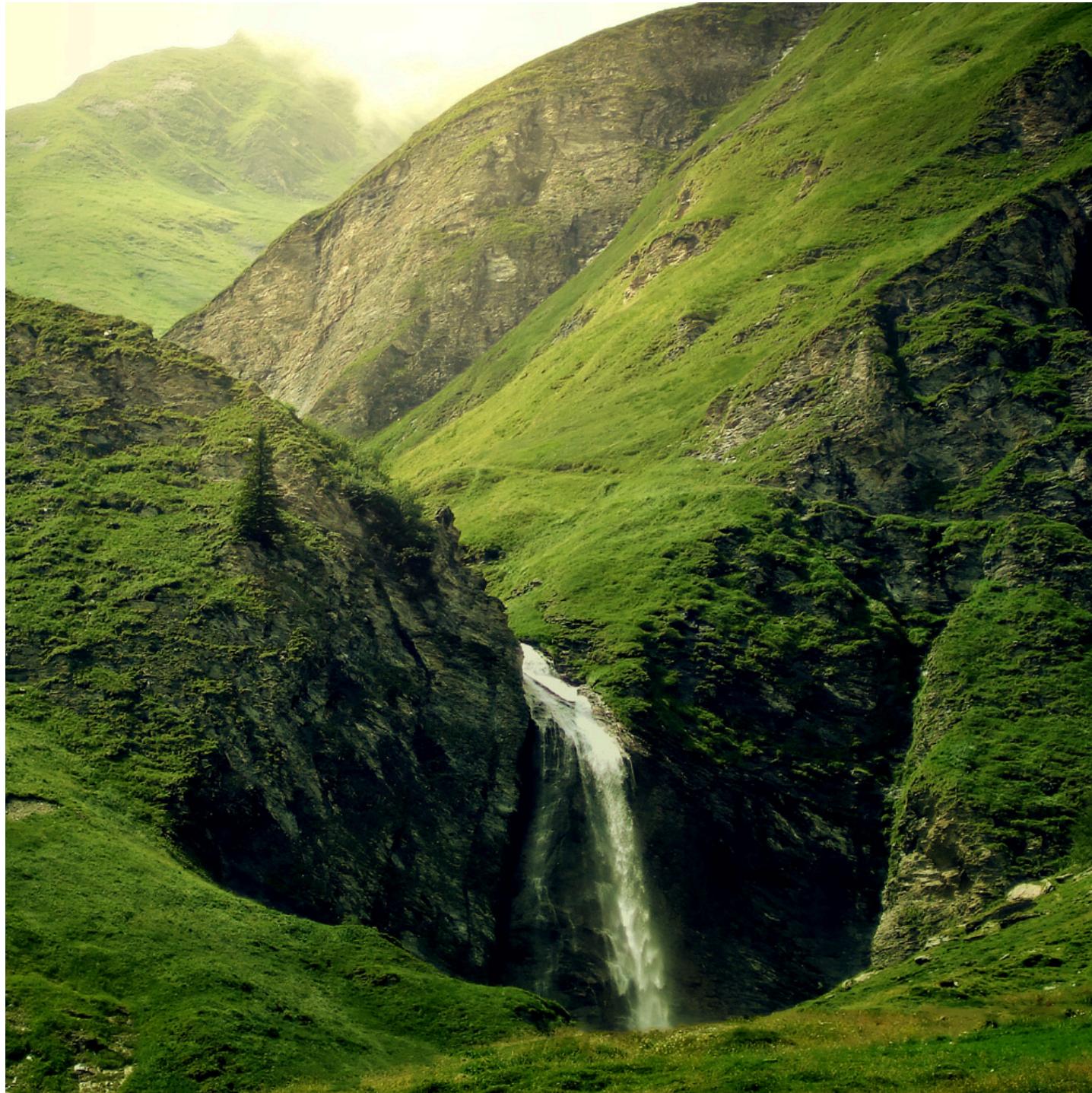


Monitoring deforestation through real-time satellite imagery analysis

By: Nisha Ramanna





Introduction

- *Deforestation's Impact:* biodiversity loss, climate change, and more
- *Real-Time Monitoring:* Crucial for timely action
- *Traditional Methods:* Often rely on outdated data, limiting their effectiveness

Our Goal

01

Real-Time Analysis

Develop a model that uses real-time satellite imagery to identify deforestation

02

Unsupervised Learning

Model won't need to be trained on labeled data

03

Detect Deforestation

Help identify these patterns in the wild



Dataset

01

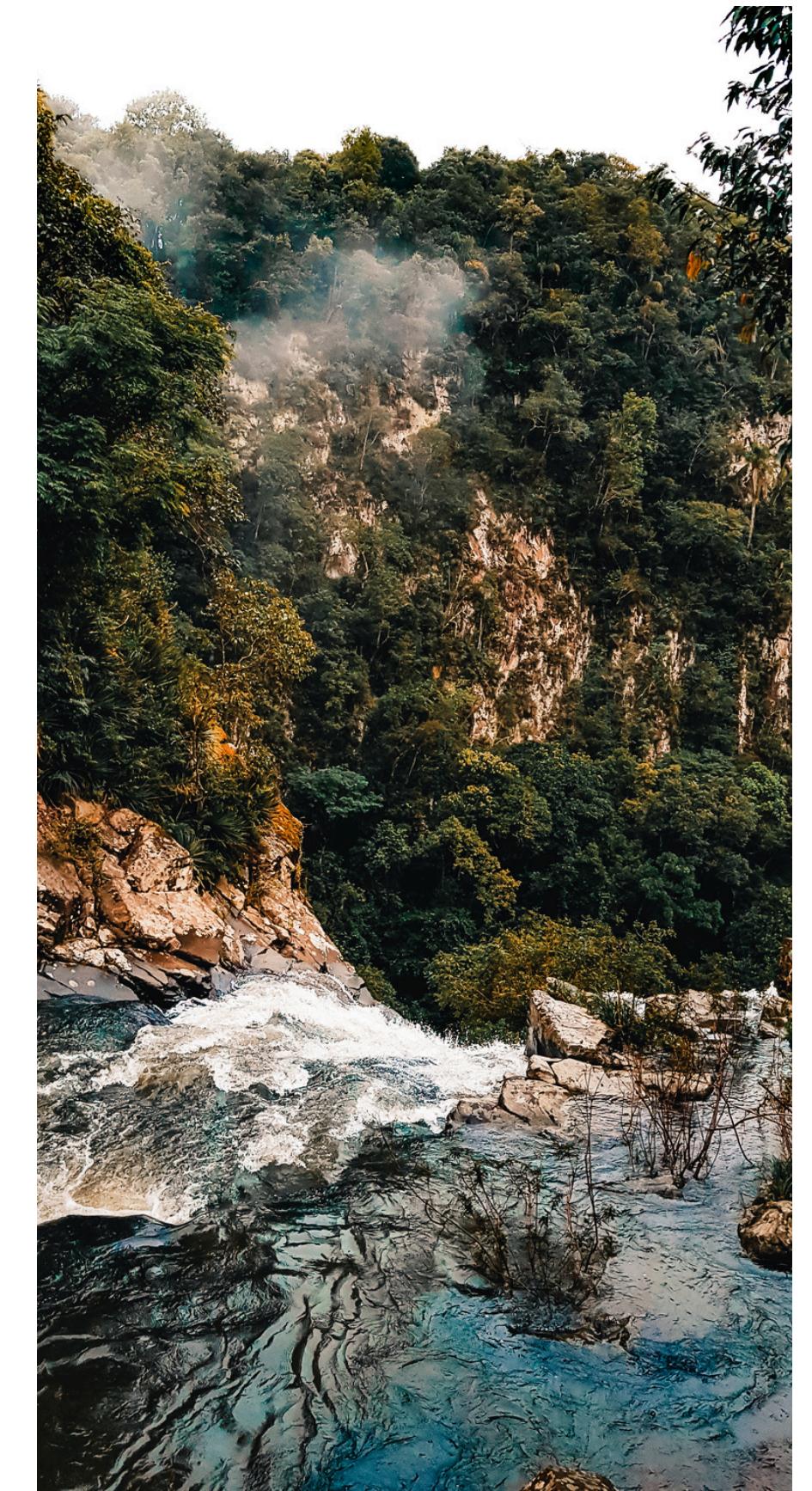
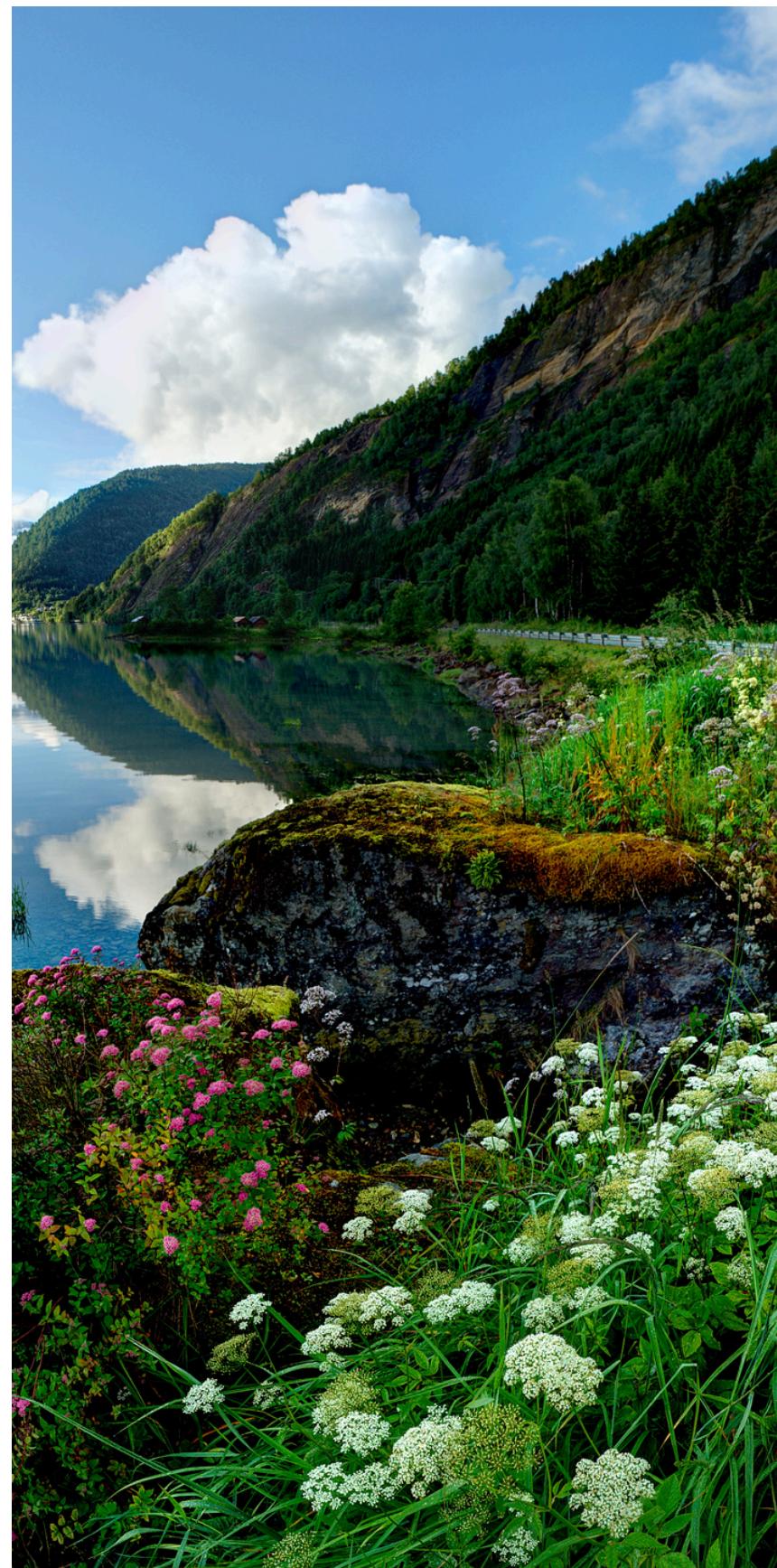
Source: Google Earth Engine

02

Coverage: Based on user input

03

Timeframe: Based on user input





Preprocessing

This step was especially important (and difficult) because I generated my own dataset

Image Scaling

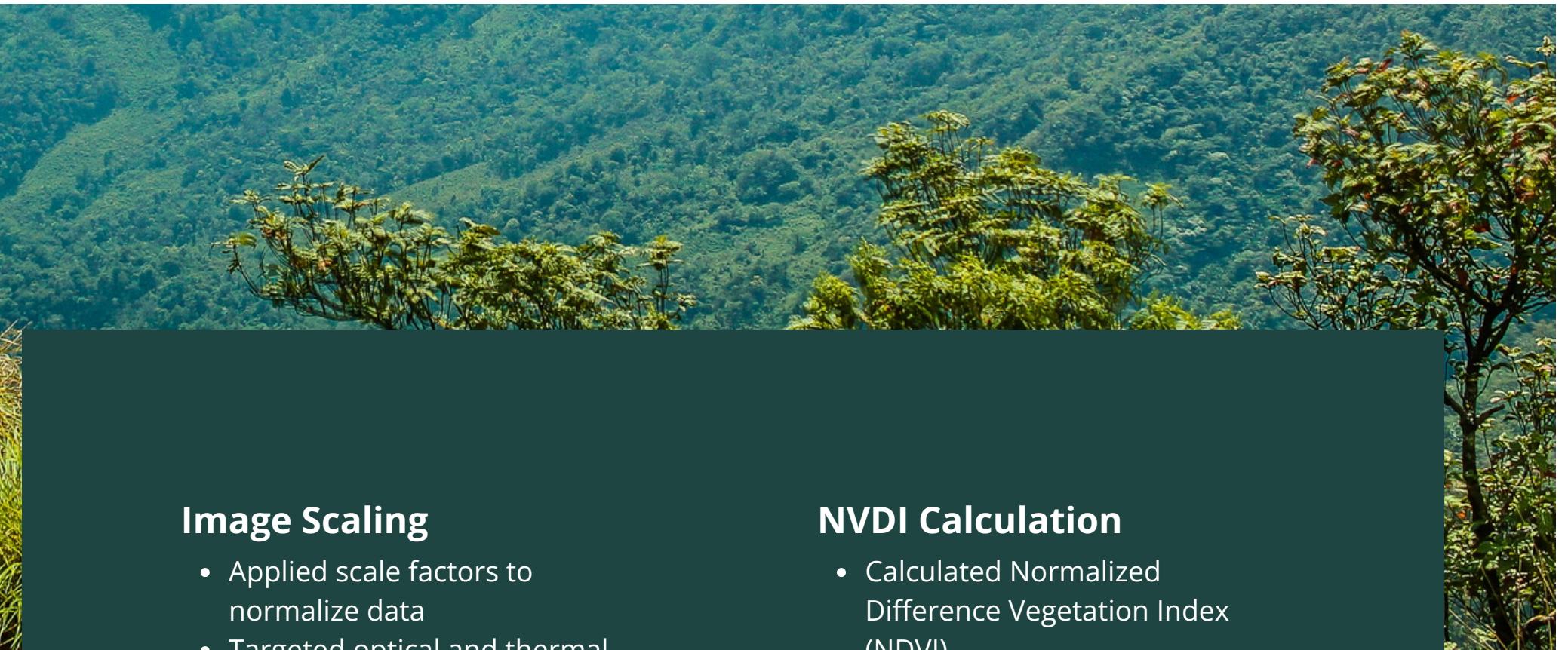
- Applied scale factors to normalize data
- Targeted optical and thermal bands

NDVI Calculation

- Calculated Normalized Difference Vegetation Index (NDVI)
- Enhances vegetation detection

Cloud Coverage Filtering

- Filtered out satellite images with > 10% cloud cover
- Ensured clearer and more accurate composite images





Model

I utilized a K-means clustering algorithm to perform unsupervised learning

Goal

- Detect deforestation by identifying changes in land cover

Training

- Used sample pixel data from composite images
- Was clustered using K-Means algorithm

Architecture

- K-Means Clustering algorithm
- Utilized 3 clusters (forested area, deforested areas, other land cover)

Result

- Subtracted cluster labels of start and end image
- Highlighted areas where significant change occurred



Big Data Tools

Dealing with large datasets previously caused the application to be slow and memory-inefficient. These tools helped to change that.

Apache Spark

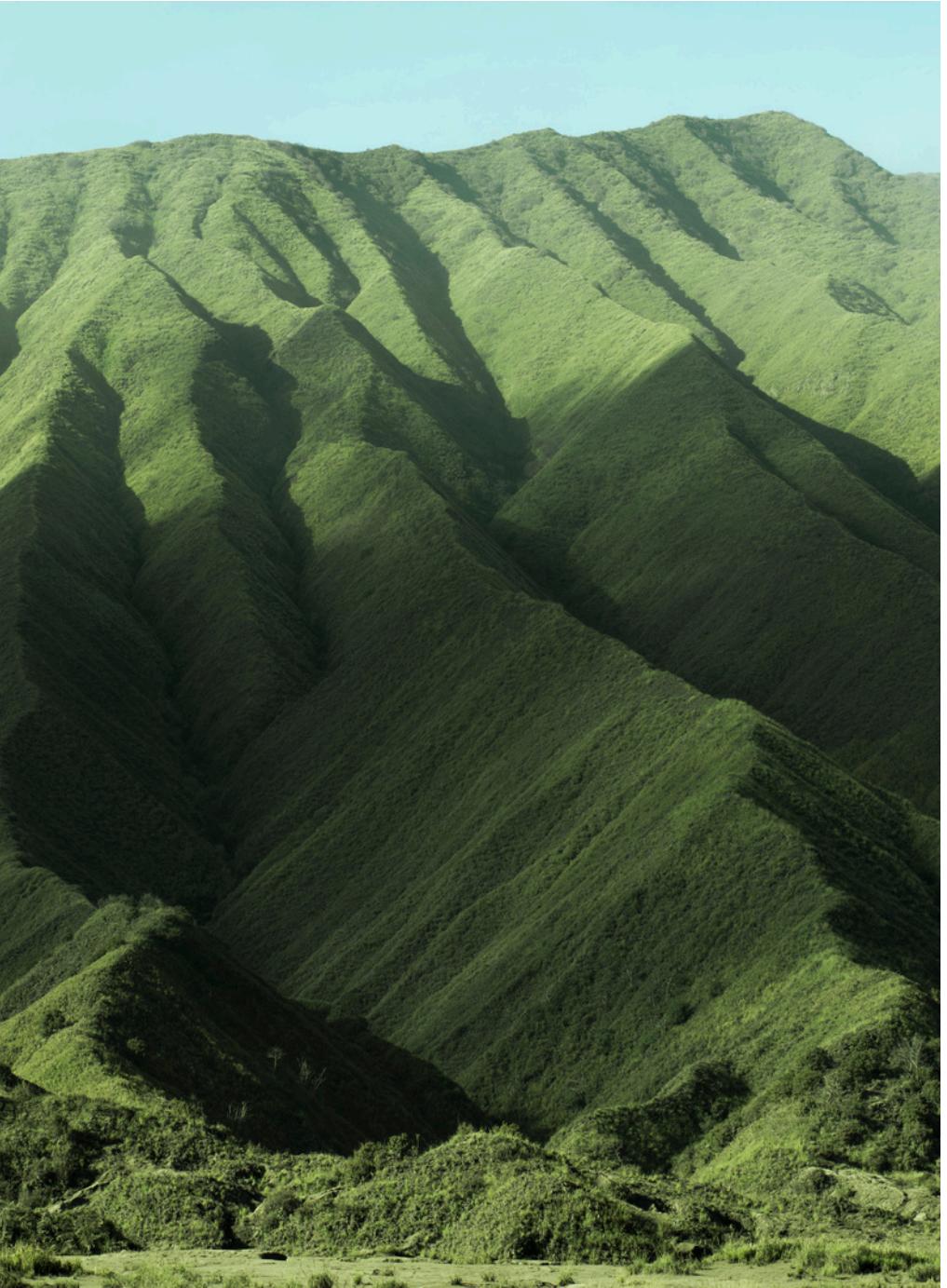
- Parallelized the processing and storing of images

MongoDB

- Stored large files using GridFS
- Allows for scalability of project

Resources

- Preprocessing:
 - <https://aiforgood.itu.int/search-results/?filter=amazon&id=3463>
- Model:
 -



Challenges & Improvements

- Struggled working with unsupervised learning & generating my own dataset for the first time
- Want to apply an extra model to track changes in clusters in the satellite imagery over time
 - Should help identify deforestation

A wide-angle photograph of a majestic mountain range under a bright blue sky with scattered white clouds. The mountains in the background are rugged with sharp peaks, some showing patches of snow. In the middle ground, a dense forest of green coniferous trees covers a hillside. A dark, semi-transparent rectangular overlay covers the center of the image. Inside this overlay, the words "Thank You" are written in a large, bold, white sans-serif font.

Thank You