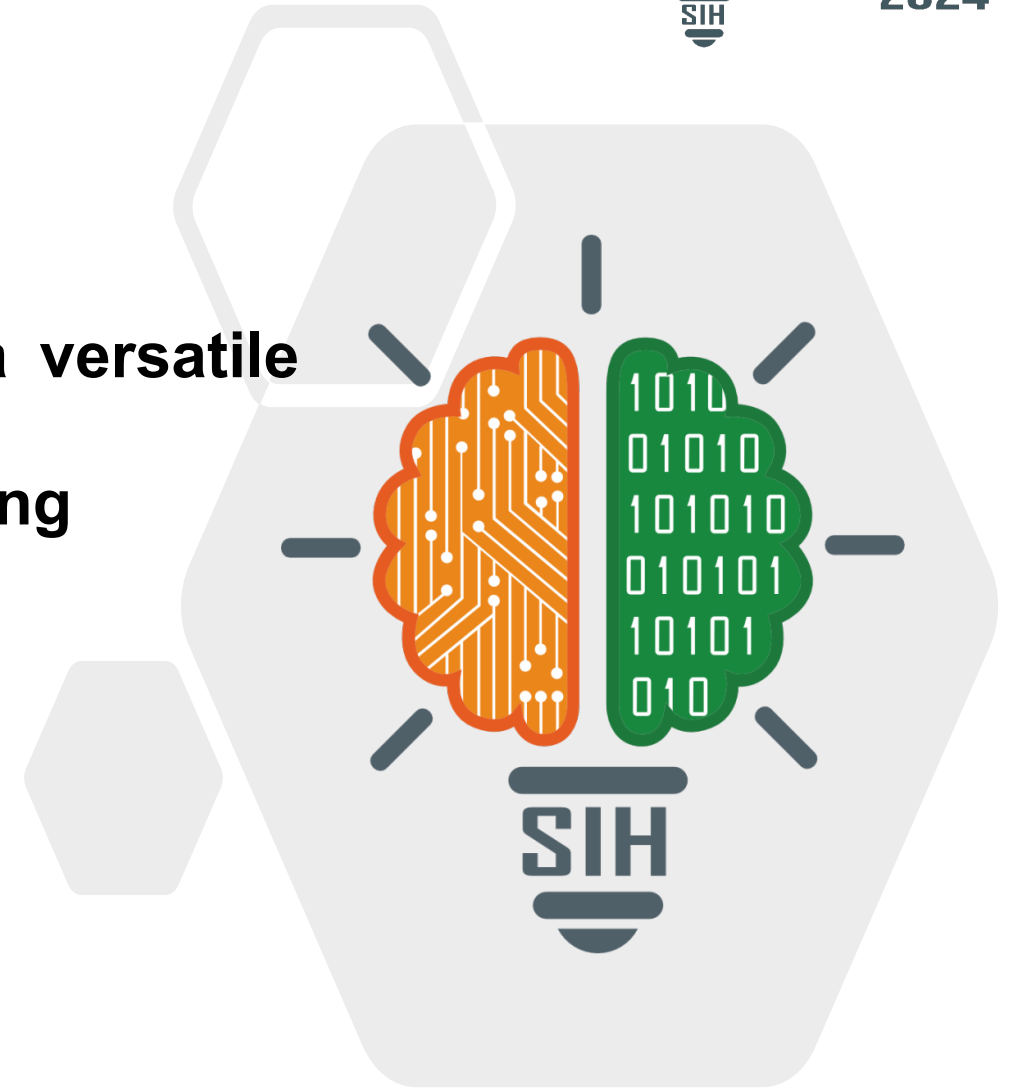


## TITLE PAGE

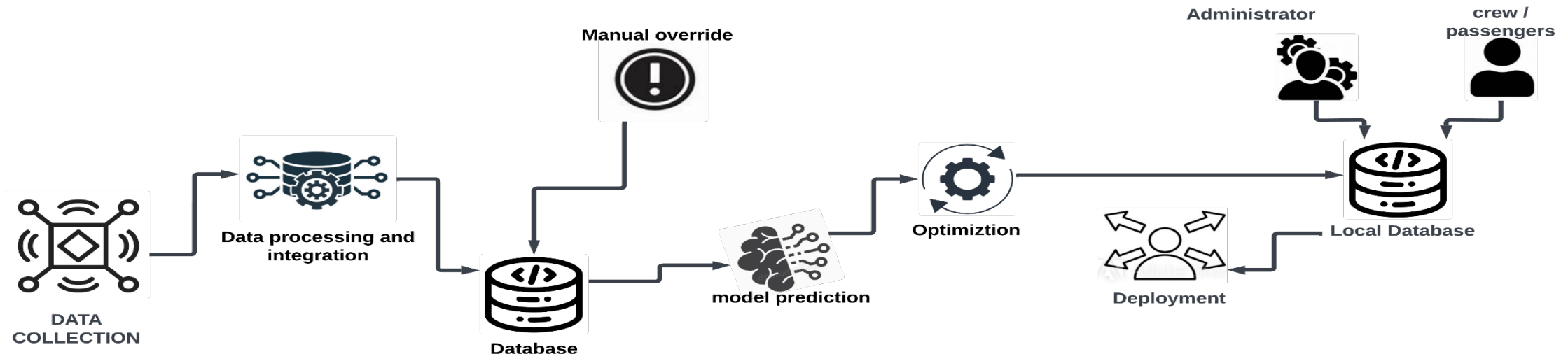
- Problem Statement ID – 1658
- Problem Statement Title-Development of a versatile and fast algorithm for the optimal ship routing
- Theme-Transportation & Logistics
- PS Category- Software
- Team ID- 38195
- Team Name - FutureX



## ❖ Proposed Solution

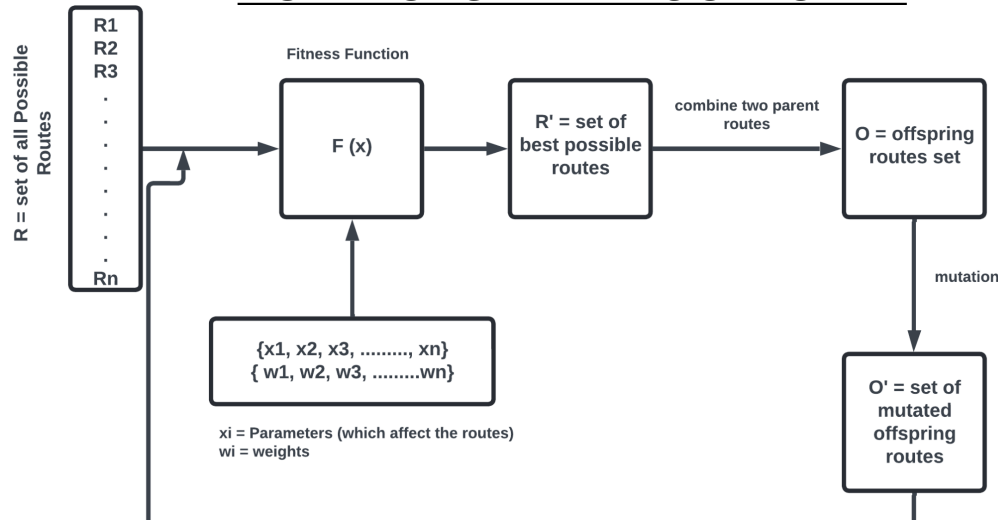
- User login via **authenticated documents and aadhaar card**, according to their **role** during the voyage; allows to give **access control** and maintain **data privacy**.
- **Customization** based on several parameters such as, the travel time, passenger comfort and route safety depending on the user suggestion
- **Operational users** can view real time route updates, safety alerts, fuel and weather monitor, port communication depending on their specific task.
- **Management Authorities** have the access to fuel and cost analytics, fleet wide monitoring, business reports, centralized alerts.
- **Passengers** login will enable features like emergency alert systems, comfort optimization.
- Allows **human intervention** in the system, **overriding** the automated optimization algorithm.
- Combining the data from **different sources** like satellites, fleet control room, IoT based ship sensors etc to provide **real time data** on engine performance, fuel consumption, weather etc.
- Divides the Indian Ocean map into **grid based matrix** for better
- Store data in **offline mode** and **sync automatically** when connection is restored. **Downloadable data** for offline access.
- **Feedback** and report available at all levels.

## WORKFLOW

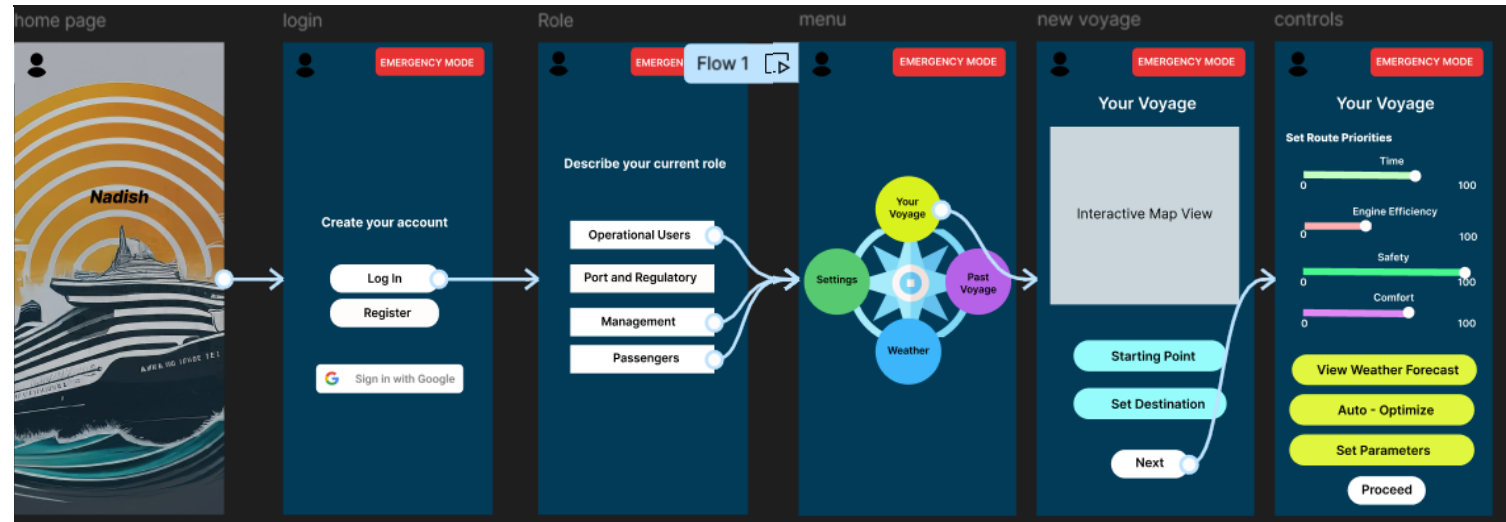


- Genetic algorithm or **Multi objective genetic algorithm** for handling multiple objectives / variables (minimum fuel consumption, maximum safety etc).
- For a single route, **weights** are given to different parameters on **priority basis** and accordingly the **fitness of route is calculated** by passing through a function. The fittest routes are then taken as parent routes and further combined to produce **offspring routes**.
- Random **mutations** in offspring routes are done to ensure **diversity** in routes.
- The process is repeated until **maximum accuracy** is achieved and no further optimization is possible.
- Combines other algorithms like **dynamic programming, BFS, Dijkstra's Algorithm** for initial route calculation with Genetic Algorithm to optimize the solution in real time.
- Uses **open source** and easily accessible language- **Python** and its libraries like **DEAP, PyGad** for Genetic Algorithm, **Matplotlib** for visualization. **Leaflet.js** to build maps and visualization of routes. **Flutter** for app interface and **Python Flask** for server side processing algorithm.

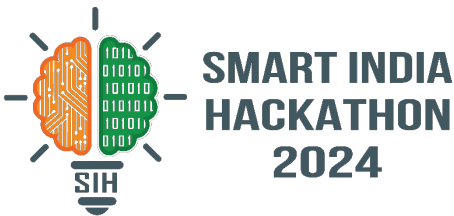
## HOW DOES THE ALGO WORK?



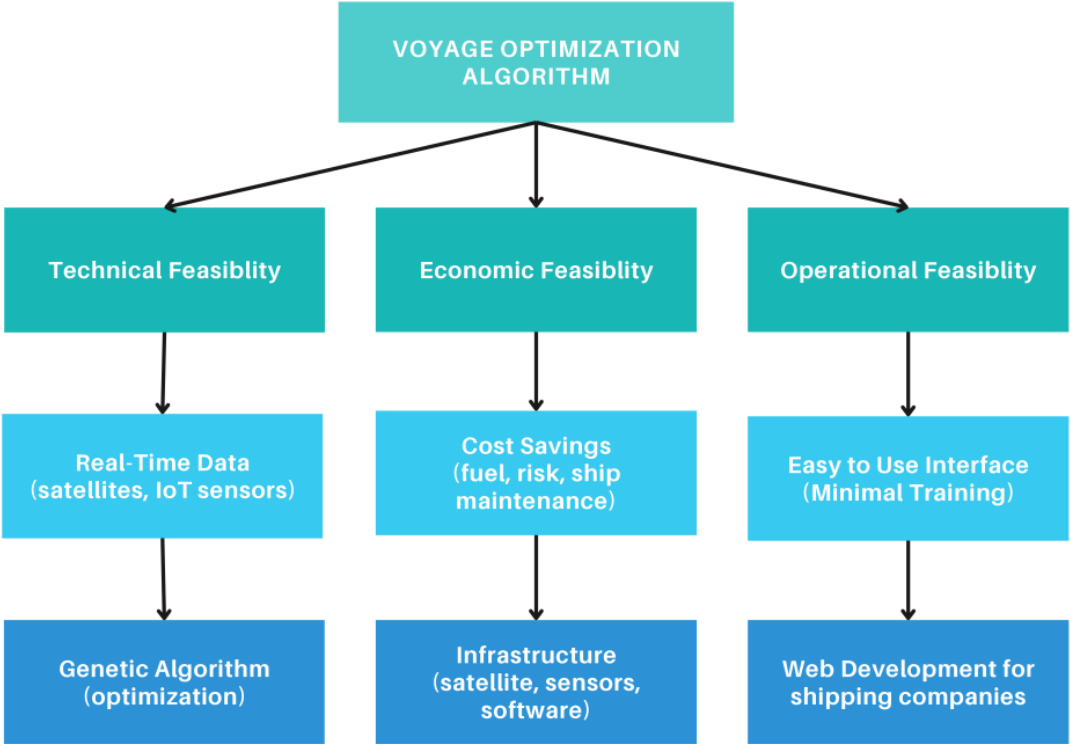
## PROTOTYPE OF THE APP



# FEASIBILITY AND VIABILITY



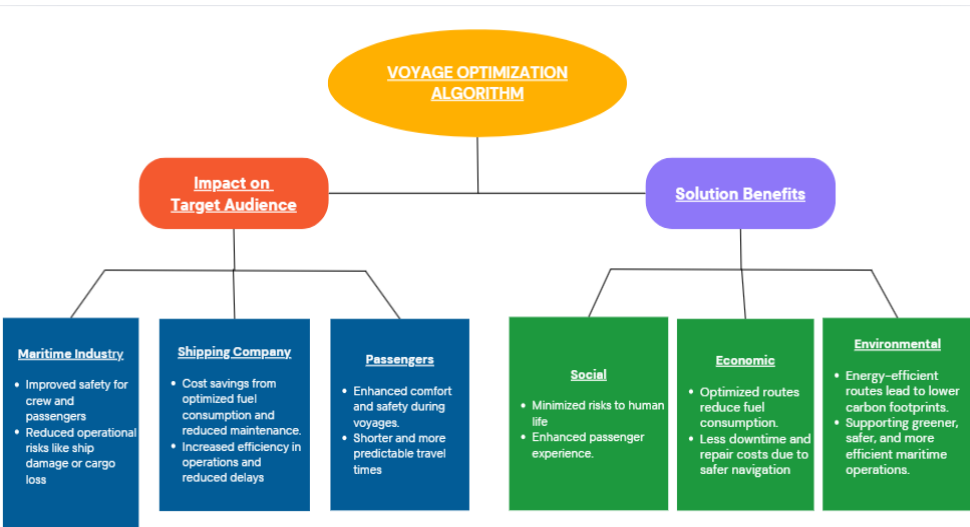
- **Real-time data** from satellites, IoT sensors, and weather forecasts.
- Multi-parameter optimization using **genetic algorithm**
- **Adaptable** to different ship types (considering ship dimensions, drift characteristics).
- Justified **investment** in **infrastructure** (satellites, sensors, and software).
- Intuitive and easy-to-use, requiring **minimal training** and support for **seamless integration** into daily operations.



CHALLENGES		COUNTERMEASURES
WEATHER UNPREDICTABILITY	→	ADAPTIVE ALGORITHM
DATA ACCURACY	→	RELIABLE DATA SOURCES
ALGORITHM COMPLEXITY	→	MODULAR DESIGN
REAL-TIME DECISION MAKING	→	EDGE COMPUTING
SYSTEM INTEGRATION	→	OPEN APIs

- **Split** optimization parameters into **smaller tasks** (fuel, time, safety) for better management.
- Process data **locally** on the ship for faster, **real-time decisions**.

# IMPACT AND BENEFITS



- Companies using the application can offer more reliable and cost effective services, **gaining an edge over competitors** who may not have access to such advanced routing technology
- Positive contribution to global efforts in combating climate change , **enhanced corporate social responsibility** and compliance with international environmental regulations

## WHY NADISH?

Feature	NADISH	Competitors
Fuel Savings	Higher fuel savings	Moderate fuel savings
Route Optimization	Multi-objective (time, safety, fuel)	Focuses on single objective
Real-Time Data	Integrates weather, fuel efficiency, and more	Limited real-time data
User Customization	Flexible route adjustments	Less customizable
Algorithm Used	Advanced genetic algorithm	Basic optimization methods

Indian Ocean - over **70 major ports** and **50%** of world's marine time trade by value, major ocean for oil trade. But this ocean **faces challenges** like **weather disruption, piracy, port congestions**. The **MOGA** implemented in NaDish will help prevent all these issues.

While, the existing apps in market focus majorly on **one parameter** only like fuel consumption or shortest distance, our app takes in account all these parameters and give a combined result to show the best route.

With over **100,000** ships transit in the ocean annually, this app will surely capture the market by proving to be useful for fleet managers and government bodies.

The world's 20 top nations with the largest merchant fleets, three—**India, Malaysia and Singapore**—are among the Indian Ocean littoral states.

The world's busiest sea lane on the global east-west trade route **passes** through the northern Indian Ocean (ref. Frontline by The Hindu) . This only shows that a promising number of users can be expected for Nadish app.

## Research Papers

- <https://icmartec.net/martec2010/2010/File4MARTEC112.pdf>
- [http://www.idr.iitkgp.ac.in/jspui/bitstream/123456789/873/3/NB14304\\_CV.pdf](http://www.idr.iitkgp.ac.in/jspui/bitstream/123456789/873/3/NB14304_CV.pdf)
- <https://www.sciencedirect.com/science/article/pii/S1873965221000736>
- [http://datajobstest.com/data-science-repo/Genetic-Algorithm-Guide-\[Tom-Mathew\].pdf](http://datajobstest.com/data-science-repo/Genetic-Algorithm-Guide-[Tom-Mathew].pdf)
- [https://www.cse.unr.edu/~sushil/class/gas/papers/Using%20a%20Genetic%20Algorithm%20to%20Explore%20A\\_-like%20Pathfinding%20Algorithms.pdf](https://www.cse.unr.edu/~sushil/class/gas/papers/Using%20a%20Genetic%20Algorithm%20to%20Explore%20A_-like%20Pathfinding%20Algorithms.pdf)

## Databases

- <https://incois.gov.in/portal/osf/osf.jsp>