SMART INDIA HACKATHON 2024

- **Problem Statement ID – SIH1658**
- **Problem Statement Title – Development of a versatile and fast algorithm for the optimal ship routing**
- **Theme – Transportation & Logistics**
- **PS Category – Software**
- **Team ID – 1390**
- **Team Name – Eureka 202**

NavYatra: Fast and Safe Ship Routing in the Indian Ocean

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Proposed Solution

A website that provides **AI based** ship routing solution by calculating an optimized route based on: Ship data, weather data, arrival and destination.
It continuously updates in **real-time** using **3D Dynamic Programming** while adapting to conditions and acting on emergencies

How It Addresses The Problem

- ➔ It provides an optimum route using **A*** and **RRT algorithm** for initial population(routes).
- ➔ Ship specifications, total price and weather conditions are considered for optimum solution.
- ➔ It helps conserve time, fuel, money, etc.

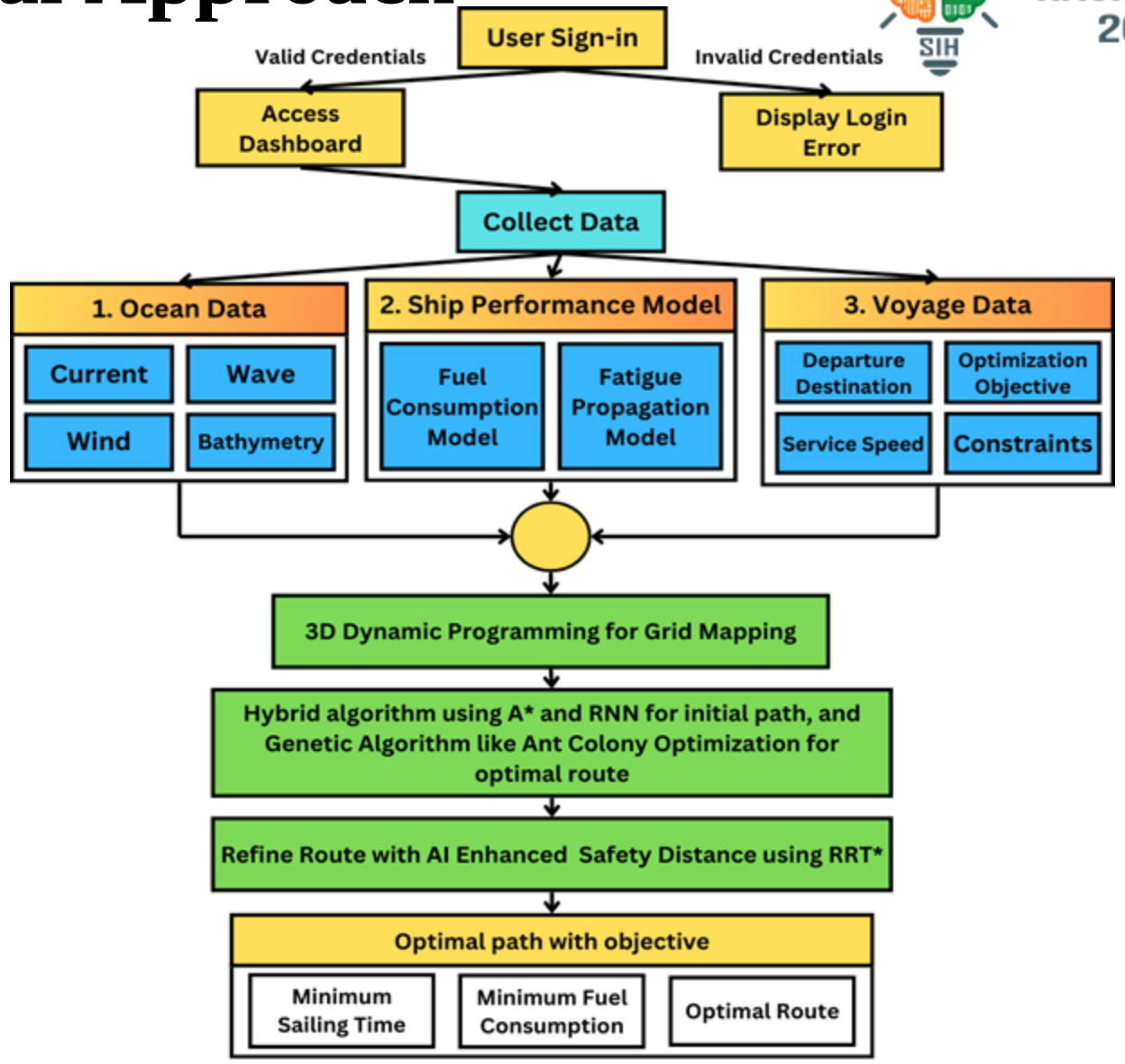
Innovation & Uniqueness

- ➔ Integration of **IMACO genetic algorithm**.
- ➔ **AI**-based route adjustments based on weather data.
- ➔ **RNN** for accurate weather prediction(**ARIMA/SARIMA**)
- ➔ Use of **RRT** for **MESS** (Multi Ellipse Safety System)
- ➔ Dynamic cost modeling
- ➔ Interactive Visualization

Technical Approach

Technology Stack

Programming Languages: Python, R, HTML5, CSS3, JavaScript
Frameworks: Flask, Django, Node.js, Express.js, AngularJS, React.js
Data Science & Machine Learning: PyTorch, Keras, TensorFlow, Scikit-learn, Dask, Ray, Seaborn, Matplotlib, Plotly, Tableau
DevOps & Deployment: AWS, Microsoft Azure, Jenkins, Kubernetes
Databases: PostgreSQL, MongoDB
Version Control & Collaboration: Git, GitHub
Mapping & GIS: ArcGIS, Google Earth, Mapbox
Maritime Industry-Specific Tools: MarineTraffic



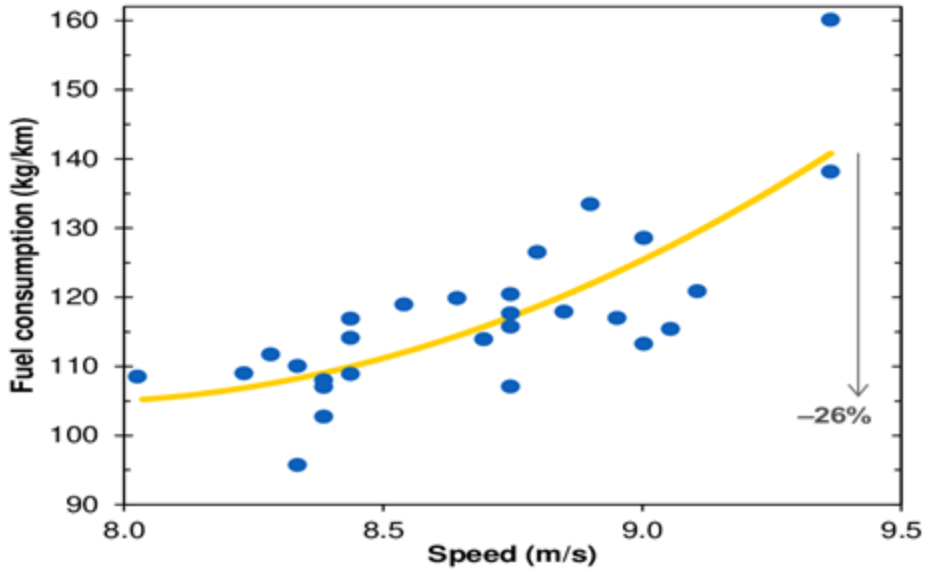
Feasibility And Viability

01	Feasibility	• Dynamic Path Calculation • Less Computation Power and Time • Using RNN to analyze historical weather data
02	Challenges & Risks	• Static Grid Are Fixed • Finding Optimal Route • Safety of the Ship
03	Strategies	• 3D Dynamic Programming Accounts for Environmental Changes • Using Hybrid Algorithm Model • Using RRT* for Multi-Ellipse Safe Space

Impact And Benefits

Impact

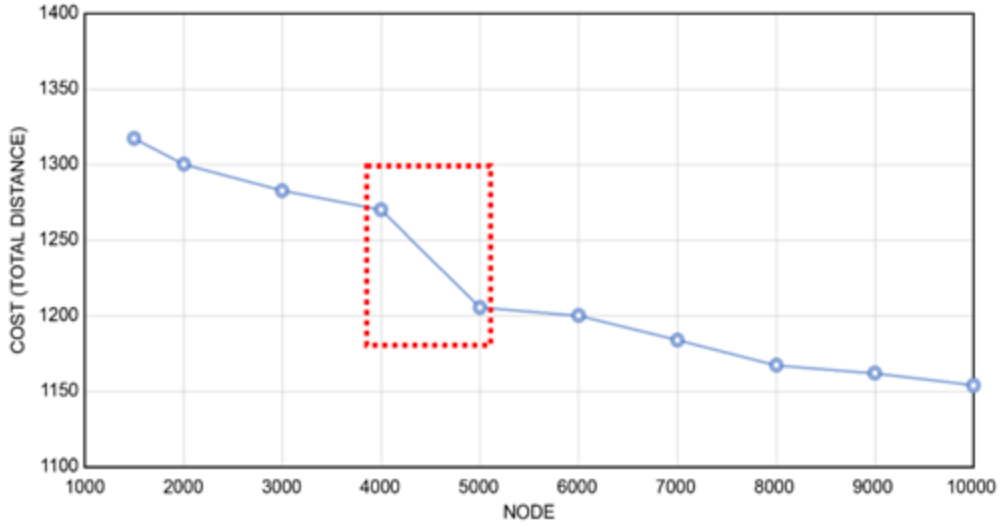
1. Potential **15%** fuel consumption reduction.
2. **20%** weather-related event reduction.
3. Economic growth through improved routes and reduced ship scrapping.



Benefits

Social: Improved safety for **6 million** sailors.

1. Economic: Reduction in operation expenses by **$1.5 billion**.
2. Environmental: **10-20%** less energy consumption.



Comparison of the cost based on the number of nodes.

Research And References

1. Weather Route Optimization Method of Unmanned Ship Based on Continuous Dynamic Optimal Control(2022).(https://www.mdpi.com/2071-1050/14/4/2165)

2. Voyage optimization algorithm for ship safety and energy efficiency(2018).(https://research.chalmers.se/publication/503070/file/503070_Fulltext.pdf)

3. Development of Ship Route-Planning Algorithm Based on Rapidly-Exploring Random Tree (RRT) Using Designated Space(2022).(https://www.mdpi.com/2077-1312/10/12/1800)

4. Optimum ship routing for the north Indian Ocean region – a decision support system.(https://www.discoveryjournals.org/discovery/current_issue/v52/n243/A21.pdf?)

5. Indian National Center for Ocean Information Services (INCOIS).(https://incois.gov.in/portal/osf/osf.jsp)

6. Youtube video 1 -(https://www.youtube.com/watch?v=ct9v-mQgYqE)

7. Youtube video 2 -(https://www.youtube.com/watch?v=wCTdHRTWtNI)