Imagery Anaysis Assignent - Shaifali

This project focuses on building a complete reproducible workflow for analyzing Sentinel-1 and Sentinel-2 data using Python, SNAP and standard geospatial libraries.

The goals include:

- Setting up an isolated environment
- Autodownload Sentinel-1 and Sentinel-2 datasets
- Preprocessing SAR data
- Performing change detection
- Preparing code and documentation for open reproducibility on GitHub

2. Environmental Setup

A new conda environment (assignment) was created to ensure consistent execeution. Package management was handled through an environment.yml file which allows reproducibility on any system.

Packages installed include

- Rasterio
- Pandas
- Geopandas
- Matplotlib
- Numpy
- Scipy
- Jupyterlab
- Glob

3. Sentinel-1 Processing

SAR preprocessing was done in SNAP for VV band. The following steps were performed :

- Orbit file correction
- Radiometric calibration
- Multilooking
- Range-Doppler terrain correction

Rest of the processing was done in Python

- Reading the Tiff files
- Resizing the files
- Calculating the log ratio for change detection
- Otsu thresholding

4. Sentinel-2 Processing

Sentinel-2 bands were processed through Python.

- Reading the datasets for detecting change
- Cloud masking
- Resampling the bands
- Calculating NDVI

5. Result and conclusion

Both S1 and S2 data were successfully preprocessed and processed. Change detection was performed for both the satellite datasets. A full EO data downloading, preprocessing and change detection workflow using SNAP and Python was demonstrated. The provided GitHub repository structure ensures future extensibility and replicability.