SMART INDIA HACKATHON 2024

PSID – 1655

Detecting oil spills at marine environment using AIS and satellite datasets

Smart Automation

(SOFTWARE)

TEAM TECHEXAGON

MENTOR

Dr. R Senthamil Selvi, Professor.

TEAM MEMBERS

Sankaranarayanan M
Sibiraj M
Sivakumar B
Hingsly Priya R
Gayathri R
Claribel Hermia P

IDEA TITLE

- The automatic identification of oil leaks and spills from ships using **AIS (Automatic Identification System)** and satellite datasets involves integrating **real-time tracking** and advanced **remote sensing technologies** to monitor marine environments effectively.

- AIS provides crucial information of the vessel's
  - ✓ Unique Identifiers [IMO number, call sign]
  - ✓ Real-time positional data [latitude, longitude]
  - ✓ Speed & Course Over Ground [SOG & COG]
  - ✓ Type of vessel , Dimensions & Draught
  - ✓ Heading, Destination & Estimated Time of Arrival (ETA)
  - ✓ Cargo details ,which thereby used to **detect a vessel in distress**.

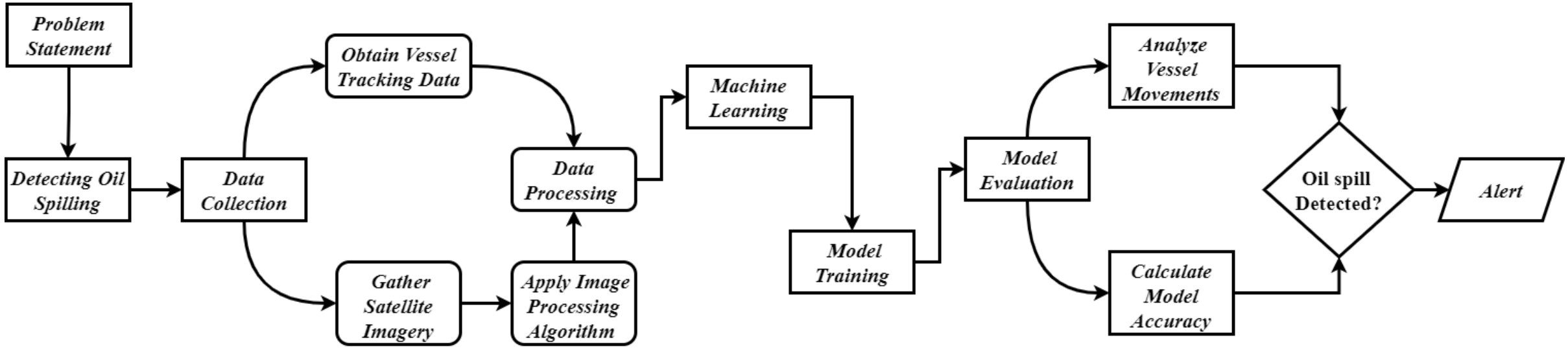
- AIS data have to be **monitored for anomalies** such as sudden changes in speed or course, erratic movements or unexpected stops. These irregularities can signal potential distress, prompting further investigation.

- The integration of AIS data can help in the **early detection** of oil leaks from a ship or vessel. The information can be passed on to the regulatory authorities for a **quicke**r and **more efficient** response.

TECHNICAL APPROACH

What Technology Will Be Used ?

- ***Programming Languages*** -> PYTHON
  - **Isolaion Forest** ML algorithm from sklearn.
    - ✓ Used to detect anomalies.
  - **Sentinalhub** (python module)
    - ✓ Used to access and integrate satellite data.
  - **Opencv**
    - ✓ Used for image processing.
- ***Tools*** -> API's from websites
  - **Marinetrafffic**
    - ✓ Provides access to real-time and historical vessel data.
  - **Sentinalhub**
    - ✓ Provides satellite images and data



FEASIBILITY AND VIABILITY

- **Reliable** APIs are used for data collecting.
- The Python programming language has a rich ecosystem of libraries and packages for a variety of tasks, such as
  - Image processing
  - Visualization
- Satellite imagery can be used to identify instances of piracy and unauthorized goods.

<u>Risks and overcoming strategies</u>:

1. **Risk**: AIS data noise and resolution constraints in satellite imagery.
   - ***Overcoming***: Boost data dependability with AIML and cross-referencing information from several sources.
2. **Risk**: A behaviour's threshold for being labelled as abnormal is arbitrary.
   - ***Overcoming***: Isolation forest is an accurate algorithm to find anomalies in data.
3. **Risk**: Possible failures in ship equipment and parts
   - ***Overcoming***: A machine learning approach that uses maintenance records and historical data to forecast maintenance needs early.

RESEARCH AND REFERENCES

Study Area:

- ***Off Mumbai:***
  - ✓ https://drive.google.com/file/d/1HUisEfMA20ilODdeoRYVneG2i1ZbRBNB/view?usp=drive_link
  - ✓ https://www.imo.org/en/KnowledgeCentre/

Dataset Link:

- ***AIS information:***
  - ✓ https://www.marinetraffic.com/en/ais/home/centerx:73.8/centery:13.7/zoom:8
  - ✓ https://www.aishub.net/
- ***Satellite datasets:***
  - ✓ https://dataspace.copernicus.eu/ **SNAP tool for processing SAR datasets**
  - ✓ https://step.esa.int/main

Case Reference:

- *Mr. Prabakar R [Marine Engineer] – **35 yrs** Of Shipping Experience in crude oil tankers*