ABSTRACT

Melanoma, particularly the Acral lentiginous melanoma (ALM) subtype, is one of the most aggressive and high-risk forms of skin cancer, especially prevalent among Asian populations such as in Indonesia. Early detection of melanoma remains a major challenge due to low public awareness, limited access to healthcare, and variable image quality caused by inconsistent lighting conditions. This study aims to develop a deep learning–based system capable of automatically detecting and classifying skin lesions using dermoscopic or general skin images, with a specific focus on ALM identification. The proposed system operates in two stages: lesion localization using the YOLOv8 object detection model and lesion type classification using the EfficientNet architecture (B0, B4, B7). The dataset used consists of five main classes: acral lentiginous melanoma, non-acral melanoma, nail disease, foot disease, and normal skin. Evaluation results show that the YOLOv8 model achieved a precision of 0.89, recall of 0.83, F1-score of 0.86, and a Mean Average Precision (mAP@0.5) of 0.90, indicating strong reliability in accurately identifying lesion areas. Meanwhile, the EfficientNet-B7 model demonstrated the best classification performance, with an accuracy of 91.81%, a macro F1-score of 0.8922, and a weighted F1-score of 0.9208. The integration of both models into a unified framework proved effective in supporting automated image-based skin diagnosis. Further evaluation using confusion matrices helped identify classification errors and patterns across similar lesion types. This study demonstrates that combining YOLOv8 and EfficientNet offers a robust and efficient approach for detecting and classifying skin lesions, with significant potential for future development in AI-based early screening tools for skin cancer that are adaptive to real-world conditions and diverse skin types.

Keywords— ***Acral lentiginous melanoma, YOLOv8, EfficientNet, Skin Lesion Detection, Deep Learning, Skin Cance***