Predicting Brazil Poverty Using Supervised Pixel-based Image Classification

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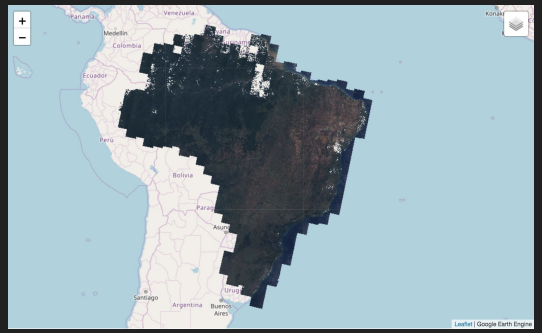
Term Project Proposal
Geospatial Software Design

Executive Summary

Urbanization is a rapid transformation of human social roots on a global scale. This unprecedented movement of people is forecast to continue and intensify in the next few decades, but methods to trace urbanization on the globe remain limited. Therefore, evaluating urbanization process using remote sensing images is a cost-efficient approach.

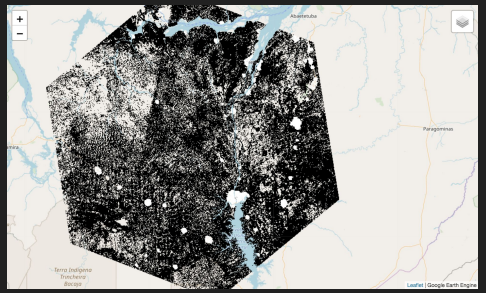
We use machine learning for pixel-based image classification of built-up areas in Brazil at a large geographic scale using Landsat 8 and DMSP-OLS data. We combine nighttime-lights data and Landsat 8 to overcome the lack of extensive ground reference data. Finally, we will demonstrate the effectiveness of our methodology, which is implemented with Google Earth Engine API in Python, through the development of 30 m resolution maps that characterize built-up land cover in Brazil.

Study Areas



- Visualize nighttime lights images (DMSP-OLS data) and Landsat 8 data.
- Adopt H3, a hexagonal tessellation mapping approach to handle large variation across regions.
- Compute and add bands NDWI, NIR, NDVI, and EVI.
- Partition Brazil with the equal-area hexagonal grid.
- Calculate DMSP-OLS thresholds in each hexagon.

Methodology



Mask out vegetation, bodies of water.

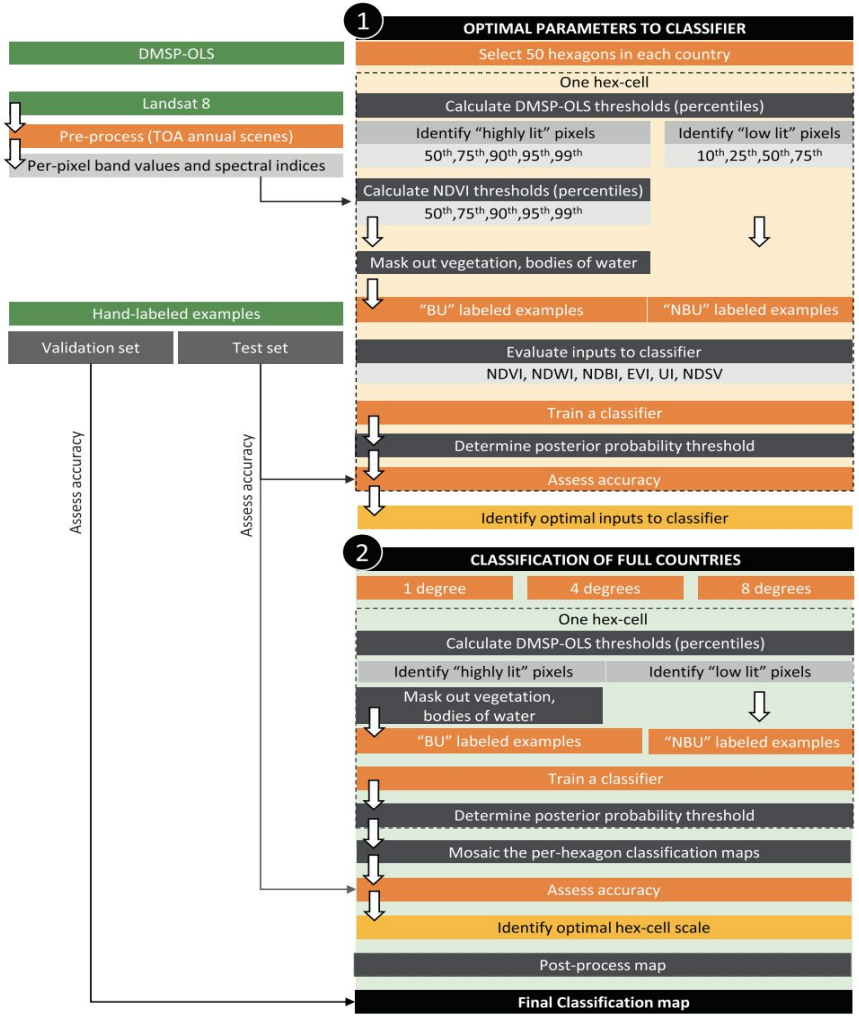
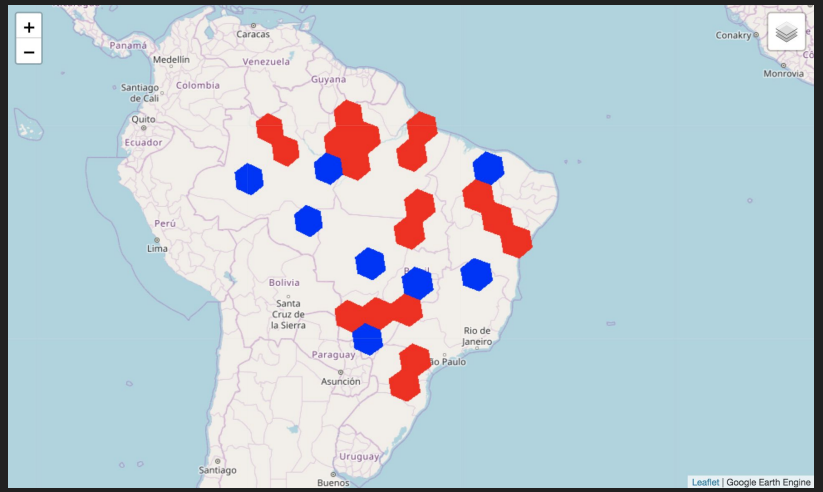


Fig. 2. Schematic illustration of the methodology.

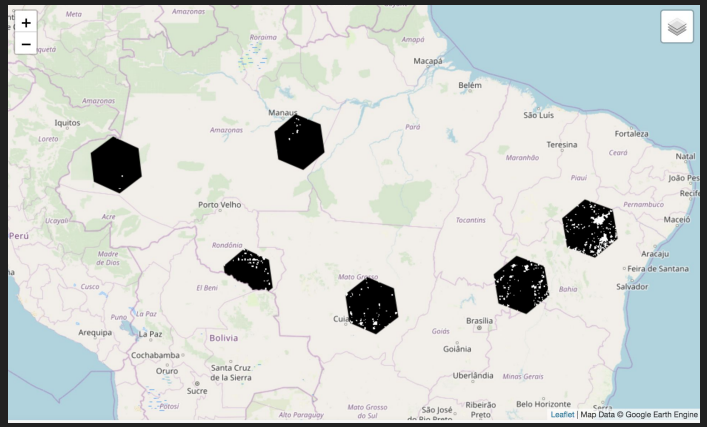
Sampling

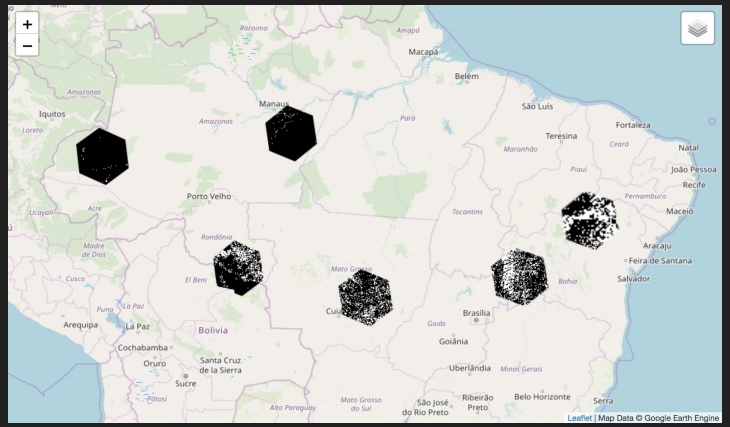


- Randomly sample 200 points from training Polygons
- Hand-label pixels as built-up areas and non-built-up areas.

Classification

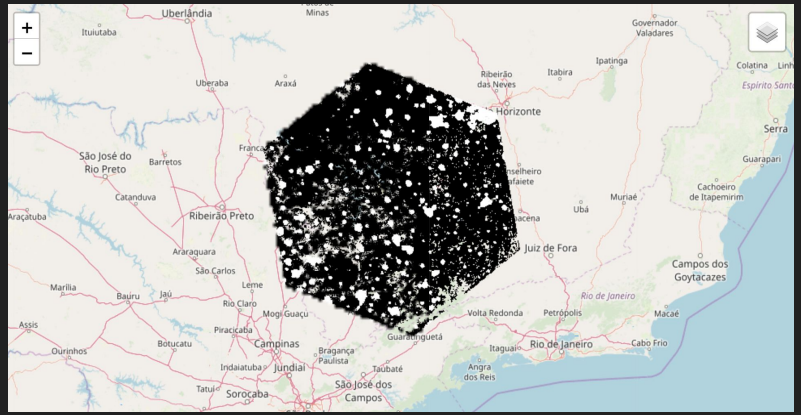
- We use a random forest classifier for classification and train our data.
- On the left is the evaluation data and on the right is the classified built up areas.





More Thoughts

Current classification results:



Try to work on other Machine Learning Methods for Supervised Classification.