A Satellite Band Selection Framework For Amazon Forest Deforestation Detection Task

Problem they are trying to solve / Purpose of method

- Detecting deforestation
- PRODES (what is that?)
- Effective forest monitoring
- Choosing a subset of spectral bands.
- We want informative bands.
- Bands provide different insights.

How does it differ from other methods?

Other methods rely on manual monitoring (of bands or deforestation?), or deep learning methods (i guess for band selection). Other band selection methods. (needs clarification)

How the method works

It consists of three steps.

1. Creation of segment dataset
2. Selecting Landsat-8 bands based on Univariate Marginal Distribution Algorithm (UMDA, what is this?)
3. Semantic Segmentation for deforestation detection

Creation of segment dataset

1. Use 9 Landsat-8 images (why only 9?)
2. Preprocess by PCA
3. Create segments using Simple Linear Iterative Clustering(SLIC)

Selecting bands based on UMDA

1. Extract Harlick texture features. (7 features per segment)
2. Segments are divided into train, val, and test
3. Apply the UMDA algorithm.

Semantic segmentation for deforestation detection

1. Reconstruct the Landsat-8 images using only the optimal bands.
2. Cropping and augmentation to create more images.
3. Train the model (DeeplabV3+)

Notes

UMDA:

- Instead of using crossover/mutation, UMDA builds a **probibilty vector** assuming **independent variables**.
- New solutions are generated by **sampling** from this learned distribution, based on the **top_performing individuals**.

SLIC: This algorithm generates superpixels by clustering pixels based on their color similarity and proximity in the image plane.

Haralick texture features: are a set of statistical measures used to quantify texture in an image, based on the **Gray-Level Co-occurence Matrix(GLCM)**. These features capture spatial relationships between pixel intensities and are commonly used in ameg analysis, pattern recognition, and computer vision tasks.

The **GLCM** represents how ofter pairs of pixel values (gray levels) occur at a certain distance and orientation in an image.

Haralick features are derived from this matrix to characterize textures.