Analyze IoT Sensor Data with Machine Learning

Rainfall Prediction

Submitted by

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Contents

INTRODUCTION

The technological revolution started a decade back through introduction of multicore processors and is evolving in a infinite rate, the physical hardware is no more a concern in the present. Wherein the software apps and cloud does everything (i.e.,) Virtualize the hardware which enable testing, implementation and more importantly the innovations as there are minimal / No barrier to explore.

In the way here a simple methodology / project is proposed to predict the rainfall with help of the environmental conditions without involving satellites forecast. The IBM IoT platform, Watson Studio, Cloud storage, IBM ML and NodeRed (UI) are involved for achieving the said process of prediction.

LITERATURE SURVEY

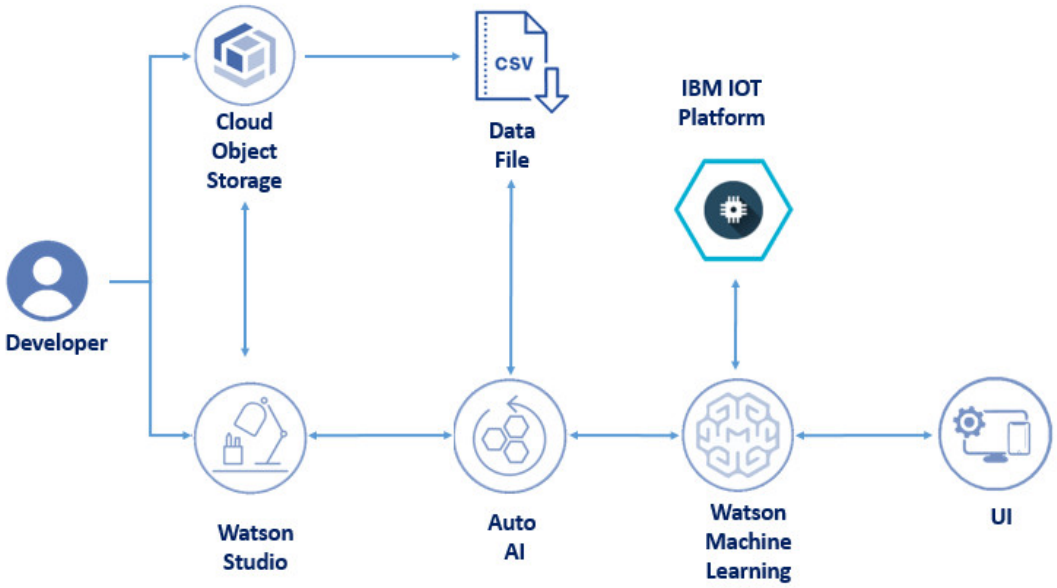
The Guidance of Team Smart Bridge and IBM Gurucool, along with session recording gave a good insight on various aspects of IBM cloud and other services and the Project documents clearly specifies the requirements and procedure, Hence detailed Literature survey wasn't required to carry out the chosen project.

Existing Problem and Solution Proposed: c

The prediction of rainfall based on the environmental condition is the requirement/problem statement. To address the same a cloud based IoT device is involve to generate random environment condition by generating random values for the atmospheric temperature, Humidity level in the atmosphere and the wind speed. A detailed study on various environment conditions has been undergone and a dataset has been design with utmost care. The dataset is used to train a AI model using ML algorithms for predicting the rainfall.

THEORITICAL ANALYSIS

The project model diagram shown below gives complete clarity on the requirements and process(es) to be involved / created to establish the UI for prediction.



EXPERIMENTAL INVESTIGATIONS

The Following are the Steps to Carried out to implement the Project

Step 1 : Create an IoT Device in the IBM IoT Platform.

Step 2 : Generate Random Values for Temperature by simulating the IoT Device created

Step 3 : Create a AutoAI project to involve Machine Learning algorithms to predict the Rainfall

Step 4 : Upload appropriate Dataset and create an AutoAI experiment

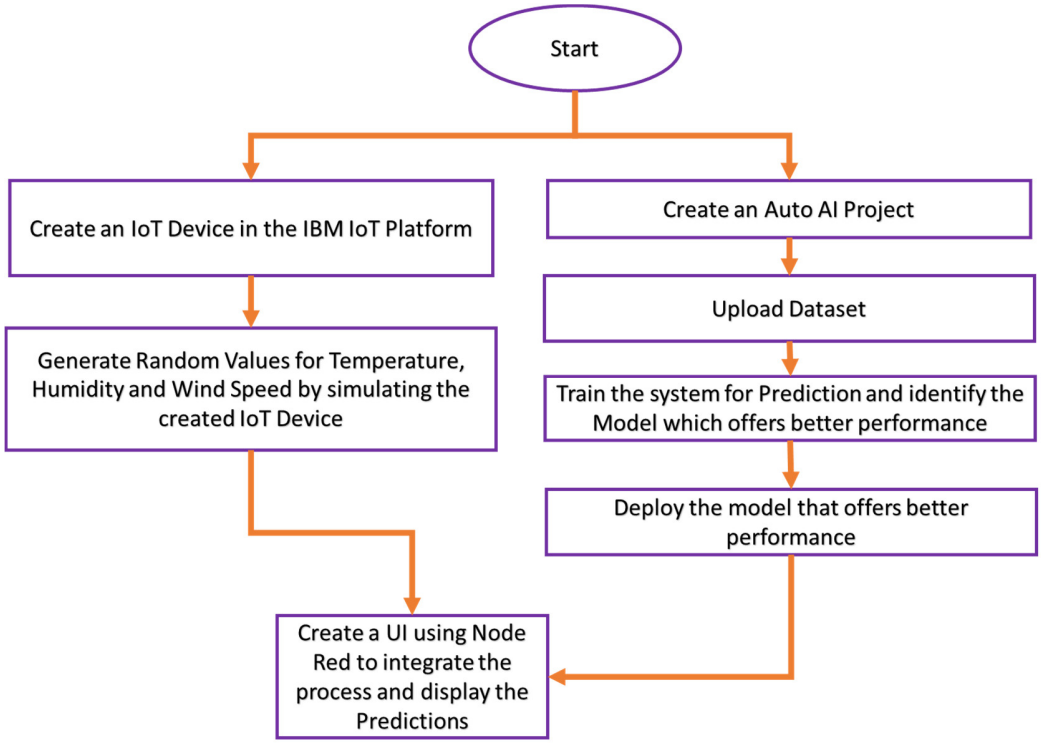
Step 5 : Once the process of Prediction is done using various algorithms, create model for the algorithm in the pipeline 1 which would offer better performance.

Step 6 : Upon saving the mode, deploy the model in the cloud space

Step 7: Create UI for displaying the prediction, validate the models with API keys and appropriate Tokens to ensure proper communication is established between the UI and the backend IoT platform / ML model.

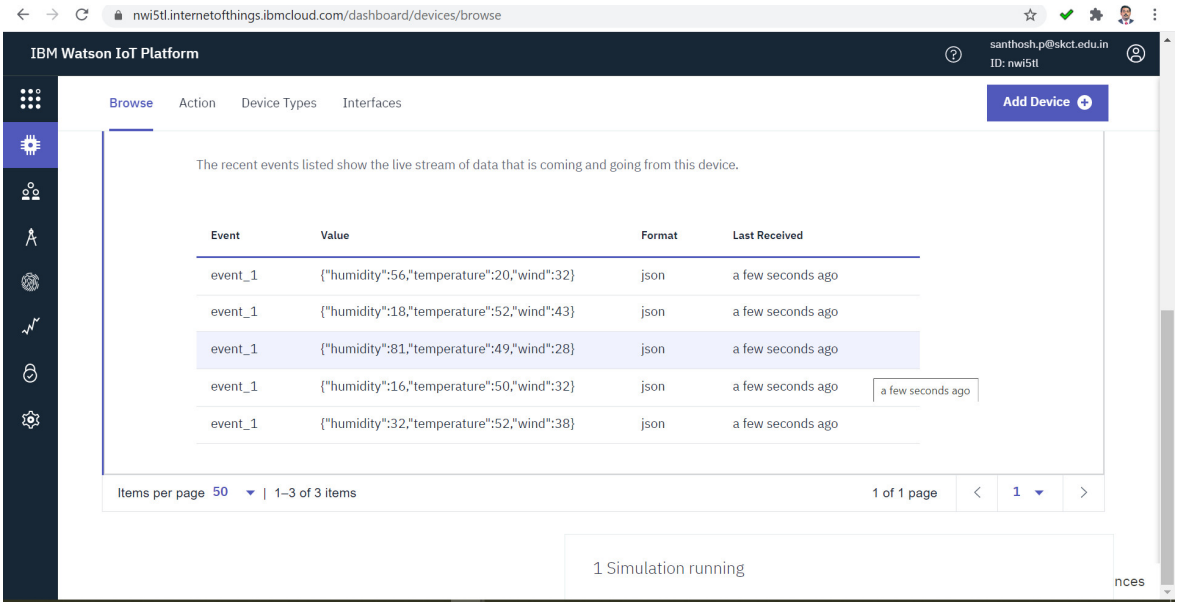
Step 8 : Establish and Evaluate the entire sequence.

FLOW CHART OF THE PROJECT

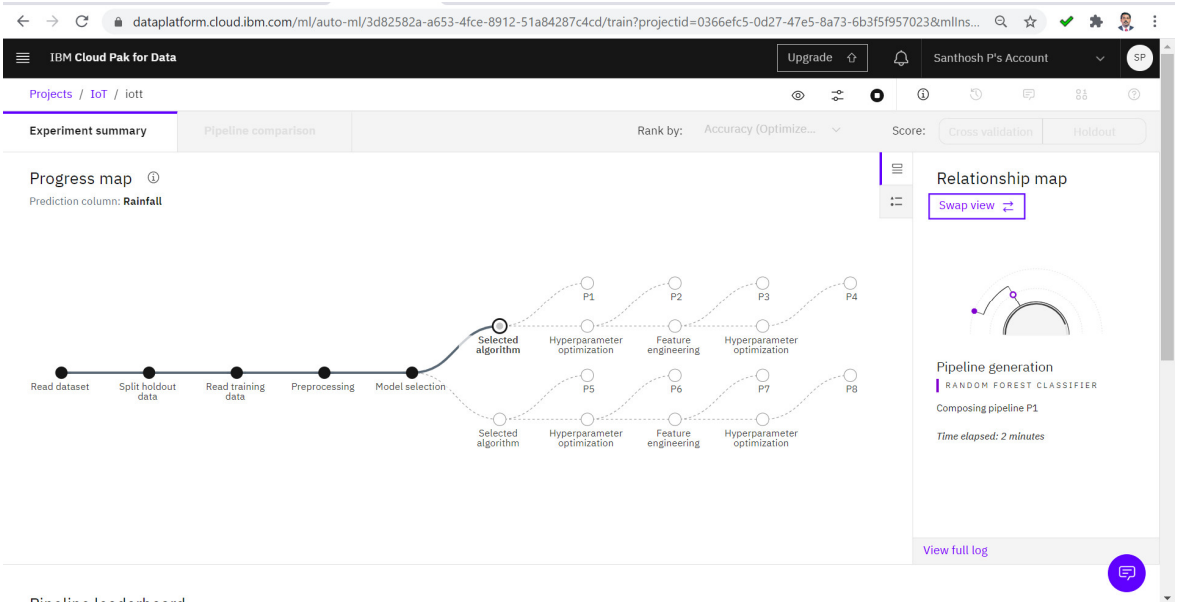


RESULTS

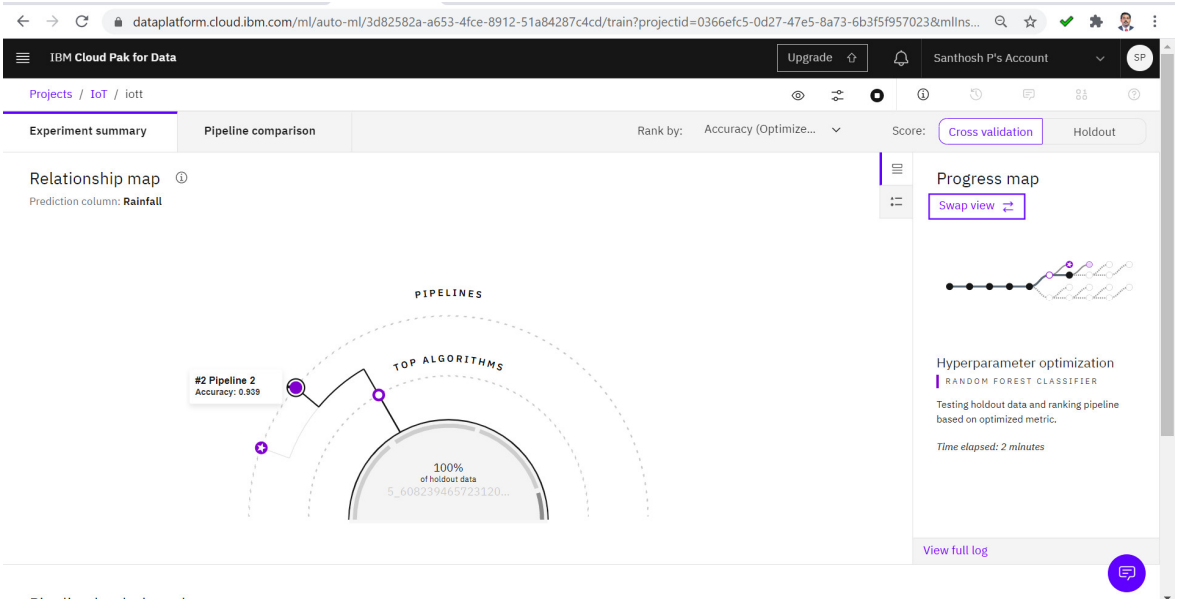
IoT Device Simulated Values of Temperature, Humidity and Wind



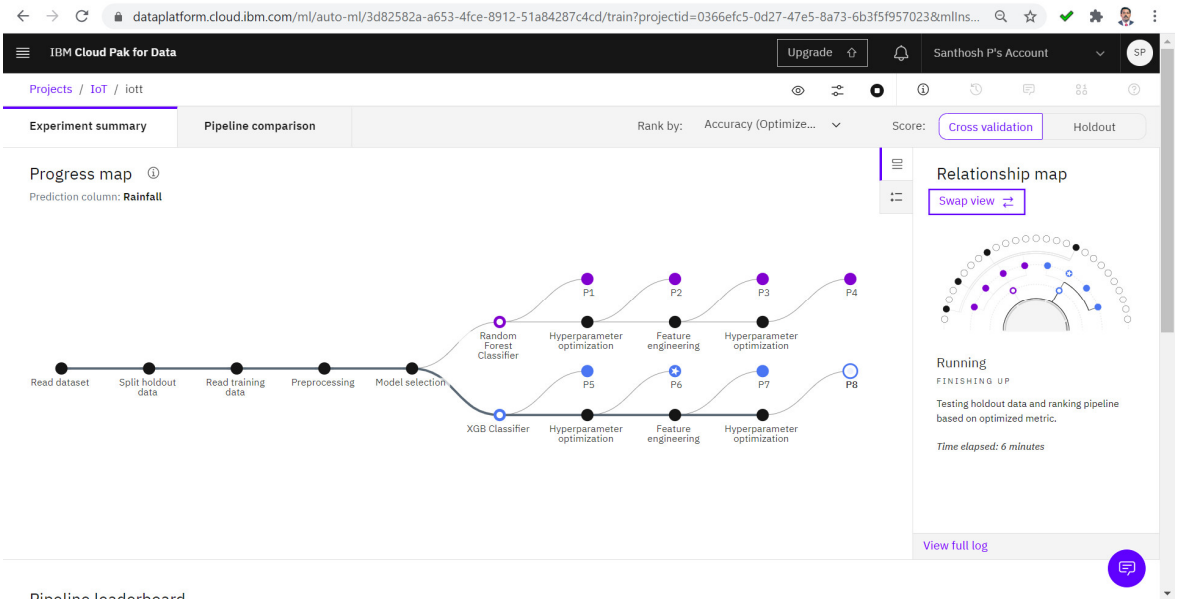
Pipeline Generation and Progress Map of Auto AI Experiment at Initial Stage



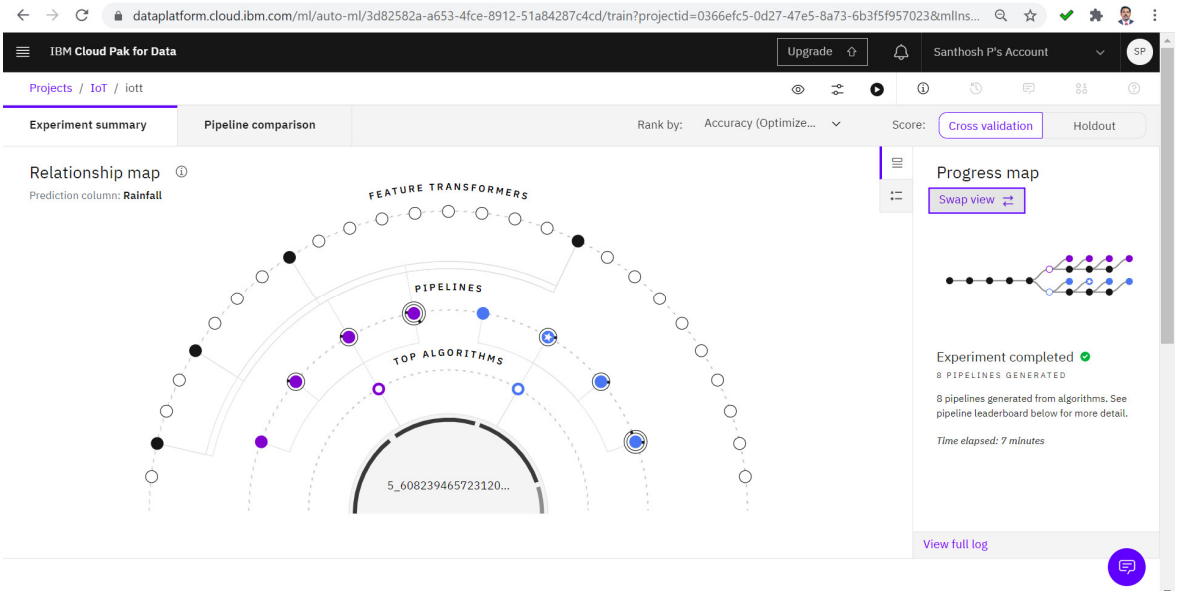
Pipeline Generation and Relationship Map of Auto AI Experiment at Initial Stage



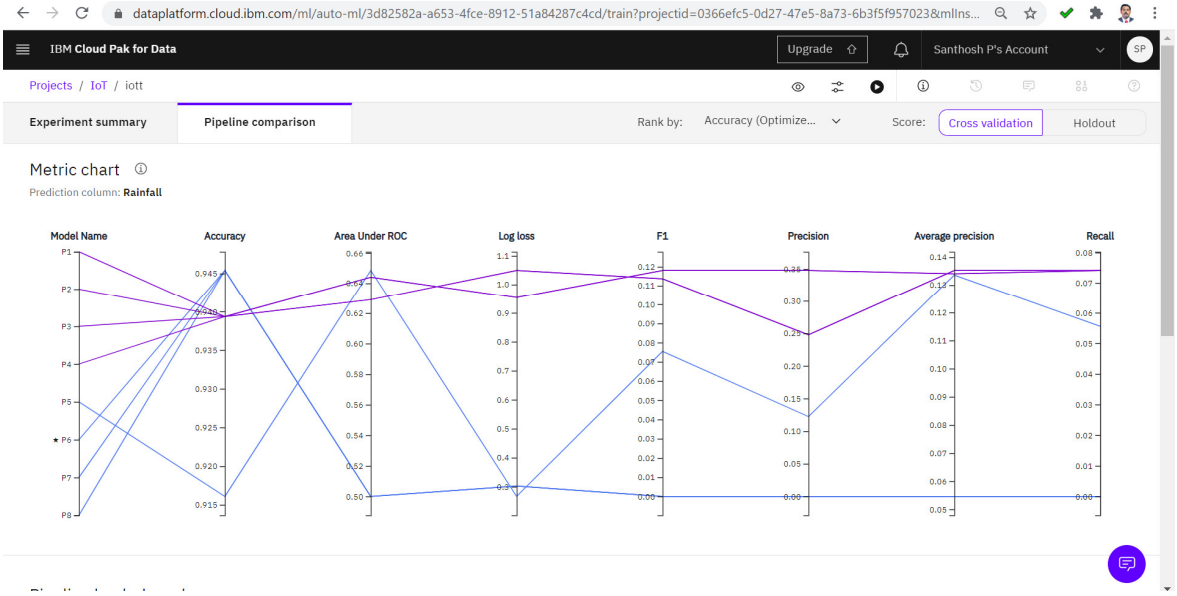
Pipeline Generation and Progress Map of Auto AI Experiment at Final Stage



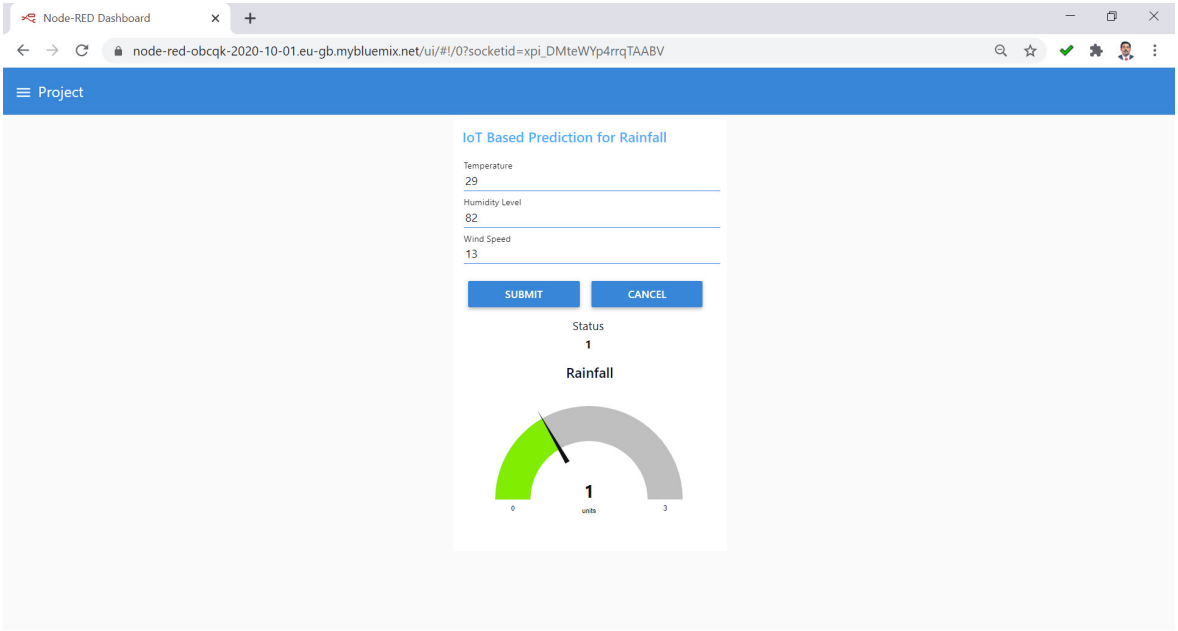
Pipeline Generation and Relationship Map of Auto AI Experiment at Final Stage



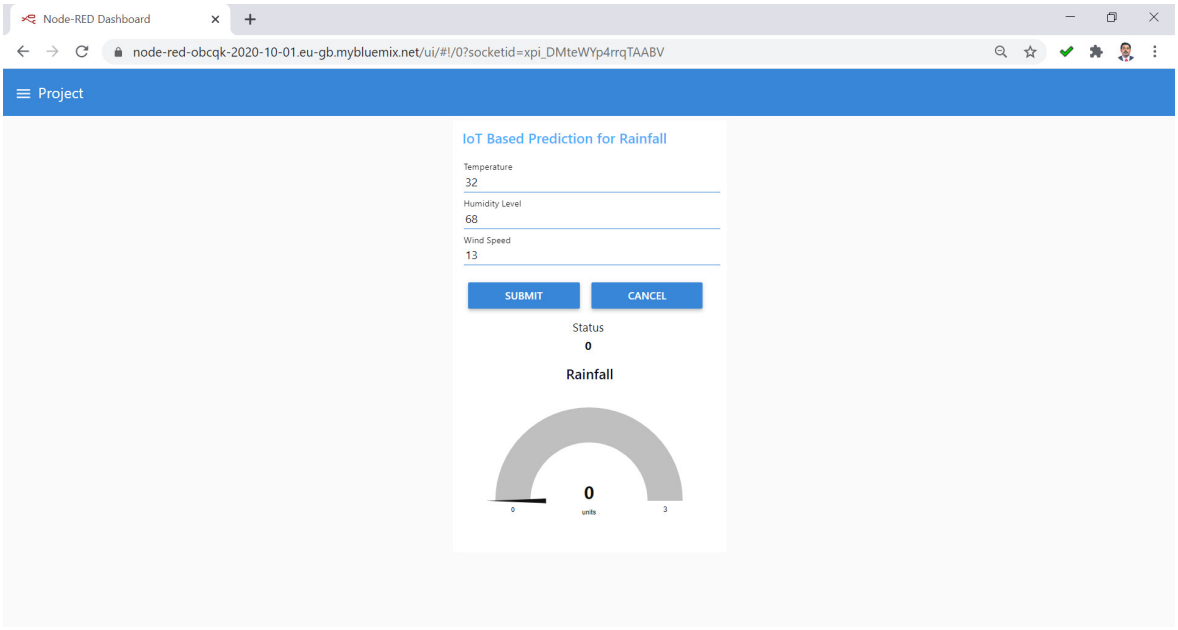
Metric Chart of Pipeline Comparison of Auto AI Experiment



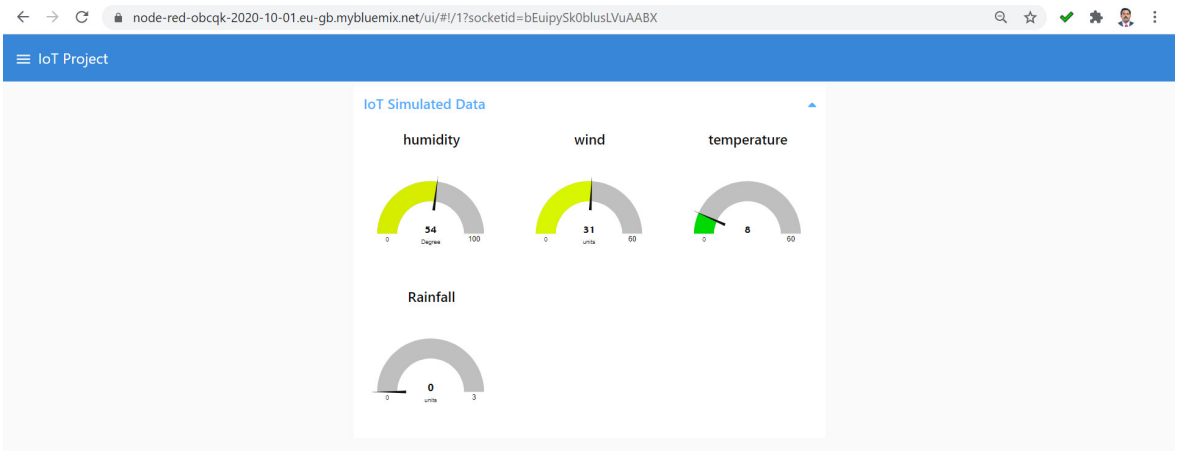
NodeRed Prediction for Manual Verification of Rainfall (True Scenario)



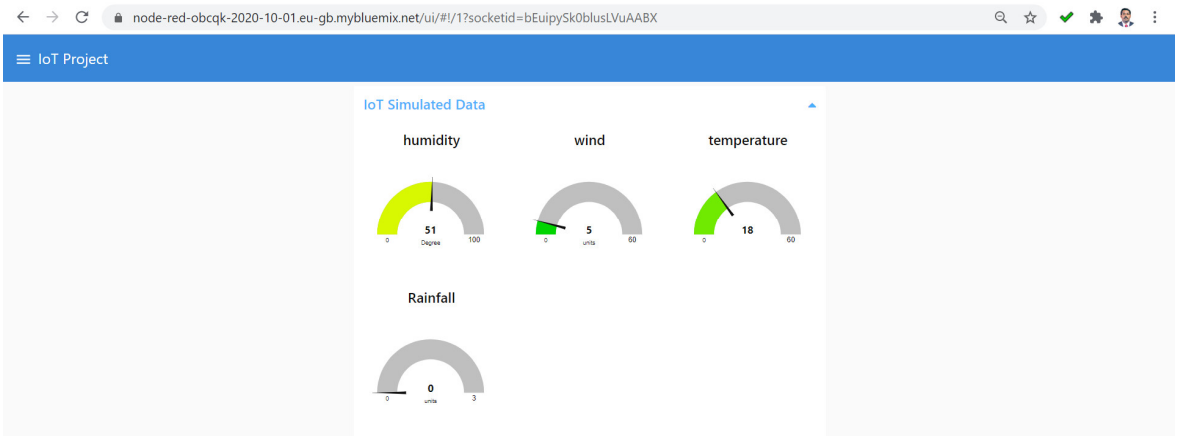
NodeRed Prediction for Manual Verification of Rainfall (False Scenario)



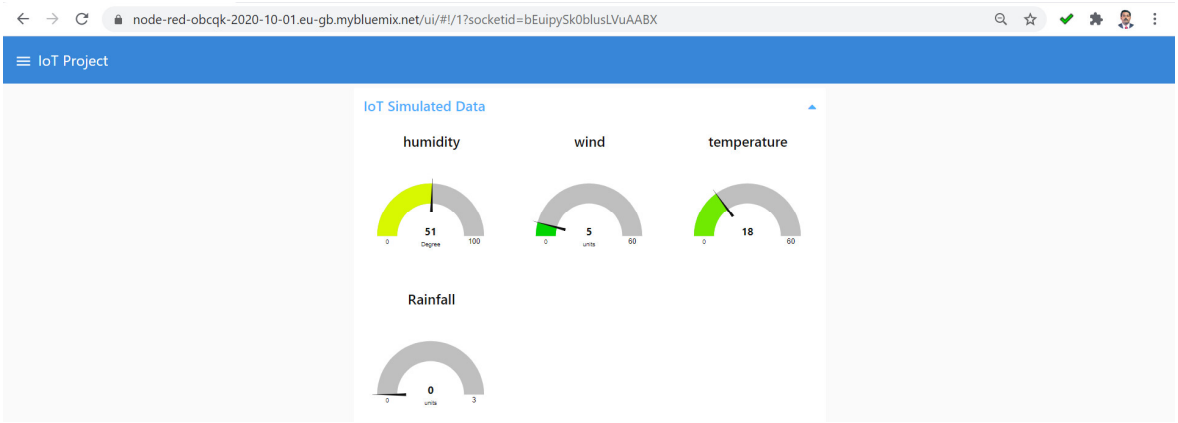
NodeRed Prediction for Rainfall based on the IoT device Simulated Value (Sample 1)



NodeRed Prediction for Rainfall based on the IoT device Simulated Value (Sample 2)



NodeRed Prediction for Rainfall based on the IoT device Simulated Value (Sample 3)



ADVANTAGES AND DISADVANTAGES

Advantage:

1. User Friendly
2. The Prediction is more accurate
3. Can be extended to similar projects to perform predictions

Disadvantage:

1. The Prediction was not suitable for the simulated values from the IoT platform as it needed similar combination, Tuning/Training of the system to extended for enhancing predictions.

APPLICATIONS, CONCLUSION AND FUTURE SCOPE

Applications

1. Chatbots
2. Image processing based application
3. Biometric authentication/Validation
4. Prediction of Disease based on systems
5. Predition of quality of food using appropriate sensors and Iot platform
6. Remote monitoring
7. Many such

Conclusion & Future Scope:

The developed project holds good for the given data set, training the system further would enable the prediction accuracy and precision and auto-learning function can be developed (i.e., with a minimal manual training and learning from other resource from cloud and internet will strengthen the model to greater extend).

BIBLIOGRAPHY

1. https://www.youtube.com/watch?v=4G2qMhhAg0c
2. https://www.youtube.com/watch?v=tUBJZfnxeTw&t=1386s
3. https://www.youtube.com/watch?v=mWZLuHpcZRY&t=11809s
4. https://www.youtube.com/watch?v=zVfp8FayCo0
5. https://www.youtube.com/watch?v=txfjhGXn7Us&t=16s
6. https://www.youtube.com/watch?v=1tbFiCpJs0k&t=11s
7. https://www.youtube.com/watch?v=nnVPOFTCmQw

APPENDIX A

IoT Device Simulator - Source Code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     },
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    }
   ],
   "devices": [
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   ],
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APPENDIX B

NodeRed flow - Source Code

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APPENDIX C

AutoAI Project Source Code

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APPENDIX D

YouTube Link and GitHub Link

Youtube Link : https://youtu.be/avqtFPMHWSE

GitHub Link : https://github.com/santhosivam/GurucoolProject