CS546: Introduction to Agriculture Cyber-Physical Systems

Final Project Report

Submitted By

Ninad Rathod - 2021CSM1015
Tauqeer Akhtar - 2021CSM1021

Under the guidance of

Dr. Mukesh Saini

Crop On-Location

Literature Survey:

Research Paper: Crop recommendation system for precision agriculture
Conference: 2016 18th International Conference on Advanced Computing (ICoAC)
The crop recommendation system presented in this paper uses a labeled dataset and Machine Learning techniques like Random tree, CHAID, K-Nearest Neighbor, and Naive Bayes to recommend the crop that is most suitable for the given soil conditions. ***But the available dataset on Kaggle is not for the Indian soil conditions and crops.***

Research Paper: Crop Recommendation System
Journal: International Journal of Computer Applications - Volume 175
Along with the Machine Learning aspects, the researchers have attempted to build a physical architecture that senses all the necessary environmental properties of the location and suggests a crop for the sensed values using Machine learning algorithms. ***However, the target audience of this product is a farmer, and such a system is not affordable for a farmer.***

Many popular android applications like *Plantix: your crop doctor, Crop doctor, and Cropguru - Farmer App* are more concerned with crop health. ***However, if we suggest farmers go for crops that are best suited for the soil conditions of the specific location, there would be lesser health issues related to the crop.***

Motivation:

Many environmental factors such as humidity, weather conditions, and temperature are involved when we try to evaluate a farming land. The geographical location (State) and Month are pretty much enough to summarize all this information.

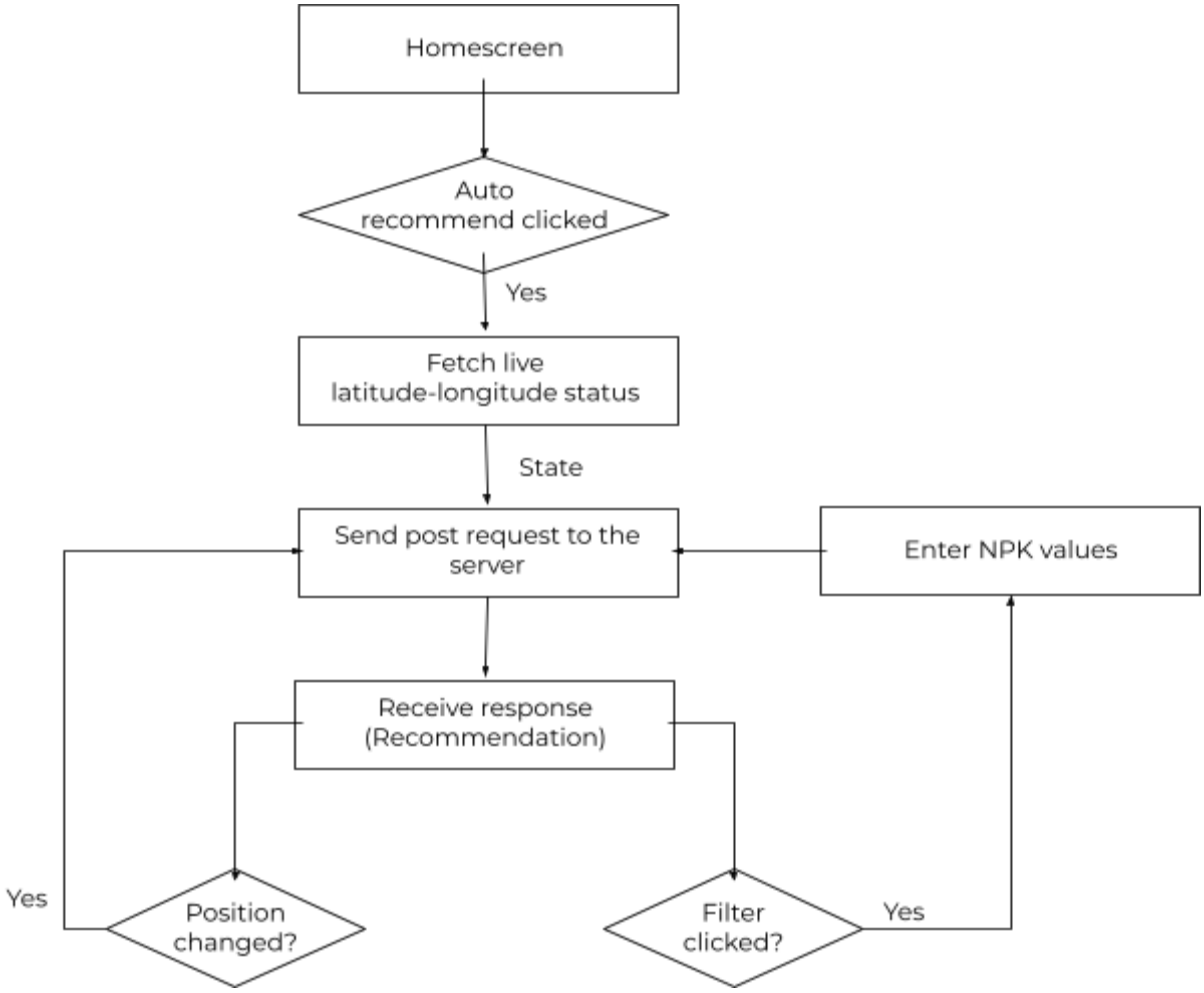
Solution: **Gather information on which crops are preferably planted for a particular state given the month of the year.**

Fertilizers are one of the main expenses in farming. Primarily fertilizers are required for nutrients such as Nitrogen, Phosphorus, and Potassium (NPK). Our crop recommendation

system will recommendation will take into account the NPK readings of the field and then recommend crops in an order with minimal fertilizer requirements.

Solution: Information related to optimal (basal) NPK fertilizer needed for all the crops needs to be gathered manually through research.

Control Flow:



Technology Stack:

Front-end	Android (JAVA)
API	Flask
Back-end	Python
Database	CSV files

How to perceive NPK sensor value?

NPK-sensor readings are given in the unit ***mg/kg***.
Fertilizer requirements are given in ***kg/ha***.
Thus sensor readings are first forecasted to a hectare of field. Then fertilizers requirements are calculated.

Fig: Soil NPK sensor

There is *3900000 kg* of soil per hectare.
Assume reading of NPK sensor is: ***x*** *mg/kg* for N

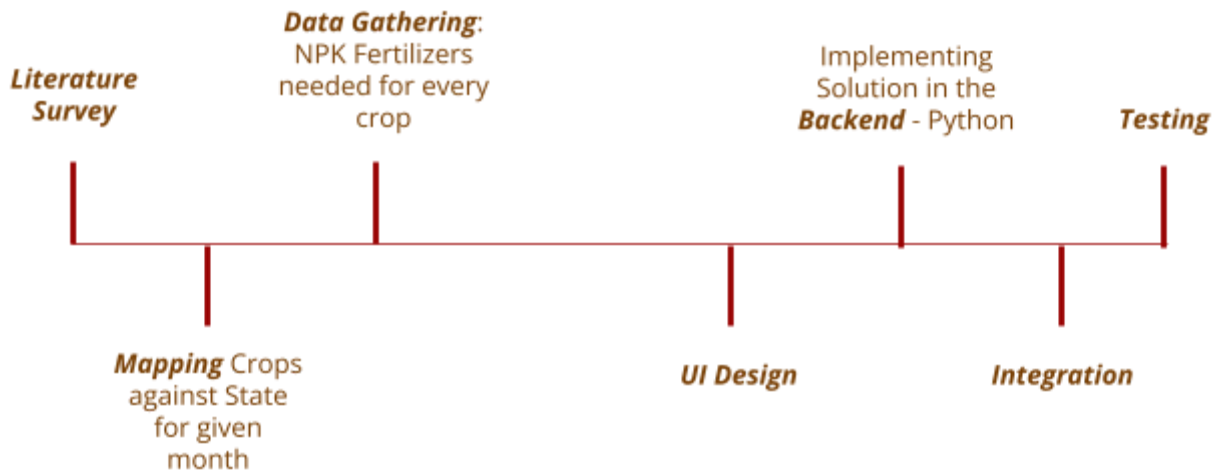
i.e ***(x * 3900000)*** *mg/ha* of N

I.e. ***(x * 3900000)/1000000*** *kg/ha* of N

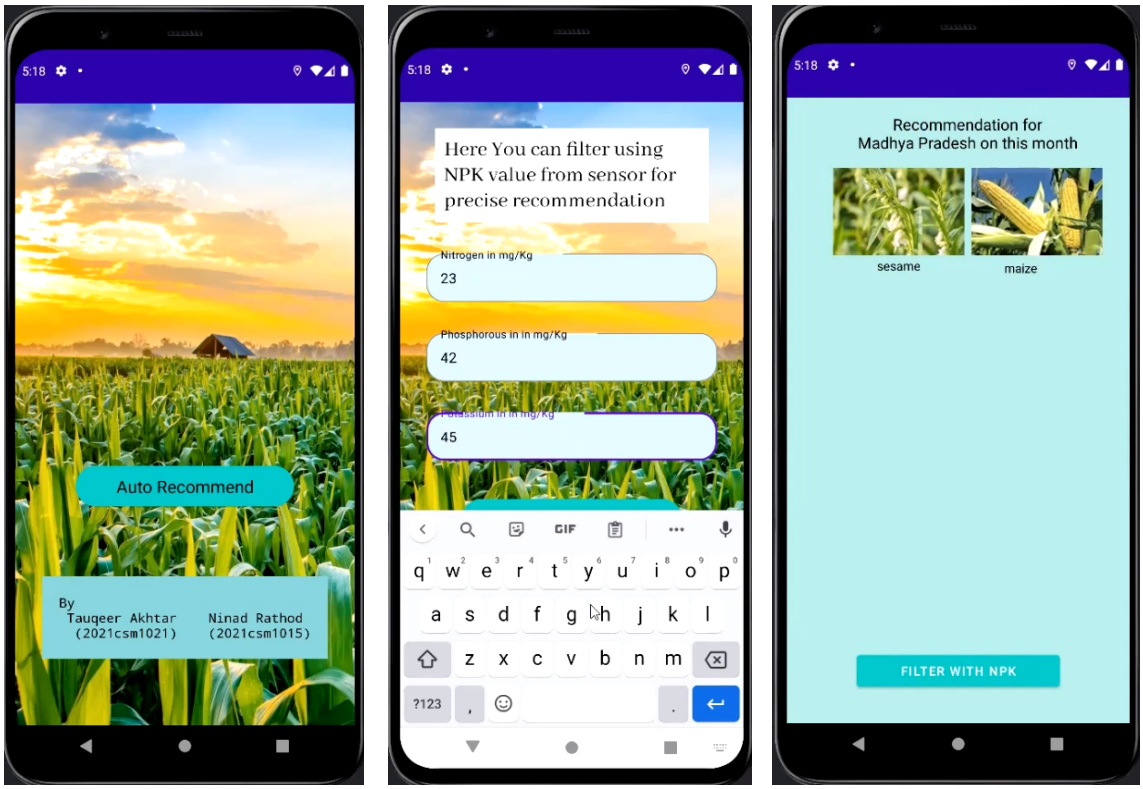
= ***(x * 39)/10*** *kg/ha* of N

= ***x * 3.9*** *kg/ha* of N

Project Phases:



Observations:



Conclusion: The final application is:

- Cost-efficient
- Runs on minimal data requirements from the user
- Not containing an ML model running in the back-end. Thus, lesser response time.
- No heavy database (like a labeled dataset for supervised ML model) requirements.
- Providing easy-to-use UI
- with little to no hardware requirements