

# Vehicle Tracking Pipeline for an Intelligent Parking System

Pranav Rajesh, Robotics and Autonomous Systems  
Mentor: Dr. Junfeng Zhao, Assistant Professor  
Ira A. Fulton Schools of Engineering



## PROBLEM STATEMENT

- Finding a vacant parking space in congested parking lots is time-consuming and frustrating
- Industrial research is conducted to develop an intelligent parking guidance system to direct human drivers to the nearest available parking lot.
- Identifying traffic congestion in the parking lots contributing to time and fuel wastage, increased greenhouse gas emissions, and traffic accidents is crucial

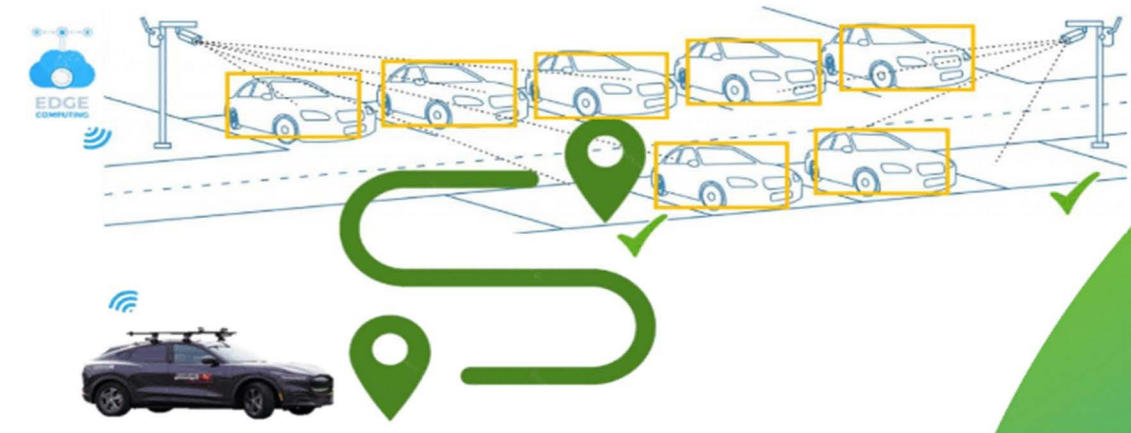
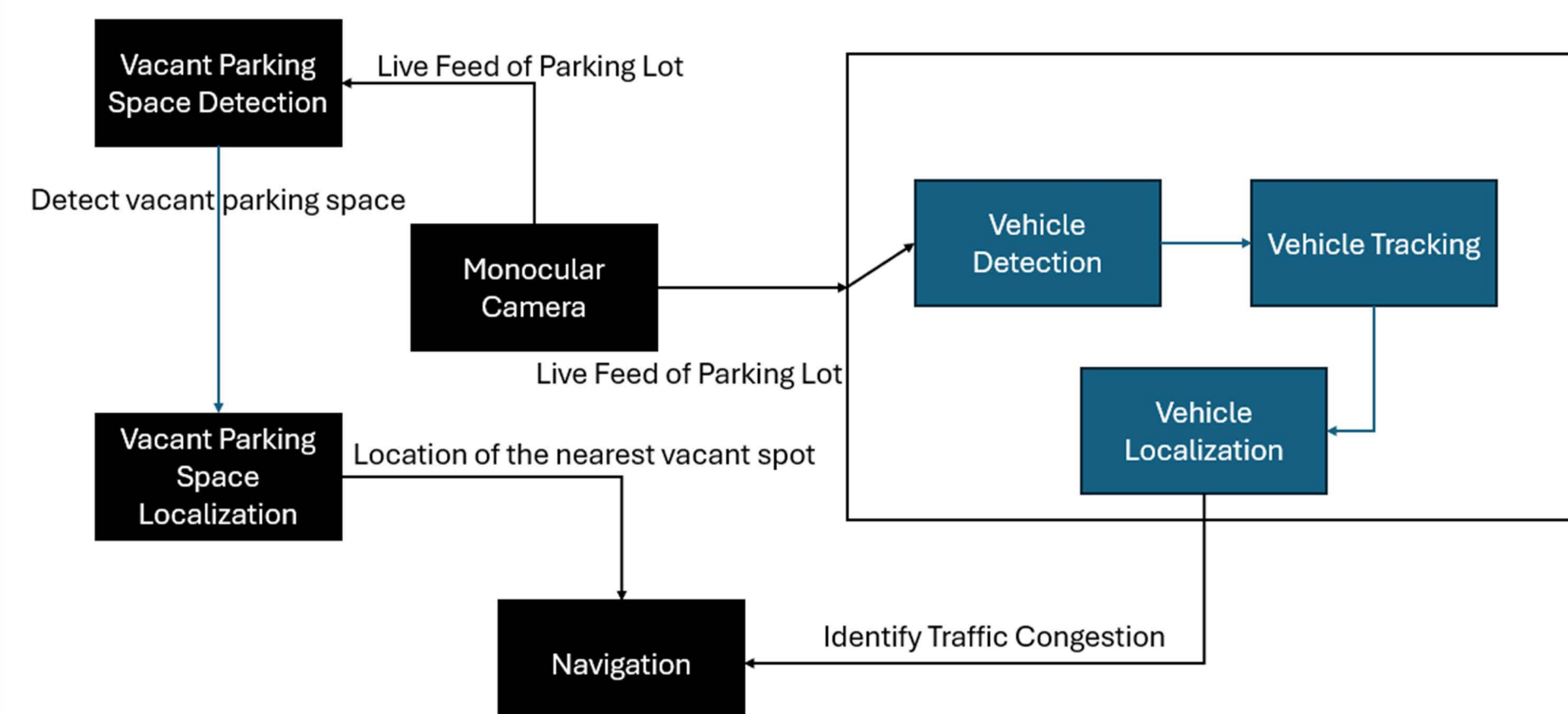


Figure Source: BELIV Lab ASU Website

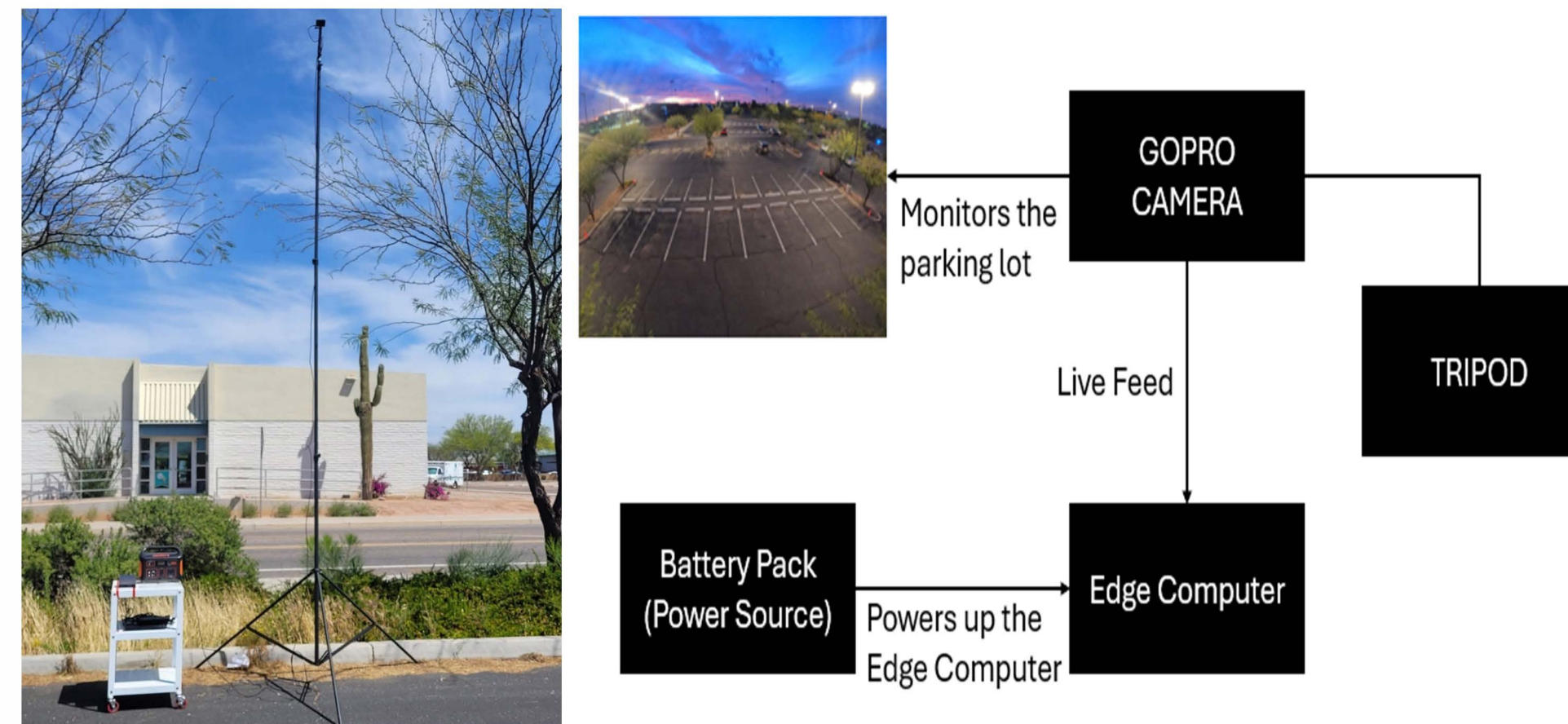
## PROJECT OBJECTIVES

- Develop a vehicle tracking and vehicle localization algorithm. Deploy the algorithms in parking lots to identify and rectify any traffic congestion

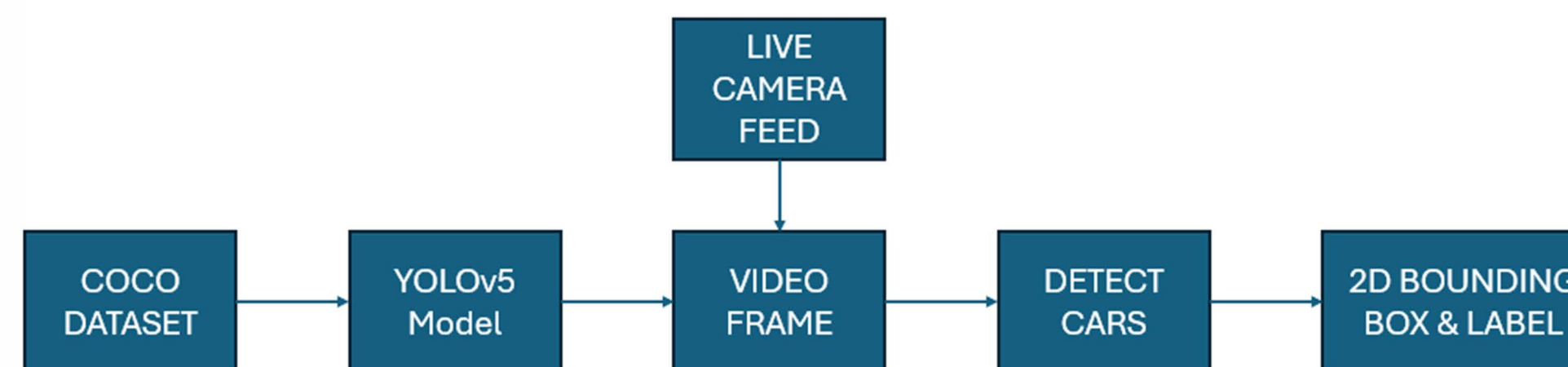
## SYSTEM ARCHITECTURE



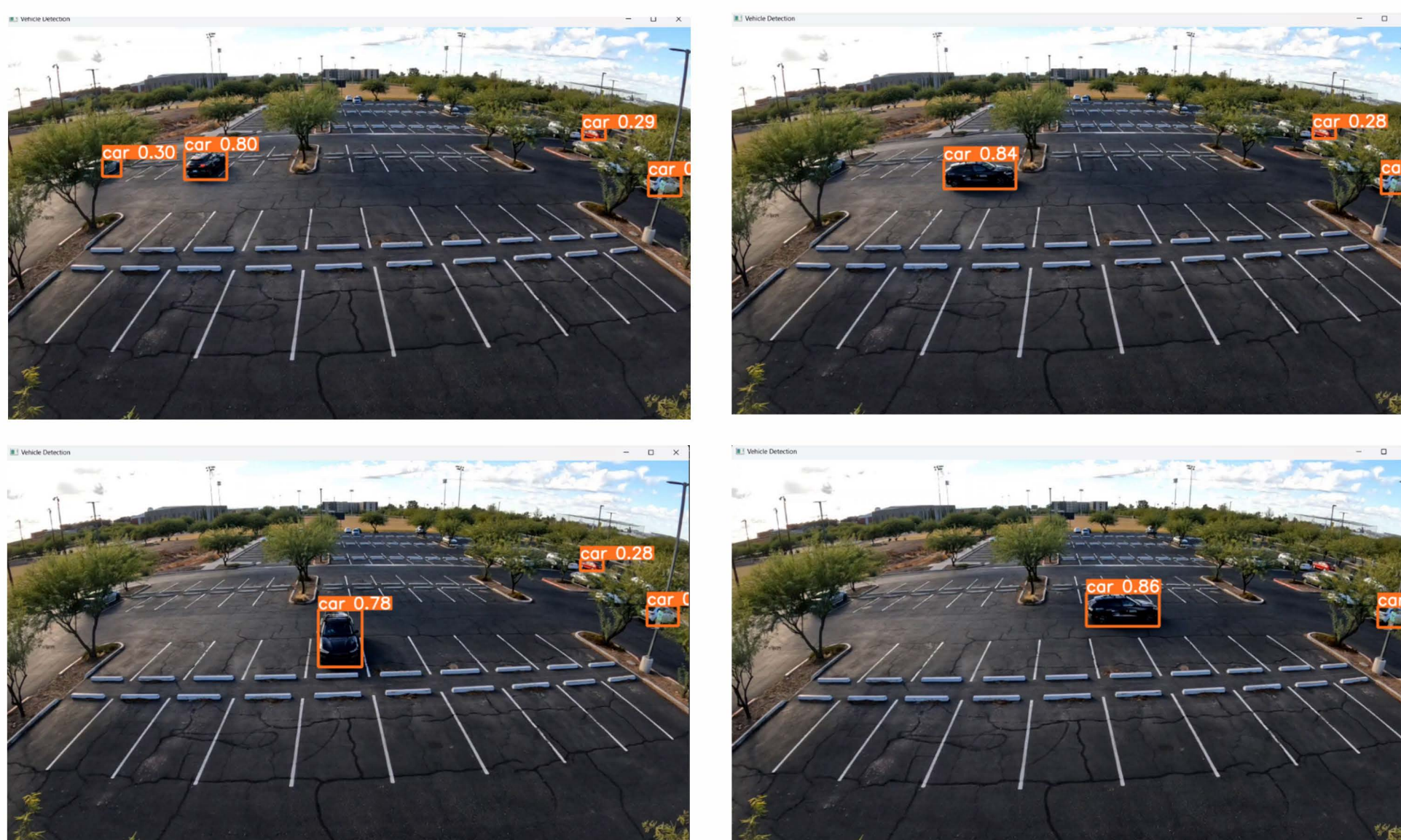
## HARDWARE SETUP



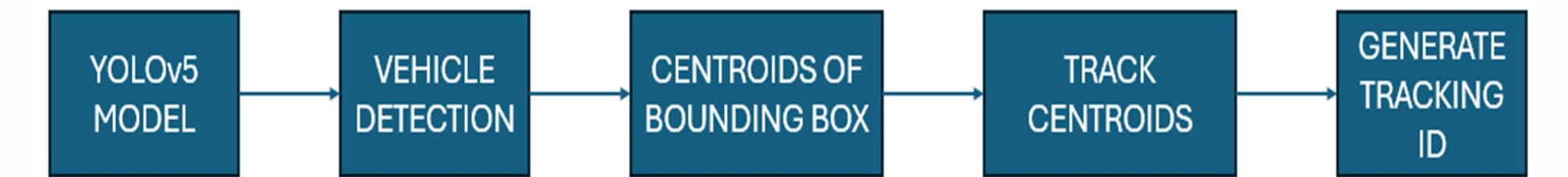
## VEHICLE DETECTION ARCHITECTURE



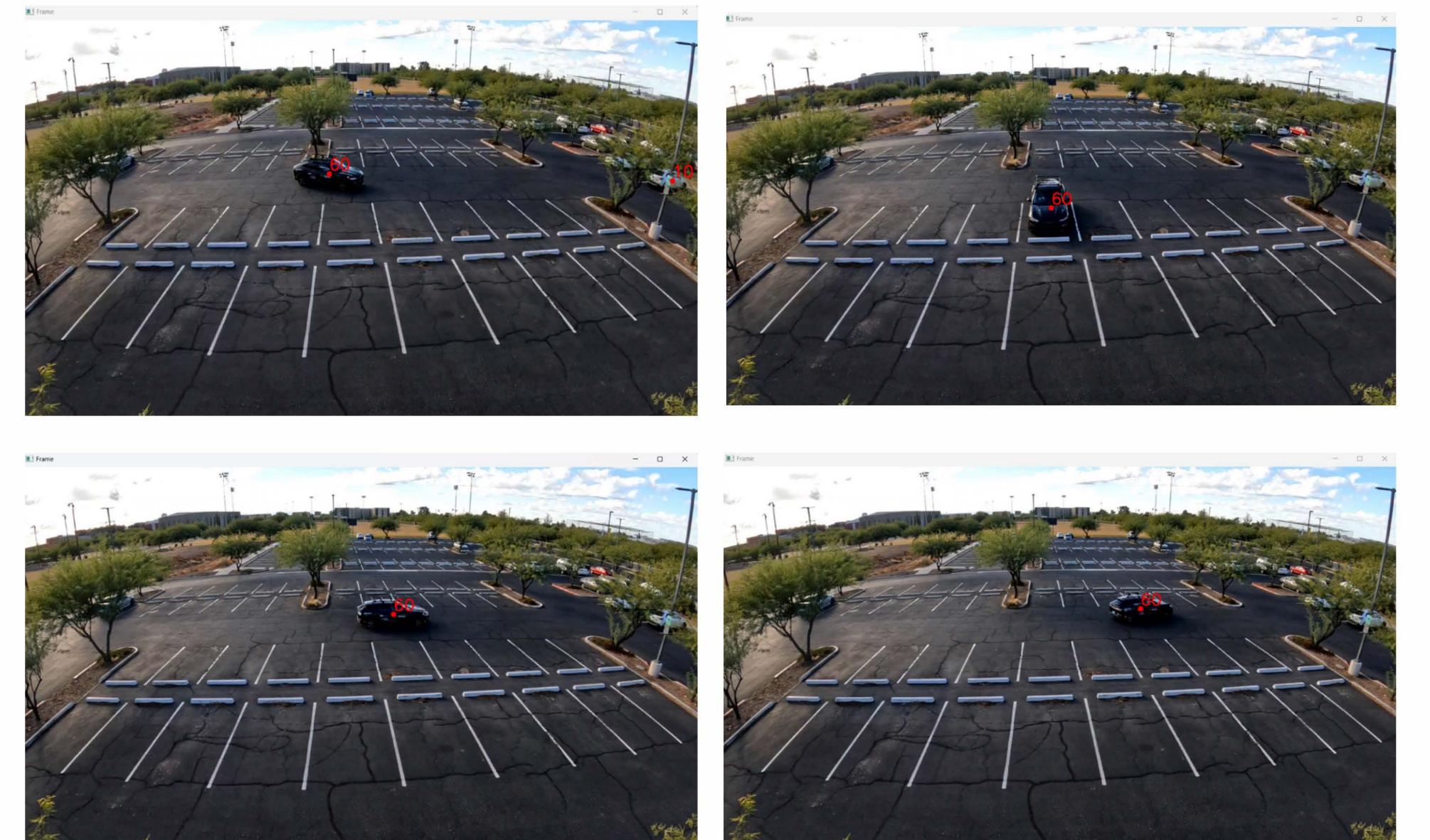
## VEHICLE DETECTION RESULTS



## VEHICLE TRACKING ARCHITECTURE



## VEHICLE TRACKING RESULTS



## FUTURE RESEARCH

- 3D Vehicle Detection/ Tracking using Monocular Cameras for outdoor/indoor parking lots
- Vehicle Localization using a Monocular Infrastructure Camera for outdoor/indoor parking lots
- Vehicle Detection/Tracking using Cameras under adverse weather conditions, i.e., rain/snow

## ACKNOWLEDGEMENT

I thank Dr. Junfeng Zhao for his unwavering guidance, invaluable insights, and tireless support throughout this research project. Thank you to all the team members for their outstanding dedication and collaborative efforts