



## PROJECT REPORT

### ANALYSIS OF YOLO V8 MODEL AND FUZZY ALGORITHM IN DETECTING VEHICLES, ASSESSING ROAD CONDITIONS AND CONTROL TRAFFIC LIGHTS

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## ABSTRACT

*This research presents an analysis of integrating object detection with traffic light control through YOLO and fuzzy logic systems to address increasing traffic congestion. The YOLO (You Only Look Once) algorithm is utilized to detect and classify vehicles in real-time, while fuzzy logic, particularly the Tsukamoto model, assesses traffic conditions and adjusts traffic light durations based on vehicle counts. The dataset from the Roboflow Universe titled "Top-View Vehicle Detection Image Dataset" was refined through image augmentation techniques such as grayscaling, contrast adjustment, and noise addition to train the YOLOv8 model. Among the YOLO variants tested, YOLOvL outperformed others with an accuracy of 0.7972, precision of 0.8736, F1-score of 0.8563, and recall of 0.8398, while YOLOvM showed stable performance. The integration of these technologies demonstrates a positive impact on traffic flow and urban congestion management. This study validates the effectiveness of combining YOLO and fuzzy logic for optimizing traffic light responses to varying traffic conditions.*

Keywords: YOLO, Fuzzy Logic, Tsukamoto Model, Traffic Management, Object Detection, Vehicle Classification, Data Augmentation, Traffic Congestion.



