

Abstract—In recent years, autonomous vehicle technology has become a major area of focus within the automotive industry. Nevertheless, the advancement of object detection methodologies in autonomous vehicles remains limited, particularly with regard to the latest object detection methodologies. In the development of object detection capabilities for autonomous vehicles, it is important to utilise simulation scenarios that are safe for the surrounding environment. The objective of this research is to evaluate the efficacy of object detection algorithms in a simulation environment utilising the DonkeyCar platform. The efficacy of several state-of-the-art algorithms will be evaluated based on two metrics: general performance measurements and scenario tests on the DonkeyCar simulator. This research compares several variants of three state-of-the-art algorithms, namely faster R-CNN, YOLO, and SSD, to determine the most efficient algorithm for real-time object detection in the context of autonomous vehicles. The study demonstrates that YOLOv10-N exhibits superior performance, achieving an mAP@0.50 value of 0.940 and maintaining an inference time of 35 FPS.

Keywords—*autonomous vehicle, donkeycar, object detection, state-of-the-art*