

ABSTRACT

The development of computer vision technology enables the implementation of real-time object detection systems on lightweight computing devices based on edge computing. This research aims to design and implement an object presence monitoring system using the You Only Look Once version 8 (YOLOv8) algorithm optimized for Raspberry Pi 5 through the utilization of the NCNN format to improve inference efficiency and speed. The detected objects include personal items that are often misplaced or lost, such as bottles, glasses, wallets, etc. The research method includes dataset collection and labeling, model training using Google Colab, model performance evaluation, conversion of the trained model into the NCNN format, implementation of a Flask-based video streaming system published through Cloudflare Tunnel, and integration of an Android application as a remote monitoring interface. The system processes images directly from the camera and displays detection results through a web interface based on MJPEG streaming that can be accessed in real time. The use of Cloudflare Tunnel and the Android application enables remote monitoring without requiring complex network configurations. Testing was conducted to measure detection accuracy, inference speed, and streaming stability. The results show that the system is capable of running in real time with an average speed of 22 FPS on the Raspberry Pi 5 device and achieves an average system success rate of above 92% across all testing aspects. Therefore, the developed system is proven to be effective, lightweight, responsive, and easy to implement as an object monitoring solution based on edge computing.

Keywords: Object detection, Computer vision, YOLOv8, NCCN, Raspberry Pi, Streaming, Android.