# Image Classification in Google Earth Engine (GEE) for Biodiversity Hotspot Mapping

Motivation

Many of the world's remaining biodiversity hotspots coincide with areas of rapid population growth and agricultural expansion. Understanding the geographic distribution of various land cover types within these hotspots is limited by a lack of current, detailed maps and the rapid land use changes underway in these areas. This is particularly true in the project study site of East Africa.
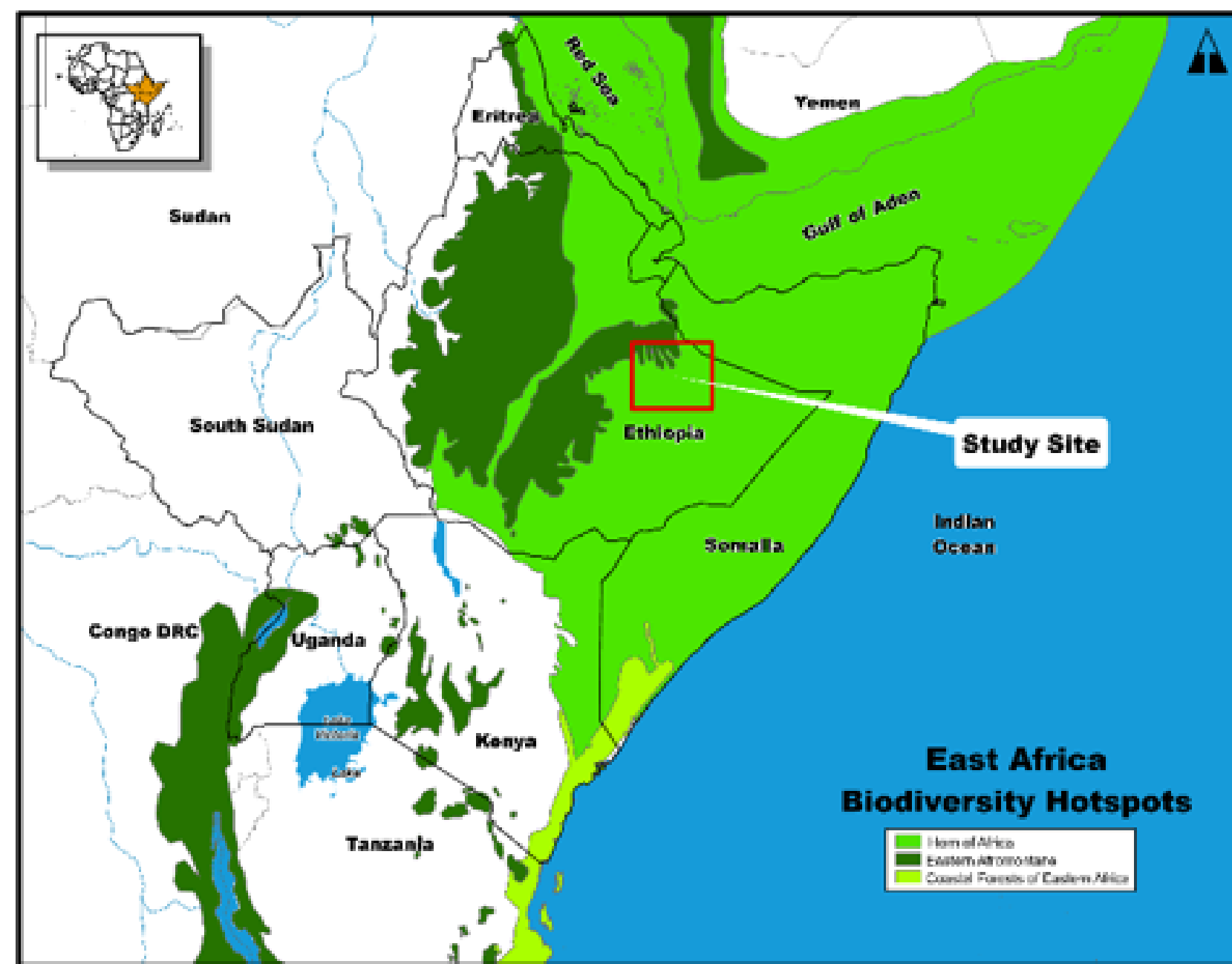
Google Earth Engine (GEE)

The cloud computing infrastructure of the Google Earth Engine (GEE) platform can facilitate the processing of big geo datasets over large areas and observe the environment for extensive periods of time.

Future Work

There may be an opportunity to create a new classification approach that combines the strengths of Google Earth Engine with the high predictive performance of other open-source platforms such as H2O Automated Machine Learning (AutoML).

Datasets

USGS Landsat 8 Surface Reflectance Tier 1
Copernicus Global Land Cover Layers: CGLS-LC100 collection 3

Methodology
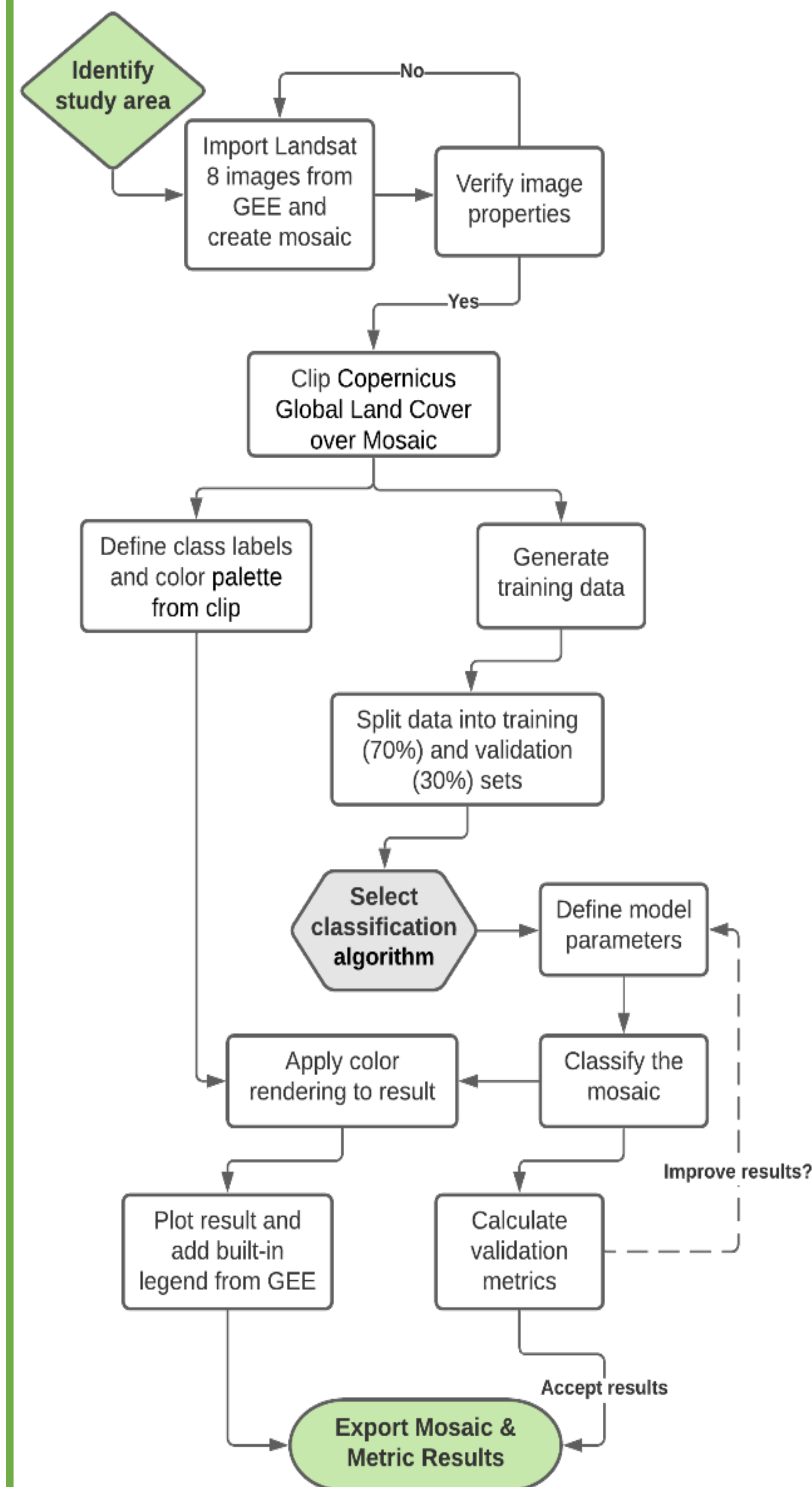
Land Cover Classes

- Shrubs
- Herbaceous Vegetation
- Cultivated & Managed Vegetation
- Urban Areas
- Bare / Sparsely Vegetated
- Water
- Herbaceous Wetland
- Closed Forest, Evergreen Broad Leaf
- Closed Forest, Deciduous Broad Leaf
- Closed Forest, Unclassed
- Open Forest, Deciduous Broad Leaf
- Open Forest, Unclassed

Remaining Challenges

GEE has computational contraints that limit model optimization.

None of the models were very successful at classifying open and closed forest habitat types.

Moderate level of commison and ommison errors in agricultrual areas coould lead to over or under estimatton levels of the encroachment in other habitat types

Results

Model	Accuracy	Kappa
Random Forest	0.75	0.40
Gradient Boosted Trees	0.74	0.39
Support Vector Classification	0.70	0.31
Classification & Regression Tree	0.64	0.26

Random Forest (RF) Classification

Gradient Boosted Tree (GBT) Classification

Support Vector (SVC) Classification

Classification and Regression Tree(CART)