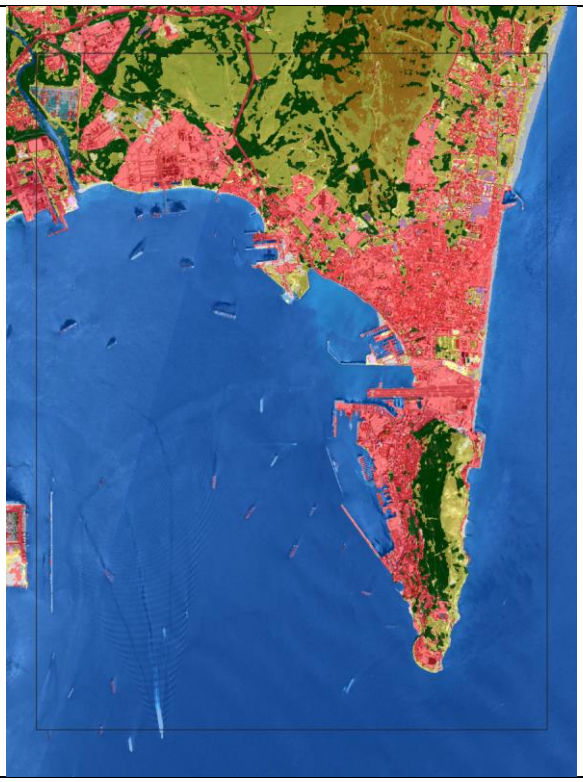
CENG 463 Project Fall 2022

Climate change has become a serious threat to humanity. Global land cover maps serve as an important means to tackle this problem. ESA has produced Global Land Cover Map from Sentinel-2 data.

We are going to generate land cover maps for unseen data by using a limited number of training samples. Gibraltar is selected as a study area as there are wide variety of land cover types.

Data:

	
Training Data	Training GT

Data Link: https://drive.google.com/drive/folders/1diOV3oaKTsXul3SB8YSWpEQ8AvtZO-Uk?usp=sharing

Test Data will be provided later.

Data is UInt16, Classlabels are Uint8.

Training data: S2A_MSIL1C_20220516_TrainingData.tif

Training labels: S2A_MSIL1C_20220516_Train_GT.tif

Class List:

Map code	Land Cover Class	LCCS code	Definition	Color code (RGB)
10	Tree cover	A12A3 // A11A1 A24A3C1(C2)-R1(R2)	This class includes any geographic area dominated by trees with a cover of 10% or more. Other land cover classes (shrubs and/or herbs in the understorey, built-up, permanent water bodies, ...) can be present below the canopy, even with a density higher than trees. Areas planted with trees for afforestation purposes and plantations (e.g. oil palm, olive trees) are included in this class. This class also includes tree covered areas seasonally or permanently flooded with fresh water except for mangroves.	0,100,0
20	Shrubland	A12A4 // A11A2	This class includes any geographic area dominated by natural shrubs having a cover of 10% or more. Shrubs are defined as woody perennial plants with persistent and woody stems and without any defined main stem being less than 5 m tall. Trees can be present in scattered form if their cover is less than 10%. Herbaceous plants can also be present at any density. The shrub foliage can be either evergreen or deciduous.	255, 187, 34
30	Grassland	A12A2	This class includes any geographic area dominated by natural herbaceous plants (Plants without persistent stem or shoots above ground and lacking definite firm structure): (grasslands, prairies, steppes, savannahs, pastures) with a cover of 10% or more, irrespective of different human and/or animal activities, such as: grazing, selective fire management etc. Woody plants (trees and/or shrubs) can be present assuming their cover is less than 10%. It may also contain uncultivated cropland areas (without harvest/ bare soil period) in the reference year	255, 255, 76
40	Cropland	A11A3(A4)(A5) // A23	Land covered with annual cropland that is sowed/planted and harvestable at least once within the 12 months after the sowing/planting date. The annual cropland produces an herbaceous cover and is sometimes combined with some tree or woody vegetation. Note that perennial woody crops will be classified as the appropriate tree cover or shrub land cover type. Greenhouses are considered as built-up.	240, 150, 255
50	Built-up	B15A1	Land covered by buildings, roads and other man-made structures such as railroads. Buildings include both residential and industrial building. Urban green (parks, sport facilities) is not included in this class. Waste dump deposits and extraction sites are considered as bare.	250, 0, 0
60	Bare / sparse vegetation	B16A1(A2) // B15A2	Lands with exposed soil, sand, or rocks and never has more than 10 % vegetated cover during any time of the year	180, 180, 180
70	Snow and Ice	B28A2(A3)	This class includes any geographic area covered by snow or glaciers persistently	240, 240, 240
80	Permanent water bodies	B28A1(B1) // B27A1(B1)	This class includes any geographic area covered for most of the year (more than 9 months) by water bodies: lakes, reservoirs, and rivers. Can be either fresh or salt-water bodies. In some cases the water can be frozen for part of the year (less than 9 months).	0, 100, 200
90	Herbaceous wetland	A24A2	Land dominated by natural herbaceous vegetation (cover of 10% or more) that is permanently or regularly flooded by fresh, brackish or salt water. It excludes unvegetated sediment (see 60), swamp forests (classified as tree cover) and mangroves see 95)	0, 150, 160
95	Mangroves	A24A3C5-R3	Taxonomically diverse, salt-tolerant tree and other plant species which thrive in intertidal zones of sheltered tropical shores, "overwash" islands, and estuaries.	0, 207, 117
100	Moss and lichen	A12A7	Land covered with lichens and/or mosses. Lichens are composite organisms formed from the symbiotic association of fungi and algae. Mosses contain photo-autotrophic land plants without true leaves, stems, roots but with leaf-and stemlike organs.	250, 230, 160

Reference: https://esa-worldcover.s3.eu-central-1.amazonaws.com/v200/2021/docs/WorldCover_PUM_V2.0.pdf

Note that some of the classes may not be present in the data set. You may ignore classes which are not present in both datasets.

Methods:

You are limited to methods which are covered in the course however you may perform feature engineering such as selecting bands or taking ratios of bands. Methods such as neural networks or deep learning should not be used.

Software:

You may only use SKLearn, OpenCV, GDAL (Data Read), Numpy, Matplotlib (Those used in your lab sessions.)

Deadline:

The week after the end of the final exams.

Report:

You should prepare a report which includes your implementation details, link to your github repo which includes codes. In addition, you may prepare a report in IEEE Paper format such as RAST2023 conference.

Your report should include details about your project such as the number of training samples, how you selected a method, and how it performs with the provided data. You should search literature briefly from Google Scholar (spend the 1st week's effort).

Presentation & Competition:

There will be project presentations by project teams. There will be a competition based on your classification score, report, and presentation.

Teams:

You can team up to 2 students.