Introduction → CEO → what CEO does → what they will use CEO for

Hello everyone ,

My name is Micky Maganini, and I work for SERVIR, a U.S. Government organization and partner of ITC. Today I am going to introduce you to a web-based tool called Collect Earth Online that was developed by SERVIR. Collect Earth Online is a satellite image viewing and interpretation platform that is free of charge. You will be using Collect Earth Online in this class to conduct an environmental analysis in your region of interest.

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Project Planning

Context

Before we learn more about Collect Earth Online, I want to provide some context about What SERVIR is.

Classification Schema

Land Cover Class	Description
Shrubs	Woody perennial plants with persistent and woody stems and without any defined main stem less than 5m tall.
Herbaceous Vegetation	Plants without persistent stems or shoots above ground and lacking definite firm structure. Tree and shrub cover is less than 10%
Agriculture	Lands covered with temporary crops followed by harvest and a bare soil period. Note that perennial woody crops will be classified as the appropriate forest or shrub land cover type.
Urban/Built-Up	Land covered by buildings and other man-made structures
Bare Ground	Lands with exposed soil, sand, or rocks and never has more than 10% vegetated cover during any time of the year.
Permanent Water	Lakes, reservoirs, and rivers. Can be either fresh or salt-water bodies.
Wetland	Lands with a permanent mistrue of water and herbaceous or woody vegetation. The vegetation can be present in either salt, brackish, or fresh water.
Closed forest – Evergreen	Tree Canopy > 70%, almost all broadleaf trees remain green year round. Canopy is never without green foliage.
Closed forest – Deciduous	Tree canopy >7-%, consists of seasonal broadleaf tree communities with an annual cycle of leaf-on and leaf-off periods.
Other Closed Forest	Closed forest not matching any of the other definitions
Open Forest – Evergreen	Top layer is 15-70% trees and the second layer is a mix of shrubs and grassland; almost all broadleaf trees remain green year round.
Open Forest – Deciduous	Top layer trees 15-70% and second layer – mixed of shrubs and grassland, consists of seasonal broadleaf tree communities.
Other Open Forest	Open forest not matching any of the other definitions,
Ocean	Oceans, seas. Can be either fresh or salt-water bodies.

Sampling and Response Design

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Sampling Design

- Design: Random Stratified Sample based on Land Cover type
- Stratification based on Copernicus Global Land Cover System
- Sample Size of 100 points per land cover class
- Total of 1400 points

Response Design

- Assessment Unit: 30m x 30m uniform grid
- One sampling point per assessment unit
- If 75% or more of the assessment unit is made up of a singular land cover class, then the entire assessment unit will be classified as that land cover class

Transition to CEO

Now that you have some context on who we are at SERVIR and why we are partnered with ITC, let's take some time to learn about Collect Earth Online.

Creating Reference Dataset

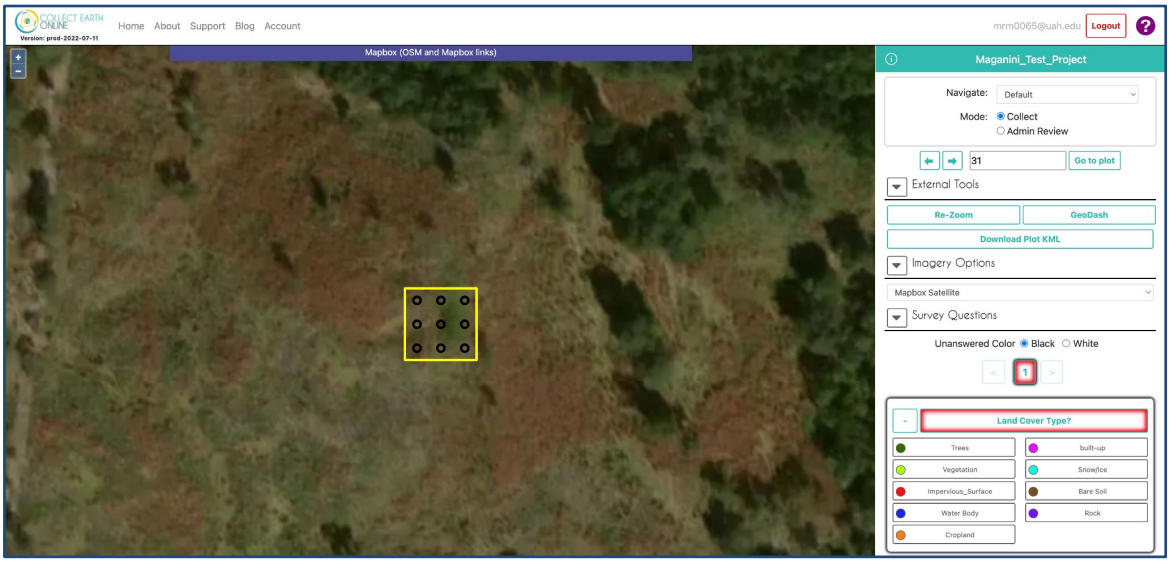
Step 1: Perform Stratified Sample

```
// Perform Stratified Sample
var strat_sample = CGLS_discrete.stratifiedSample({
  'numPoints': 100,                                    //Create 100 points within each stratum
})
```

Step 2: Export unlabelled reference data to Google Drive

```
// Export Stratified Sample to Google Drive
Export.table.toDrive({
  collection: strat_sample,
  description: 'ghana_unlabeled_reference_data',
  fileFormat: 'geoJSON'
});
```

Collecting Reference Data with Collect Earth Online



CEO definition → why it was created → REDD+ → historically → CEO

Collect Earth Online is a free and open source satellite image viewing and interpretation system. Collect Earth Online was created because of a need for countries with limited financial resources to be able to maintain their commitments to global climate agreements. For example, the REDD+ framework, created by the United Nations Framework Convention on Climate Change, requires countries to update their carbon stocks annually. To do this, each member country needs an accurate land cover map of their country. But historically, the cost of obtaining high resolution satellite imagery to create these products was exorbitant. Collect Earth Online has changed that, allowing not only government practitioners, but students, researchers, and civilian scientists access to high

resolution imagery and software to collect land cover reference data.

Split Reference Data

```
////////////////////////////////////////////////////////////////////////////////
//                      Step 1:  Split Reference Data                         //
////////////////////////////////////////////////////////////////////////////////


// Split the reference dataset, using 70% for training the model and 30% for testing

// Here is a function that splits data into training and validation groups. Set at 70% training/30% validation.

var splitData = function(data){
  var dict = {};
  var randomTpixels = data.randomColumn();
  var trainingData = randomTpixels.filter(ee.Filter.lt('random', 0.7));
  var valiData = randomTpixels.filter(ee.Filter.gte('random', 0.7));

  dict.training = trainingData;
  dict.validation = valiData;

  return dict;

};

// Run the function above on our reference data
var split_data = ee.Dictionary(splitData(ref_data));

var training_set = split_data.get('training')
var testing_set = split_data.get('validation')
```

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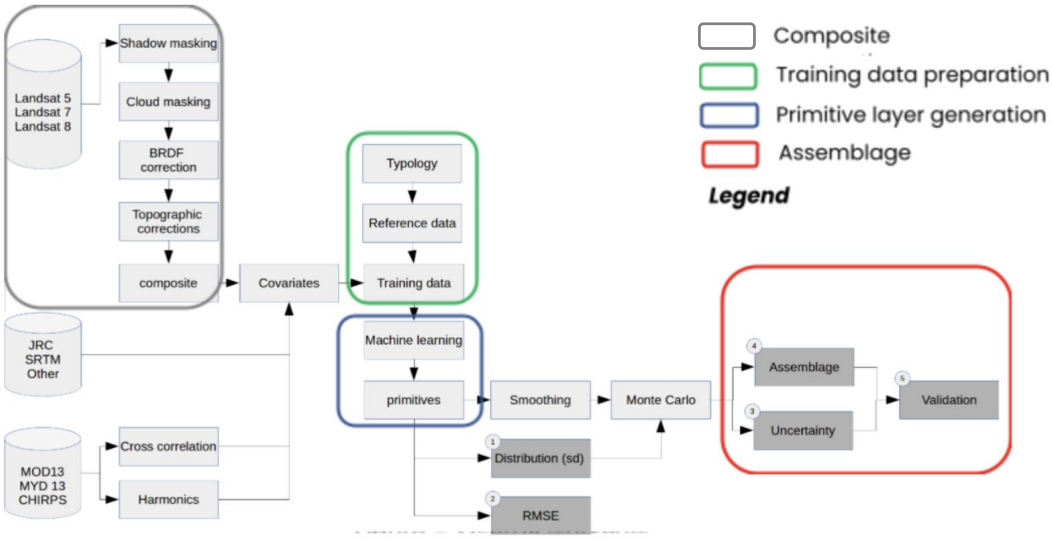
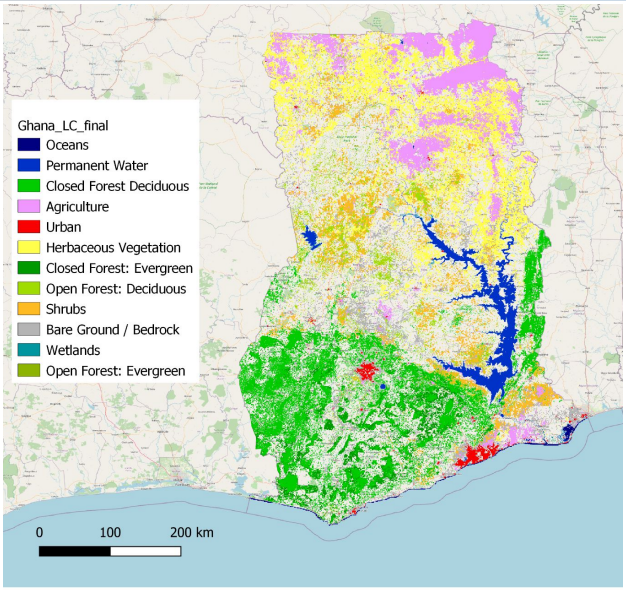
Creating a Land Cover Map using Machine Learning

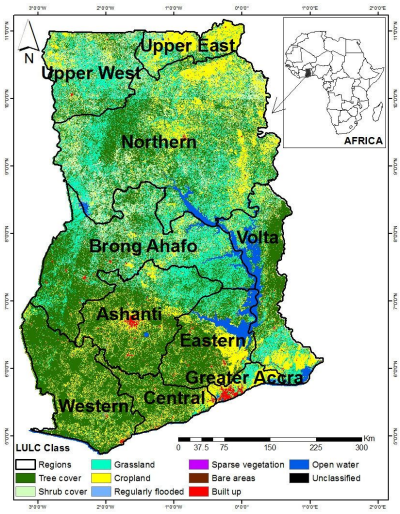
RLCMS Methodology



Results



2020 Land Cover Map of Ghana – RLCMS



2016 Land Cover Map of Ghana (Kwawuvi et al 2021)

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Evaluating Accuracy

Accuracy Assessment

True Class

Predicted Class	Ocean	Permanent Water	Closed Forest: Deciduous	Agriculture	Urban	Herbaceous Vegetation	Closed Forest: Evergreen	Open Forest: Deciduous	Shrubs	Bare Ground	Wetlands	Open Forest: Evergreen	Other Closed Forest	Other Open Forest
Ocean	21	0	0	0	0	0	0	0	0	0	0	0	0	0
Permanent Water	0	55	0	0	0	1	0	0	0	0	0	0	0	0
Closed Forest: Deciduous	0	0	21	1	0	1	12	3	3	1	0	0	0	0
Agriculture	0	0	1	8	2	5	0	1	1	2	0	0	0	0
Urban	1	0	0	0	4	0	0	0	0	2	0	0	0	0
Herbaceous Vegetation	0	0	0	5	0	9	0	1	6	0	0	0	0	0
Closed Forest: Evergreen	0	0	3	0	0	0	1	0	0	0	0	0	1	0
Open Forest: Deciduous	0	0	2	1	0	2	0	3	1	2	0	0	0	0
Shrubs	0	0	2	0	0	4	0	2	3	0	0	0	0	0
Bare Ground / Bedrock	0	0	0	1	1	3	0	2	0	2	0	0	1	0
Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Forest: Evergreen	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Closed Forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Open Forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Accuracy: 62.3%

Cohen's Kappa Statistic: 55.8%

Classes Showing Good Identification:

1. Ocean
2. Permanent Water
3. Closed Forest: Deciduous
4. Agriculture
5. Urban

Acknowledgements

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Collect Earth Online was initially developed by SERVIR, and is now supported by a broad base of partners. CEO was inspired by Collect Earth, a desktop software developed by FAO. The development team includes Arthur Luz, Jordan Combs, Matt Spencer, Richard Shepherd, Oliver Baldwin Edwards, Sif Biri, Roberto Fontanarosa, Francisco Delgado, Githika Tondapu, Billy Ashmall, Nishanta Khanal, John Dilger, Karen Deyson, Karis Tenneson, Kel Markert, Africa Flores, Emil Cherrington, and Eric Anderson.

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Sources

- Development Team: https://sams.servirglobal.net/detail/7
- All other info: https://www.collect.earth/about/

Syllabus → Office Hours → Set up a time → Module 1 → Thanks

So I will now put the link to the syllabus I have created in the chat. The syllabus contains links to all of the curriculum materials I have created, as well as my contact information. I have also included a Google Meets Link for “office hours” and will be available after 3:00 p.m. Monday through Friday to meet with you. So you can text or email me to set up a time to meet on that Google Meets link and show me how you are working with ClimateSERV, or ask any questions you may have. So with the remaining time, we can start to work through Module 1 individually and put any questions you may have in the chat. And thank you everyone for allowing myself and SERVIR to be a part of your learning experience.


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