INTISARI

Senjata api dimaksudkan sebagai alat pertahanan diri. Namun, tidak jarang senjata api malah digunakan untuk melakukan berbagai tindak kejahatan. Setiap harinya, lebih dari 500 orang meninggal akibat kekerasan senjata api. Selain itu, statistik mencatat setidaknya terdapat 1.4 juta kematian terkait senjata api secara global selama periode 2012-2016. Salah satu bentuk tindak kejahatan senjata api yang sering terjadi dan sangat memilukan adalah penembakan masal. Penembakan masal sering terjadi di tempat umum yang penuh keramaian. Berdasarkan permasalahan tersebut, diperlukan upaya pencegahan untuk meminimalisir penyalahgunaan senjata api terutama di ruang publik. Upaya pencegahan dapat dilakukan dengan mengoptimalkan penggunaan kamera pengawas (CCTV) menggunakan bantuan teknologi *computer vision*. Dengan teknologi *computer vision*, dapat diterapkan automasi deteksi objek senjata api dengan cepat dan akurat untuk kemudian dapat memberikan peringatan kepada petugas berwajib untuk segera melakukan tindakan preventif.

Pada penelitian ini dilakukan pengembangan berbagai model deteksi objek senjata api dari beberapa algoritma *deep convolutional neural network* jenis *one-stage detector*, diikuti dengan perbandingan hasil pengembangan model untuk mencari algoritma deteksi objek yang berpotensi diterapkan secara *real-time* dengan memiliki *trade-off* terbaik antara performa dan kecepatan. Dari hasil penelitian, didapat bahwa algoritma YOLOv8 memiliki *trade-off* performa dan kecepatan terbaik. YOLOv8 memiliki waktu prediksi tercepat pada varian *nano* dengan *inference time* hanya sebesar 8.1 ms, dengan nilai mAP 54.0. Sementara itu, varian *large* pada YOLOv8 memberikan performa terbaik dengan nilai mAP 65.7, namun dengan *inference time* sebesar 17.4 ms.

Kata kunci : deteksi objek, senjata api, *one-stage detector*, *mean average precision*, *inference time*

ABSTRACT

Firearms are supposed to be used as self-defense tools. However, it is not uncommon for firearms to be used to commit various crimes. Every day, more than 500 people die because of gun violence. Furthermore, statistics record that there were at least 1.4 million firearm-related deaths globally during the period of 2012-2016. One form of firearm-related crime that often occurs and is very distressing is mass shootings. Mass shootings frequently occur in crowded public places. Based on those problem, preventive efforts are needed to minimize the misuse of firearms, especially in public spaces. Preventive efforts can be carried out by optimizing the use of surveillance cameras with the assistance of computer vision technology. With computer vision technology, rapid and accurate automated detection of firearms can be implemented, which can then provide warnings to security officer to take immediate preventive action.

In this study, the development of various firearm object detection models from several deep convolutional neural network algorithms, specifically the one-stage detector type, was conducted. This was followed by a comparison of the development results to find the object detection algorithm that has the potential for real-time implementation with the best trade-off between performance and speed. From the research results, it was found that the YOLOv8 algorithm has the best trade-off between performance and speed. YOLOv8 has the fastest prediction time in the nano variant with an inference time of only 8.1 ms, with an mAP value of 54.0. On the other hand, the large variant of YOLOv8 provides the best performance with an mAP value of 65.7, but with an inference time of 17.4 ms.

Keywords : *object detection, firearms, one-stage detector, mean average precision, inference time*