Satellite Imaging

Flood Detection Project

Team 21

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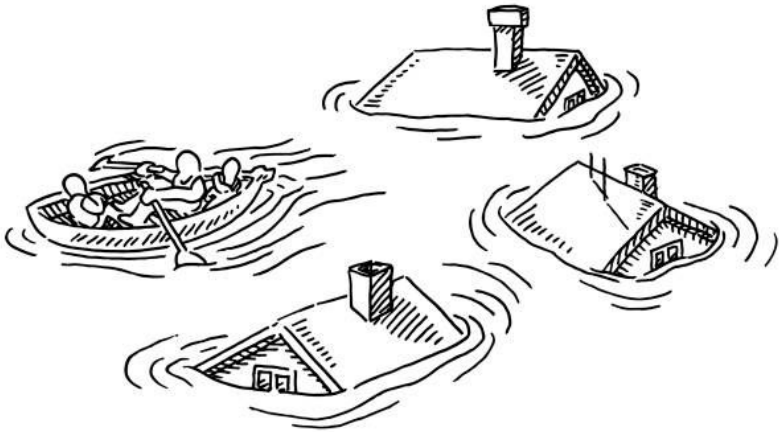
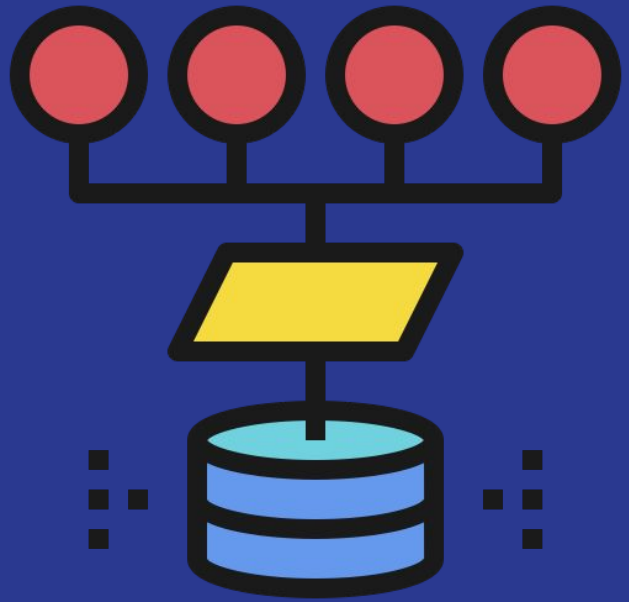
The problem

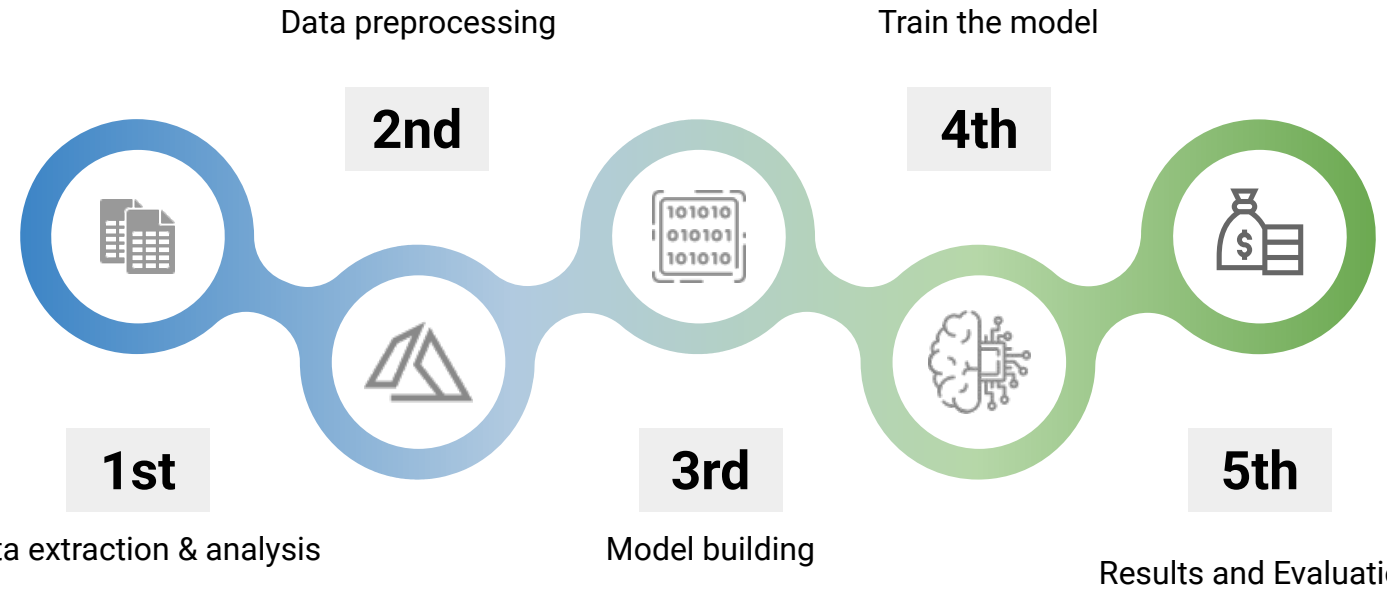
- Flood is a devastating natural disaster that affect millions every year.
- Being able to detect Flood areas quickly could save life and resources.
- The project detects whether there is a flood in a given image and determine the exact areas of the flood.



Pipeline



Pipeline


Data preprocessing
Train the model
2nd
4th
101010
010101
101010
1st
3rd
5th
Data extraction & analysis
Model building
Results and Evaluation

Preprocessing

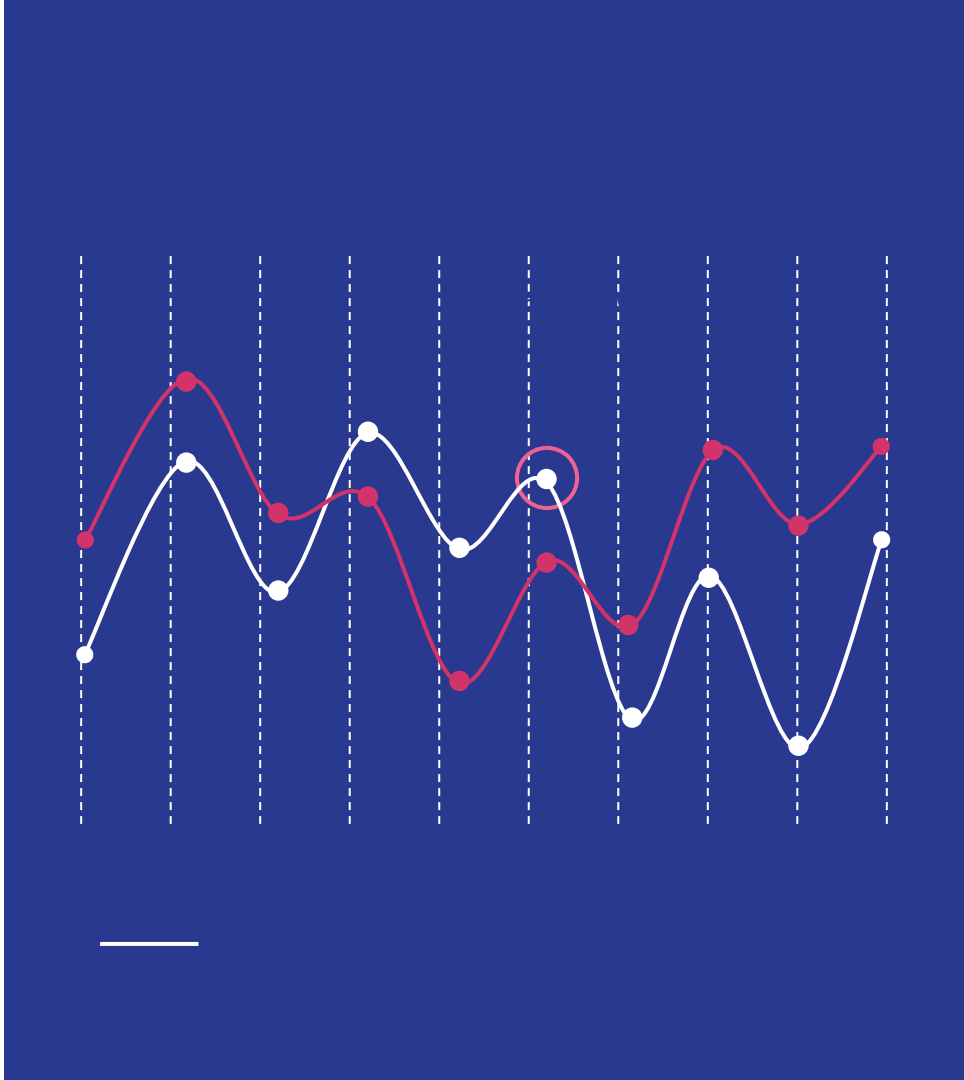


Image Resizing

- The preprocessing steps for this project involved resizing all images to (512, 512) and performing haze removal on each image using a suitable algorithm.

- The purpose of these steps was to prepare the images for subsequent analysis and feature extraction. Resizing the images to a common size helps to standardize the dataset so that the images can be compared and analyzed more easily. Minimum size of flooded & non-flooded images was (152, 123, 3) & maximum size of flooded & non-flooded images was (3072, 4592, 3).

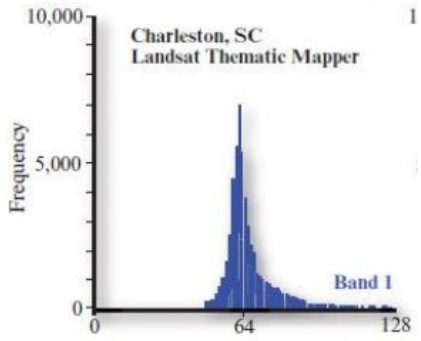
- A size of (512, 512, 3) was chosen based on the specific requirements of the project.

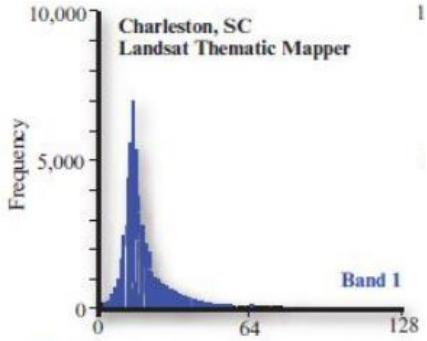
- This size should be large enough to capture most of the details in the larger images while still being a significant improvement over the smaller images.

Haze Removal By Dark Subtraction

- Haze removal is an important step in satellite imaging applications because atmospheric haze can obscure features of interest in the images. There are various algorithms that can be used for haze removal, including dark channel prior, guided filter, and color attenuation prior. The specific algorithm used in this project was haze removal by dark subtraction, which was chosen based on its effectiveness in removing haze from satellite images.

- Minimum value of image with 100 pixels will be used as a threshold.





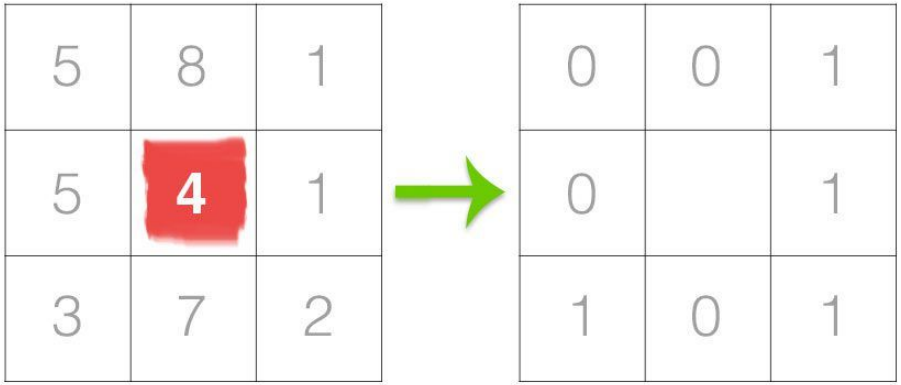
Haze Removal By Dark Subtraction

- Preprocessed image

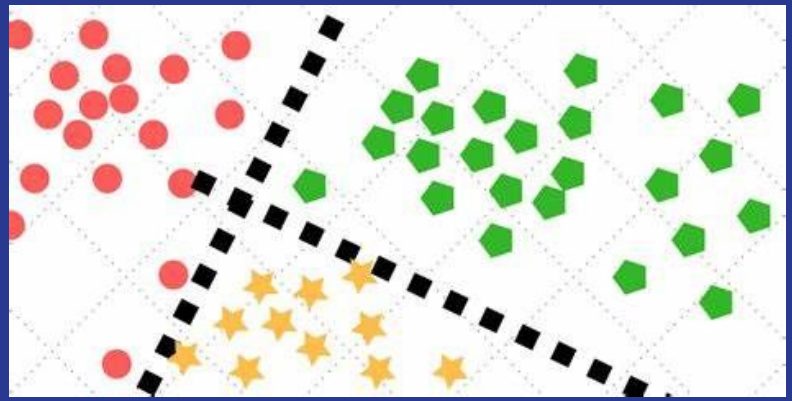
Features Extraction

Feature Extraction

- Local Binary Pattern was used to extract features
- A Feature vector of length 64 was extracted for each image
- We used a bigger Radius and No. of points in LBP to extract more global features



Classifiers

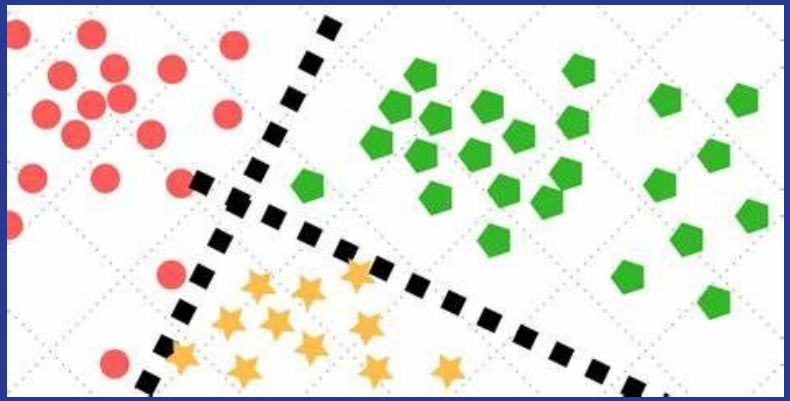


Classifiers

Two Models were used for the classification problem

- ResNet50 was used and tuned, it was trained on Resized and Normalized Images directly.
- Logistic Regression Was Also used for classification on LBP feature vectors.

Clustering

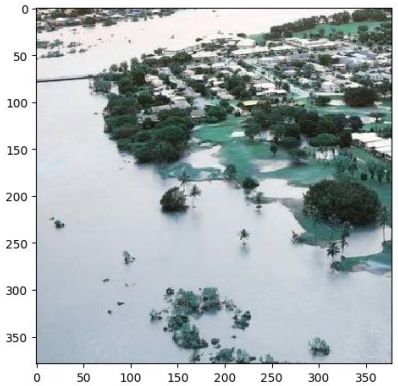


Clustering

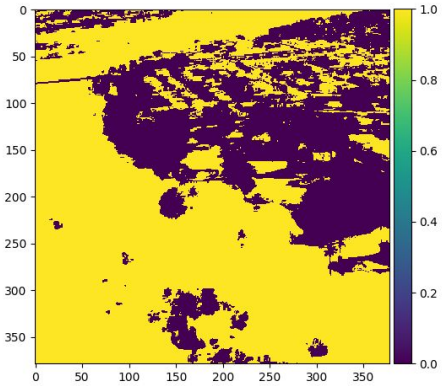
We used IsoData clustering algorithm with 2 main classes flood and non-flood

The algorithm is configured as need but we used :

- 2 main classes
- Maximum number of iterations 20
- Merge threshold 20 pixel
- And max variance 5

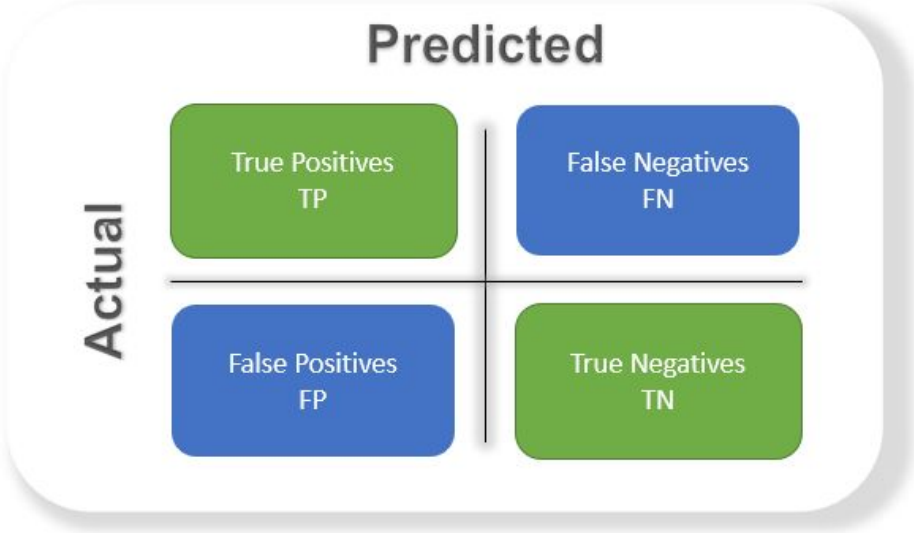


Original



Flooded Yellow part

Results and Evaluation



Results and Evaluation

Model	Confusion Matrix		Precision	Recall	Accuracy	Omission Error	Commision Error	F1 Score
ResNet50	68	2	0.96	0.96	0.964	0.04	0.04	0.96
	3	66						
Logistic Regression	58	12	0.82	0.82	0.82	0.18	0.18	0.82
	13	56						

Thank you