Preface

In a time of remarkable urbanization and environmental change, the need for precise land cover classification methods has grown significantly. Carefully defining and keeping an eye on built-up regions is essential for prudent urban planning, resource management, and environmental conservation as urban landscapes grow and change.

With a particular focus on the changing urban landscape of Navi Mumbai, this thesis summarizes a thorough investigation into the field of urban land cover classification. Considering the quickening rate of urban growth, the project aims to meet the urgent demand for sophisticated approaches that can reliably identify and classify built-up regions. The study attempts to create a reliable categorization model suited to the particulars of Navi Mumbai's urban landscape by utilizing state-of-the-art developments in remote sensing & machine learning technology.

By means of methodical data gathering, examination, and modelling, the study attempts to clarify the intricate relationship between spectral indices obtained from satellite images and the underlying characteristics of urban landscapes. The project aims to improve the accuracy and dependability of land cover categorization by utilizing the combined advantages of spectral indices including NBAI, BRBA, IBI, BUI, NBI, MBAI, NDBI, UI, NDVI, and WI in conjunction with advanced machine learning algorithms.

Starting with data preparation & feature extraction using Landsat and Sentinel-2 imagery, the approach consists of multiple phases. An essential part of the validation and training process for the classification model is ground truth data, which is derived using Sentinel-2 raster images representing Land Use Land Cover (LULC). Based on the derived spectral indices, land cover categories are analysed and classified using machine learning methods such as Logistic Regression, Random Forest, Decision trees, K nearest neighbours, Gradient Boosting, XGBoost and AdaBoost.

The research endeavour’s conclusions provide noteworthy significance for sustainable development initiatives, urban planning, and environmental management in Navi Mumbai. The study intends to equip decision-makers with the information and resources required to negotiate the challenges of urbanization in a quickly changing landscape by offering practical insights into the patterns of urban growth & land cover change.