



UNDERGRADUATE THESIS

EAR DISEASE CLASSIFICATION SYSTEM USING CONVOLUTIONAL NEURAL NETWORK WITH MOBILENETV2 ARCHITECTURE

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DESIGN AND CONSTRUCTION OF AN INFORMATION SYSTEM FOR MONITORING VEGETATION DENSITY AND CONDITION BASED ON GOOGLE EARTH ENGINE USING MULTI-SPECTRAL VEGETATION INDICES OF LANDSAT 8 COLLECTION 2 IMAGERY IN SURABAYA

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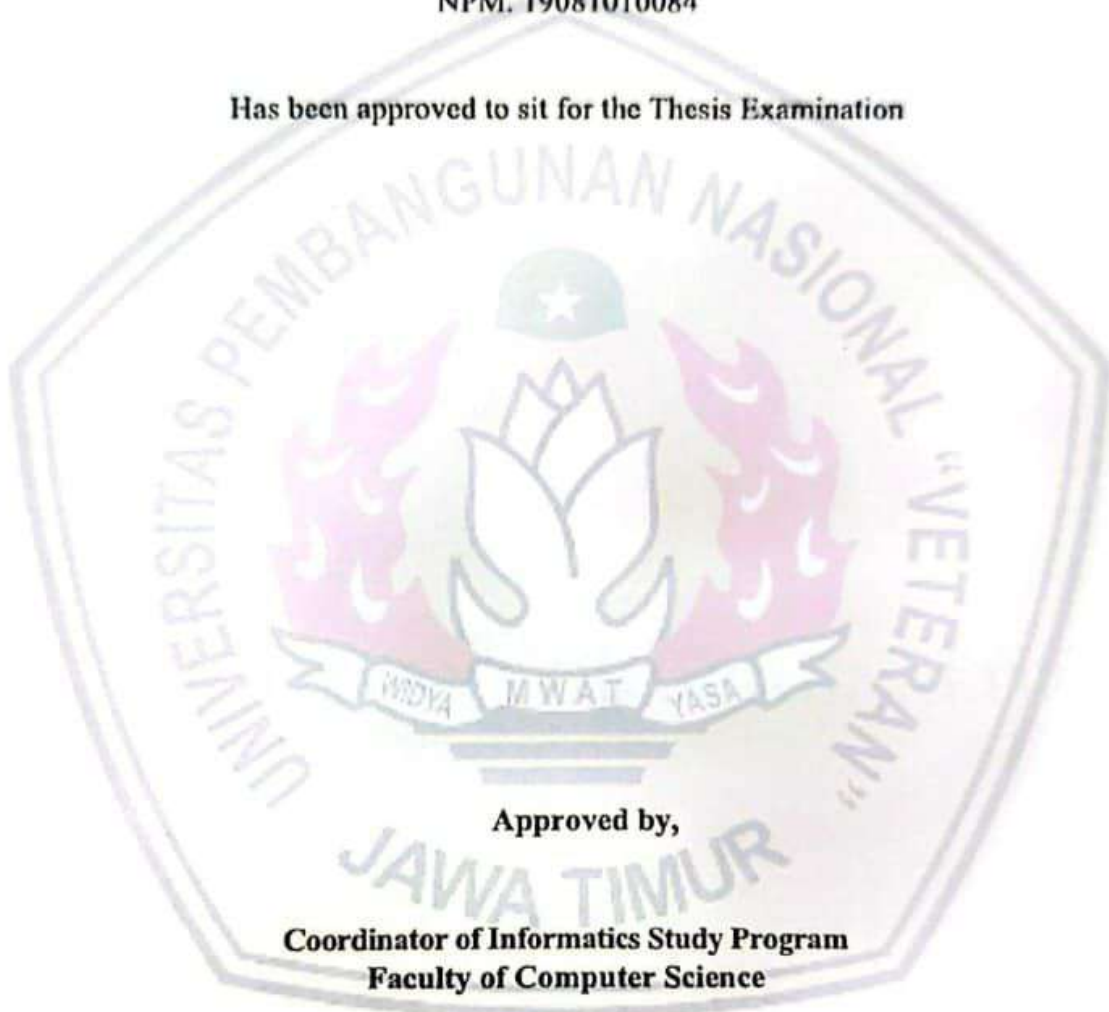
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I further declare that this scholarly work is free from any element of plagiarism. Should any indication of plagiarism be found in this thesis at a later date, I am prepared to accept sanctions in accordance with the prevailing laws and regulations.

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ABSTRACT

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Ear disease can affect people of all ages and, if not detected early, may lead to complications such as permanent hearing loss. Limited access to early screening remains a major obstacle to ear disease detection in Indonesia. This study aims to develop a system that classifies tympanic membrane images into two categories, normal and abnormal, using a Convolutional Neural Network (CNN) with the MobileNetV2 architecture and a transfer learning approach. The dataset was obtained from Kaggle with 956 images, reduced from nine disease classes into two classes and expanded to 5,736 images through flip and rotation augmentation. Six testing scenarios were designed by varying the epoch (10, 20, 30) and batch size (16, 32) to observe the effect of both hyperparameters on model performance. Testing on 861 test images produced accuracies ranging from 79.4% to 83.1%. The scenario with 30 epochs and a batch size of 16 achieved the highest accuracy (83.1%) and precision (85.4%), while the scenario with 10 epochs and a batch size of 16 achieved the highest recall (90.4%) with the fastest training time (18 minutes). A trade-off pattern between precision and recall was observed, in which models trained with fewer epochs tended to be more aggressive in detecting the abnormal class. For early screening purposes that prioritize sensitivity, the scenario with 10 epochs and a batch size of 16 is recommended because it minimizes false negative cases.

Keywords: binary classification, early detection, ear disease, image augmentation, MobileNetV2

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Surabaya, July 22, 2026

Ahmad Zakiyyun Ibadurrahman

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