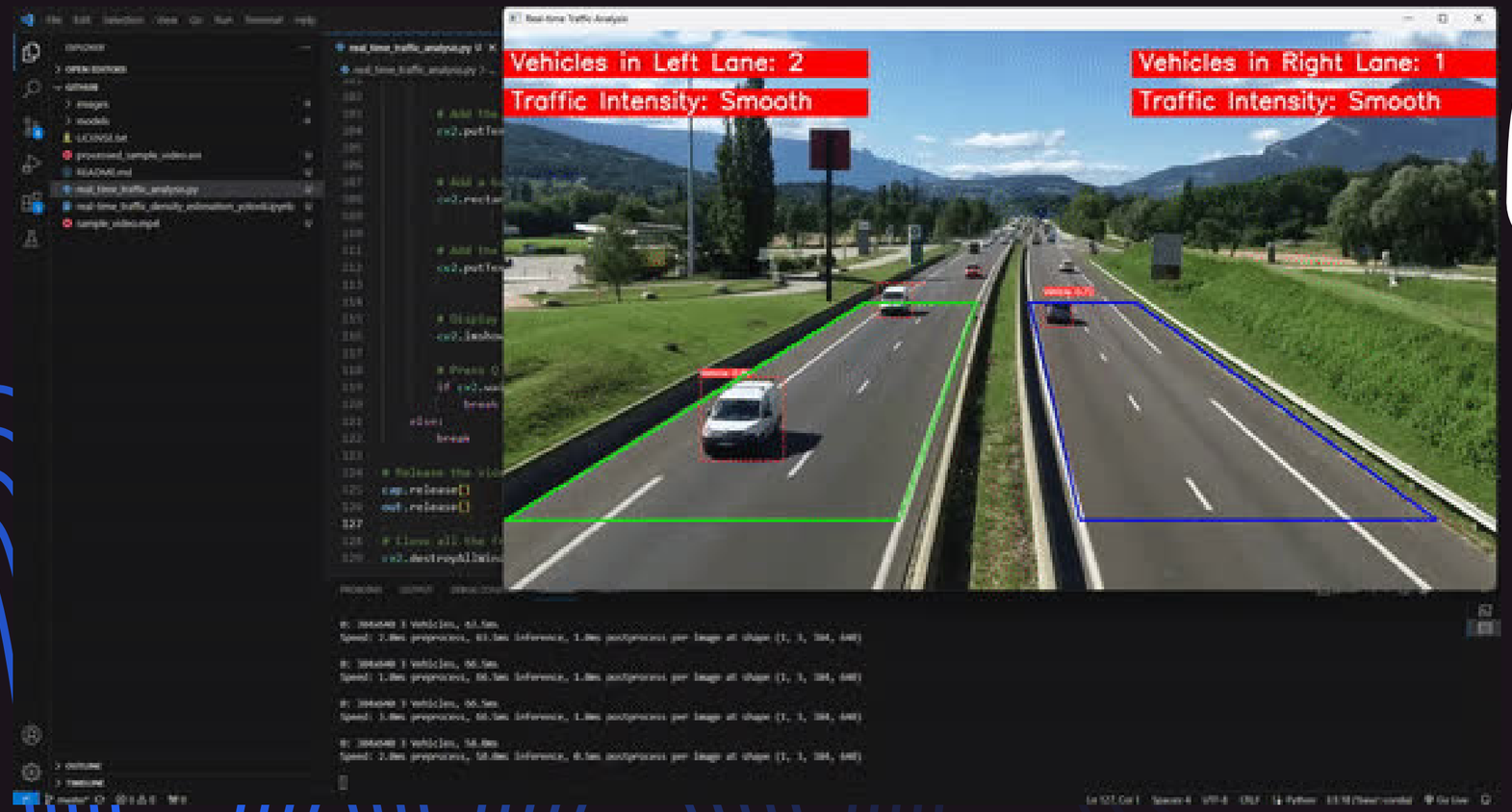
Results of training YoloV9 Vehicle Detection Model:





Retrained the model to minimize underrepresented classes

Data Processing: *In Progress*



DESIRED RESULTS!!

PROBLEMS AND RESTRICTIONS

- Installation dependencies
- Less Computation power
- Our current model unable to support Videos due to library disfunctionalities
- Better - YOLOv8

Problems with YoloV9 and the need to Switch to YoloV8:

- **Detection Inconsistency:** YOLOv9 struggles with small and partially occluded vehicles, affecting traffic monitoring accuracy.
- **High Computational Demand:** YOLOv9's architecture is resource-intensive, limiting real-time application efficiency.
- **OpenCV Integration Issues:** YOLOv9 has compatibility problems with OpenCV, complicating integration and hindering performance.
- **YOLOv8 Advantages:** YOLOv8 offers better detection, optimized performance, and easier OpenCV integration for traffic control systems.

CURRENT SOLUTIONS:

- Switch to YOLOv8 Model
- Use an extensive OpenCv model rather than the inbuilt library
- Aggregate the processed data (vehicle counts, densities, and emergency vehicle presence) at regular intervals (e.g., every few seconds).
- Prepare the aggregated data as feature vectors suitable for input into the MARL model.
- Input Vectors - Vehicle density and Emergency Vehicles
- Reward State - Waiting time of Vehicle

IN PROGRESS : COLLECTIVE VEHICLE DENISTY DATA AND WAITING TIME AGGREGATE CALCULATION

In progress: MARL Model Construction

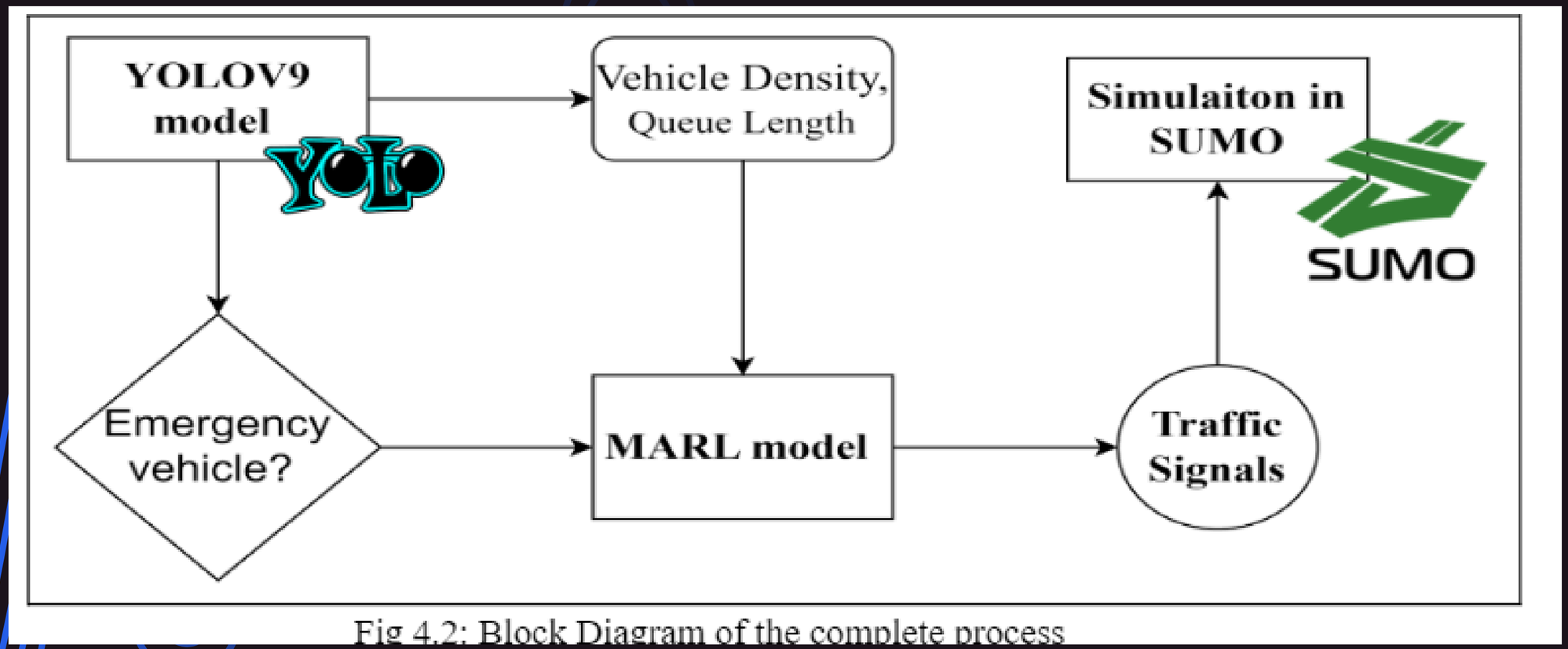
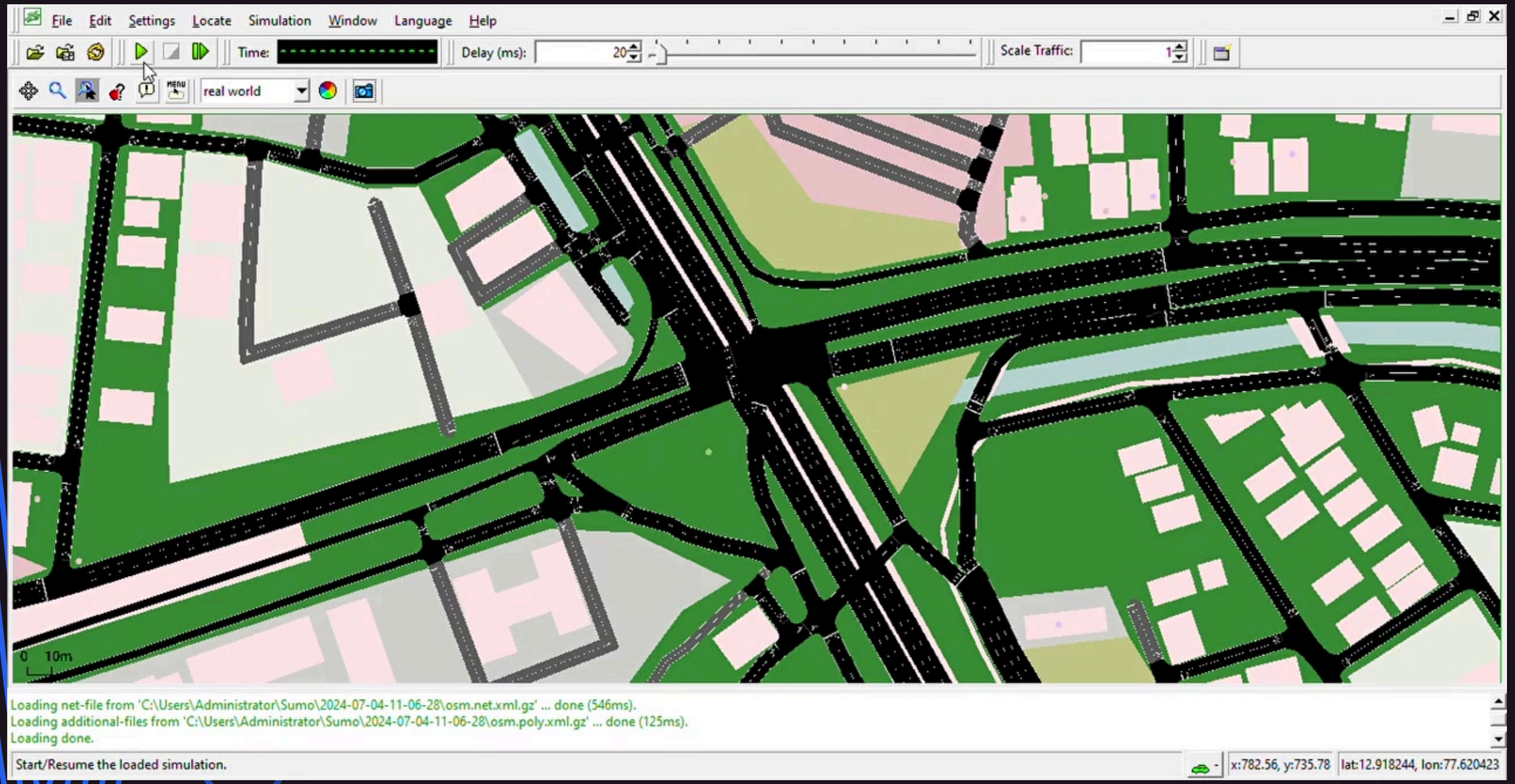


Fig 4.2: Block Diagram of the complete process

Simulation with SUMO

Simulating the Silk Board Junction Bengaluru



Thank You!