Hope Foundation's
International Institute of Information Technology (I^2IT)
Hinjawadi, Pune- 411057
Innovation & Leadership
www.isquareit.edu.in

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Team and idea registration for Smart India Hackathon-2024

Team: Human Cyborgs **Ministry/ Organization: Ministry of Earth Sciences**

Problem Statement (PS) number: SIH1658

Problem statement title: **Development of a versatile and fast algorithm for the optimal ship routing**

Brief description of idea:

Background: Most of the goods are transported around the world by shipping which relies heavily on fossil fuels for powering. Given the expenditure of the shipping industry on the fuel, a main objective of a shipping company is to optimize the ship route for the least fuel consumption.

Depending on the type and purpose of the voyage, it is also desirable to optimize several other parameters such as, the travel time, passenger comfort and route safety, to avoid any damage to the ship, cargo, crew and passengers. Optimization of each of these parameters serves a purpose.

For instance, an energy efficient route may not be safe in terms of weather. Therefore, to avoid loss of life and property, route weather safety needs to be considered. An application suggesting the optimal route based on the chosen set of optimal parameters for any voyage between two ports in the Indian Ocean, will immensely benefit the Indian shipping industry.

Description: At the heart of any optimal ship routing application lies the optimization algorithm. Although scientific literature is available on various methods of optimizing the ship routes, given the commercial potential, there are no applications available publicly which can be customized for the Indian Ocean region.

The optimization methods reported in literature range in complexity, computation time, versatility, etc. Various factors, such as, the forcings (surface winds, currents and waves), design of the ship and ship drift characteristics, impact the ship's motion at sea.

The optimal route must be continually evolving because the weather conditions keep changing as a ship proceeds on its voyage.

Therefore, it is crucial to choose a suitable optimization method that can optimize several parameters for a range of ships (with varying type, dimensions, drift characteristics of a ship) and develop an algorithm to return an optimal route within a reasonable computational time. The algorithm can optimize for the voyage time and safety to begin with but with a scope for addition of more optimization parameters.

	Name	Year & Dept.	Gender (M/F)	Email id	Mobile no.
Team Leader	Shravani Kamble	TE- IT	F	shravanick23feb@gmail.com	9325992922
Team Member	Chaitanya Gite	TE- IT	M	chaitanyagite2424@gmail.com	7249244240
Team Member	Gauri Umale	TE- IT	F	gauumale05@gmail.com	7666002486
Team Member	Chinmay Patil	TE- IT	M	chinmaypatil2306@gmail.com	8329323792
Team Member	Suraj Nakhale	TE- IT	M	surajnakhale2407@gmail.com	8956197364
Team Member	Raghav Daga	TE- IT	M	raghavdaga1104@gmail.com	7058933061

Dr. Jyoti Surve	Dr. Jyoti Surve	Prof. Ravindra Joshi
Name and signature of Mentor	Name and signature of HoD	Name and signature of SPOC