

DREDGING ANALYSIS AND DECISION SUPPORT SYSTEM

MINISTRY: Ministry of Ports, Shipping and Waterways

PS CODE: SIH1311

PROBLEM STATEMENT: Dredging Analysis and Decision Support System, Monitor the real-time draft, Support System to predict the siltation.

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Problem Statement

- India has one of the largest merchant shipping fleets with about 1500 vessels.
- **Dredging Corporation of India Limited**, or DCI, is an Indian dredging company which does dredging for Indian seaports exclusively.

5500m³

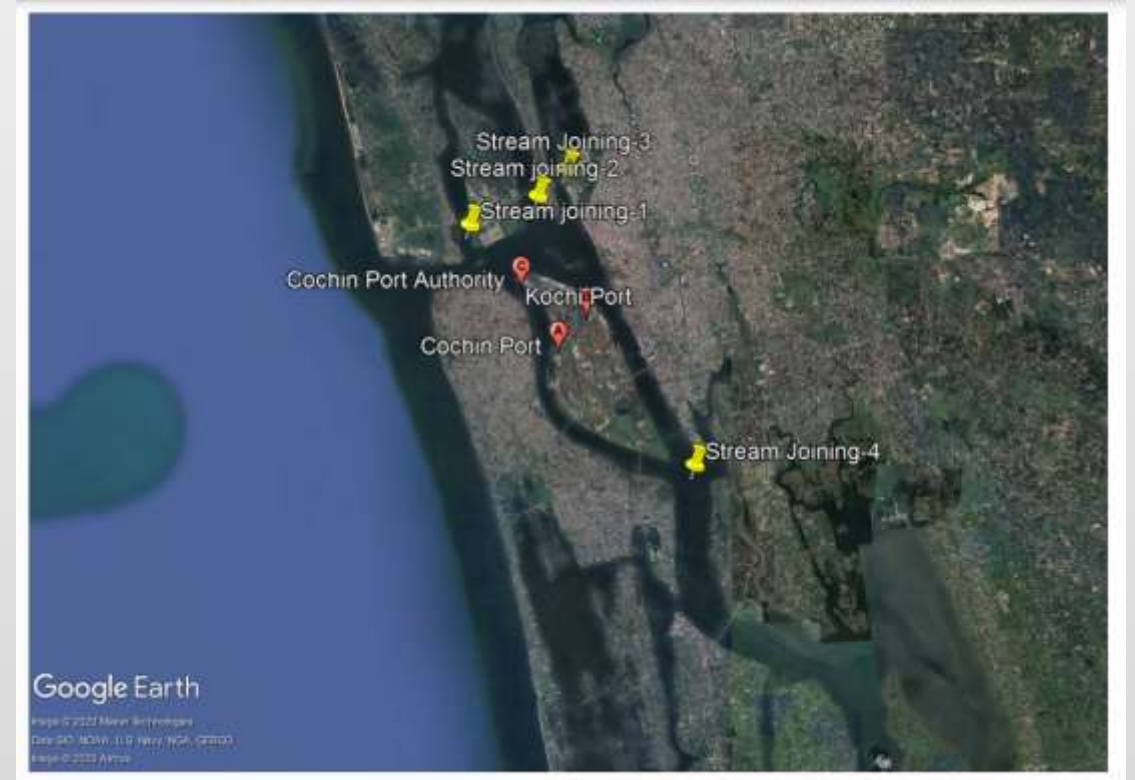
Capacity of
DR19,DR20,
DR21

- - Duel-fuel
- - Less fuel
- consumption

7400m³

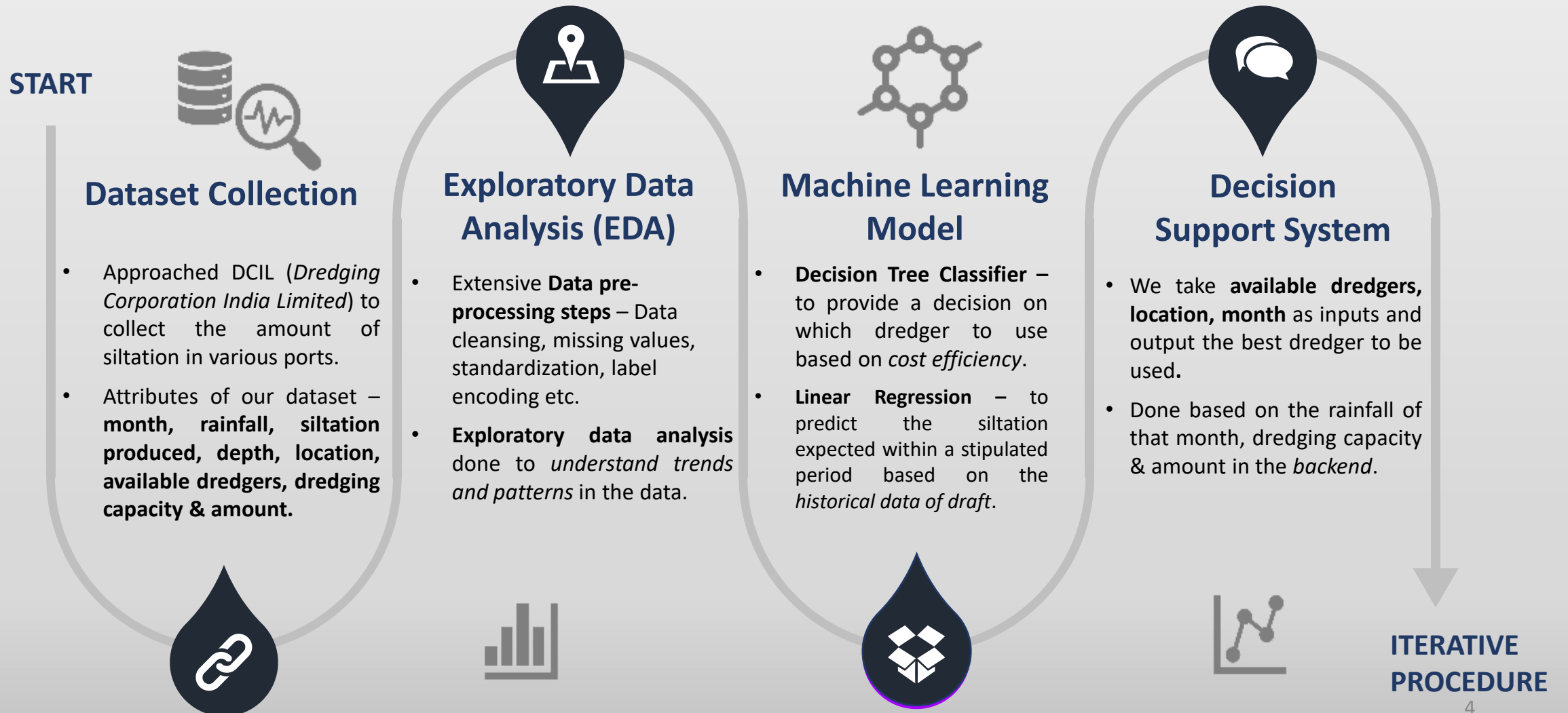
Capacity of
DR14,DR15,
DR16

- Aged dredgers
- More fuel
- consumption

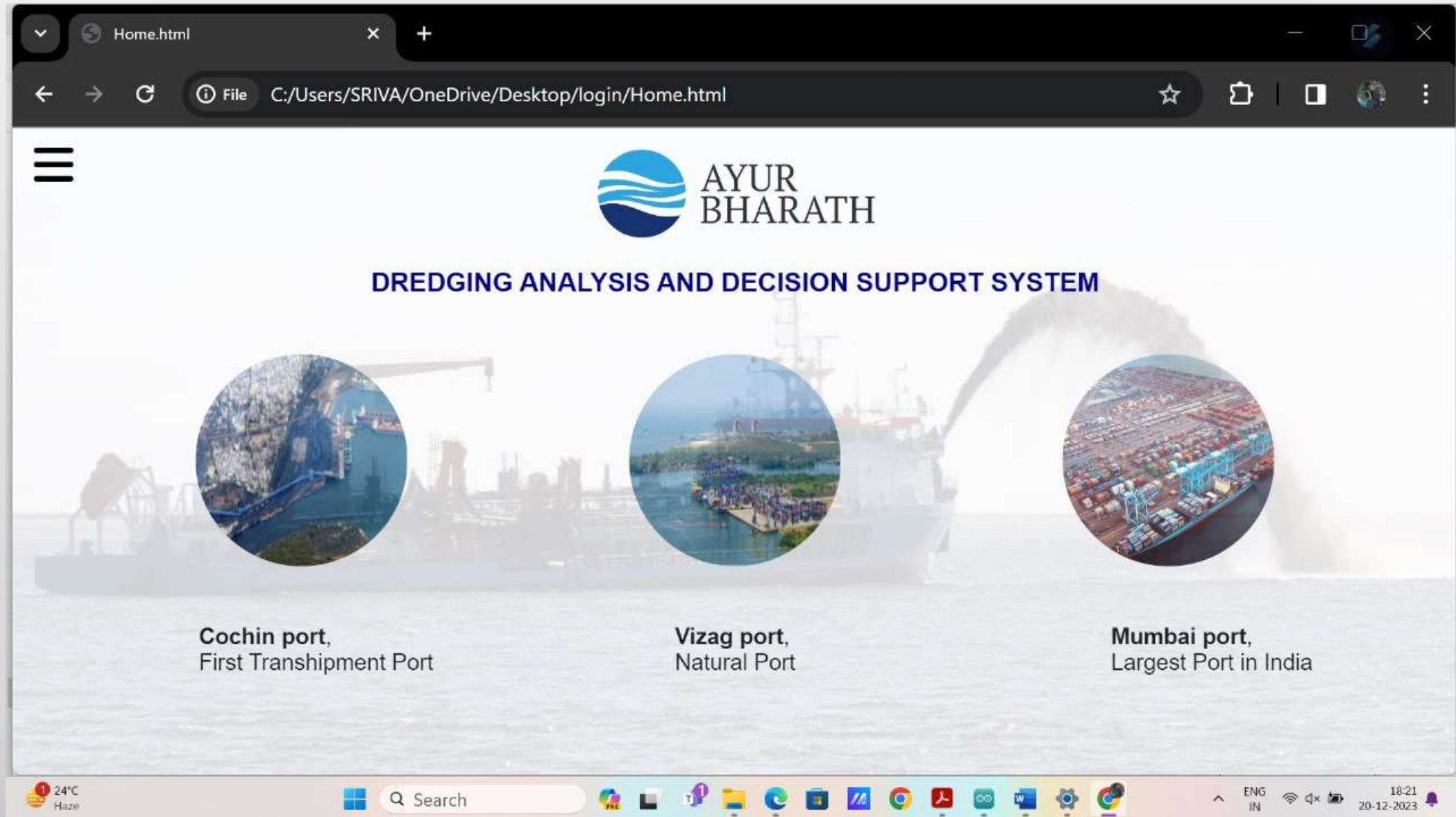


- We need to find a balance with dredging and fuel consumption.
- Give analysis of dredging done.
- Predict the siltation level.

Solution Approach



Snippet of our Home Page:



Data collection & pre-processing

Split Training & Testing

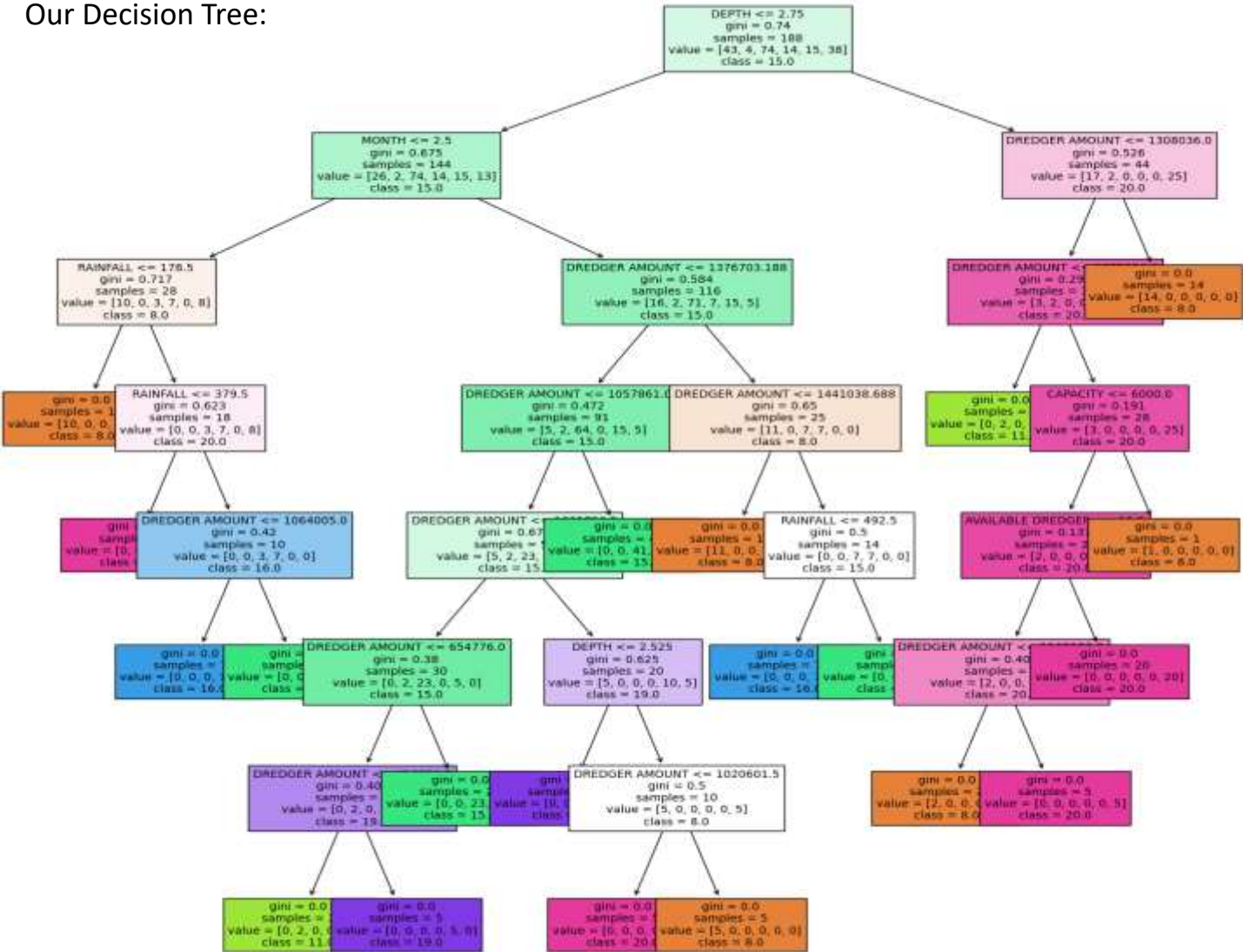
Plot correlation charts for analysis

Model Fit

Test on new data
and output the
suitable Dredger

Model Accuracy

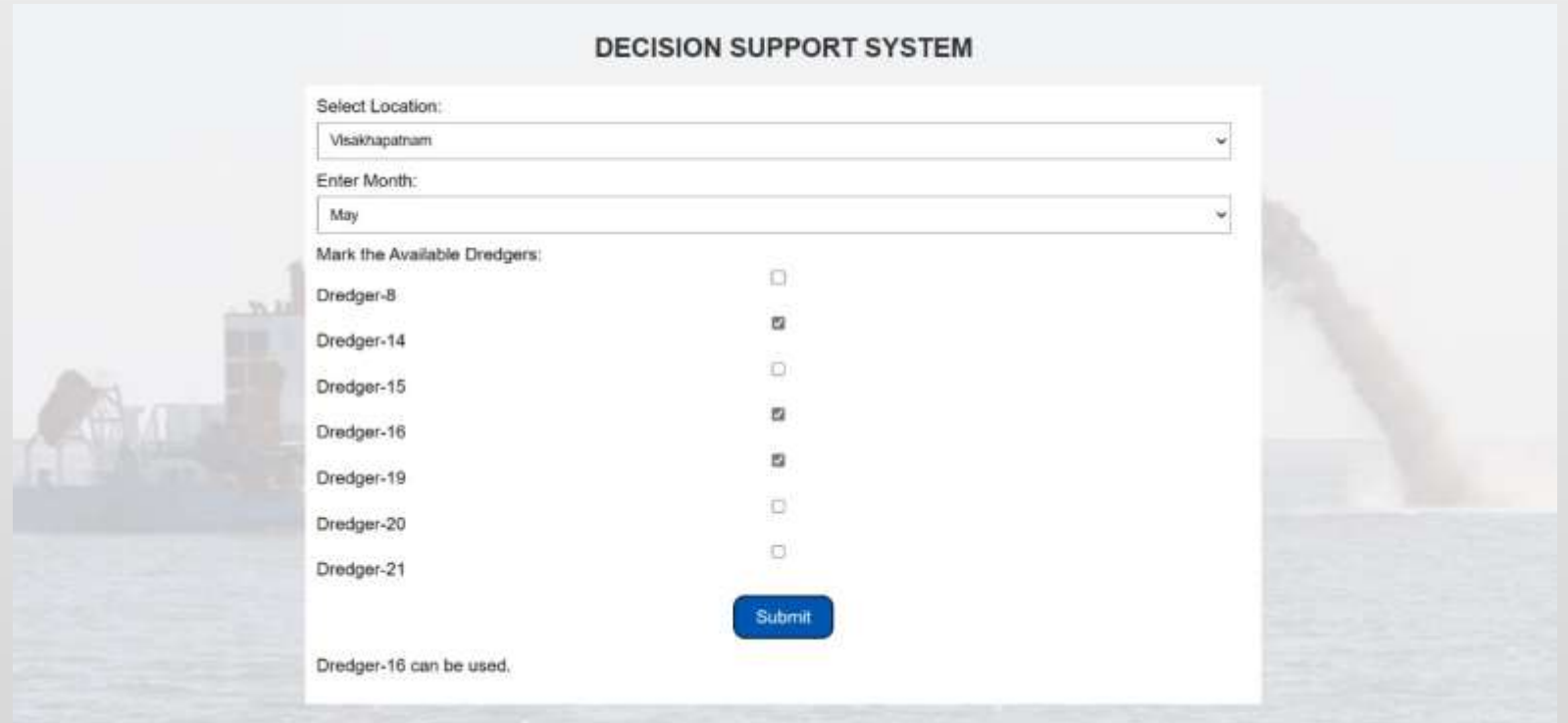
Our Decision Tree:



Decision Support System

Snippet of Our Decision Support System:

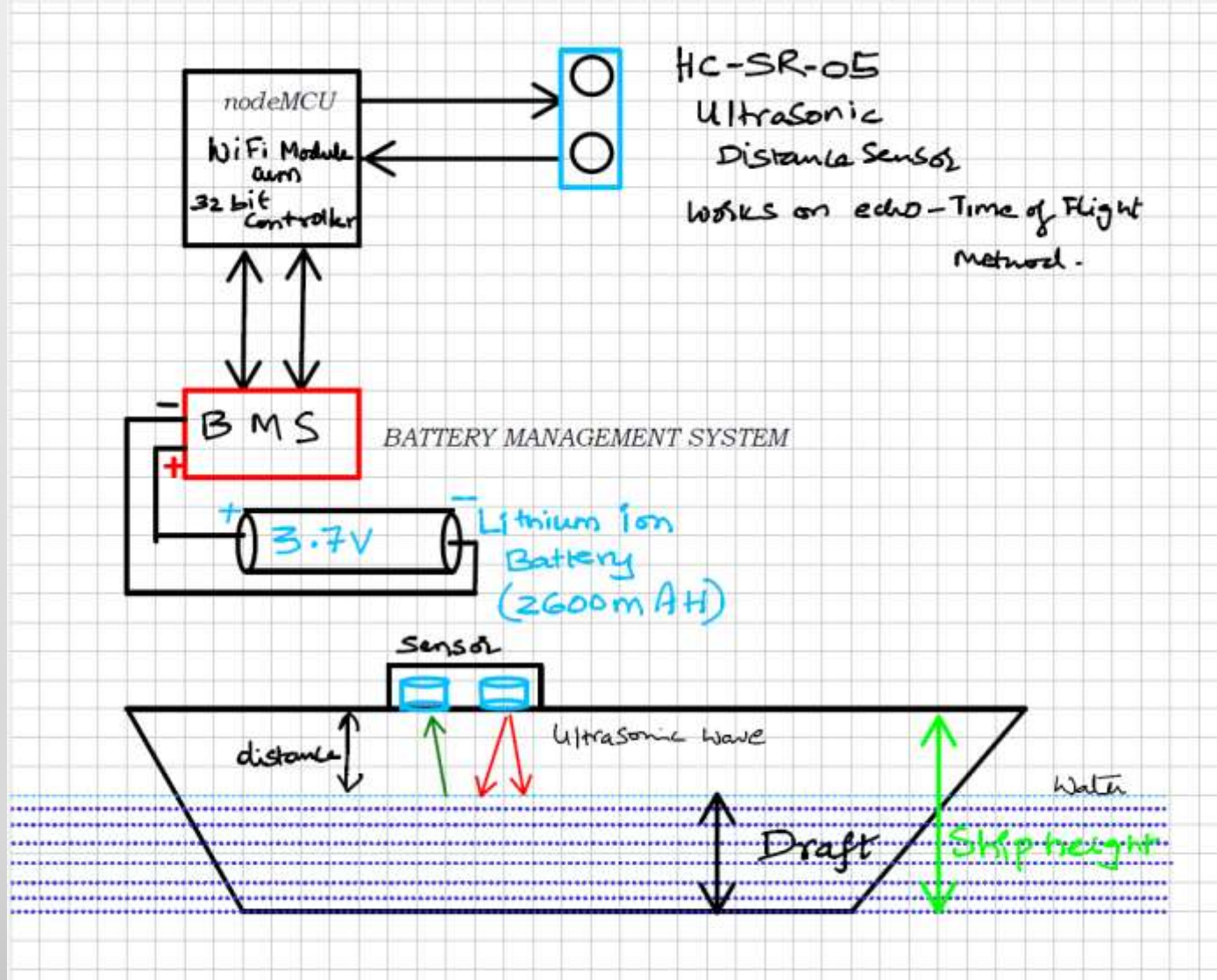
- We take *location, month, available dredgers* as the input.
- And we output the best dredger to utilize which is also *cost-efficient*.
- We use **Decision Tree Classifier** for this purpose by saving it in the form of *model.pkl* and integrating with our website using *Flask*.
- At present, we got an accuracy rate of **96%**.



The screenshot shows a web application titled "DECISION SUPPORT SYSTEM". It features a form with the following elements:

- Select Location:** A dropdown menu with "Visakhapatnam" selected.
- Enter Month:** A dropdown menu with "May" selected.
- Mark the Available Dredgers:** A list of dredgers with checkboxes:
 - Dredger-8: ☐
 - Dredger-14: ☒
 - Dredger-15: ☐
 - Dredger-16: ☒
 - Dredger-19: ☒
 - Dredger-20: ☐
 - Dredger-21: ☐
- Submit:** A blue button.
- Output:** Below the button, it says "Dredger-16 can be used."

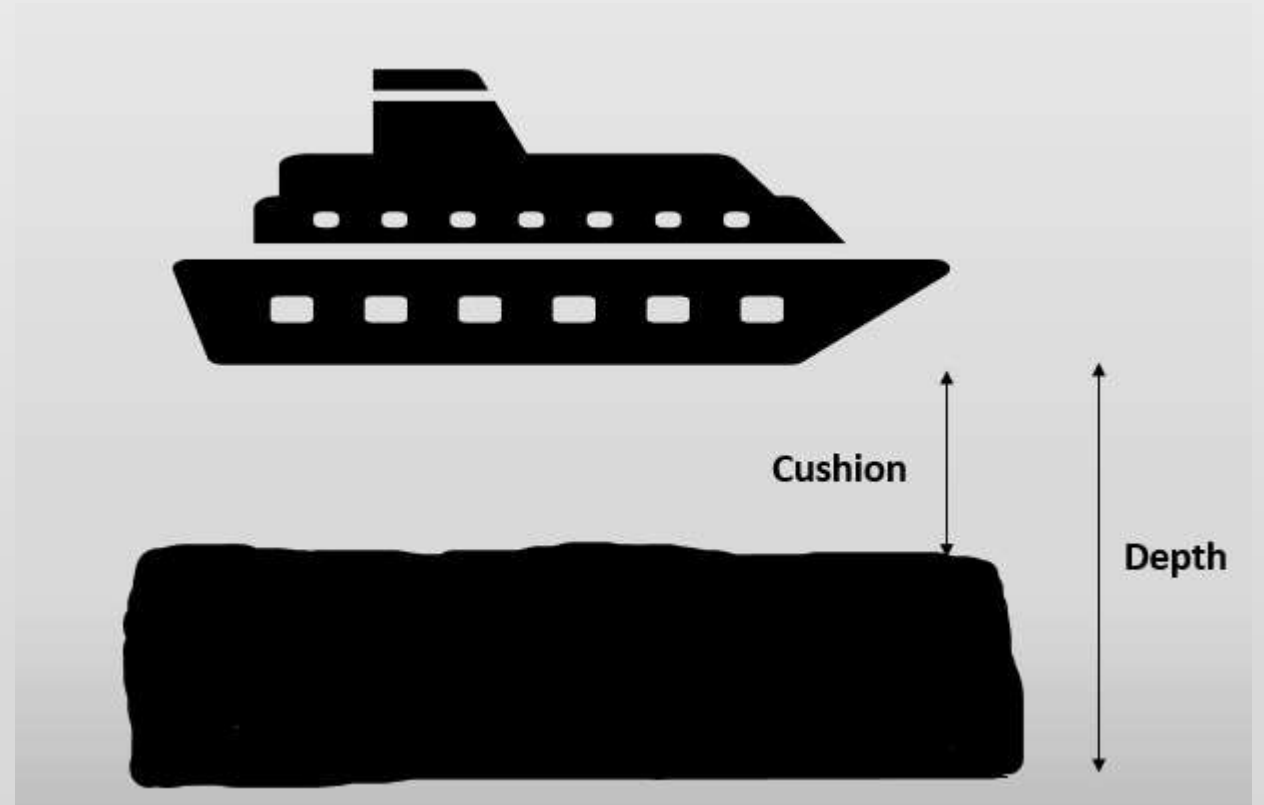
Real Time Draft Monitoring



- $Draft = Height - Distance \text{ of the model}$
- We use ultrasonic sensors to monitor the draft.
- They calculate the target's distance by emission of ultrasonic sound waves, converting them into electrical signals.
- Speed of emitted ultrasonic waves is faster than the audible sound.
- The sensing range lies between 40cm to 300 cm.
- The response time is between 50 milliseconds to 200 milliseconds.

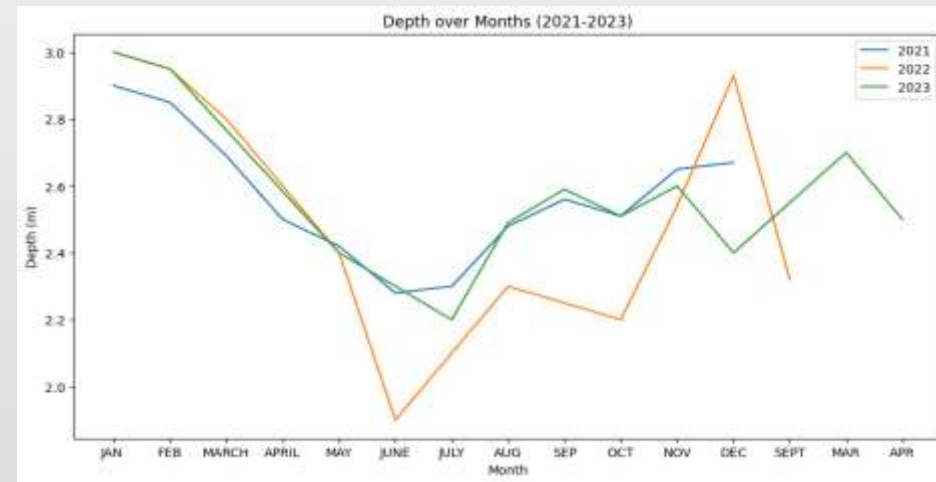
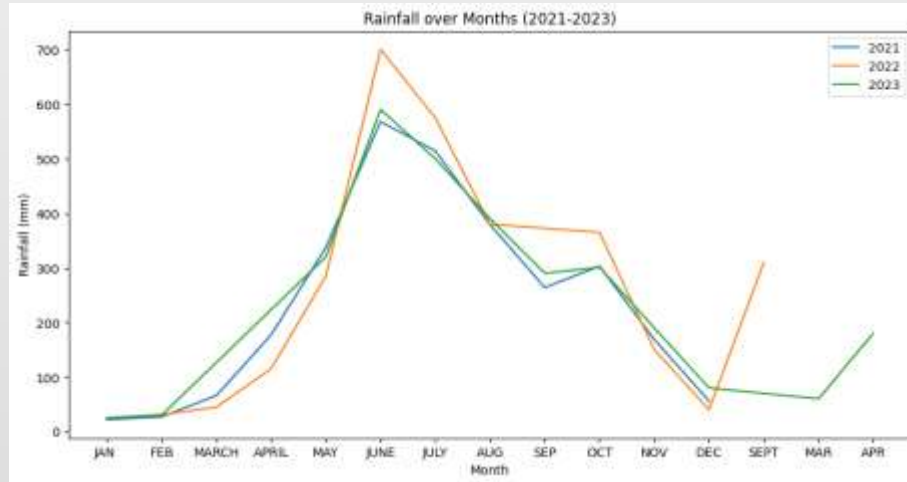
Siltation Prediction

- Done by taking the cushion level from the sea and estimating the amount of siltation to be removed using historical data of the dredging.
- As the rainfall increases the cushion level decreases and the siltation on the bed increases.
- *Silt Level = Depth - Cushion*

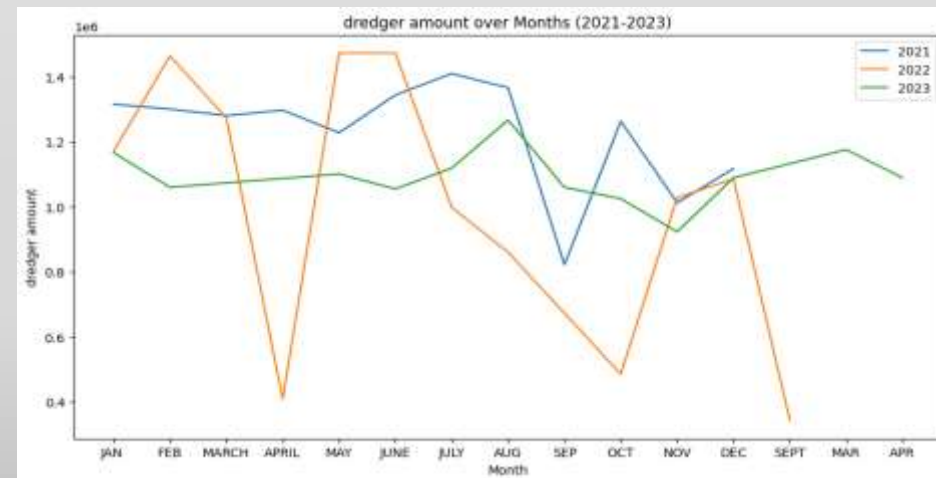


Dredging Analysis

DASHBOARD



Year-wise graphs of rainfall, depth, amount of dredging done & correlation charts between all the parameters is shown.



Business Applicability

Indian Government

Ministry of Port Authority



- Siltation Prediction and Decision Support System are used by the port authorities to quote amount in the tender. This reduces the amount wasted in quotation.
- **Draft Monitoring** helps them to identify the height and kind of the ship that can enter the port.

Construction Development Expert



- The silt which is obtained from the bed of the sea can be used for the constructional purposes.
- The leftover silt can be exported to other countries to generate *revenue*.



THANK YOU!