



OCEAN SHIELD

Illegal Fishing Detection





DETECTING ILLEGAL FISHING ACTIVITIES USING AIS DATA



The Problem area:

- Severe **environmental impacts** due to indiscriminate net fishing that catches all species.
- Estimated **\$34 billion annual economic loss** globally due to IUU fishing.
- Gives space to perform other **Illegal Activities**

The Solution:

- Develop a **predictive model to identify** illegal fishing patterns among events of vessels turning their AIS off.
- Focus on **analyzing vessel behaviour** to detect illegal activities.

THE DATA

(53744, 14)

- Welch et - Unseen Fishing Hotspots
 - Data on **suspected AIS disabling events** highlights when vessels stop broadcasting, indicating potential illegal activities.
- Carrier Vessel Encounters
 - This dataset records fishing vessels transferring supplies or fish to carrier vessels. Indicating potential IUU.
- Fishing Effort
 - Adds information and features to Welch Dataset

- **Gap_id (index)**
- **Vessel_length_m**
- **Vessel_tonnage_gt**
- **Gap_hours**
- **Distance_to_High_Risk_Zone_m**
- **Distance_to_MPA_m**
- **Distance_event_start_to_end_m**
- **Distance_Difference_From_Shore_m**
- **Tonnage_per_meter**
- **Vessel_class_drifting_longlines**
- **Vessel_class_squid_jigger**
- **Vessel_class_trawlers**
- **Vessel_class_tuna_purse_seines**
- **Flag_encoded**
- **IUU_Classified ▲**

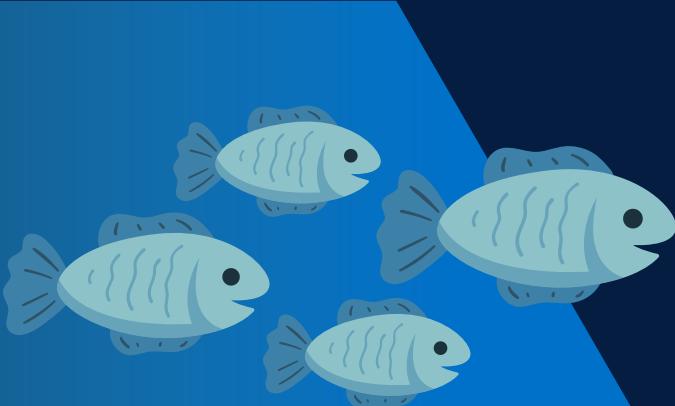


2017-2019

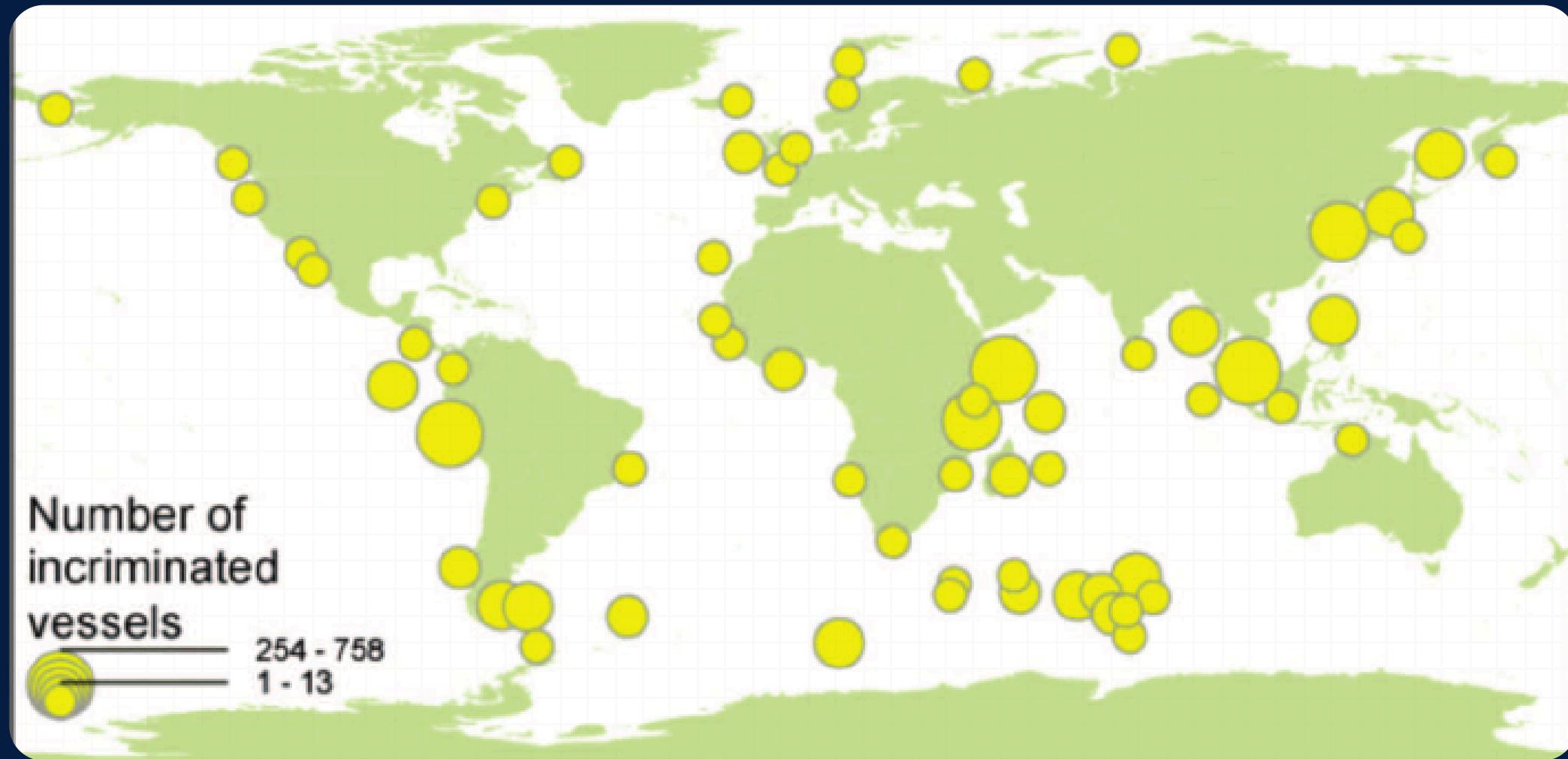
ISOLATION FOREST

Isolation Forest is **effective in detecting anomalies**, which is crucial for identifying IUU fishing patterns.

- IUU fishing activities often deviate from normal fishing patterns in various ways, such as unusual locations, times, speeds, or behaviors. Isolation Forest can detect these diverse patterns without specific pre-defined rules.
- By incorporating features like distance to high-risk zones or MPAs, Isolation Forest can focus on regions where IUU fishing is more likely, enhancing its effectiveness in detecting relevant anomalies.



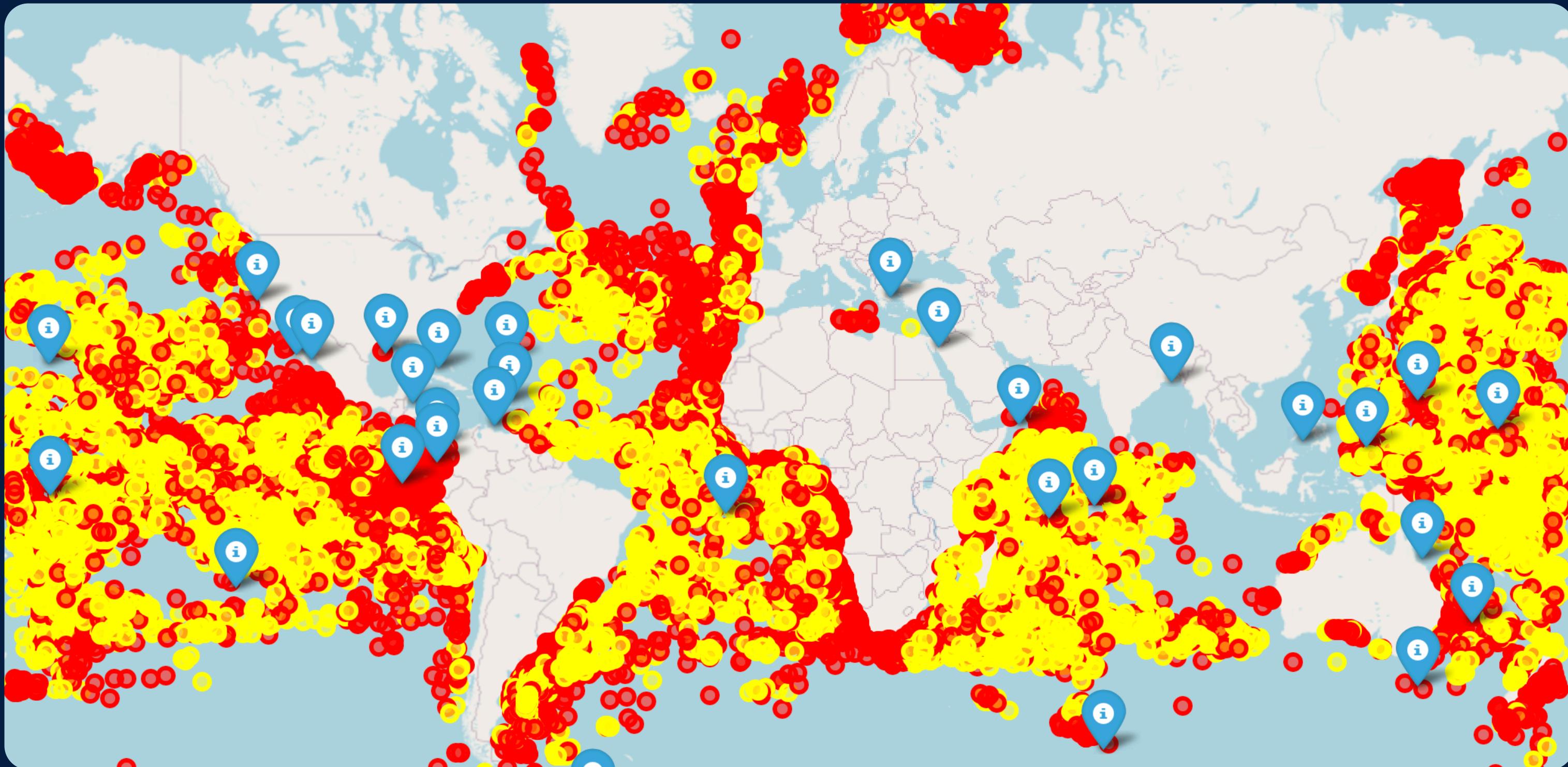
IUU KNOWN REGIONS



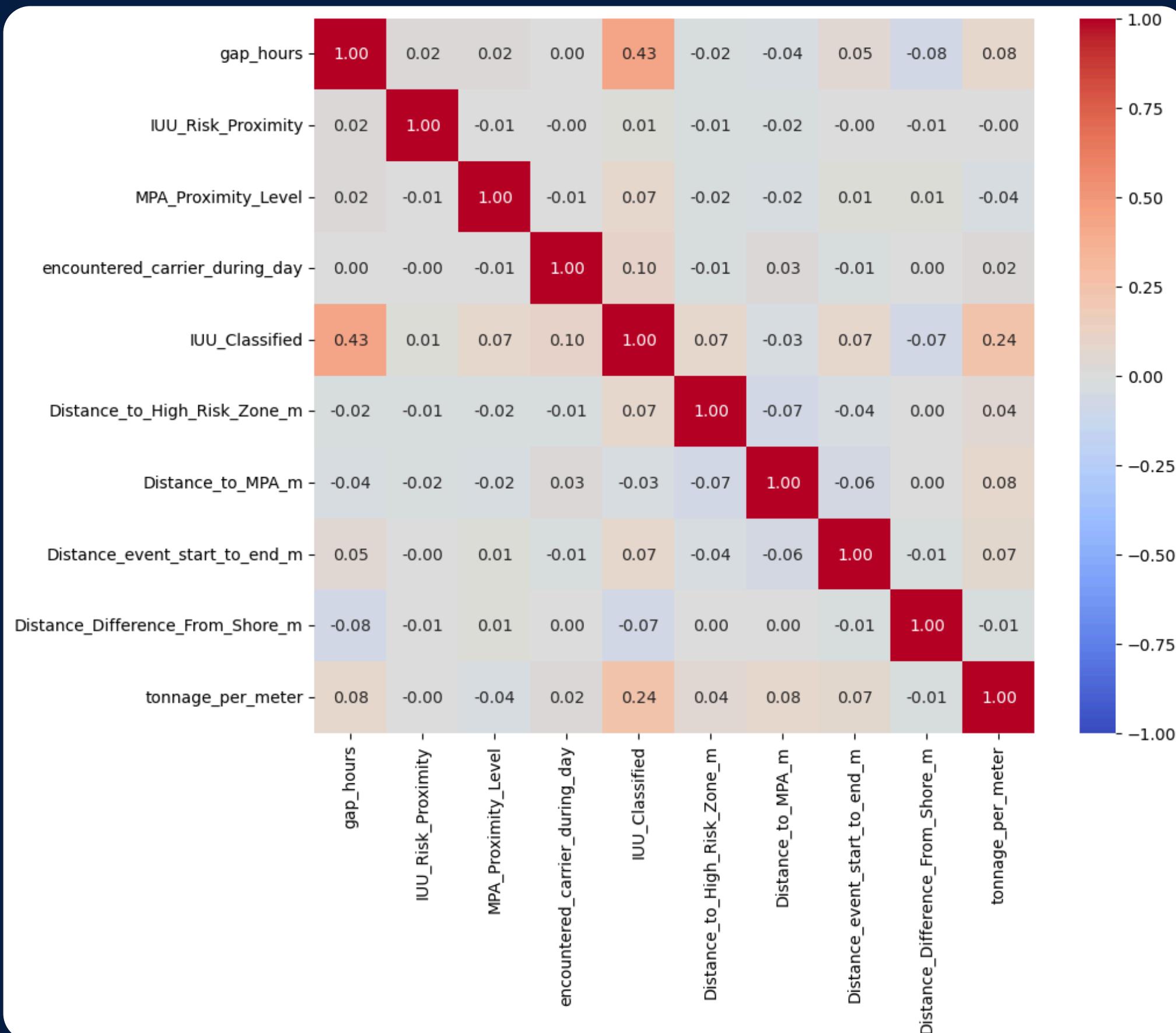
MAP OF GLOBAL ILLEGAL FISHING INCIDENTS,

SOURCE: SEAS, OCEANS AND FISHERIES, RASHID SUMAILA

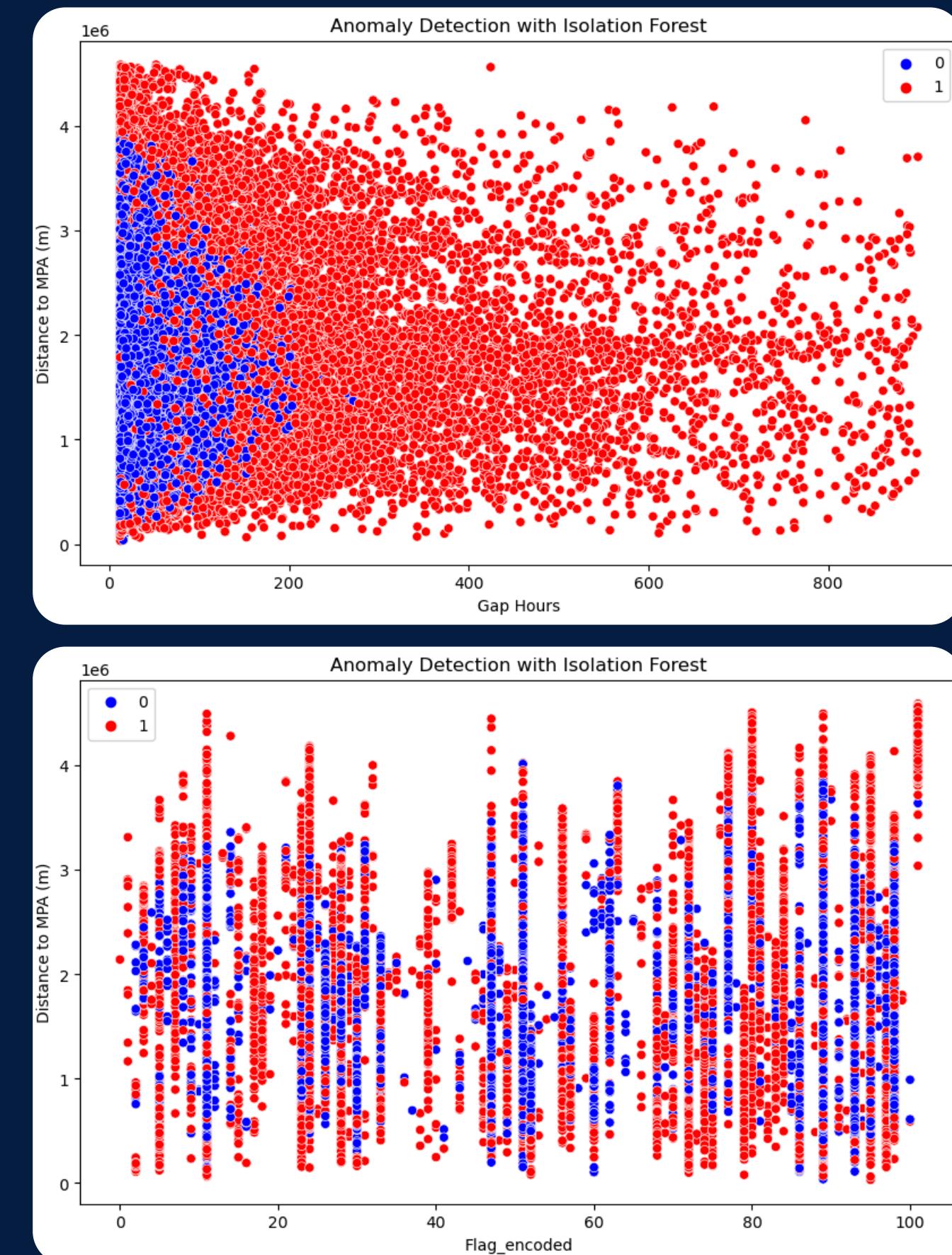
ISOLATION FOREST LABELS



CORRELATION MATRIX



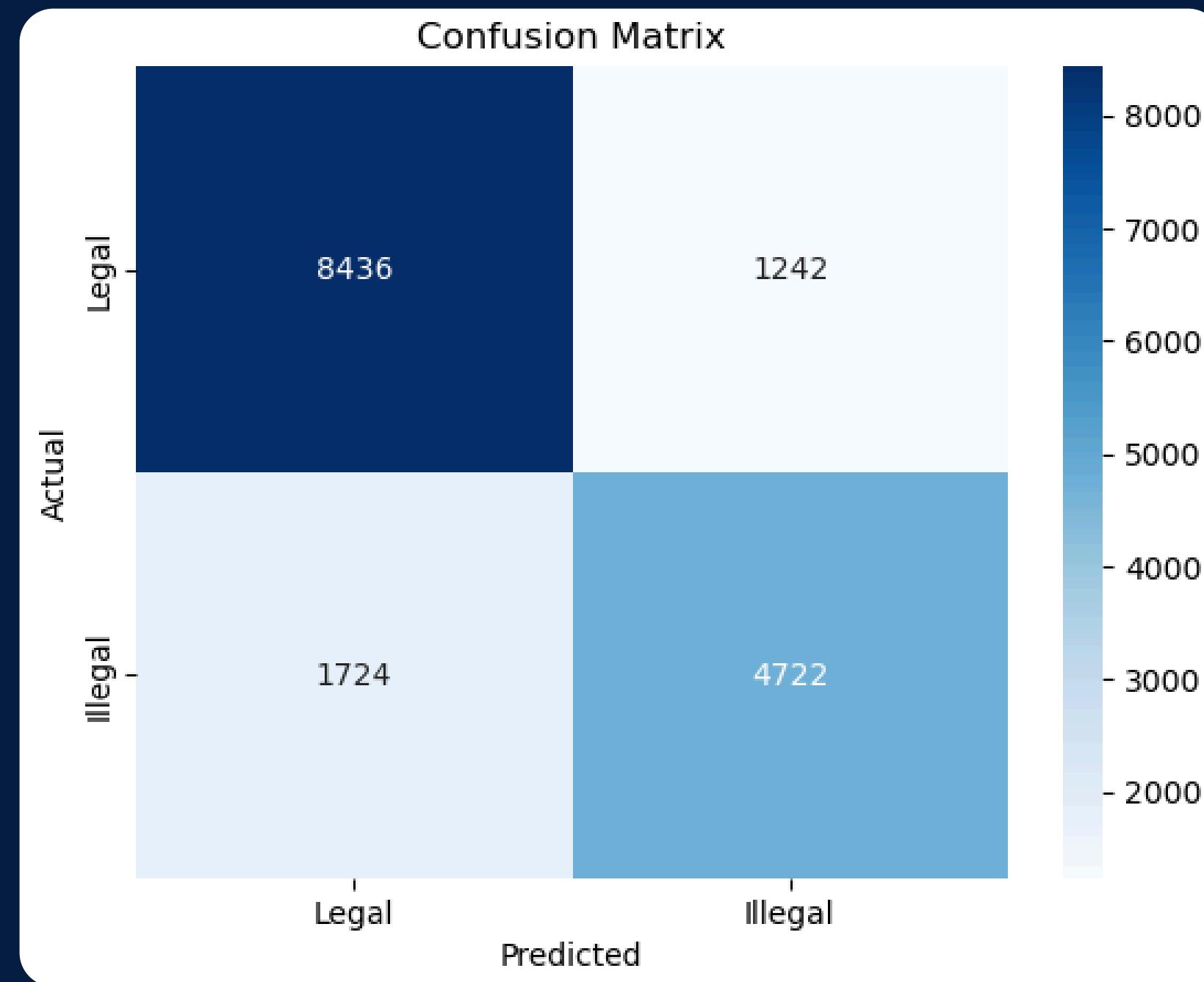
ANOMALY DETECTION



MODELS

Model	Accuracy	Precision	Recall	F1
Logistic Regression	81.6%	81%	82%	81%
Random Forest	91.4%	91%	91%	91%
XGBoost	91.6%	92%	91%	91%
MLP Neural Networks	90%	90%	89%	90%

MODELS



Prioritizing sensitivity (ensuring that as many true anomalies are detected as possible) over specificity (avoiding false positives).

DEMO

Sprint 3 - Presentation

localhost

Model Comparison for Illegal Activity Detection | Gamma

your_script

User Input Parameters

Input Guide:

- Gap Hours: 12 - 899
- Distance to MPA (km): 30.90 - 4592.03
- Vessel Class: Choose from the dropdown
- Flag: Choose from the dropdown
- Model: Choose from the dropdown

Gap Hours
23

Distance to MPA (km)
1945.93

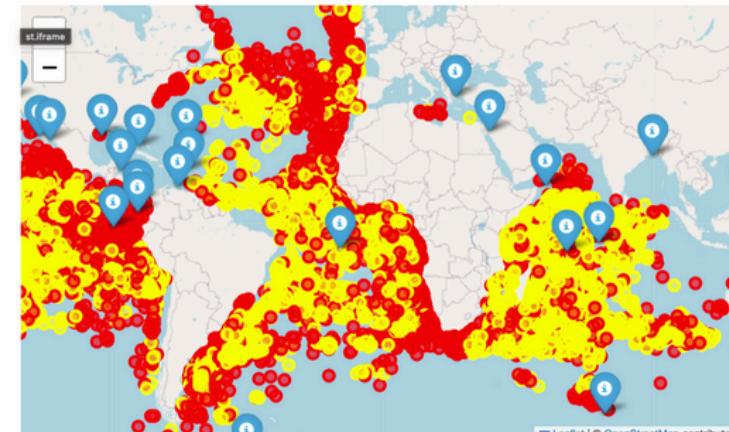
Vessel Class
drifting_longlines

Flag
CHN - China

Select Model
Logistic Regression

Marine Protected Areas and Vessel Activities

Map displaying Marine Protected Areas and Vessel Activities





THANK YOU

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