TECHFIESTA 2025

Farmatrix

Problem Statement ID - T2K25A6

Problem Statement Title - Yield Prediction using Remote Sensing

Domain - Agriculture

Team Name - Team AgroTech

Team Leader Name - Krishna Punjabi

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Current Problems in Farm Yeild Prediction

- Lack of Accuracy
- Delays in Prediction
- Lack of Resource Management
- Ignorance for fertilizer optimization

FARMATRIX

- Farmatrix predicts Farm Yield using diverse datasets and satellite imagery
- It utilizes Yeo-Johnson Power Transformation for improved accuracy
- Farmatrix also ensures fertilizer optimization for efficient resource use and Provides crop-specific predictions

Access our Prototype: https://tinyurl.com/465r9jmh

WORKFLOW OF FARMATRIX

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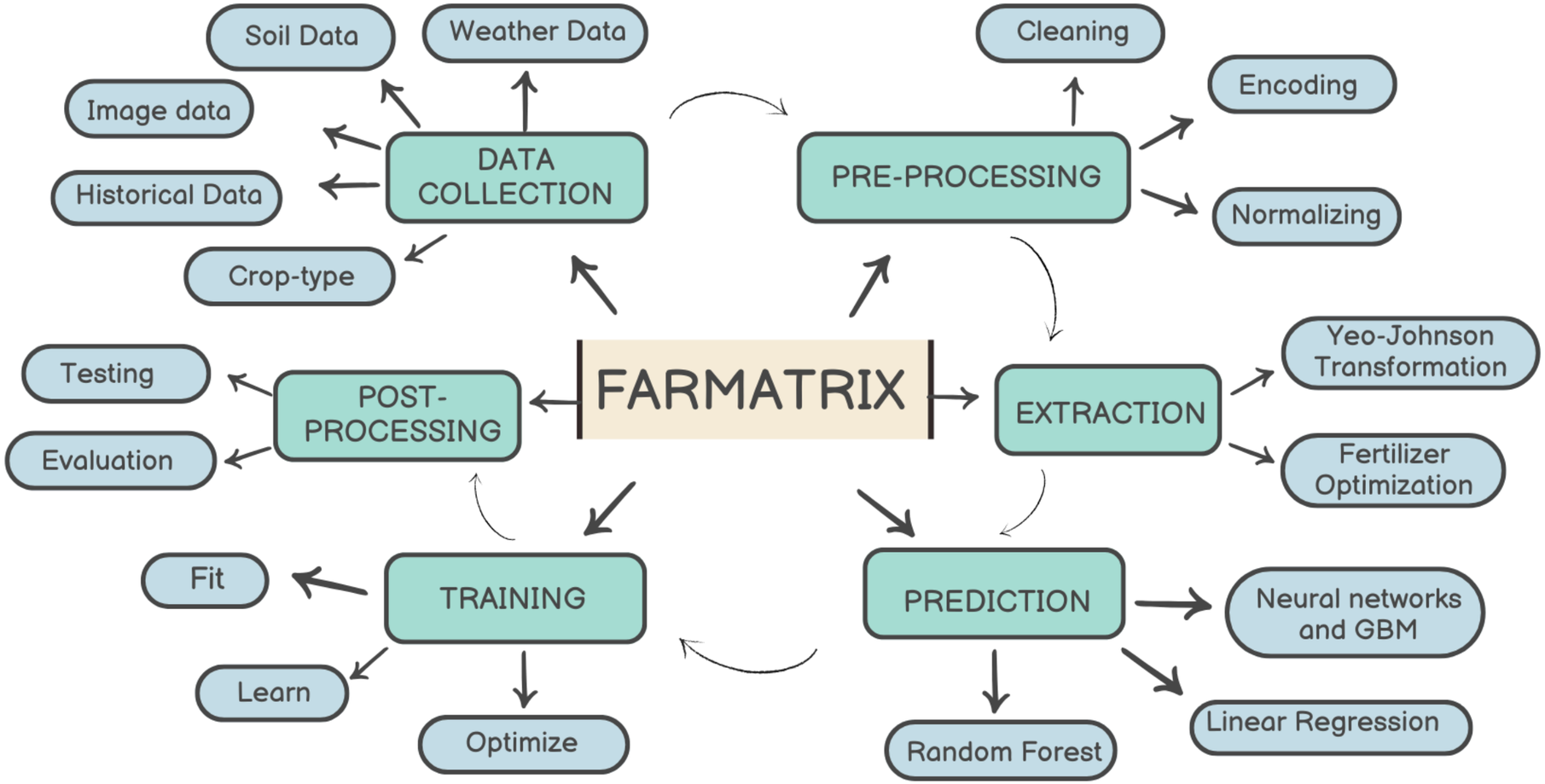

METHODOLOGY

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GAP-ANALYSIS

By examining data gaps in soil health, weather forecasts, and resource utilization, we found inefficiencies in the farming methods used today.

PLANNING

To successfully close these gaps, our team created a solid methodology that combines satellite data integration with ML models using hybrid approach

IMPLEMENTATION

We created Farmatrix as a comprehensive solution that combines preprocessing, feature extraction, data collection, and predictive analytics. We also used different methods to increase the accuracy of the Model.

TESTING

To verify predictions and enhance model performance for practical situations, extensive testing will be carried out on a variety of datasets.

EVALUATION

In order to achieve optimal dependability and scalability, we will adapt based on feedback and measure the effect of Farmatrix on crop productivity, resource optimization, and sustainability.

FEASIBILITY AND KEY FEATURES

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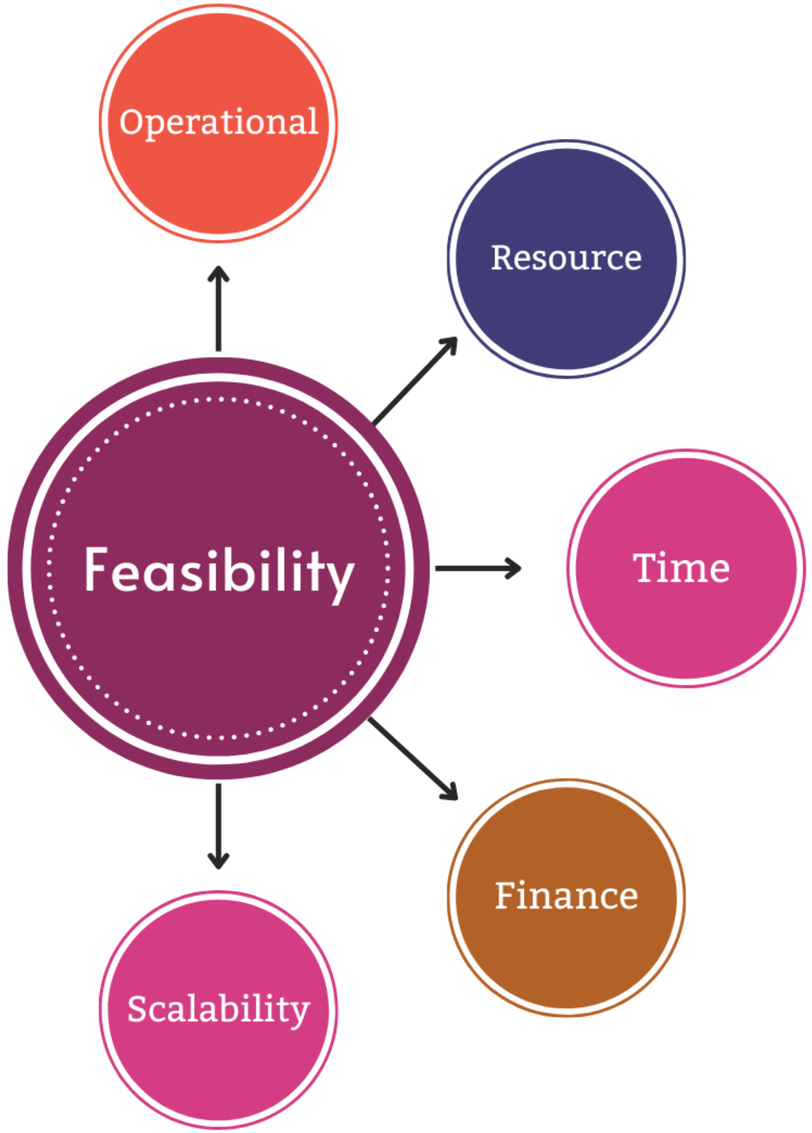

01.

Enhanced Accuracy

Farmatrix uses hybrid modeling, Yeo-Johnson transformation, and feature extraction to increase prediction accuracy and minimize inaccuracies.

02.

Fertilizer Optimization

Promotes sustainable farming by optimizing resources, lowering waste, and increasing crop output through fertilizer recommendations.

03.

Hybrid Approach

Uses machine learning models like neural networks, GBM, random forests, and linear regression to ensure precise and effective predictions.

04.

Continous Intergration

Integrates fresh data and retrains models on a regular basis to guarantee adaptability and smooth updates.

IMPACT AND USE-CASES

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PRACTICAL USE-CASES

CROP-TYPE RECOMMENDATION

Enhances profitability and resource efficiency by aligning crop selection with environmental conditions.

RESOURCE OPTIMIZATION

Optimizes the use of seeds, fertilizers, and pesticides by providing precise recommendations.

SATELLITE BASED FARM MANAGEMENT

Integrates satellite image data to monitor large-scale farm conditions, identify underperforming areas, and plan corrective actions.

PEST MANAGEMENT

Makes recommendations for treatments and preventative measures to reduce crop damage.

EDUCATION

Serves as a tool to educate farmers about modern agricultural practices, precision farming, and resource optimization.

CROP YEILD PREDICTION

Helps farmers estimate production and make informed decisions about crop selection and resource allocation.

FERTILIZER OPTIMIZATION

Reduces resource wastage and improves crop health and yield, promoting sustainable farming practices.

PRECISE IRRIGATION

Prevents overwatering or underwatering, ensuring efficient water usage.

TECH-STACK FOR FARMATRIX

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Programming Languages

Python (Core Programming), React (frontend), SQL (data manipulation)

Deployment

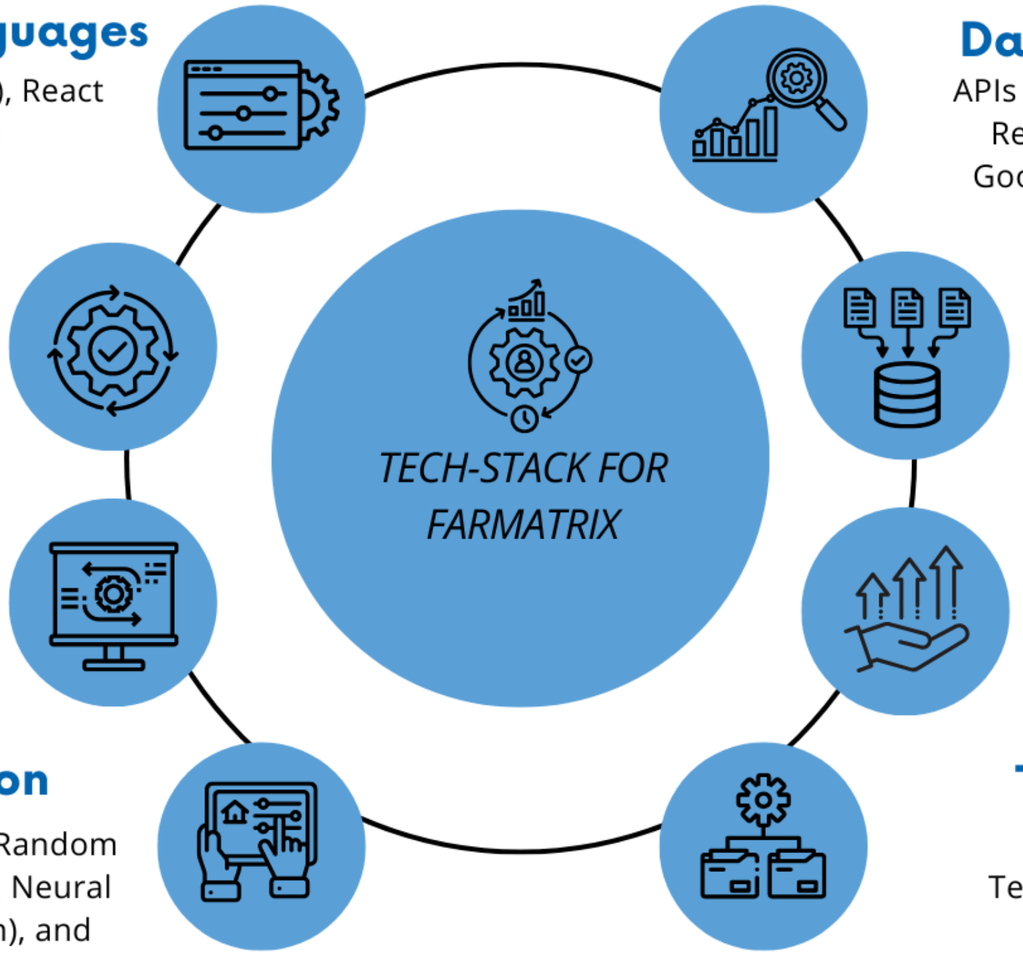
Flask for APIs, Docker for containers, and AWS/Azure for hosting

Post-processing

Evaluation with Scikit-learn and visualization using Matplotlib or Plotly.

Prediction

Linear Regression, Random Forest (Scikit-learn), Neural Networks (PyTorch), and GBM (LightGBM).



Data Collection

APIs (OpenWeatherMap, SoilGrids), Remote Sensing (SentinelHub, Google Earth Engine), Databases (PostgreSQL, MongoDB)

Pre-processing

Pandas, NumPy for data cleaning; Scikit-learn for encoding and normalization

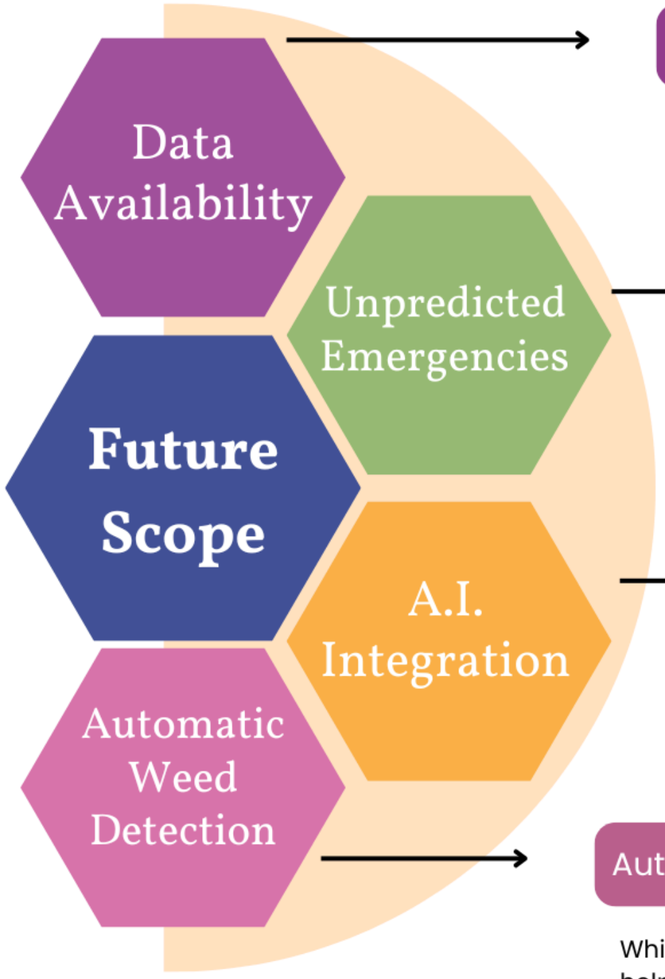
Extraction

Transformations (Yeo-Johnson in Scikit-learn) and optimization (Pyomo, SciPy)

Training

Scikit-learn, TensorFlow, and PyTorch

OUR NEXT STEPS



Data Availability

The main constraint of Farmatrix will be the ease of data availability which can consume significant time of developers. To overcome this real-time data analyzation is preferred.

Unpredicted Emergencies

Unpredicted Emergencies like Earthquakes, Famines, and floods can cause miscalculations and thus more training of Farmatrix must be done using large datasets of different conditions.

A.I. Integration

Artificial Intelligence can be integrated to make the model easy to use and solve the queries and user doubts in real-time. Farmatrix can integrate the AI feature based on the farm industry requirements.

Automatic Weed Detection

While Fertilizer Optimization is a special feature of Farmatrix, Automatic weed detection can help in better understanding of the plant. Weeds depend on crop-type and automation will be essential if real-time data from satellites and drones is used.