





Understanding Cloud Organization from Satellite Images

DL 3546 – University Of Toronto – December 2019

THE TEAM



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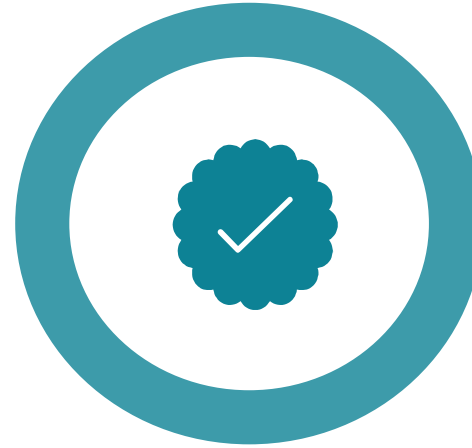


AGENDA

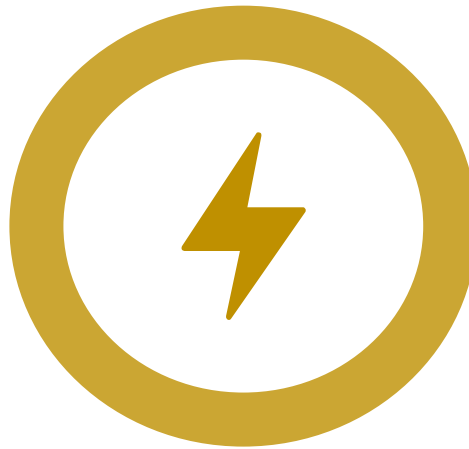
Problem



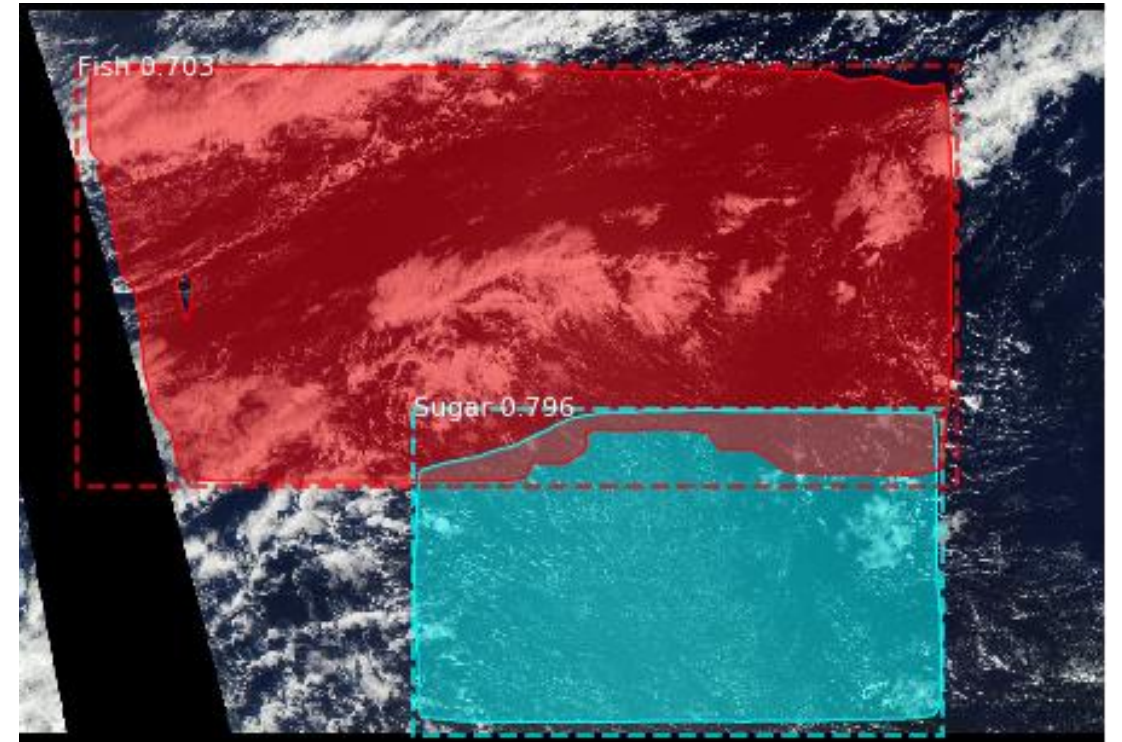
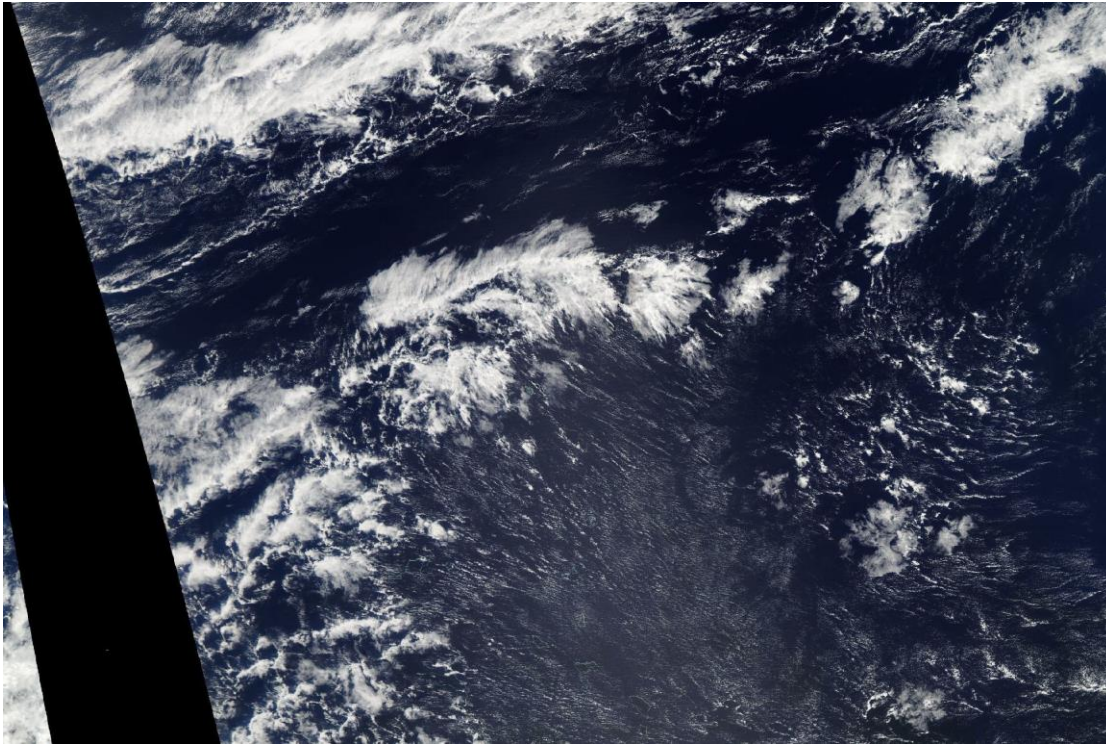
Key Findings



Solution

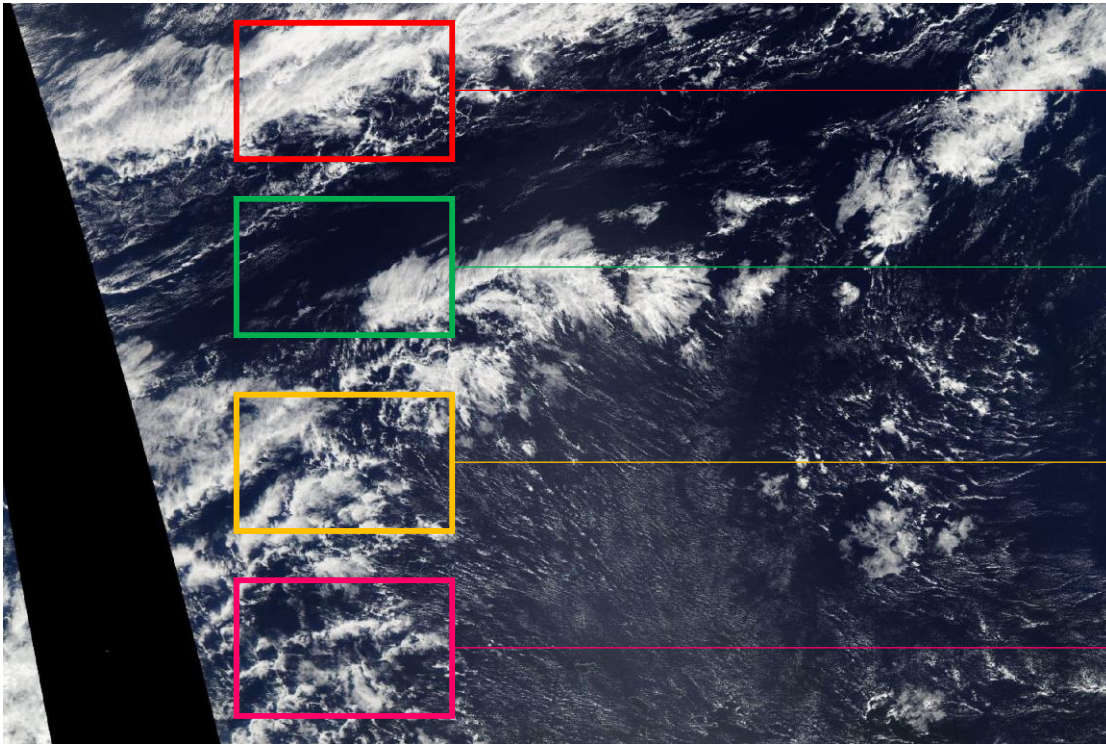


Problem Statement



Object Detection & Instance Segmentation

Problem Statement



Flower

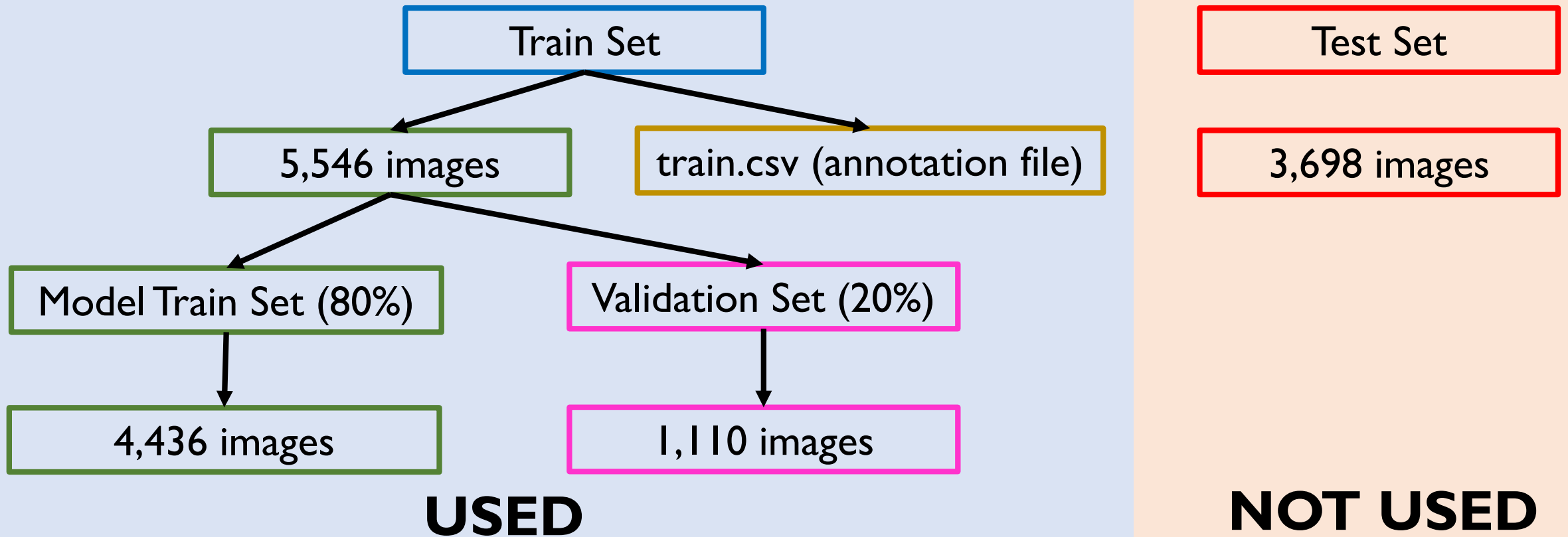
Fish

Gravel

Sugar

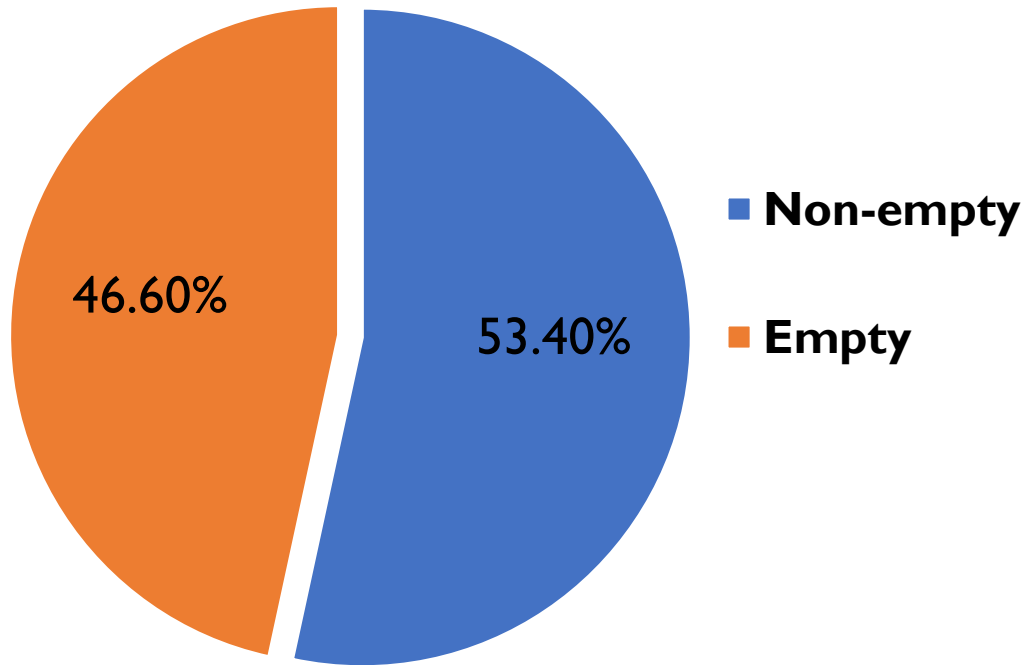
ALL
Or
NONE

Solution – Dataset

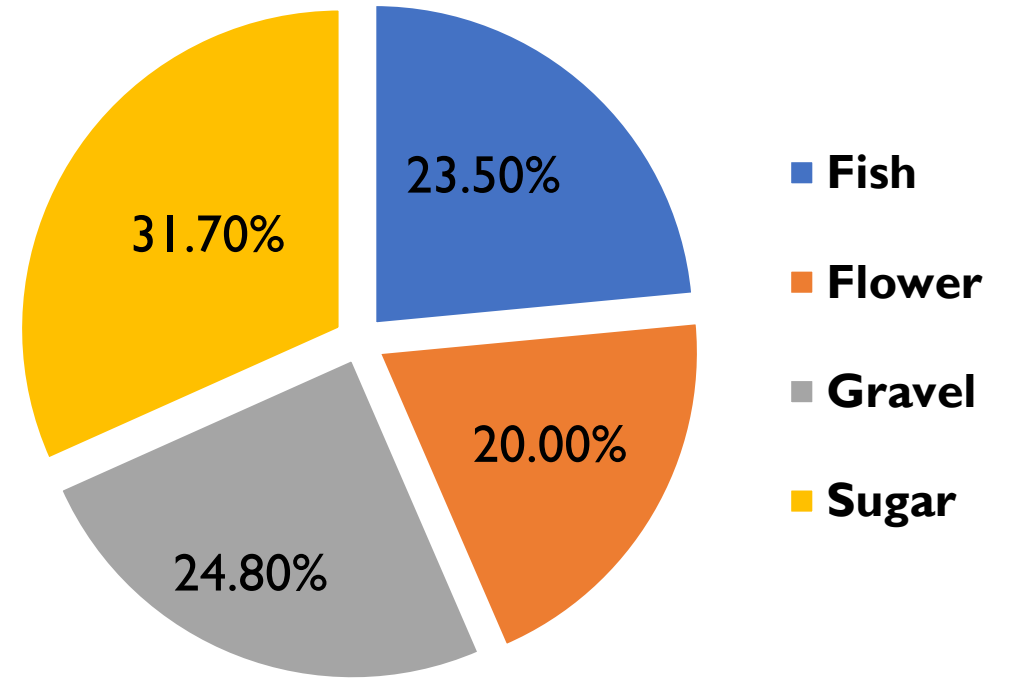


Solution – EDA

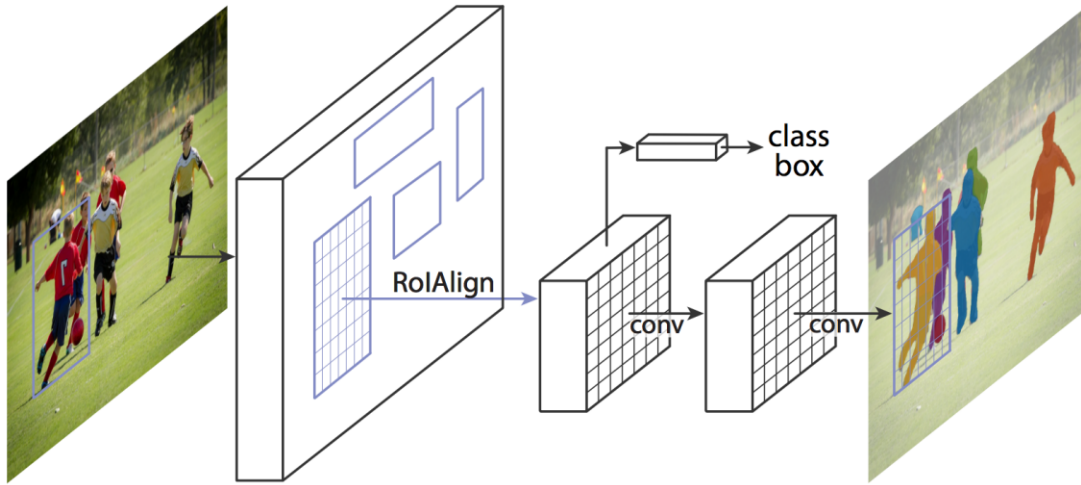
Masks



Cloud Types



Solution – Model



Model: Mask R-CNN (Detection & Segmentation)

Weight: Coco

Image Dimension: 1400 x 2100 (H x W)

Steps Per Epoch: 2,218

Validation Steps: 555

Confidence: 70% (minimum)

Heads Layer Epoch: 1 (few as possible)

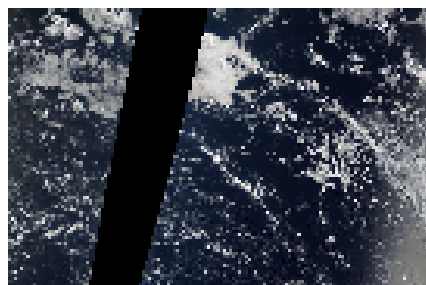
All Layer Epoch: 5 (Hardware limitations)

Training Time: ~16 hrs (Colab - GPU)

Evaluation Metric: Mean Average Precision (mAP)

Solution – Image Mask

H x W=1400x2100



Sugar



Flower



-



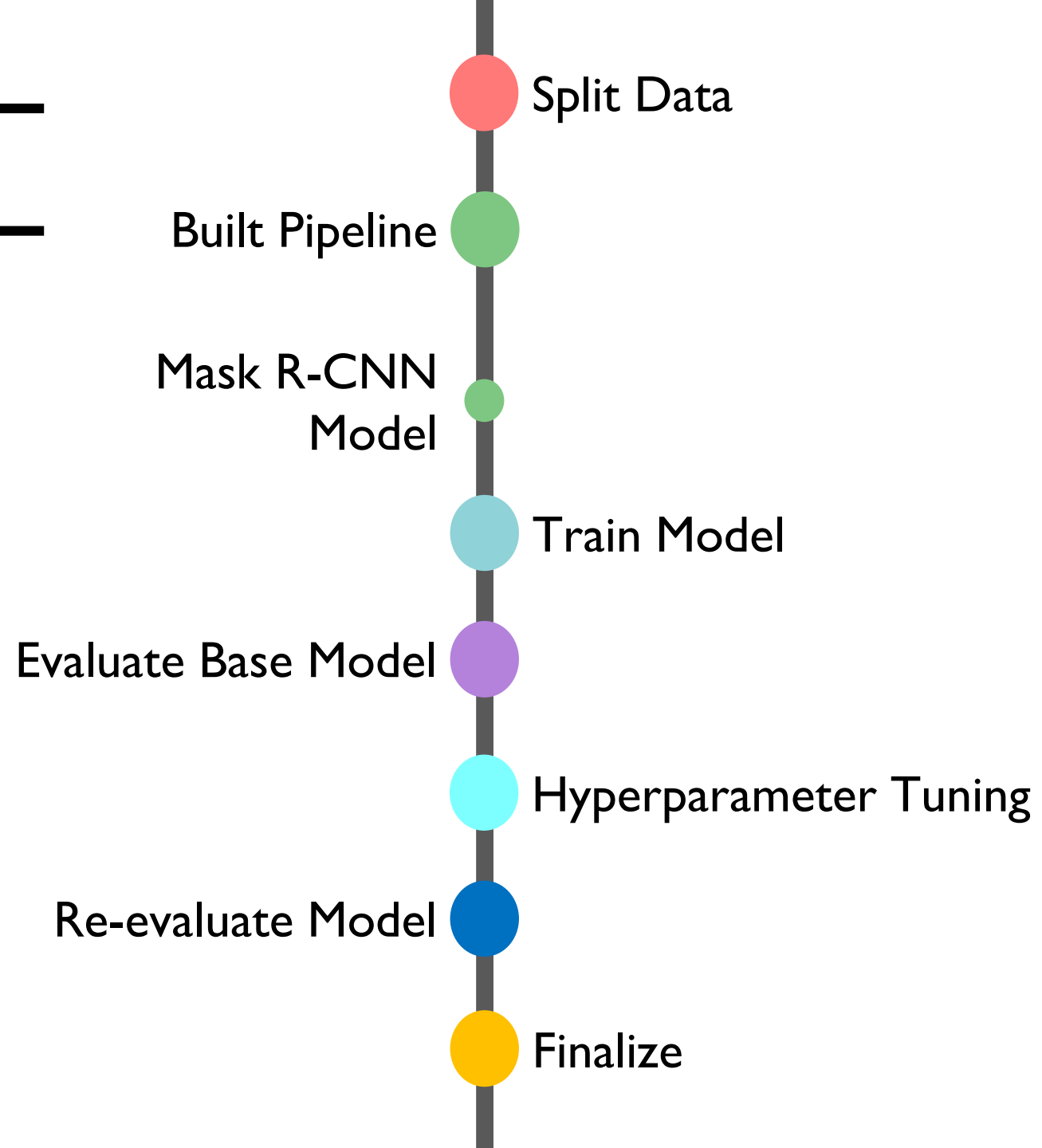
-



Image ID: 4216
Image Name: d9949bd.jpg



Solution – Journey



Key Outcomes

Produced a generalized model that **detects and segments** cloud types from a satellite image with a **mean average precision (mAP) score** of:

24.90 %

Train Dataset

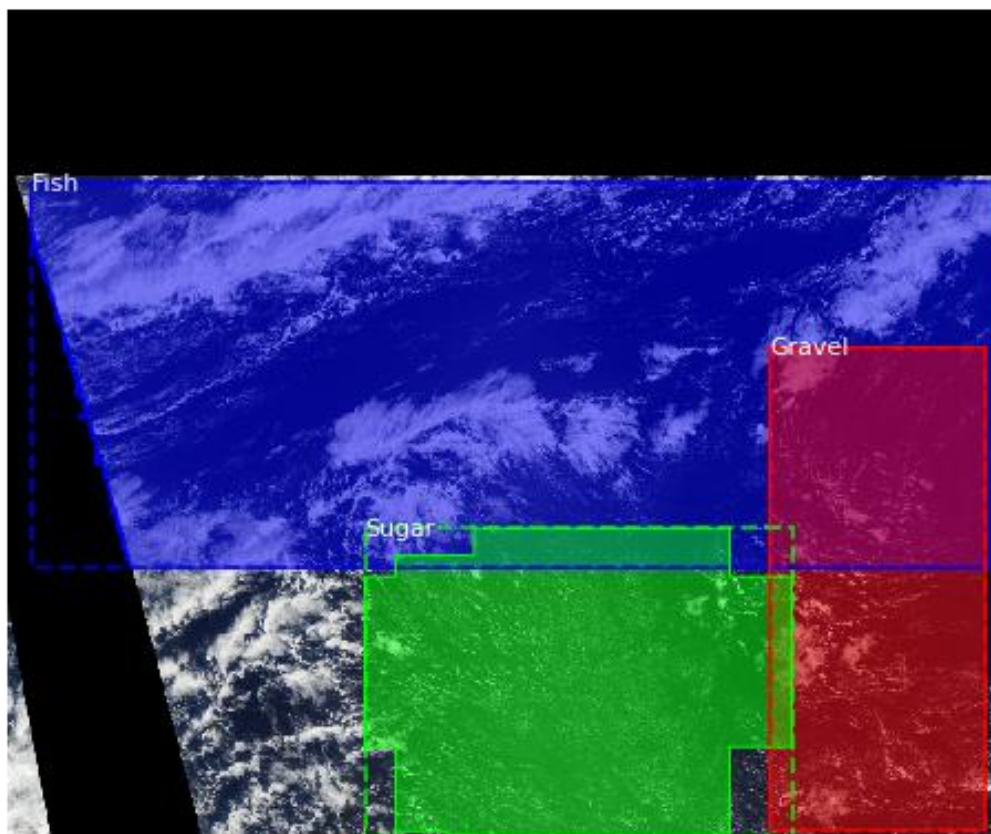
23.21 %

Validation Dataset

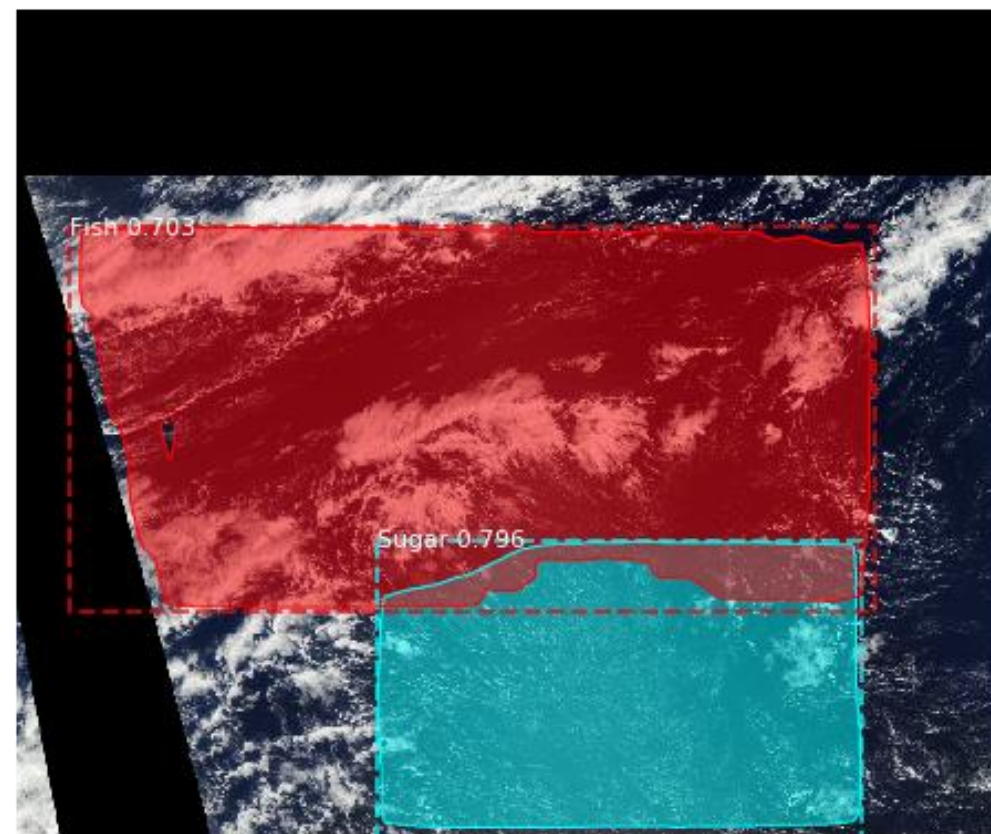
Key Outcomes

Image ID: 2460
Image Name: 009e2f3.jpg

Actual



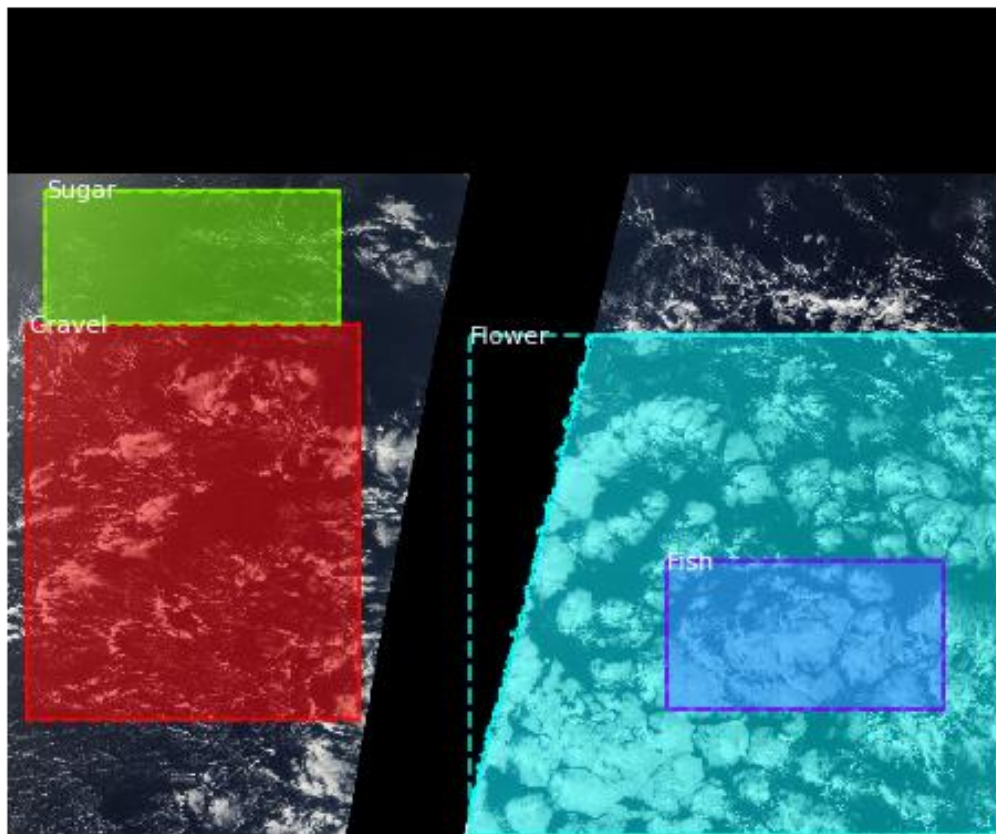
Predicted



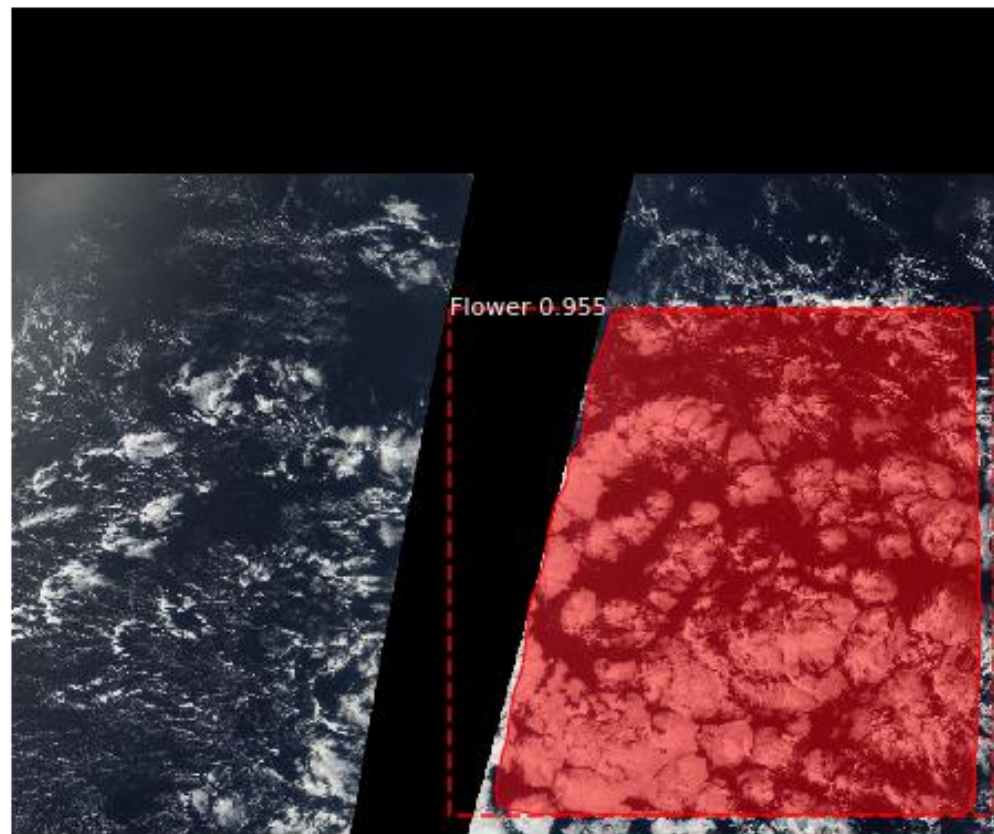
Key Outcomes

Image ID: 3501
Image Name: 7cfbbcc.jpg

Actual



Predicted



Next Steps

Train the model for more epochs (100)

Use Image Augmentation with pre & post processing

Experiment with different weights (Imagenet)

Experiment with different DL Packages (Py-torch) / Models (Faster R-CNN, U-Net)

Annotate images with segmentation masks

Thank You

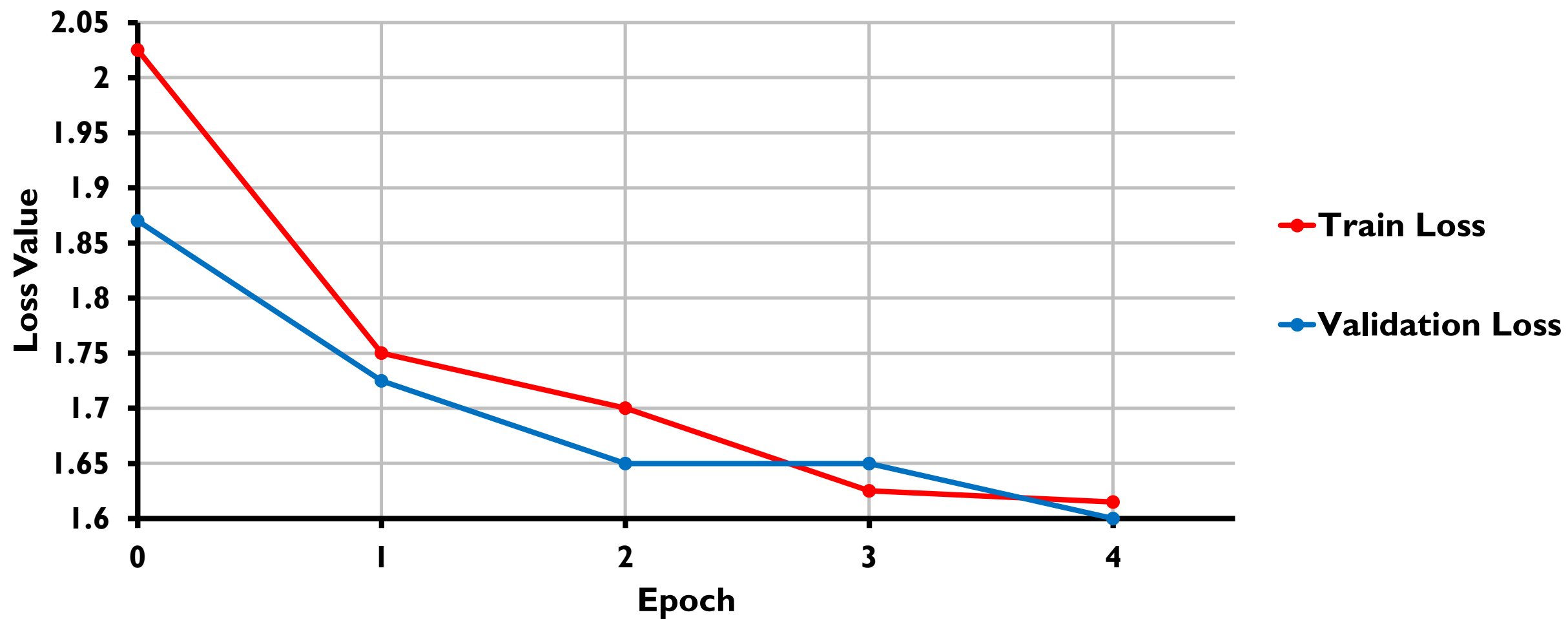
SCAN ME



<https://github.com/nishp763/SCS-DL-3546-Final-Project>

Appendix – Loss

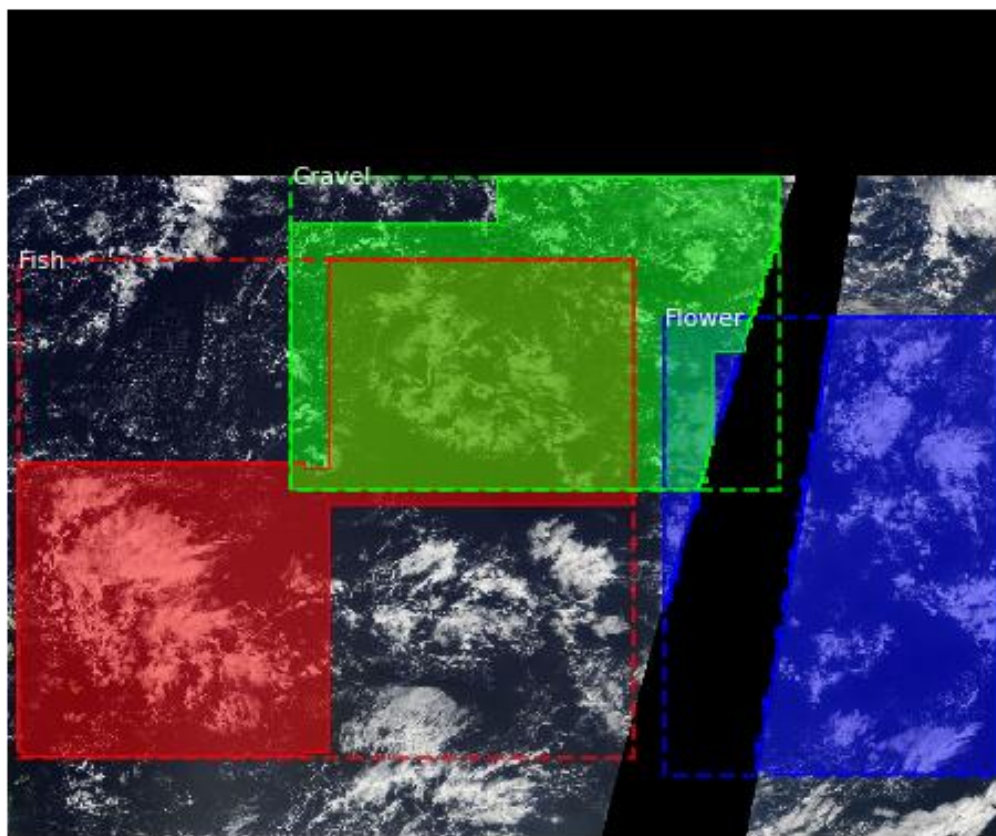
Loss Function



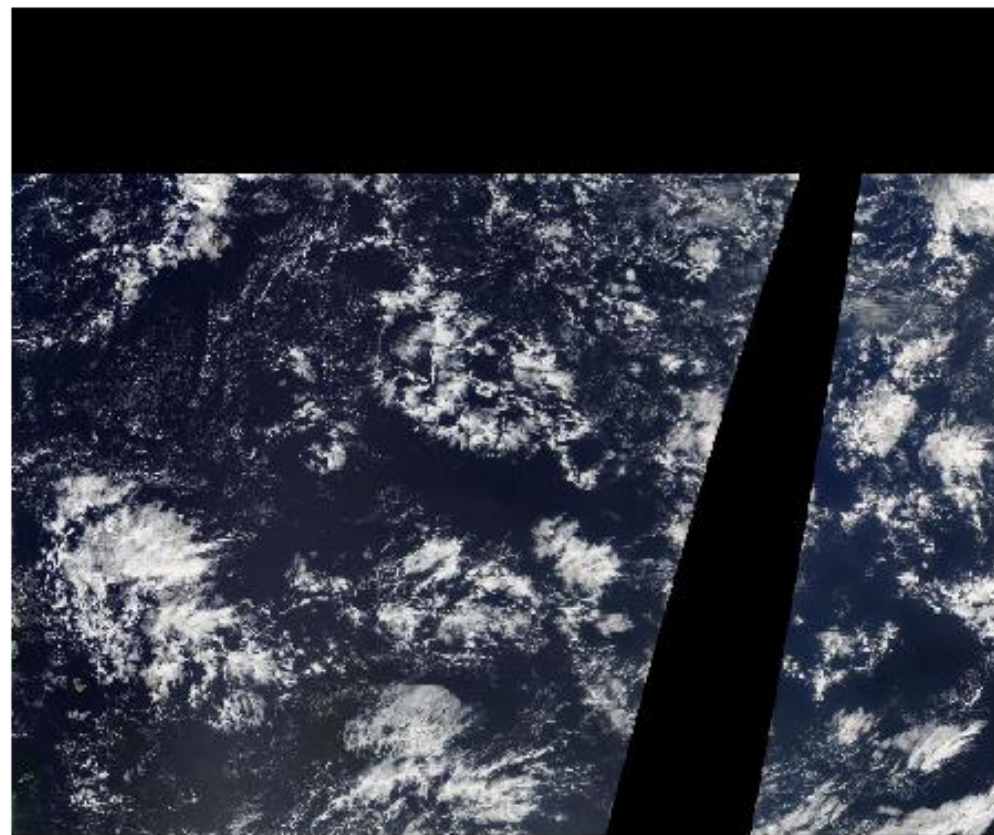
Appendix – No Detection

Image ID: 3512
Image Name: 191c732.jpg

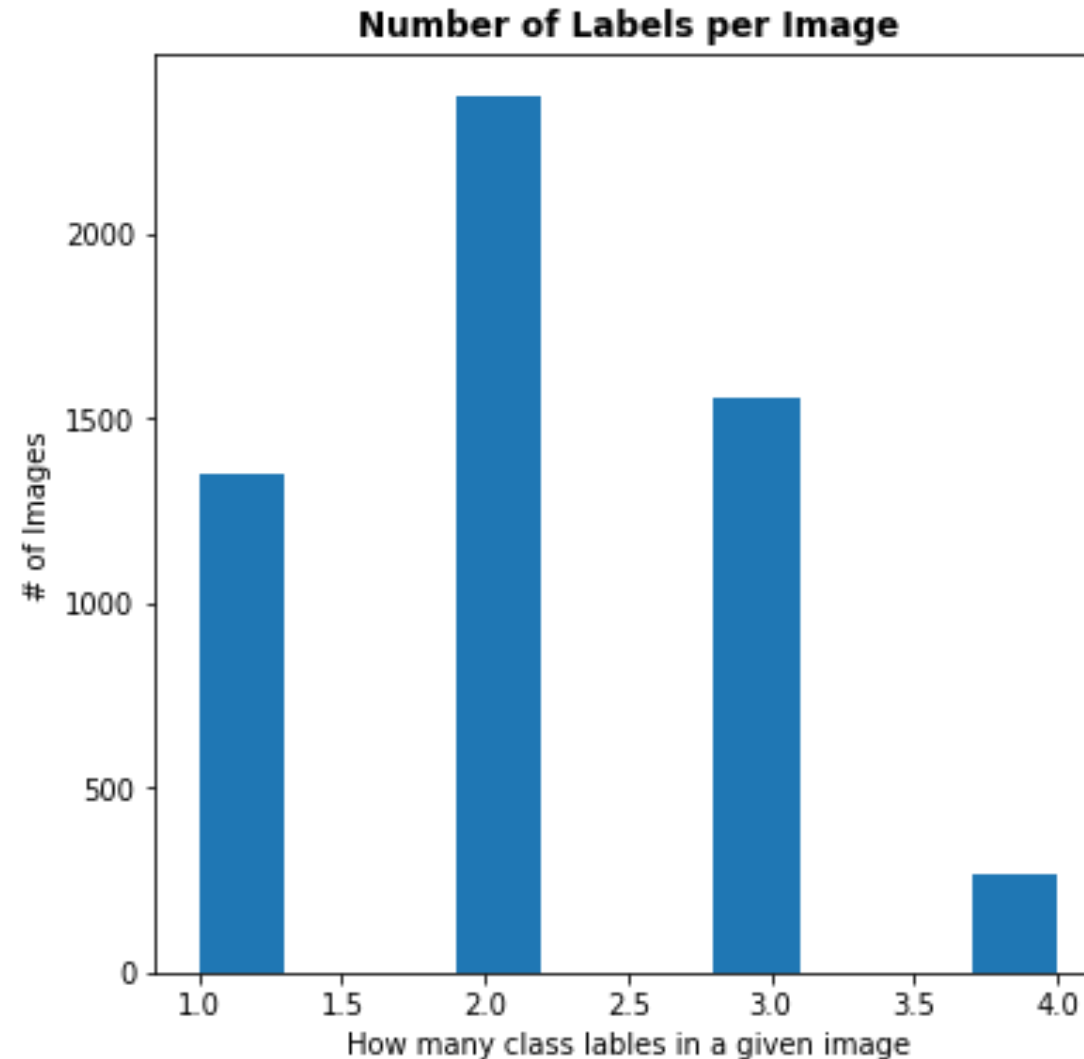
Actual



Predicted



Appendix – Label Frequency



Appendix – Correlation

Cloud type correlation heatmap

