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EVALUATION OF MANGROVE SPECIES CLASSIFICATION TECHNIQUES: ARTIFICIAL INTELLIGENCE (AI) vs OBJECT-BASED IMAGE ANALYSIS (OBIA)

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DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

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ABSTRACT

Mangrove ecosystems are importance for coastal regions, as they support the health of the environment and a wide variety of species. The mangrove species in these ecosystems have evolved unique adaptations, like leaves that emit salt and roots that grow above ground, to endure high salinity, making them well-suited for coastal areas and helping the ecosystem adaptability at Tuba and Dayang Bunting Island, Langkawi. The goal of this research is to enhance methods for classifying mangrove species by utilizing Artificial Intelligence (AI) and Object-Based Image Analysis (OBIA) because traditional approaches have limitations in offering specific species-level information. WorldView-3 images with a spatial resolution of 0.3 meters were used, in addition to on-the-ground attributes such as leaves and roots. Datasets with labels were used to train AI models such as machine learning classifiers and deep neural networks in order to classify these objects into various mangrove species. The findings showed that AI reached a high accuracy of 99% in classification, outperforming OBIA obtained 94%, which has only a slight difference in accuracy. This research emphasizes the ongoing importance of remote sensing in classification methods, even with the superior accuracy shown by AI. The results provide fresh perspectives on methods for categorizing mangrove species that could assist government agencies on Langkawi Island, like the Langkawi Development Authority (LADA), in improving conservation and management through mapping and classification. The research highlights how AI and OBIA can enhance the accuracy of ecological monitoring and advocates for the incorporation of advanced technologies in environmental conservation efforts.

Keywords: Mangrove Species, Classification, WorldView-3 (WV-3), Artificial Intelligence (AI), Object-Based Image Analysis (OBIA).

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