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Optimized Warehouse Management Of Perishable Goods For A Food Delivery Company

Introduction

This is a Software model on Demand Forecasting of perishable goods using machine learning solutions.

Overview

A food delivery service has to deal with a lot of perishable raw materials which makes it all, the most important factor 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 on a weekly basis and since the raw material is perishable, procurement planning is of utmost importance.

Survey

Existing problem

Wastage in the perishable fresh produce fruits and vegetables supply chain from harvesting stage till it reaches the consumer is very high in emerging markets like India. Studies are inadequate in analysing the causal factors of food losses in this context.For a developing country like India, in addition to the economy, it can have greater implications on food security and conservation of environmental resources. This work can be utilized by supply chain designers, managers, and policy makers.

According to current estimates, India's total population will reach 1.45 billion by 2028, similar to China's, and 1.7 billion by 2050, equivalent to nearly the combined population of China and the United States today. Given that India is already struggling to feed its population, its current food crisis could worsen significantly in the coming decades.

According to the 2013 Global Hunger Index (GHI), India ranks 63rd position. Despite India's considerable improvement over the past

quarter-century – its GHI rating has risen from 32.6 in 1990 to 21.3 in 2013. Even Though, one-quarter of the world's undernourished people live in India, more than in all of Sub-Saharan Africa.

What accounts for India's chronic food insecurity? Farm output has been setting new records in recent years, having increased output from 208 million tons in 2005-2006 to an estimated 263 million tons in 2013-2014. India needs 225-230 million tons of food per year; so, even accounting for recent population growth, food production is clearly not the main issue.

The most significant factor – one that policymakers have long ignored – is that a high proportion of the food that India produces never reaches consumers. Sharad Pawar, a former agriculture minister, has noted that food worth $8.3 billion, or nearly 40% of the total value of annual production, is wasted.

This does not capture the full picture: for example, meat accounts for about 4% of food wastage but 20% of the costs, while 70% of fruit and vegetable output is wasted, accounting for 40% of the total cost. India may be the world's largest milk producer and grow the second largest quantity of fruits and vegetables (after China), but it is also the world's biggest waste of food. As a result, fruit and vegetable prices are twice what they would be otherwise, and milk costs 50% more than it should.

It is not only perishable food that is squandered. An estimated 21 million tons of wheat – equivalent to Australia's entire annual crop – rots or is eaten by insects, owing to inadequate storage and poor management at the government-run Food Corporation of India (FCI).

There are several reasons why so much perishable food is lost, including the absence of modern food distribution chains, too few cold-storage centers and refrigerated trucks, poor transportation facilities, erratic electricity supply, and the lack of incentives to invest in the sector.

Proposed solution

The machine learning Model solution has been prepared which should have the ability to predict accurately. And the accuracy can be achieved if more data is provided.

Hence More data Gives More Accuracy in demand Forecasting. (Three years

of data is considered for prediction)

In this model, the demand forecasting for vegetables is predicted.

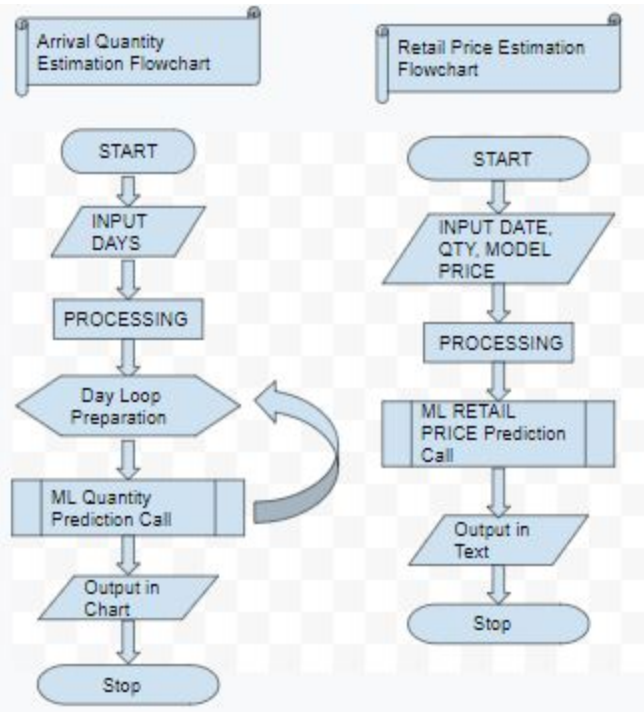
The Factors that are taken into consideration for demand forecasting are:-

1. Seasonal Changes affect demand forecasting.
2. Quantity of the crop arrival also affects.
3. Demand also depends on the type of crop. (Onion, Tomato, Potato are considered for demand prediction)
4. The region also affects crop demand. (Major cities like Delhi, Mumbai, Chennai, Kolkata, Hyderbad, Bengaluru, Ahmedabad are considered for demand prediction)
5. Login and Logout feature has been added to ensure security.

Software Designing:

A solution model has been created using Node-red Application and Watson Stdio.The web App with Machine learning model can provide the Solution prediction accurately.

Flowchart:



Advantages:

1)Future demand can be predicted in food industries.

2)Cost estimation of perishable food.

3)Quantity estimation of perishable food.

4)Accurate demand forecast

5)No human intervention needed

Disadvantages:

1)Sudden changes affect demand forecasts.

2)Predictions may vary at times of Natural Calamities.

Applications:

1)Used in food industries.

2)Used in warehouse management.

3)Machine learning techniques allow predicting the amount of products to be purchased during a defined future period.

4)Compared to traditional demand forecasting methods, machine learning accelerates data processing speed

Conclusion:

Therefore, our project can be used to predict the price and arrival quantity of perishable food products in future.

Future Scope:

The growing demand of Machine Learning (ML) and Artificial Intelligence (AI) in almost every industry is compelling the employees across the globe to learn new skills in Data science. It is said that AI and ML are expected to impact and transform our lives in ways beyond imagination similar to the internet.

Fortunately for demand planners, ML can now help further improve the forecast from *40% of actual to 70% of actual*.

Machine Learning can predict future weather patterns at the local level and

identify how it connects to local demand patterns. **Machine Learning** can also determine if a lag exists between the weather changes and the demand of products on a real-time basis. The life cycle of a product plays a critical role in demand **forecasting**.

Bibliography:

1)Data Collected from:

- Statistics:Price and Arrival Statistics- http://nhb.gov.in/statistics/price-arrival-statistics.html
- Open Government Data Platform (OGD) India is a single-point of access to Datasets/Apps in open format published by Ministries/Departments : https://data.gov.in/

2)Storage : https://www.cloud.ibm.com

3)Machine learning:

- https://en.wikipedia.org/wiki/Machine_learning
- https://www.ibm.com/in-en/analytics/machine-learning

4)Watson Studio:https://www.ibm.com/in-en/cloud/watson-studio

5)Node-RED:

- https://en.wikipedia.org/wiki/Node-RED
- https://nodered.org/

Appendix:-

Github repository-
https://github.com/SmartPracticeschool/SBSPS-Challenge-3270-Optimized-Warehouse-Management-of-Perishable-Goods-for-a-Food-Delivery-Company

App url Link:- https://node-red-gfbxa.eu-gb.mybluemix.net/ui

Team Members:-

- *Venkata Gunasekhar V (Team Lead)*
- *Shaama M*
- *Vinay Krishna*

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Daily Update Report

Analysing Project:-

Project analysis has been done.
Contents from different websites has been read and understood.

Data Collection:-

Vegetables data of Delhi, Mumbai, Chennai, Kolkata, Hyderbad, Bengaluru, Ahmedabad are collected from the website for past 3 years.
Arranging of the data for Tomato,Onion is completed.

Wragling Of the data is also done for vegetables data .csv filea:
1)Onion.
2)Tomato.
3)Potato.

ML Model:-

ML model for quantity and retail price estimation for Chennai, Mumbai, Delhi, Kolkotta, Hyderbad, Bengaluru, Ahmedabad onion is created and deployed.
There are two prediction needed for each vegetable and city:-

Name	Prediction Column	Depending Column
Quantity Estimation	Arrival Qty	Days
Retail Price Estimation	Retail Price per ton	Year,Month,Day,Initial Price per ton,Arrival Qty

*select depending coloums in *experiment settings* before conducting autoai experiment

ML deployment model details:-

Name	Email	Api key	Instance id	Service end point
Chennai Onion(qty)	venk19433.ec@rmkec.ac.in	hSnZH7r2c9-dBtb6o75faFYDm9rI2mbEG_XIKMcieoPy	b000888a-a0c5-448e-a462-ba13d700b8a1	https://eu-gb.ml.cloud.ibm.com/v4/deployments/07680ca6-6bb5-430f-bf51-54d4e572b4f0/predictions
Chennai	venk19433.ec	hSnZH7r2c9-dBt	b000888a-a0c5-	https://eu-gb.ml

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Onion(retail)	@rmkec.ac.in	b6o75faFYDm9rI2mbEG_XIKMcieoPy	448e-a462-ba13d700b8a1	.cloud.ibm.com/v4/deployments/deced555-c007-44f2-a006-04855aa74352/predictions
Chennai Potato(qty)	vina19439.ec@rmkec.ac.in	nrl_hOK8nFYsa4YH-UfTmuOGJB7k1TVih0jtb5NvG42K	234a7fff-22d6-479c-88cd-143354cdfccc	https://eu-gb.ml.cloud.ibm.com/v4/deployments/80d3e7e8-9131-4a1f-9735-f88b90ecf531/predictions
Chennai Potato(retail)	vinaykrishna174@gmail.com	adRRgrq4np4u-c5-1EppEHI675e2KbfVWpCvk1yW_MWR	5aa83119-afab-4b5b-b56e-a56e59a27e79	https://eu-gb.ml.cloud.ibm.com/v4/deployments/d58930e3-5d79-490b-87c9-ab5791591635/predictions
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Mumbai Onion(retail)	venk19433.ec@rmkec.ac.in	hSnZH7r2c9-dBtb6o75faFYDm9rI2mbEG_XIKMcieoPy	b000888a-a0c5-448e-a462-ba13d700b8a1	https://eu-gb.ml.cloud.ibm.com/v4/deployments/fb7245fe-45ce-44b5-a479-e1e070ad39e5/predictions

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Mumbai Potato(qty)	vina19439.ec@rmkec.ac.in	nrl_hOK8nFYsa4YH-UfTmuOGJB7k1TVih0jtb5NvG42K	234a7fff-22d6-479c-88cd-143354cdfccc	https://eu-gb.ml.cloud.ibm.com/v4/deployments/030889be-2749-48bd-9257-e726ecb37160/predictions
Mumbai Potato(retail)	vinaykrishna174@gmail.com	adRRgrq4np4u-c5-1EppEHI675e2KbfVWpCvk1yW_MWR	5aa83119-afab-4b5b-b56e-a56e59a27e79	https://eu-gb.ml.cloud.ibm.com/v4/deployments/7f2f0a5e-0dae-484e-b25e-e25da3ef7332/predictions
Mumbai Tomato(qty)	Padmacharan63@gmail.com	SYVbZPs_mMjhnlRcWlwrZbYK5M12pksKnZ64t7OlbZCM	128bd6e1-2b3b-4c06-86ce-651b4990403b	https://eu-gb.ml.cloud.ibm.com/v4/deployments/f2132790-8912-4142-8e3b-f55f129990ac/predictions
Mumbai Tomato(retail)	venk19433.ec@rmkec.ac.in	hSnZH7r2c9-dBtb6o75faFYDm9rI2mbEG_XIKMcieoPy	b000888a-a0c5-448e-a462-ba13d700b8a1	https://eu-gb.ml.cloud.ibm.com/v4/deployments/f67e99d5-0afc-4497-a6ed-85a7172109f3/predictions
Delhi Onion(qty)	vgsece@gmail.com	0LYblGAgJ1JopOHmI7v917Zt04rKx2F6nO0FQqVz3T1f	864997fc-e93a-4cb6-a61d-6bbcc047f252	https://eu-gb.ml.cloud.ibm.com/v4/deployments/532b5543-8b51-44da-b52b-b6e9d8a1d098/predictions
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Ahmedabad Tomato(qty)	Dpc0704@gmail.com	TPkWZlEYexJ_z9ZvmXbBIZHlBchEo1WLs709vsDDJkt1	75d38dca-402a-4337-be9b-398fa7ce8227	https://eu-gb.ml.cloud.ibm.com/v4/deployments/2f6c93e7-bec7-471b-a8f5-0e8d4cd08640/predictions
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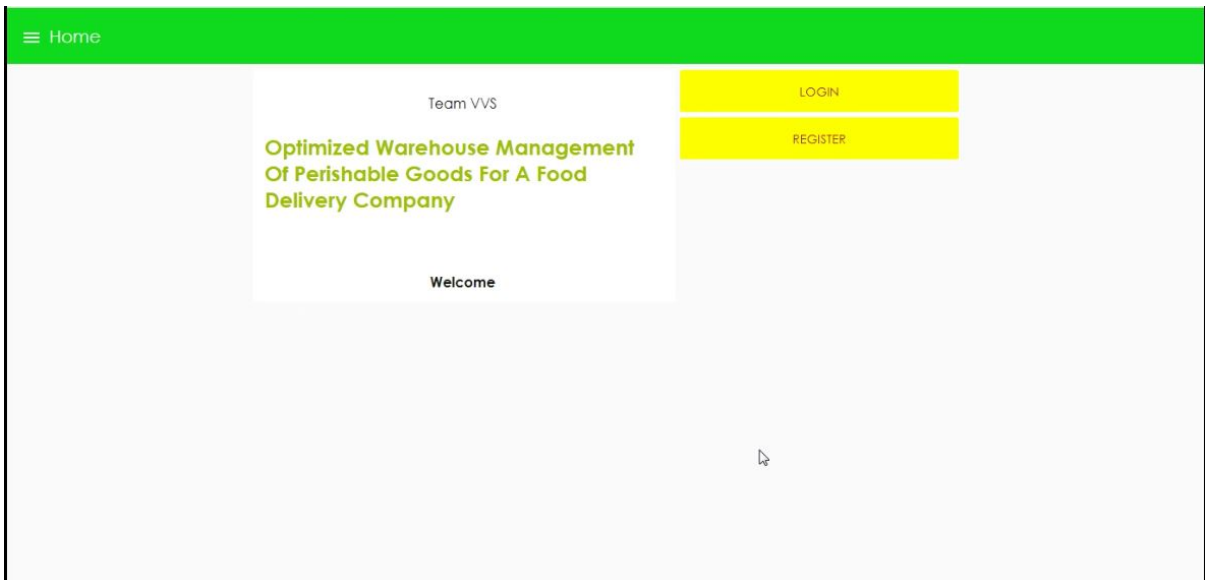
UI Model:-

UI model for all cities and all vegetables has been created.



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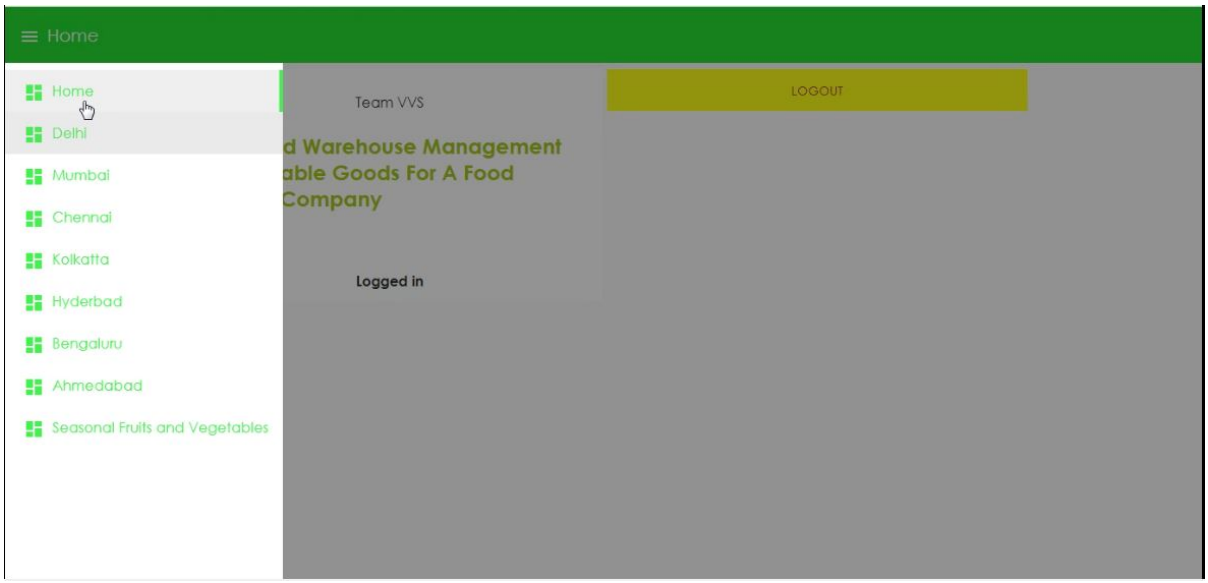
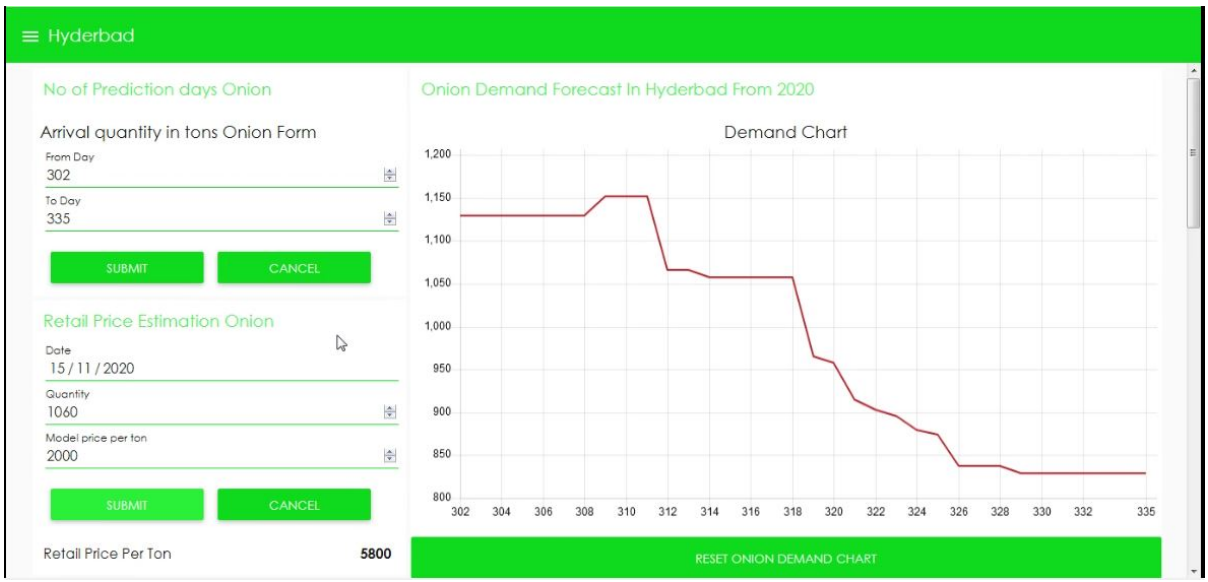
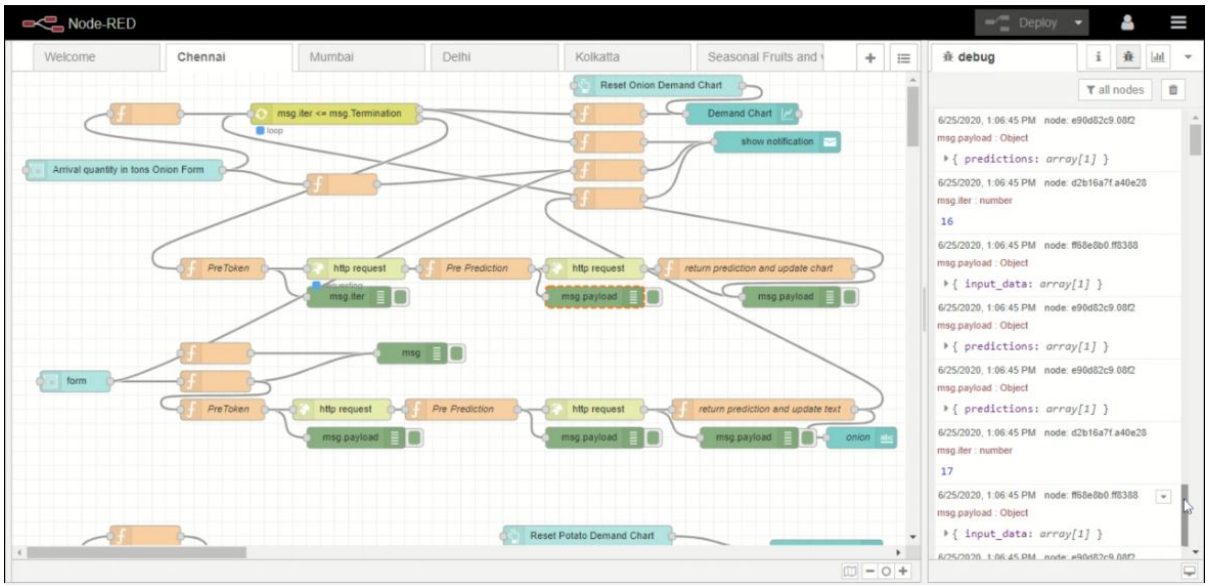




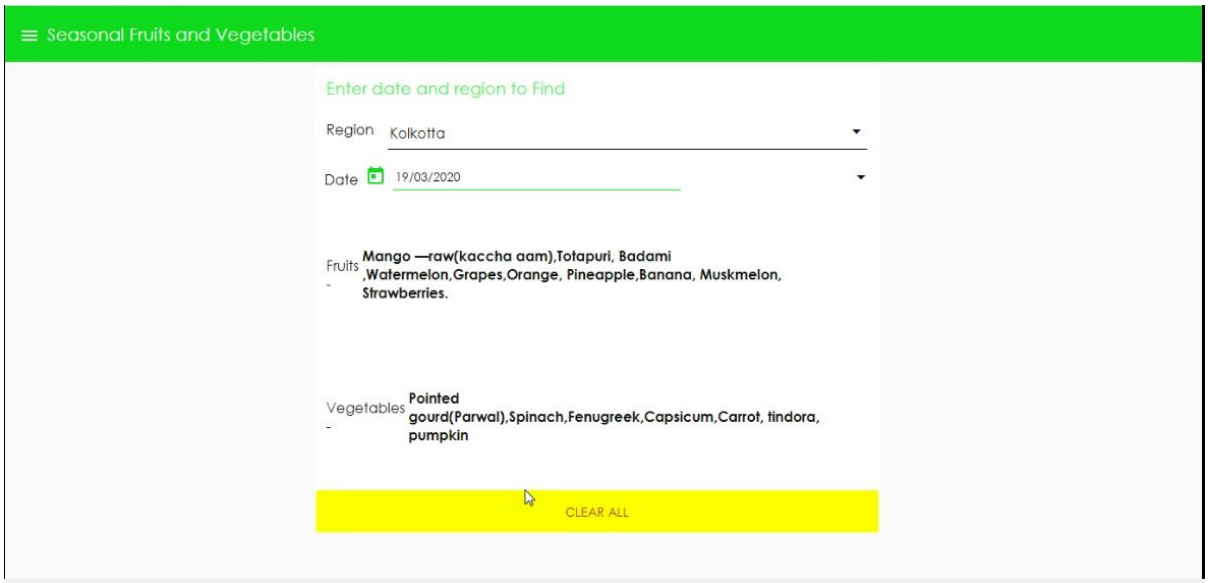
Integration of ML deployments with UI model is completed.

TEAM-VVS



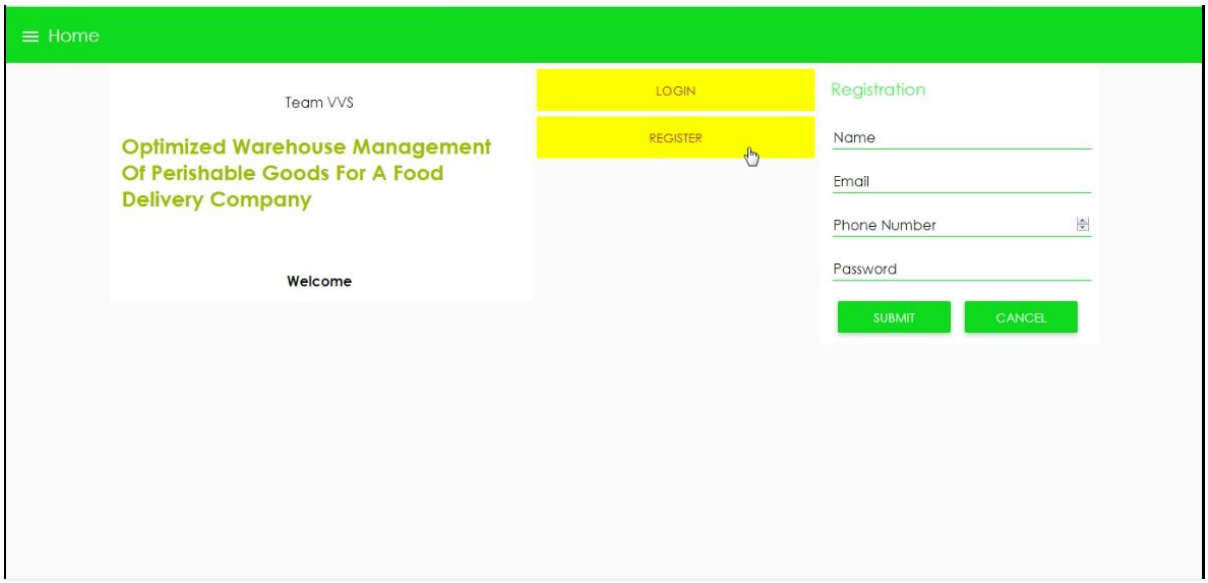
Additional features:-

Seasonal Fruit and vegetable prediction has been added.



Login and Logout feature has been added.

TEAM-VVS



Team Members:-

- *Venkata Gunasekhar V (Team Lead)*
- *Shaama M*
- *Vinay Krishna*

App url Link:- https://node-red-gfbxa.eu-gb.mybluemix.net/ui

and more...