**PROJECT REPORT**

**1.INTRODUCTION**

**1.1 Overview**

This is an overview of the project for the hackathon. The data was fed to the cloud and the best machine learning algorithm that gives the most accurate results on the test data-set was chosen. A machine learning model was trained using the chosen algorithm. This model will be the core technology on which our web and mobile applications will function.

A web application was created which interact with the ML model deployed on the IBM Cloud. The user- interface created will take product code, city code, base price, promotion of an event as inputs, and display different graphs that will show the predicted weights and the predicted earnings for a particular product in a particular week.

The machine-learning algorithm used can make demand forecasts based not just on historical sales data but also on other influencing parameters like internal factors such as advertising campaigns. The ML model was used to display the information on a mobile application as well. Itis based on the same principles that the website is built upon.

**1.2 Purpose**

The purpose of the project is that with the help of accurate predictions, we can prevent the issue of overstocking and understocking thereby preventing the wastage of goods and resources. The company will be able to create a balance between market demands and its interests. It shall promote a healthy competitive environment for various businesses to prosper causing overall economic growth. This will secure its future growth and ensure a steady supply of fresh goods which will have a positive impact on the economy, society, and environment in the long run.

**2.LITERATURE SURVEY**

**2.1 Existing problem**

A food delivery service has to deal with a lot of perishable raw materials which makes it all, the existing problem for such a company is to accurately forecast daily and weekly demand. Too much inventory in the warehouse means more risk of wastage, and not enough could lead to out-of-stocks - and push customers to seek solutions from your competitors. The replenishment of the majority of raw materials is done every week and since the raw material is perishable, thus procurement planning is of utmost importance.

**2.2 Proposed solution**

The proposed solution is a web application/mobile application that will interact with the ml model integrated on the IBM cloud. The web application will take product code, city code, base price of the product, and promotion of the product as inputs and display different graphs that will show the predicted weights and the predicted earnings for a particular product in a particular week. The machine-learning algorithm used can make demand forecasts based not just on historical sales data but also on other influencing parameters like internal factors such as advertising campaigns.

**3.THEORETICAL ANALYSIS**

**3.1 Block Diagram**

After many attempts on different types of algorithms, we found the best algorithm for our model i.e the “random forest” algorithm. The model training can be intuitively explained with the help of the following block diagram.

TRAINING DATA

DATA PREPROCESING

MODEL SELECTION AND

TRAINING

DATASET

HYPERPARAMETER OPTIMISATION

TESTING DATA

PREDICTIONS

REQUESTS USING API

MODEL DEPLOYMENT

**3.2 Hardware/Software designing**

Various IBM software technologies are used in making of the project.

For back-end implementation IBM Machine Learning service AUTO AI is used to select the best possible algorithm for the prediction.

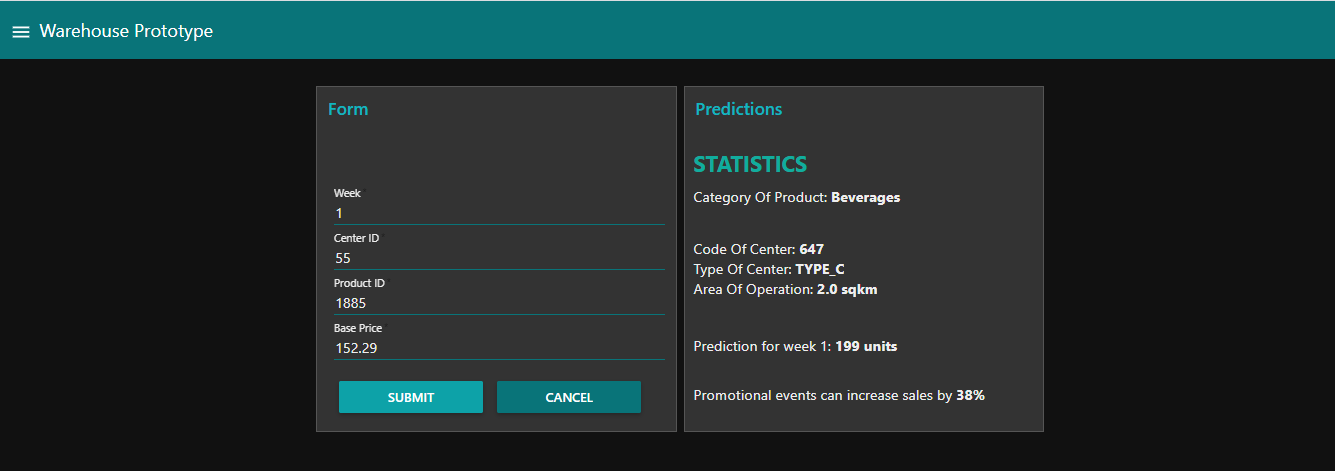
DB2 database is used to store the necessary information about the product and center,

And finally, Node-Red is used for the front-end implementation.

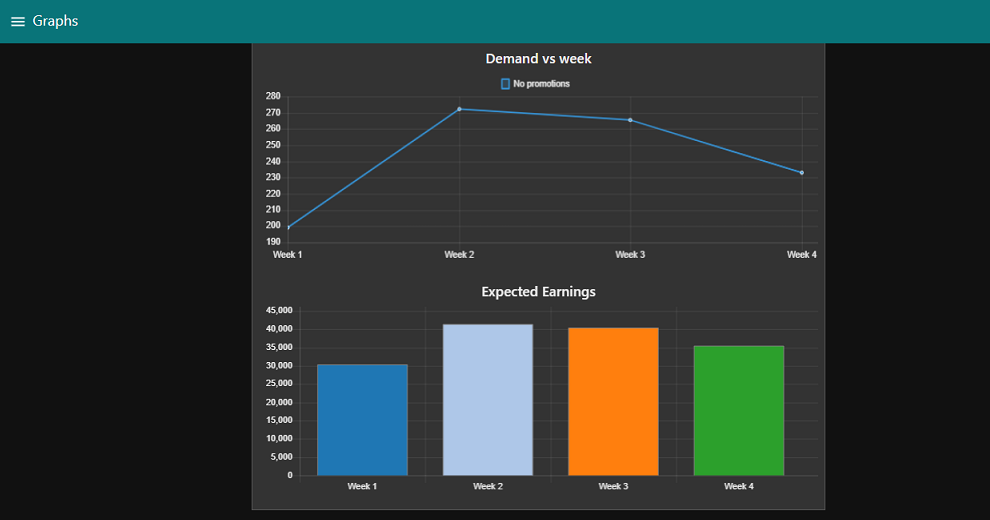
For mobile application development, android studio is used.

**4.EXPERIMENTAL INVESTIGATIONS**

**4.1** This is the user interface created which takes Center Id ,Product Id,the base price of the product and the week number on which the number of orders of that product is to be predicted.

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**4.2** After entering the required inputs in the form as shown above we get the required predictions.The visualization is enhanced by creating two graphs.The first graph shows the predictions i.e the expected number of orders for the product in the coming weeks.The second graph shows the expected earnings of the product in the coming weeks.



**5.FLOWCHART**

DISPLAY PRODUCT AND CENTER INFO

FETCH REQUIRED DATA FROM DATABASE

USERS FROM INPUTS

DATA PROCESSING

HTTP REQUESTS USING API

DISPLAY FUTURE DEMAND GRAPH

ML MODEL PREDICTIONS

DISPLAY EXPECTED EARNINGS GRAPH

DISPLAY PREDICTIONS AND SALES TIPS

**6.RESULT**

The final result is a web application and mobile application with a user-interface that displaystwo graphs.

The first one is the “product-graph” which forecasts the demands of each product so that the owner could plan the replenishment of the goods. This would help the company in minimizing wastage and preventing shortage.

The second one is the “earnings-predictor” graph which would predict the earnings the company will endure in the upcoming weeks.This will secure its future growth and ensure a steady supply of fresh goods which will have positive impacts on the economy, society, and environment in the long run.

**7.ADVANTAGES & DISADVANTAGES**

The model can efficiently classify the goods and predict demands according to the product details and center details. But it cannot take extreme scenarios into consideration including cases like the current COVID pandemic and the global recession following it.

**8.APPLICATIONS**

It can have a wide area of applications, particularly in the manufacturing sector where we need accurate inventory management and demand forecasting. Thus it shall be crucial for supply-chain management.

**9.CONCLUSION**

Taking various constraints into account the management team of the company will prioritize goods and optimize the order quantities. Companies can have the right amount of stocks in their inventories so our customers won't have to seek from the alternatives leading to disruption in the supply chain.

**10.FUTURE SCOPE**

With the help of different time series algorithms, we will be able to depict trends in the demands of the good more accurately.And hence will try to apply better algorithms for better results.

**11.BIBLIOGRAPHY**

1.<https://www.youtube.com/watch?v=IDKCmC1fCiU>

2. <https://www.youtube.com/watch?v=T6lf39TYjAY>

3.<https://www.google.com/sorry/index?continue=https://drive.google.com/file/d/1w7dj_14HpIltZu_IRYlowem2Nb5Klfnz/view%3Fusp%3Dsharing&q=EgSfQfUcGKesvPgFIhkA8aeDS-U2DxBerDHgrz2Ue_-wxQGShC3eMgFyShFTT1JSWV9JU1BfTUVTU0FHRQ>

4. <https://www.youtube.com/watch?v=athPUUQ1r58>

5. <https://www.youtube.com/watch?v=Vcn4OuV4Ixg>

6. <https://www.youtube.com/watch?v=Lt_VyD-b9_0>

7. <https://cloud.ibm.com/docs>

**APPENDIX**

**A.SOURCE CODE**

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<strong>{{msg.payload.center\_type}}</strong></div>\n<div>Area Of Operation: <strong>{{msg.payload.op\_area}} sqkm</strong></div>\n\n","storeOutMessages":true,"fwdInMessages":true,"resendOnRefresh":true,"templateScope":"local","x":790,"y":360,"wires":[["d3e98da9.41ce8"]]},{"id":"69546e13.d3aec","type":"debug","z":"8f28e1c3.1125a","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"payload","targetType":"msg","x":820,"y":160,"wires":[]},{"id":"b5d47115.8f65a","type":"ui\_template","z":"8f28e1c3.1125a","group":"b7b2727d.76a5f","name":"Prediction week","order":3,"width":"6","height":"1","format":"<div>Prediction for week {{msg.payload.week}}: <strong>{{msg.payload.weekpred}} units</strong></div>","storeOutMessages":true,"fwdInMessages":true,"resendOnRefresh":true,"templateScope":"local","x":1000,"y":500,"wires":[[]]},{"id":"572a7917.fce678","type":"function","z":"8f28e1c3.1125a","name":"promotion ","func":"var center\_id = global.get('center\_id')\nvar week = global.get('week')\n\nvar product\_id = global.get('product\_id')\nvar base\_price = global.get('base\_price')\nvar promotion = 1\nvar city\_code = global.get('city\_code')\nvar center\_type = global.get('center\_type')\nvar op\_area = global.get('op\_area')\nvar category= global.get('category')\nvar token=msg.payload.access\_token\nvar instance\_id=\"bbf42d69-f24f-4be6-ab91-f80a99b73cfd\"\nmsg.headers={'Content-Type': 'application/json',\"Authorization\":\"Bearer \"+token,\"ML-Instance-ID\":instance\_id}\nmsg.payload= {\"input\_data\": [{\"fields\": [\"week\", \"center\_id\", \"product\_id\", \"base\_price\", \"promotion\", \"city\_code\", \"center\_type\", \"op\_area\", \"category\"], \"values\": [ [week,center\_id,product\_id,base\_price,promotion,city\_code,center\_type,op\_area,category] ]}]}\nreturn msg;\n","outputs":1,"noerr":0,"x":340,"y":720,"wires":[["62d93900.eba798"]]},{"id":"62d93900.eba798","type":"http request","z":"8f28e1c3.1125a","name":"","method":"POST","ret":"obj","paytoqs":false,"url":"https://eu-gb.ml.cloud.ibm.com/v4/deployments/b965e824-16e5-4036-a9be-88ffc31799df/predictions","tls":"","persist":false,"proxy":"","authType":"","x":530,"y":720,"wires":[["14a7c843.947d98"]]},{"id":"14a7c843.947d98","type":"function","z":"8f28e1c3.1125a","name":"","func":"promopred=msg.payload.predictions[0].values[0][0]\nglobal.set(\"promopred\", promopred)\nreturn msg;","outputs":1,"noerr":0,"x":670,"y":720,"wires":[["b56c3f86.707fb"]]},{"id":"b56c3f86.707fb","type":"function","z":"8f28e1c3.1125a","name":"","func":"let nopromopred = global.get(\"week\_0\")\nlet promopred = global.get(\"promopred\")\nlet percent = Math.round(100 \* (promopred - nopromopred) / nopromopred)\nglobal.set(\"percent\_increase\", percent)\nmsg.payload.percent\_increase = percent\nreturn msg;","outputs":1,"noerr":0,"x":930,"y":720,"wires":[["fa3004b7.fd1768"]]},{"id":"fa3004b7.fd1768","type":"ui\_template","z":"8f28e1c3.1125a","group":"b7b2727d.76a5f","name":"Percent increase by promo","order":4,"width":"6","height":"1","format":"<div>Promotional events can increase sales by <strong>{{msg.payload.percent\_increase}}%</strong> </div>","storeOutMessages":true,"fwdInMessages":true,"resendOnRefresh":true,"templateScope":"local","x":1140,"y":720,"wires":[[]]},{"id":"5c2a6227.90d29c","type":"ui\_chart","z":"8f28e1c3.1125a","name":"","group":"77cac3fb.2082ec","order":1,"width":"12","height":"6","label":"Demand vs week","chartType":"line","legend":"true","xformat":"Week","interpolate":"linear","nodata":"waiting","dot":true,"ymin":"","ymax":"","removeOlder":1,"removeOlderPoints":"4","removeOlderUnit":"604800","cutout":0,"useOneColor":false,"useUTC":false,"colors":["#3695d9","#ff8800","#ff7f0e","#2ca02c","#98df8a","#d62728","#ff9896","#9467bd","#c5b0d5"],"useOldStyle":false,"outputs":1,"x":1110,"y":660,"wires":[[]]},{"id":"5ae41a5.a2530e4","type":"ui\_group","z":"","name":"Form","tab":"52e63638.248d68","order":1,"disp":true,"width":"6","collapse":false},{"id":"77cac3fb.2082ec","type":"ui\_group","z":"","name":"PREDICTIONS","tab":"92cd58ef.a00ed8","order":1,"disp":true,"width":"12","collapse":false},{"id":"f213cec1.0b3","type":"dashDB","z":"","hostname":"dashdb-txn-sbox-yp-dal09-08.services.dal.bluemix.net","db":"BLUDB","port":"50000","name":""},{"id":"b7b2727d.76a5f","type":"ui\_group","z":"","name":"Predictions","tab":"52e63638.248d68","order":3,"disp":true,"width":"6","collapse":false},{"id":"52e63638.248d68","type":"ui\_tab","z":"","name":"Warehouse Prototype","icon":"dashboard","disabled":false,"hidden":false},{"id":"92cd58ef.a00ed8","type":"ui\_tab","z":"","name":"Graphs","icon":"dashboard","disabled":false,"hidden":false}]