

**MACHINE LEARNING CLASSIFICATION OF MANGROVE HEALTH
USING SATELLITE DATA IN THE AREA OF INTEREST (AOI) OF
SEGARA BIRU MANGROVE, LONTAR VILLAGE, SERANG DISTRICT**

By

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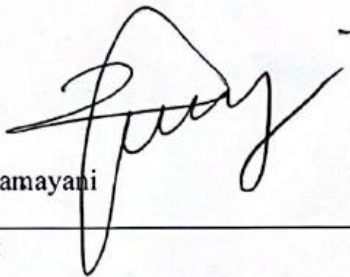


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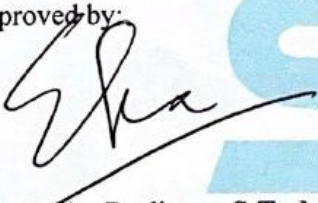
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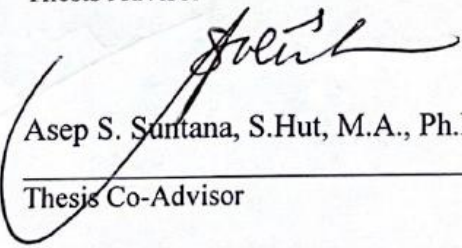
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ABSTRACT

MACHINE LEARNING CLASSIFICATION OF MANGROVE HEALTH USING SATELLITE DATA IN THE AREA OF INTEREST (AOI) OF SEGARA BIRU MANGROVE, LONTAR VILLAGE, SERANG DISTRICT

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Mangrove health can deteriorate gradually before visible mortality occurs, creating a need for monitoring approaches that can distinguish intermediate conditions and support field verification. This study aimed to develop a satellite-based machine learning approach for classifying mangrove health into Healthy, Stressed, and Dead classes in the Segara Biru Mangrove Area of Interest, Lontar Village, Serang District, Banten. Sentinel-2, Sentinel-1, and Landsat 8 data were used to derive eight satellite-derived features: NDVI, EVI, NDRE, NDMI, MNDWI, LST_Celsius, VH, and VH/VV Ratio. A total of 321 ground-reference observations were used for supervised classification. Feature selection, redundancy assessment, feature-scenario evaluation, class-imbalance handling, and comparisons of Random Forest, Support Vector Machine, and XGBoost were conducted using hyperparameter optimization and Stratified 5-Fold Cross Validation. The Full_8 configuration provided the strongest classification performance, while SMOTE was selected as the balancing method. Tuned XGBoost achieved the highest performance with an Accuracy of 0.8060 and Macro F1-score of 0.8048. VH was the most consistently influential feature in Permutation Importance and SHAP analyses. Annual classifications from 2020–2025 further characterized changes and health-state transitions within the study area. The results provide supporting information for KTH monitoring and field verification.

Keywords: Mangrove Health, Machine Learning, Satellite Remote Sensing, XGBoost, Feature Selection

Tiara Ramayani



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DEDICATION

Dedicated to myself, for staying strong, persevering through every challenge, and never giving up until this thesis was completed; to my beloved parents, for their unconditional love and endless prayers; to my little princess, who gives meaning to every step of my journey and has been my greatest motivation to keep moving forward; to my loved ones, for their unwavering support; and to the mangroves, whose resilience reminds us that nature needs our care and support, inspiring this work to contribute to the harmony between technology and environmental conservation for a sustainable future.



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