ABSTRACT

Tuberculosis (TB) remains one of the major public health challenges in Indonesia, particularly in regions with limited access to medical personnel. Early detection through chest x-ray imaging is an effective approach to support the diagnostic process. However, the shortage of medical professionals, especially radiologists, poses a significant challenge to timely and accurate diagnosis. Therefore, an automated detection system is needed to assist in the rapid and accurate screening of TB, particularly in primary healthcare facilities.

This study aims to develop a desktop-based tuberculosis detection system that integrates the YOLOv8 algorithm with chest x-ray input obtained via webcam. The YOLOv8 model was trained using a chest x-ray dataset consisting of three classes (Normal, Pneumonia, and TB), and was evaluated using precision, recall, and mAP@50 metrics. The fine-tuned model demonstrated excellent performance with a precision of 0.942, recall of 0.936, and mAP@50 of 0.543. The system is designed to operate locally without complex installation processes, making it suitable for healthcare facilities with technical and human resource limitations.

System testing showed that x-ray detection could be performed in real-time using a webcam, with optimal accuracy achieved at a distance of 40–60 cm. Detection results are visualized using bounding boxes and compared to expert interpretations by pulmonologists. The evaluation showed a high level of agreement between the model's predictions and the doctor's markings, although further improvements are needed in distinguishing between pneumonia and tuberculosis. Thus, this system has strong potential as a practical and adaptive tool for early TB screening in settings with limited diagnostic resources.

***Keywords**: Tuberculosis, YOLOv8, Deep Learning, Detection System*