CS6611 – CREATIVE AND INNOVATIVE PROJECT (CIP)

ZEROTH REVIEW – Team No. 37

ANALYSIS OF THE SPATIOTEMPORAL FLUCTUATIONS IN MANGROVES USING MACHINE LEARNING AND GEOGRAPHIC INFORMATION SYSTEM WITH HEALTH ASSESSMENT

Madhumitha P S (2021503520) Achyut Prasad D C (2021503002) Sandhiya S (2021503552)

Supervisor: Dr. R. Kathiroli

DOMAIN:

Machine Learning, Remote Sensing, Geospatial Image processing

INTRODUCTION:

Mangrove forests are one of the world's most precious resources for people and marine life and the need to protect them has never been more urgent. Mangroves function as a crucial buffer zone, preventing soil erosion, shielding communities from wave action and storms, and minimizing losses of life caused by extreme weather events. They are the most efficient carbon capture system on the planet, storing up to 10 times more carbon per hectare than terrestrial forests.

PROBLEM STATEMENT:

Mangrove forests are a crucial ecosystem that has numerous social and ecological benefits but these regions face increasing threats from erosion, sea level rise, climatic change, and global warming. Hence it is important to understand the spatiotemporal changes and their health is essential for conservation strategies. The traditional techniques for analysing the changes concerning space and time are time-consuming, and lack precision, making them unsuitable for large-scale monitoring and analysis. Hence there is a need to develop automated methods of investing in machine learning techniques to achieve efficiency, accuracy, and scalability.

ABSTRACT:

This study focuses on analysing the spatiotemporal fluctuations in mangroves and their health status. Different types of high-resolution satellite imagery like

multispectral and radar from diverse sources like Sentinel 1, Sentinel 2, and Landsat will be studied and employed. Before analysis, performing preprocessing on images is crucial. Different types of image corrections such as atmospheric (e.g., FLAASH), radiometric (e.g., histogram matching), and geometric corrections are performed on the images collected to reject anomalies, errors, and distortions that may be present in the images. The study employs Geographic Information Systems (GIS) to perform intricate spatial analyses. Different types of vegetation indices like NDVI, SAVI, and EVI sensitive to mangrove environments are used to assess health conditions throughout the study area. Machine learning classifiers, such as Random Forests (RF), Support Vector Machines (SVM), and Gradient Boosting Machines (GBM) extract insightful patterns and relationships between VIs and other environmental-related indices.

OBJECTIVE:

The objective is to analyze the spatiotemporal variations in mangrove forests and assess their health status using diverse satellite imagery, GIS, ML algorithms, and different vegetation indices. Gaining deeper insights into mangrove dynamics contributes to the development of strategies for enhancing their resilience in the face of environmental challenges, and mitigating future damage.

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Supervisor's Signature

Dr. R. Kathiroli, Assistant Professor, CT MIT