SMART INDIA HACKATHON 2024

- **Problem Statement ID - SIH1657**
- **Problem Statement Title - Integrated Geo-Referenced Fish Catch Data Repository and Access System**
- **Theme - Smart Automation**
- **PS Category - Software**
- **Team ID- 45276**
- **Team Name - Phishers**

Phishers

Jal Insights : A Comprehensive Platform for Geo-Referenced Fish Catch Data Visualization and Analysis

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Detailed explanation of the proposed solution

Data Input & Classification : Bulk Excel uploads with **authentication**; separate modules for species occurrence and abundance data.

Data Storage : PostgreSQL with PostGIS for **geo-referenced data**; fast search, updates, and backups, ensuring consistency.

Search & Filters : Advanced filters by **species, region, depth, and time** for pattern analysis.

Visualization : Interactive maps, **heatmaps**, and time-series graphs using Leaflet.js/Google Maps API. Data exportable.

Scalability & Admin Control : Secure downloads for **role based access** ; Rest APIs for collaborations.

How it addresses the problem

Centralized Platform : **Eliminates scattered datasets**, consolidating data for easier access and management.

Data Handling : Checks **authenticate source** of data, organizes, and classifies fish catch data automatically, saving time and reducing errors.

Spatial Database Integration : Combines **relational and geo-referenced** data for comprehensive analysis, improving data accuracy.

Advanced Search & Visualization : Enables quicker insights through **filters**, depth-based queries, and time-series visualizations.

Scalability & Admin Control : Ensures secure data management and scalability as data inputs grow from **multiple sources**.

Innovation and uniqueness of the solution

Providing Sustainability Score & Alerts : Leverage **AI models** & environmental factors for real-time sustainability scores & alerts. **Cloud-based analytics** efficiently processes data, promoting regulated fishing.

AI-Driven Interactive Chatbot : Powered by **NLP models** , offers real-time, **multilingual** support for fish species searches & platform navigation. It provides advice on fishing practices, streamlines data searches, & enhances user experience.

Predictive Modeling : It offers real-time, customizable fish data with **dynamic visualizations**. Prediction model leverages historical & input data to automatically select the most accurate model, enhancing prediction accuracy.

Modular API : Modular API allows external data contributions with real time data synchronization. If **API** is provided direct fetching of data can be done without **data scrapping**.

Real-Time Sync : Real-time data **synchronization** ensures access to latest fish catch data. Utilizing **Web Sockets** , data updates will instantly sync. It enhances the system's responsiveness, providing users with seamless, up-to-date data access.

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TECHNICAL APPROACH

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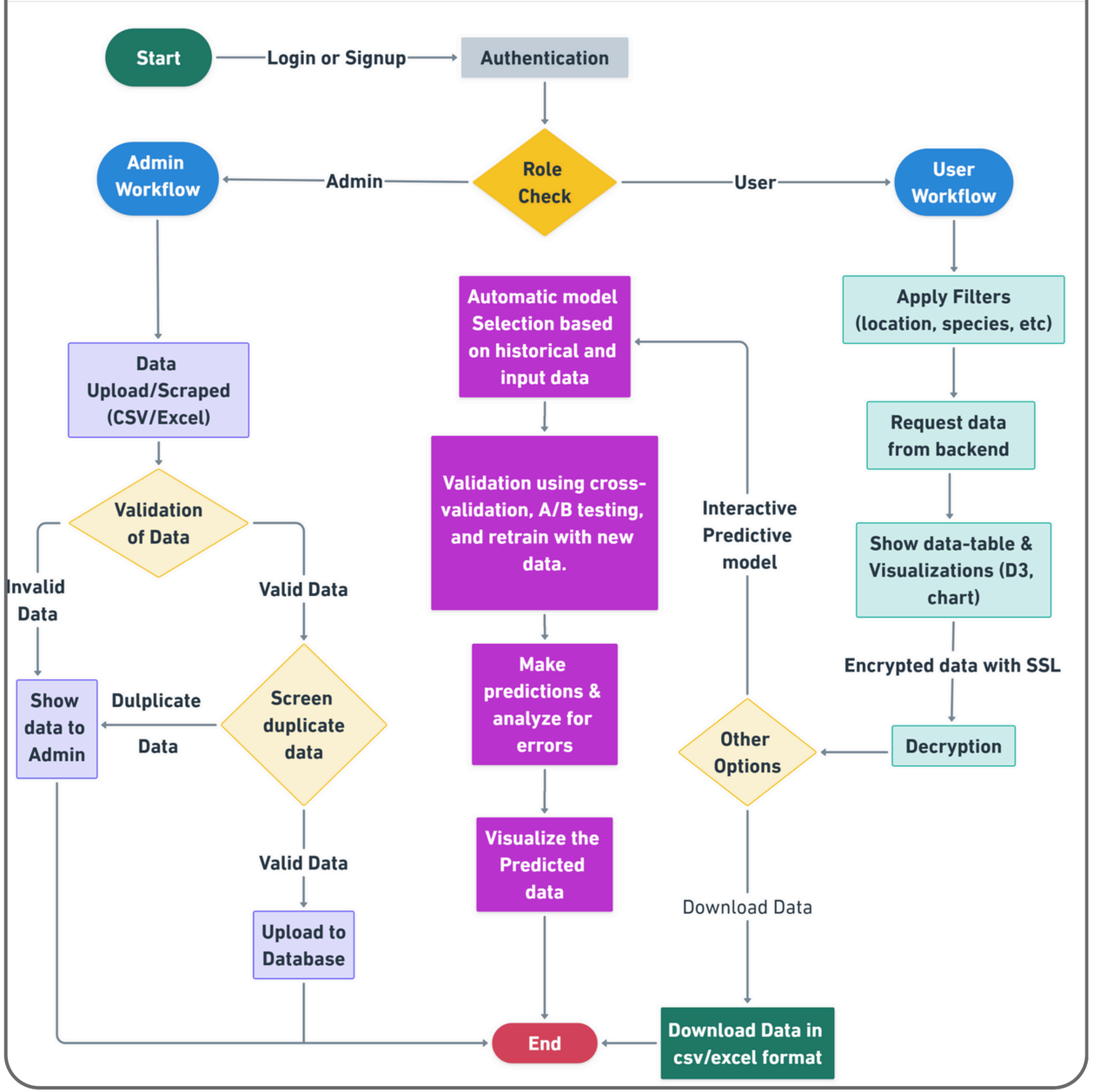
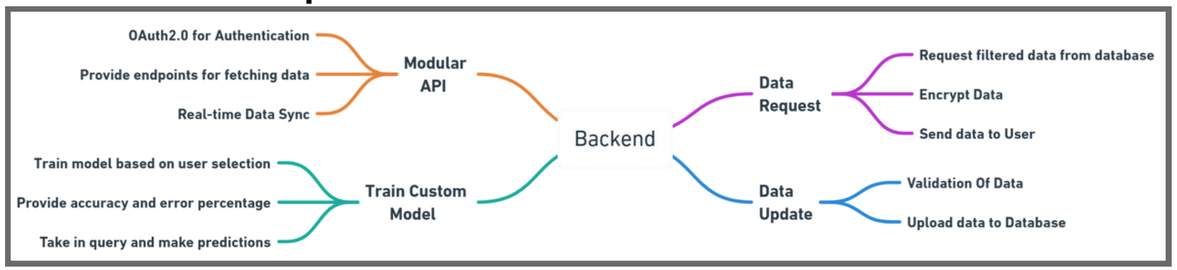
WorkFlows(Login workFlow , admin workFlow , user workFlow)

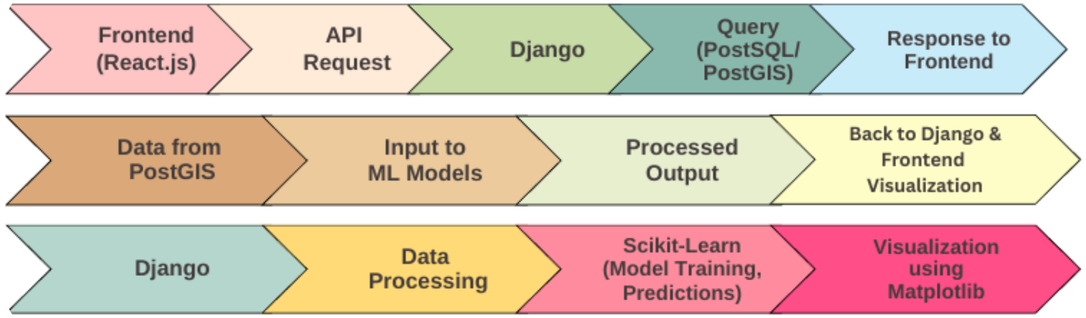


METHODOLOGY AND PROCESS FOR IMPLEMENTATION

Backend Mindmap



General Workflow



TECHNOLOGIES TO BE USED

TECH STACK	
FRONT END	HTML , CSS , JAVASCRIPT , REACT
BACK END	DJANGO FRAMEWORK , RESTFUL APIs
DATABASE	POSTGRESQL , POSTGIS , PANDAS , NUMPY
SECURITY	OAUTH2.0 , SSL ENCRYPTION
VISUALIZATION	MATPLOTLIB , D3.js
ML INTEGRATION	SCIKIT-LEARN , TENSORFLOW
GEO-LOCATION SERVICES	LEAFLET.js , GOOGLE MAPS API

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FEASIBILITY AND VIABILITY

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Feasibility

Category	Details
Proven Technologies:	Utilizes established frameworks like React.js, PostgreSQL, and PostGIS for stability and scalability
Data Standardization:	Implement INCOIS protocols for consistent oceanographic and fishery data formats.
Automated Data Validation:	Ensures data integrity and reduces manual data cleaning efforts through built-in validation mechanisms.
Cloud Infrastructure:	Hosted on AWS/Google Cloud, enabling scalable data storage and processing
Extensible Architecture:	Easily integrates future enhancements like real-time data sync and AI-based predictive models.
Role-based Access Control:	Secure access system with scalable permissions management for admins, researchers, and guest users

Viability

CHALLENGES AND RISKS	STRATEGIES TO OVERCOME THESE CHALLENGES
Handling Large Datasets	Use Redis for caching; cloud auto-scaling for managing large datasets.
Real-time Data Validation	Automated validation scripts ensure consistency before uploading.
Scalability Concerns	Horizontal scaling and Docker for scalability.
Securing Sensitive Data	OAuth 2.0, SSL/TLS, and role-based access control (RBAC).
Data Backup & Reliability	Daily backups and redundant storage solutions to prevent data loss.
High Latency for Geospatial Queries	Use PostGIS indexing and optimize spatial query performance.
User Authentication Complexity	Implement multi-factor authentication (MFA) for enhanced security.

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IMPACT AND BENEFITS

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Potential Impacts

Scientists & Researchers

- The platform fosters global collaboration and shared research efforts.
- Fish behavior shifts provide key data for climate change research.
- Historical data tracks long-term changes in fish populations and environments.
- Real-time data aids research on fish stocks, migration, and ecosystems.

Fisheries

- Geo-data optimizes fishing routes, saving time and fuel.

Conservationists & Environmentalists

- Geo-data pinpoints habitats, guiding targeted endangered species conservation.

Policymakers & Regulators

- Geo-referencing aids tracking and enforcement of fishing laws.
- Real-time data enables adaptive fisheries management policies.

Benefits

Environmental

- Geo-data identifies and protects endangered species habitats.
- Continuous data detects pollution and climate threats early.
- Tracking fish shifts helps adapt strategies to climate change effects.

Social

- Market data empowers fishers to negotiate fair prices and engage.
- Real-time data boosts profits for small-scale fishers, reducing exploitation.
- Communities learn sustainable practices, enhancing fishing methods.

Economic

- Targeting sustainable markets boosts fishers' revenue through global supply chains.
- Geo-data planning reduces fuel and time costs.
- Real-time data enables fishers to negotiate fairer prices.

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RESEARCH AND REFERENCES

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Research Links :-

- ESSO-INCOIS-Indian National Centre for Ocean Information Services
- INCOIS LAS
- Potential Fishing Zone Advisory
- PeskAAS: A near-real-time, open-source monitoring and analytics system for small-scale fisheries | PLOS ONE

Other Links :-

- Proposed User Interface (Figma)