SmartInternz HackChallenge 2021

AI Assisted Farming for Crop Recommendation & Farm Yield Prediction Application

Team : Modern Farming
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1. Introduction:

1.1 Overview:

An Artificial Intelligence Digital Farming Application is built to help farmers by using Watson Studio, Cloud Foundry, Watson IoT Platform and Node Red App. Watson Studio for deploying Auto-Ai services and in turn deploy Machine Learning Models. The IOT Platform Service was used to collect soil conditions using Sensor Data and feed it to the Dashboard and ML model to predict the optimal crop.

1.2 Purpose:

The purpose is to build an AI based Farming Farming Application which can recommend the best crop to be sown in given area by using the soil condition, Nutrient Values and Weather in that given location. And also, to provide the prediction of the yield for given crop based on Season, Crop, Region and Area by using Watson studio and IoT Services.

2.Literature Survey:

2.1 Existing Problem:

In farming climatic factors such as rainfall, temperature and humidity play an important role in the agriculture lifecycle. Increasing deforestation and pollution result in climatic changes, so it's difficult for farmers to take decision to prepare the soil, sow seeds and harvest.

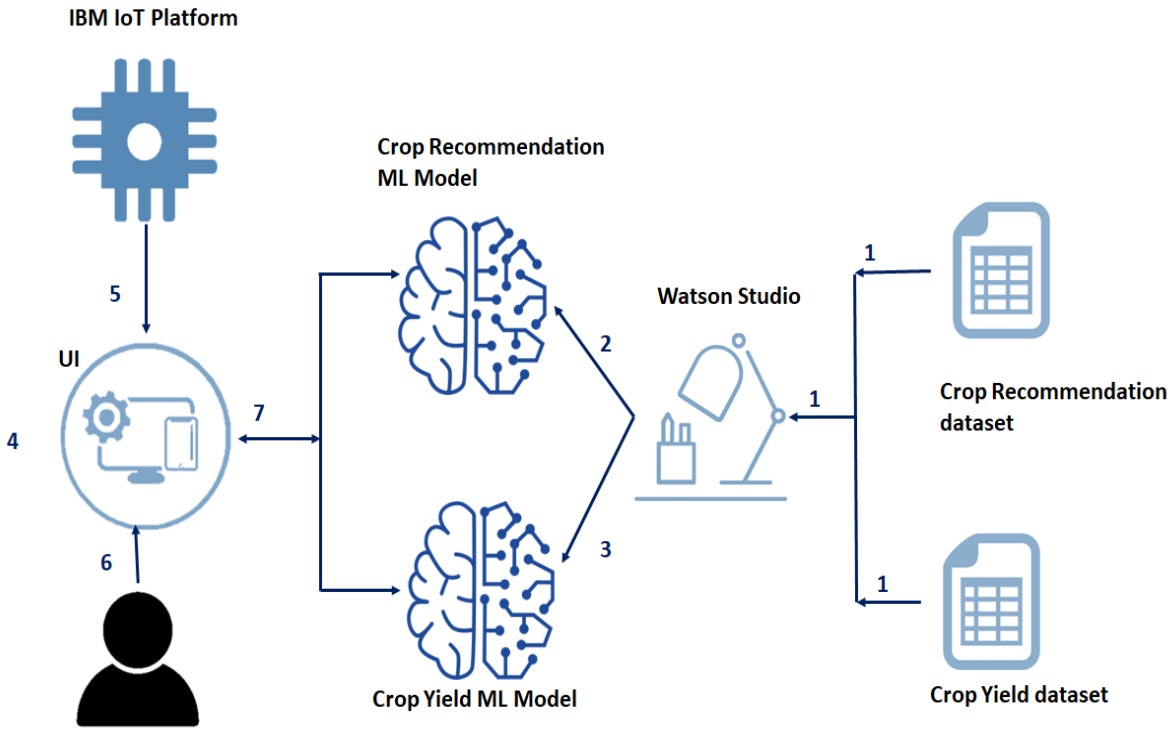
Every Crop need specific nutrition from soil. The deficiency can lead to poor quality of crop. The climatic situation is also important factor which can impact the production. As well as it is necessary for soil to shuffle the crop to maintain balance in its nutrients. Harvesting the same crop again and again may lead the nutrition deficiency of soil.

2.2 Proposed Solution:

This system collects the land nutrients values using an IoT device, in addition to humidity and rainfall and recommend the most suitable crop based on analysis of the past data where the same scenario given the maximum output. It also gives yield production if the recommended crop is cultivated which is also on based of the analysis of the past data.

3. Theoretical Analysis:

3.1 Block Diagram:



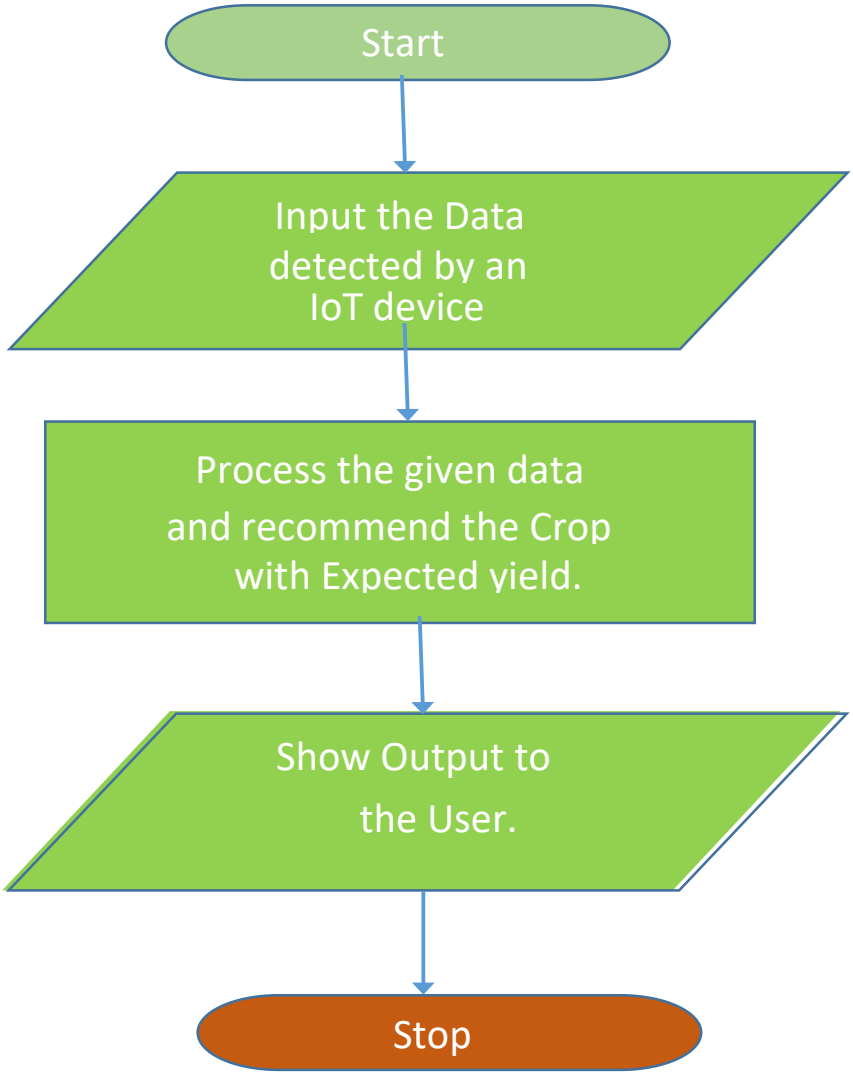
3.2 Hardware and Software Requirements:

- **Hardware Requirements**
    - IoT Device (In here we are using a simulated Iot device)
- **Software Requirements**
    - IBM Cloud
    - Watson Iot Platform
    - Watson Studio
    - Auto-AI in Watson Studio
    - Cloud Foundry
    - Node Red

4. Experimental Investigations:

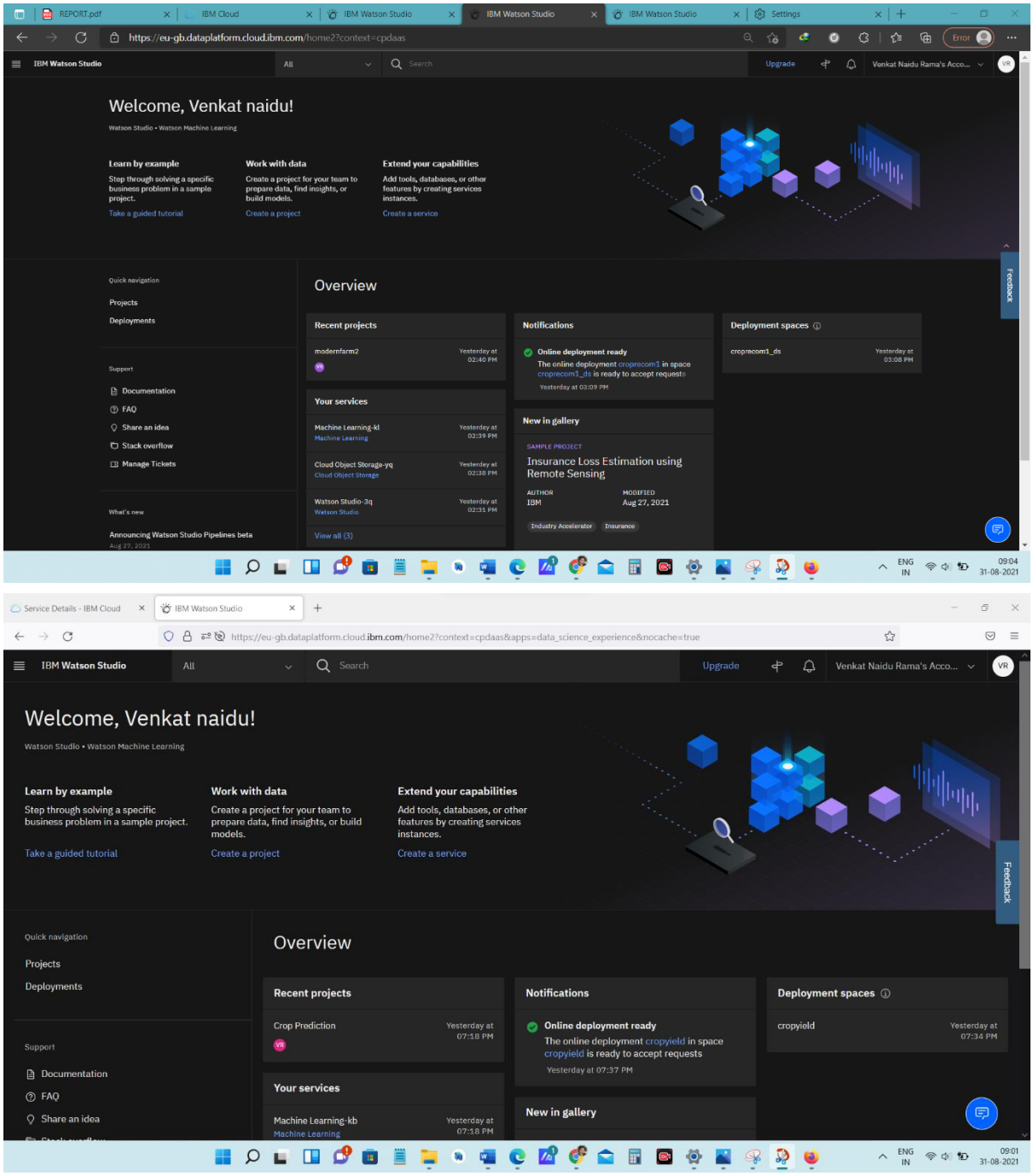
India is very vast in terms of Agricultural Concept. Every region is very different in terms of weather, soil fertility, climatic situation and the method used to cultivate the respective crop and it varies region to region and person to person. Thus, it becomes difficult to predict any factor related to farming. It may lead to get unexpected outcome.

5. Flow Chart:



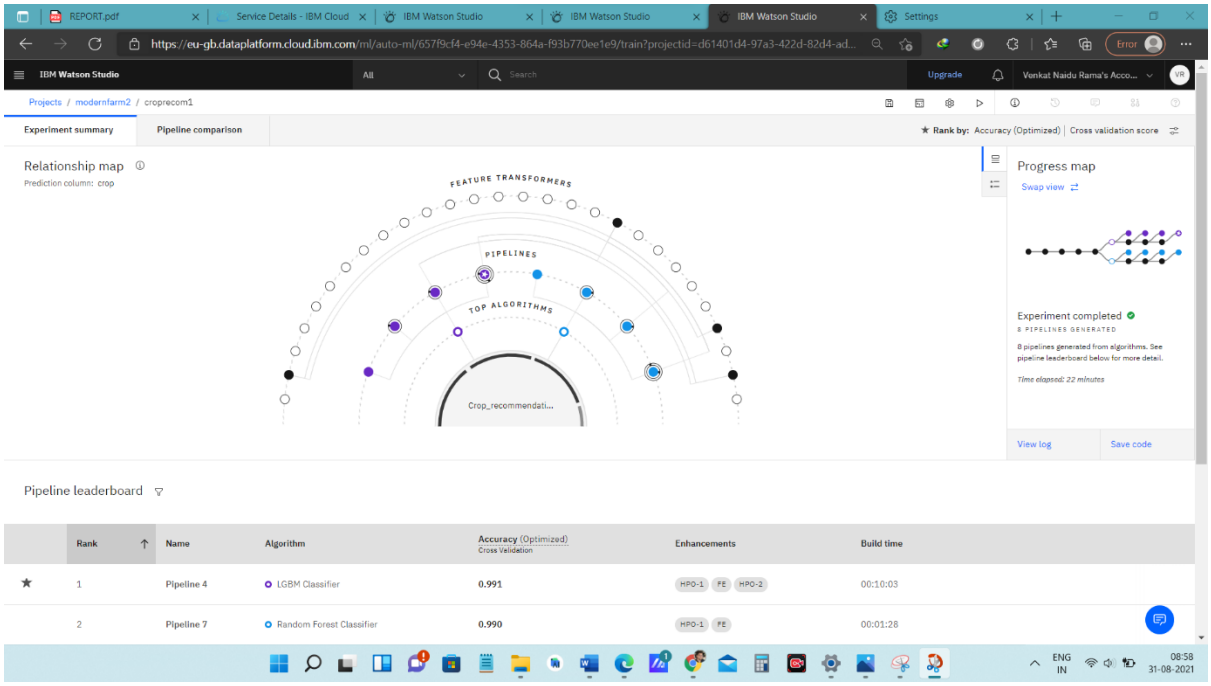
6. Results:

- Auto AI Model is successfully built using given datasets with an accuracy of 99.1%.
- Node Red had been launched successfully with cloud foundry.
- Iot Platform integrated with Node Red Dashboard UI.

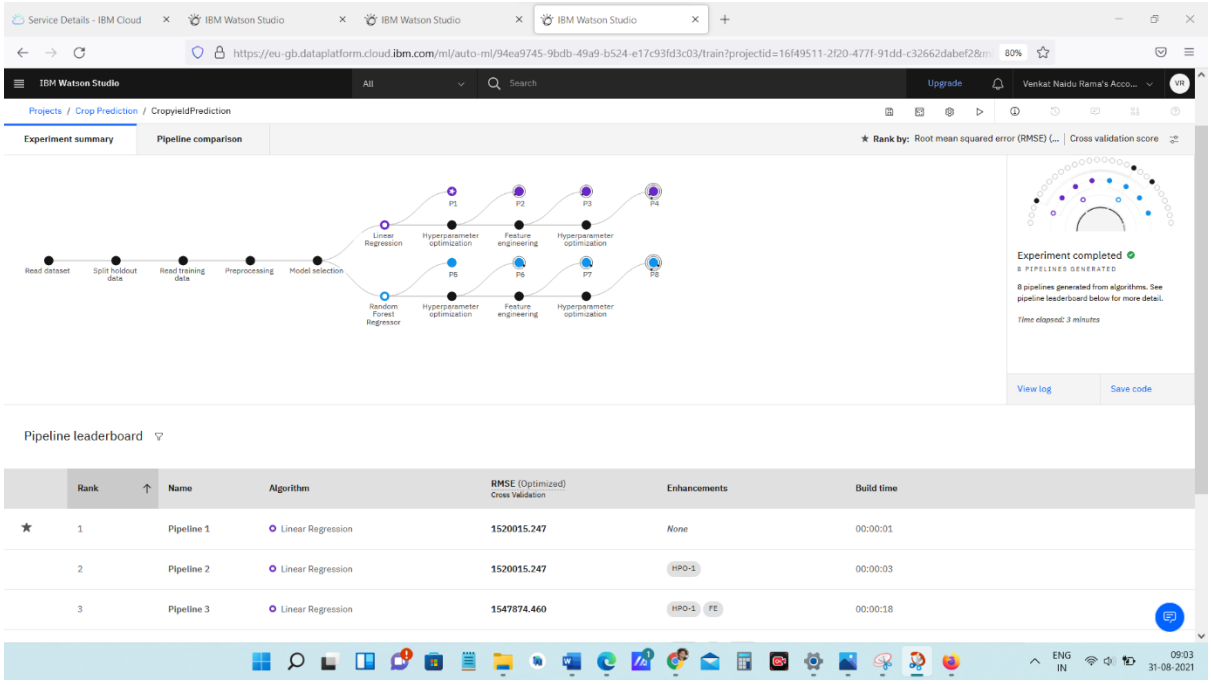


1.Watson Studio Deployment spaces

Machine Learning Models:



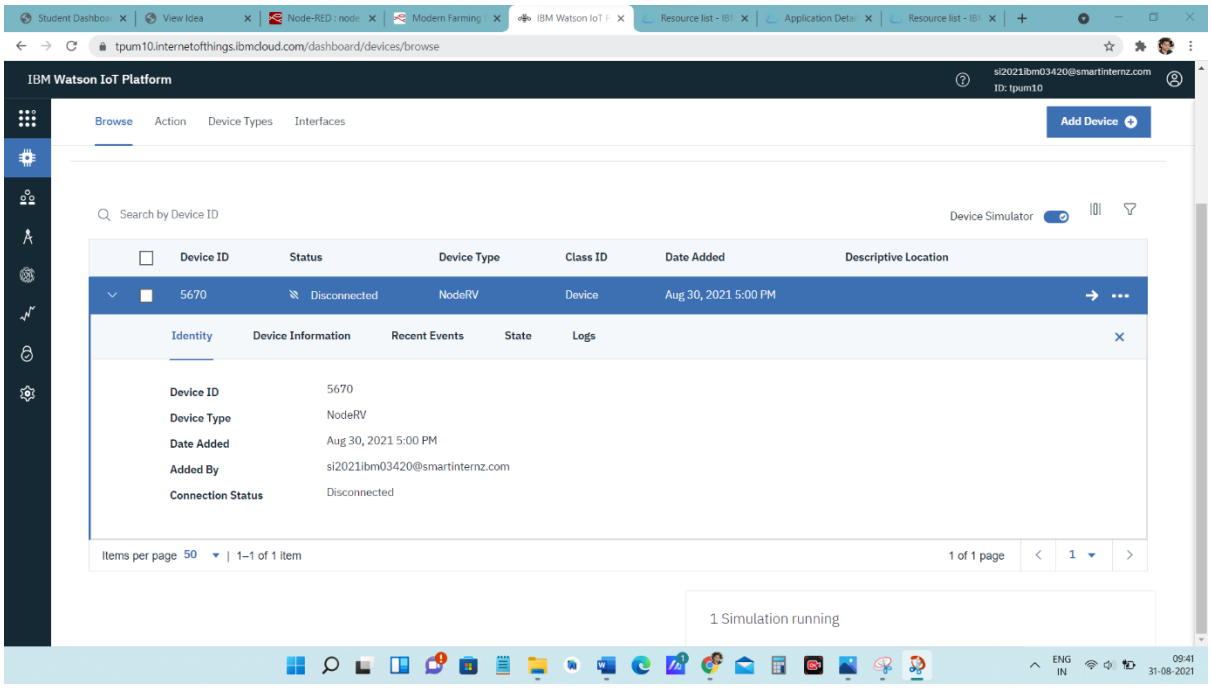
2.LGBM Classifier model for Crop Recommendation



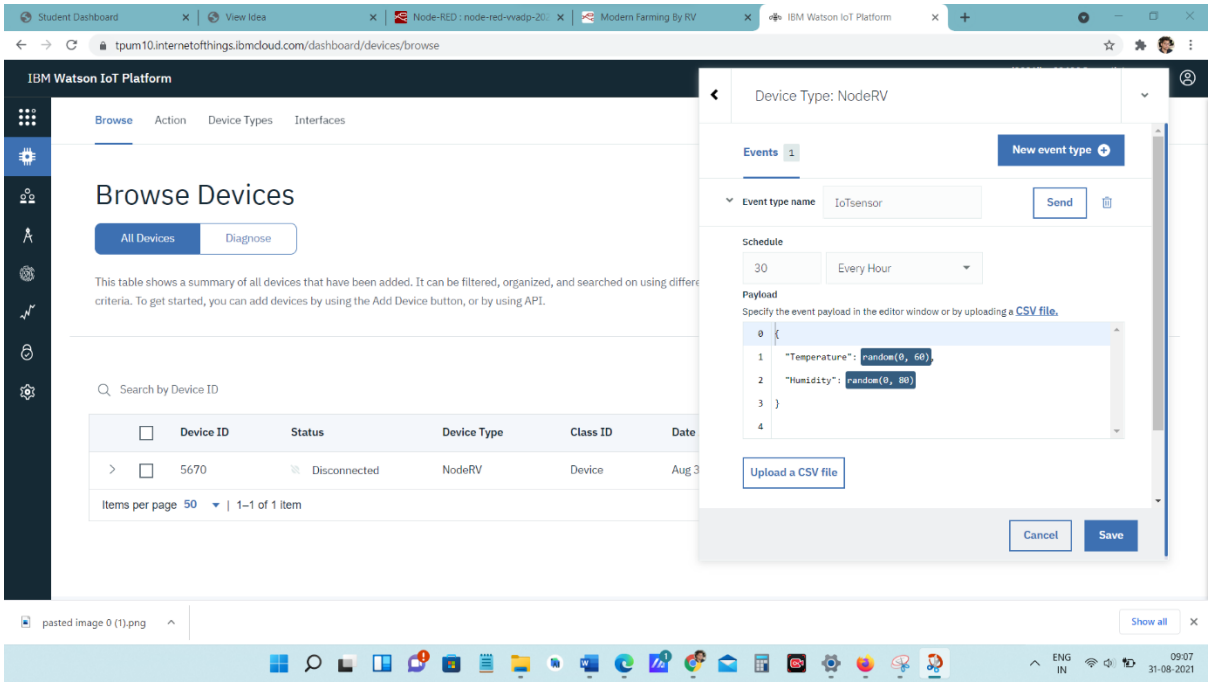
3.Linear Regression model for Crop Yield

(Note: I deployed two models from two different accounts because of CUH limit**)**

WATSON IOT Platform:

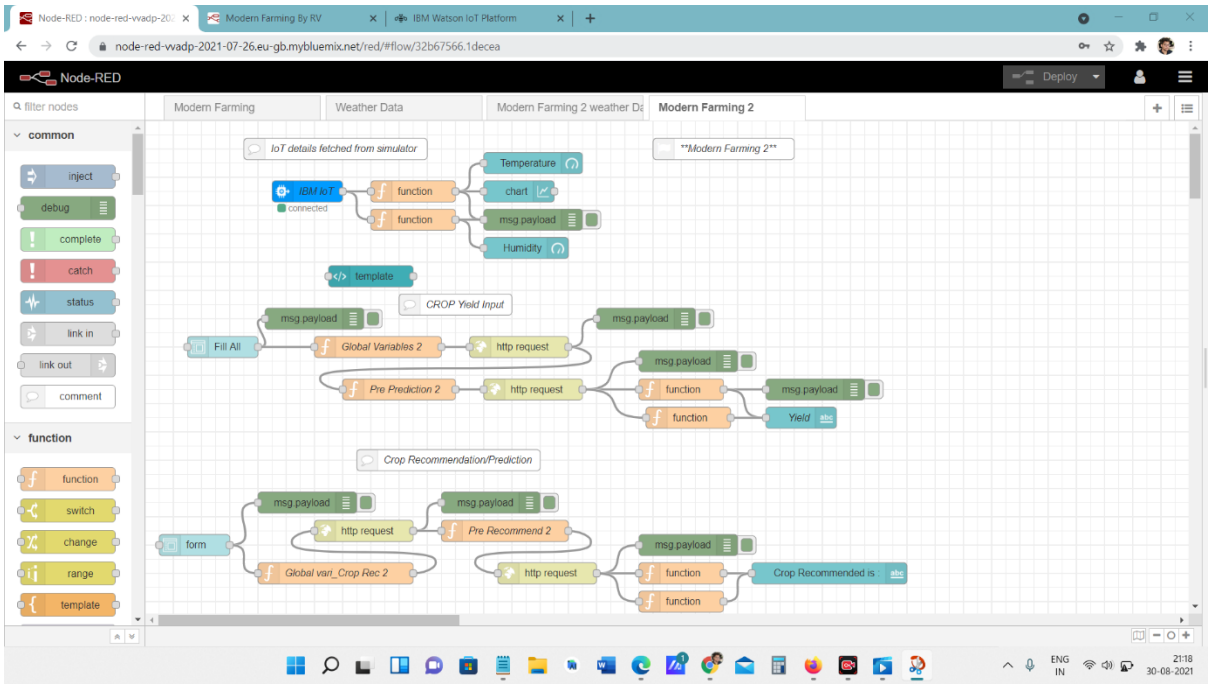


4.IoT Device

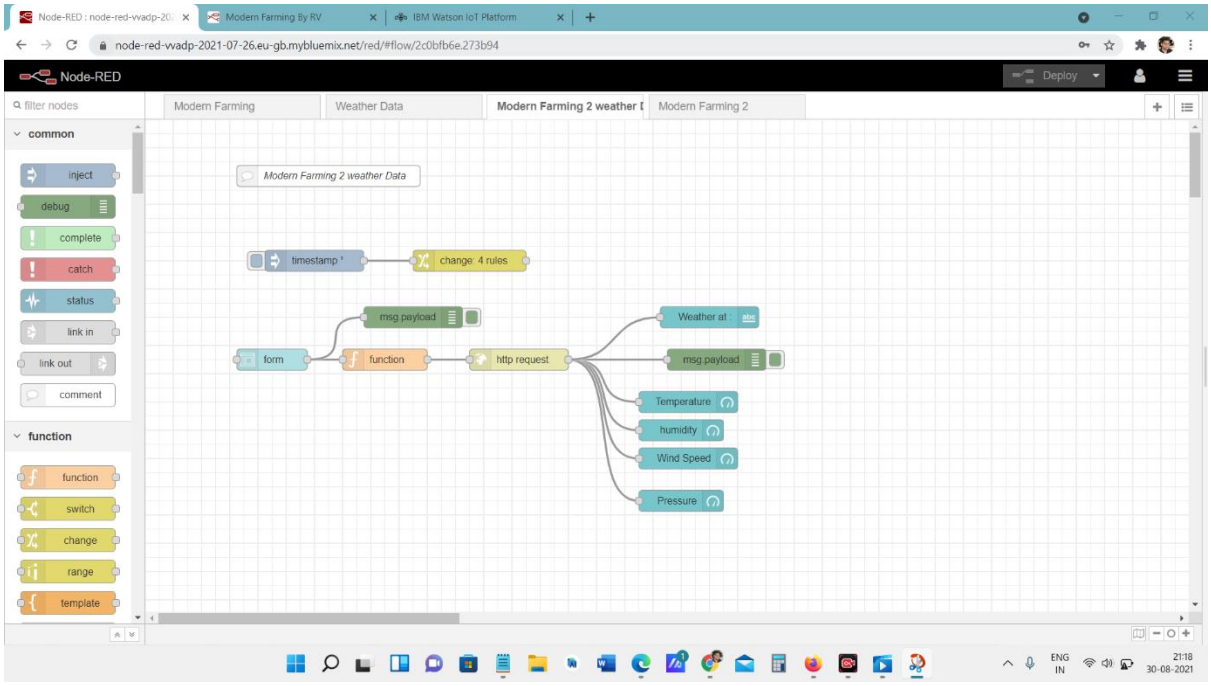


5.IoT Simulation Node

Node RED Flows:



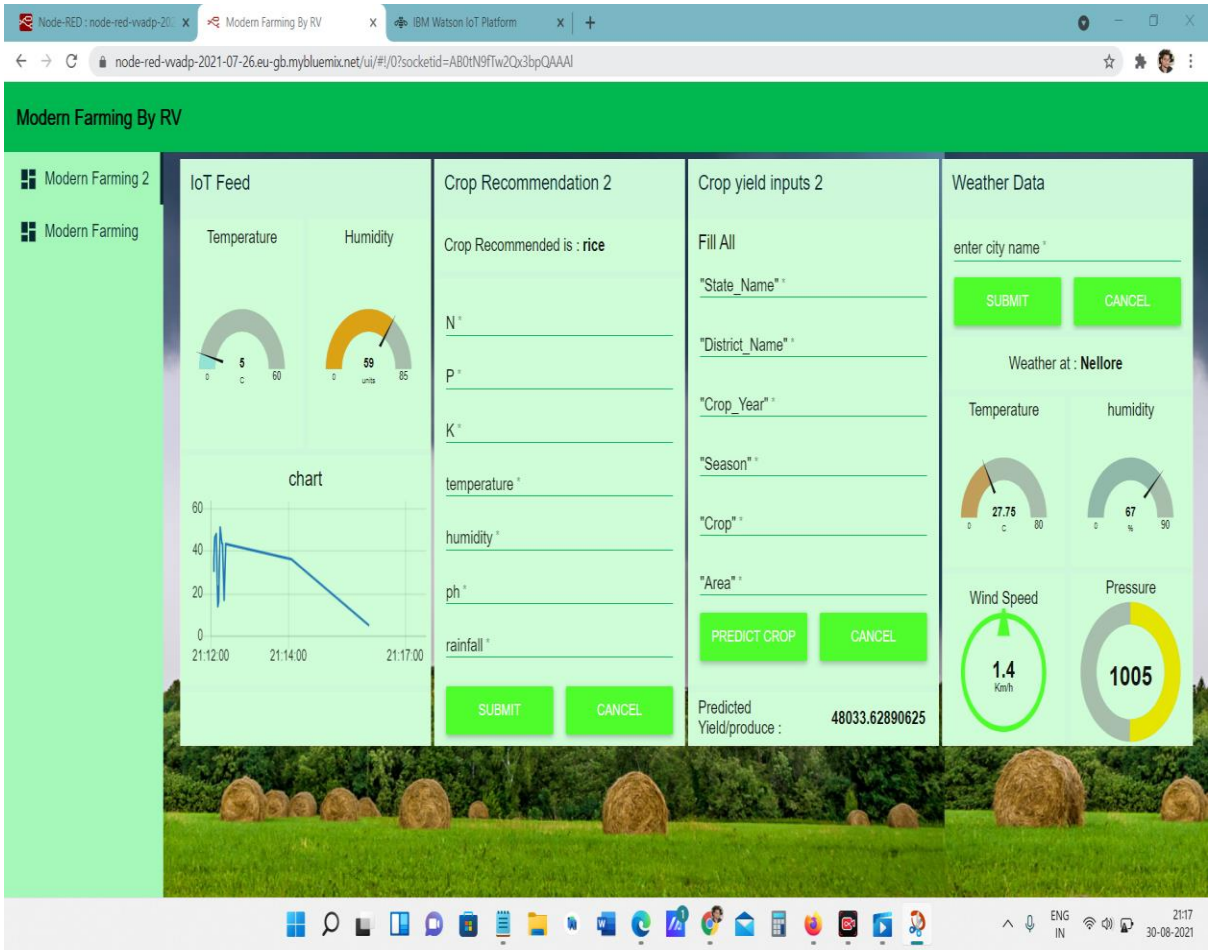
6.Node RED Flow for IoT, Crop Recommendation, Crop Yield



7.Node RED Flow for Weather

USER INTERFACE OF DEPLOYED NODE RED:

- **IoT Feed Output**
- **Crop Recommendation (I/O)**
- **Crop Yield (I/O)**
- **Weather Data**



Advantages and Dis-Advantages:

Advantages:

- Accurate Recommendations achieved using Watson Studio - 99.1%
- IOT Sensors give real time predictive analysis, which is displayed on the dashboard.
- The result is based on large number of data collected in past thus the accuracy is high.
- The system helps farmers to take decision to sow the crop.
- Artificial intelligence helps farmers get more from the land while using resources more sustainably.
- Artificial intelligence can improve plant breeding and crop management practices.
- It promotes digital farming.

Dis-Advantages:

- The result does not cover all the region of India.
- The result does not cover each and every agriculture product harvested in all the regions.
- Crop Sense Sensors require Internet services to be able to connect to the Cloud. This might not be available in remote regions of India.

Applications:

- The system can be used to get suitable crop to sow in the field.
- The System can also be used to predict the crop yield.
- The System can be used to fetch IoT feed from IoT device which helps to monitor Soil and Weather condition.
- The modernization of farming can improve the society as a whole. Standing in the sun for hours in a day is no longer necessary if irrigation and fertilizer systems are automated.
- Automated Farming can be an upcoming industry which can create new jobs and increase the GDP and productivity of the nation. Crops can be grown in surplus and exported to other countries if rapid modernization can be implemented to this industry.

Conclusion:

- The proposed solution consists the analysis done by IBM cloud-based service IBM Auto AI and it recommends the Crop to sow and estimate the Yield. It displays output using the Node RED dashboard User Interface. Any user with understanding of Internet will be able to use this system.

Future Scope:

- Suitable fertilizer and pesticide recommendation system can be implemented along with this system.
- In addition to this system, cultivation cost can also be predicted.
- Soil nutrient booster or fertilizer recommendation system will be beneficial if system detect any soil nutrient deficiency.
- Pest/Disease Detection using Cameras and Surveillance systems for crops so that farmers can be alerted on the presence of rodents/pests on their farms. This way, the damage caused by pests/diseases can be prevented before it happens.

BIBILORAPHY:

1. Dataset for Crop Recommendation: https://www.kaggle.com/siddharthss/crop-recommendation-dataset

2. Dataset for Crop Yield:

https://github.com/shreyzo/Crop-yield-and-profitability-prediction/blob/main/crop_production.csv

3. Project Deployment in GitHub : https://github.com/smartinternz02/SBSPS-Challenge-5427-AI-Assisted-Farming-for-Crop-Recommendation-Farm-Yield-Prediction-Application