2 - credit Summer Internship Project (5/8)
Semantic Segmentation of Aerial Satellite Imagery

Team members: Srilakshmi H (2022510053), Poorna prakash S (2022510026),
B. Tech AI and DS

Abstract of the project:
In recent years, advancements in satellite technology have enabled the acquisition of high-resolution aerial imagery, unlocking immense potential for a wide range of geospatial applications. This project focuses on implementing a semantic segmentation pipeline for aerial satellite imagery of Dubai, obtained by MBRSC satellites. The primary objective is to classify each pixel of the image into one of six predefined classes: Building, Land (unpaved area), Road, Vegetation, Water, and Unlabeled.

The dataset comprises 72 high-resolution images organized into six tiles, with pixel-wise annotations corresponding to the six classes. The segmentation models to be implemented include U-Net, E-net, Attention-net and DeepLabV3+, leveraging convolutional neural networks to achieve precise segmentation boundaries. The Neural network models architecture utilizes an encoder-decoder design to capture contextual information and refine segmentation outputs, while DeepLabV3+ incorporates a robust feature extraction backbone and atrous spatial pyramid pooling for accurate multi-class segmentation.

Custom preprocessing pipelines were developed to resize, normalize, and encode the dataset for efficient model training. The project also includes the implementation of advanced evaluation metrics like Intersection-over-Union (IoU) and class-wise IoU to quantify model performance. The outputs of the models are visualized using segmentation masks, offering insights into class distributions and model accuracy.

The results of this project highlight the potential of deep learning models for semantic segmentation in geospatial applications, such as urban planning, environmental monitoring, and disaster management. Future work can focus on scaling the models to larger datasets, improving real-time inference capabilities, and exploring advanced architectures like transformer-based models, SAM models and DINO models for enhanced accuracy and generalization.