

18. Building detection and building footprint extraction using Deep Learning for Indian Cities

Aim

To develop a deep learning-based model for automatic detection and extraction of building footprints from Very High-Resolution satellite(VHRS) and Drone data for Indian cities

Study Area: Multiple Indian Cities (in parts): Hyderabad, Miryalguda, Indore, Amritsar, Kanchipuram

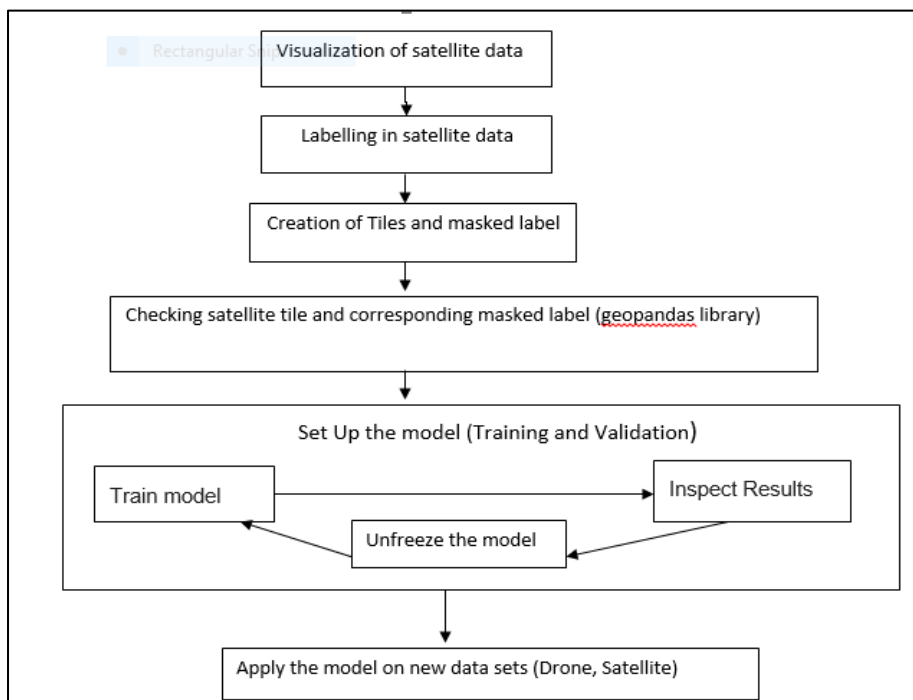
Satellite and Drone data

- VHRS data of 0.5m resolution
- Drone data 0.04m resolution

Tools and technologies: Open-source framework

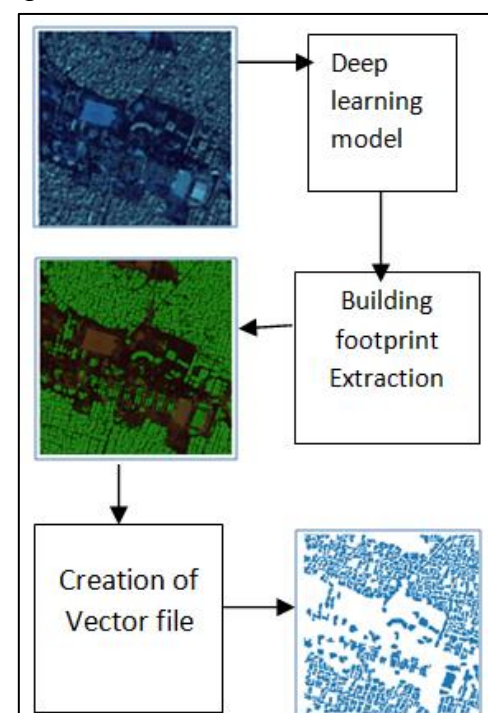
Table 1. Tools and Technologies

Purpose	Tools / Technologies
Language	Python and Jupyter Notebook
Additional Library	Geopandas, Gdal, etc
DL Framework	Tensor Flow, Keras



Scope

The Present work is towards the automatic detection of buildings and extraction of



building footprints from VHRS and Drone data for Indian cities using Deep learning-based approach and the Creation of a building footprint layer in vector and raster format.

Current constraints / Challenges

Under this research, the combined architecture of Resnet with Unet is developed for building footprint extraction from VHRS data and Drone data. The model is working successfully with 85% accuracy and has obtained satisfactory results for identifying and extracting building footprints. However, the accuracy of building boundaries still needs to be improved compared to manual mapping. The model has some limitations also, which include,

- Wrong classification of concrete floor, shadows as buildings, Not recognizing buildings under the trees
- The algorithm reports intermediate results for the classification of building footprints in dense urban areas, as the masking needs to yield suitable geometric vectors.
- The model is working with reasonable accuracy, but there is scope for improvement by adding more training samples for Indian cities.

Expected outcome: The model for building footprint extraction and vector file creation applies to various cities in the Indian scenario. It is, thus, expected to reduce/replace the manual extraction effort/method.

Status of work: Ongoing; Expected completion: December 2023.

Results

VHRS 0.5m Spatial Resolution Building Footprint Extraction In Dense Urban Area



Fig1 A: Input **Hyderabad** City VHRS 0.5m

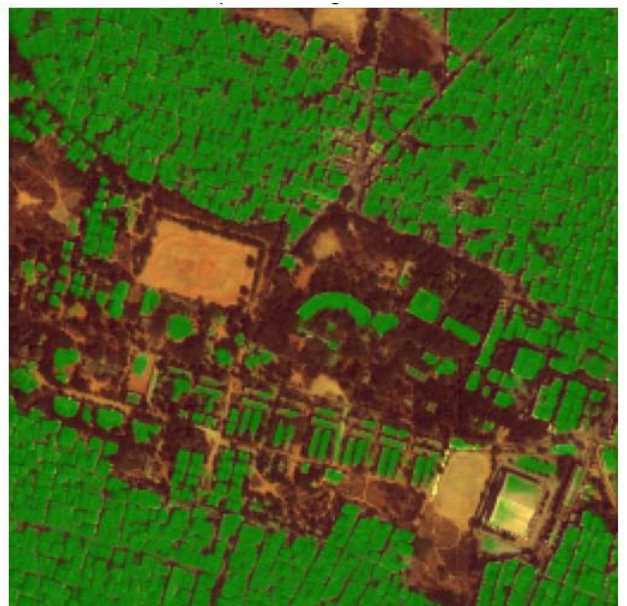


Fig 1B: Output with detected building green color

Drone data Spatial Resolution 0.04m



Fig 2A: Input **Kanchipuram** City Drone 0.04m

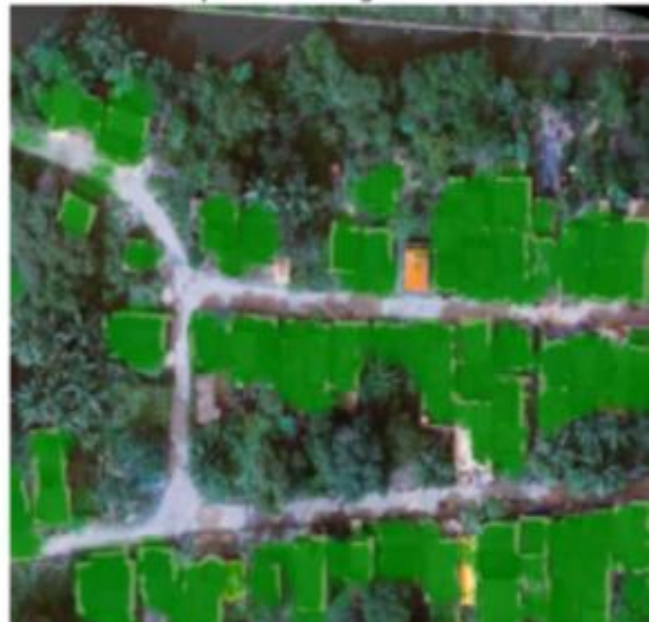


Fig 2B: Output with detected building green color