ABSTRAK

Penelitian ini bertujuan untuk mengembangkan sistem deteksi otomatis ular berbisa dan tidak berbisa menggunakan algoritma YOLO11. Konflik antara manusia dan ular semakin meningkat akibat perubahan lingkungan seperti deforestasi dan urbanisasi, yang menyebabkan perpindahan habitat alami ular ke daerah permukiman. Ketidaktahuan masyarakat mengenai jenis ular dan cara penanganannya sering kali berujung pada tindakan berisiko dan kasus gigitan yang berbahaya. Oleh karena itu, diperlukan teknologi berbasis kecerdasan buatan untuk mendeteksi keberadaan dan jenis ular secara akurat dan cepat. Penelitian ini mengimplementasikan tiga skenario pelatihan model, yaitu YOLO11 versi nano, nano dengan hyperparameter tuning, dan versi medium. Hasil evaluasi menunjukkan bahwa model versi nano memperoleh precision sebesar 70,8%, recall 70,9%, mAP@0.5 sebesar 74,6%, dan mAP@0.5:0.95 sebesar 56,7%. Sementara itu, model nano dengan hyperparameter tuning memperoleh mAP@0.5 sebesar 71,5% dan mAP@0.5:0.95 sebesar 54,6%. Model versi medium menunjukkan performa terbaik dengan precision 81,7%, recall 72,5%, mAP@0.5 sebesar 80%, dan mAP@0.5:0.95 sebesar 65,9%. Dengan hasil ini, sistem deteksi ular diharapkan dapat digunakan dalam berbagai lingkungan, seperti perkebunan, pemukiman, dan fasilitas umum, guna meningkatkan keselamatan masyarakat serta mendukung upaya konservasi satwa liar.

Kata Kunci: YOLO11, Ular, Sistem Deteksi, Kecerdasan Buatan

ABSTRACT

This study aims to develop an automatic detection system for venomous and non-venomous snakes using the YOLO11 algorithm. Conflict between humans and snakes is increasing due to environmental changes such as deforestation and urbanization, which cause the displacement of snakes' natural habitats to residential areas. People's lack of knowledge about snake species and how to handle them often leads to risky actions and dangerous bite cases. Therefore, artificial intelligence-based technology is needed to detect the presence and types of snakes accurately and quickly. This research implements three model training scenarios: YOLO11 nano version, nano version with hyperparameter tuning, and medium version. The evaluation results show that the nano version achieved a precision of 70.8%, recall of 70.9%, mAP@0.5 of 74.6%, and mAP@0.5:0.95 of 56.7%. Meanwhile, the nano model with hyperparameter tuning obtained an mAP@0.5 of 71.5% and mAP@0.5:0.95 of 54.6%. The medium version demonstrated the best performance, achieving a precision of 81.7%, recall of 72.5%, mAP@0.5 of 80%, and mAP@0.5:0.95 of 65.9%. With these results, the snake detection system is expected to be applied in various environments, such as plantations, settlements, and public facilities, to improve public safety and also support wildlife conservation efforts.

Keywords: YOLO11, Snake, Detection System, Artificial Intelligence