Project Report: Deforestation Detection and Monitoring

# Objective and Problem Statement

The objective of this project is to build a system that can detect deforestation in satellite images, with a focus on the Amazon Rainforest. The project leverages machine learning algorithms to process satellite imagery and detect changes over time. The goal is to provide a tool that can help monitor environmental changes and the extent of deforestation.

# Methodology

The approach for this project involves the use of Convolutional Neural Networks (CNNs) for land classification on multi-band satellite imagery. The dataset used is the 'Planet: Understanding the Amazon from Space' from Hugging Face. The images were preprocessed to enhance features such as vegetation and land surface. Various deep learning techniques were applied to train the model, including image augmentation, normalization, and change detection between images from different time periods. The model was trained using a combination of supervised learning techniques.

# Results

The model achieved satisfactory results in detecting deforestation patterns in the Amazon rainforest, with performance metrics evaluated using accuracy and precision. Anomalies were detected using algorithms like Isolation Forest, and the model was able to identify areas with significant changes in vegetation.

# Challenges and Discussion

Several challenges were encountered during the project, including handling large satellite images, managing data imbalance, and dealing with noisy data. Additionally, the high computational cost of training deep learning models on large image datasets posed challenges in terms of both time and resources. Future work could focus on improving model accuracy by implementing advanced techniques such as transfer learning or by incorporating other environmental factors like temperature and rainfall to further refine the deforestation detection process.