

IBM Hack Challenge 2020

Warehouse Optimisation

23JumpStreet

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Problem

Warehouse management is challenging. Following are some of the problems:

1. Inaccurate Inventory
2. Redundant activities
3. Seasonal Demands
4. Avoiding Product Damage

and many more...

What's the Solution?

Predicting the demands

Food Item

Week *
1

Center *
12545

Meal *
234

Checkout Price *
346.98

Base Price *
200

☒ Email Promotion

☐ Homepage Feature

SUBMIT

CANCEL

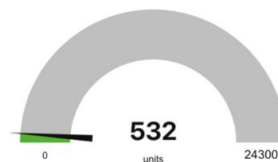
Prediction

527

1. **Enter** the food item details
2. **Submit** to receive the Prediction
3. **Plan** according to the prediction
4. **Get** the number of actual food dispatched
5. **Visualise** everything

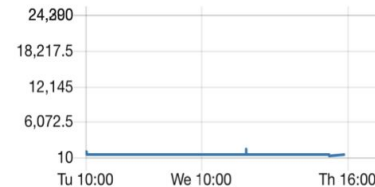
Counter

Actual Food Dispatched



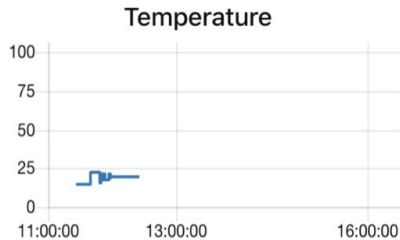
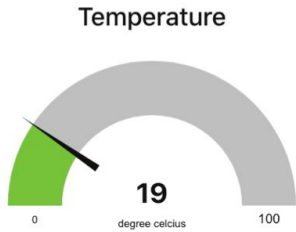
Checkout Time
Thu Jul 09 2020

Dipatch History



Monitoring the Health

Temperature



Status

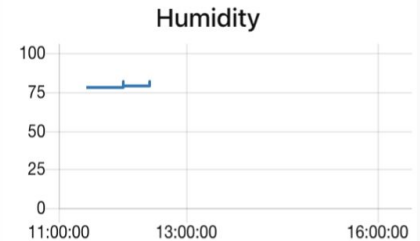
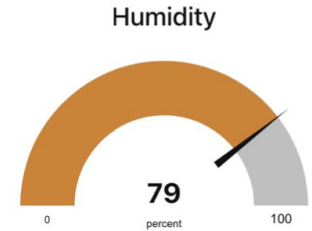
Normal

1. **Get** notified if the environment is perishable
2. **Open** Health tab to check what parameter is abnormal
3. **Go** fix it
4. **Visualise** status and history anytime

Perishable Environment

Sensors have detected abnormal environment which may perish certain food items. Please take action!

Humidity



Status

Normal

Automating the process

Watson

You Say *
home = 0

SEND CANCEL

Watson Says
homepage = 0 successfully recorded

PREDICT

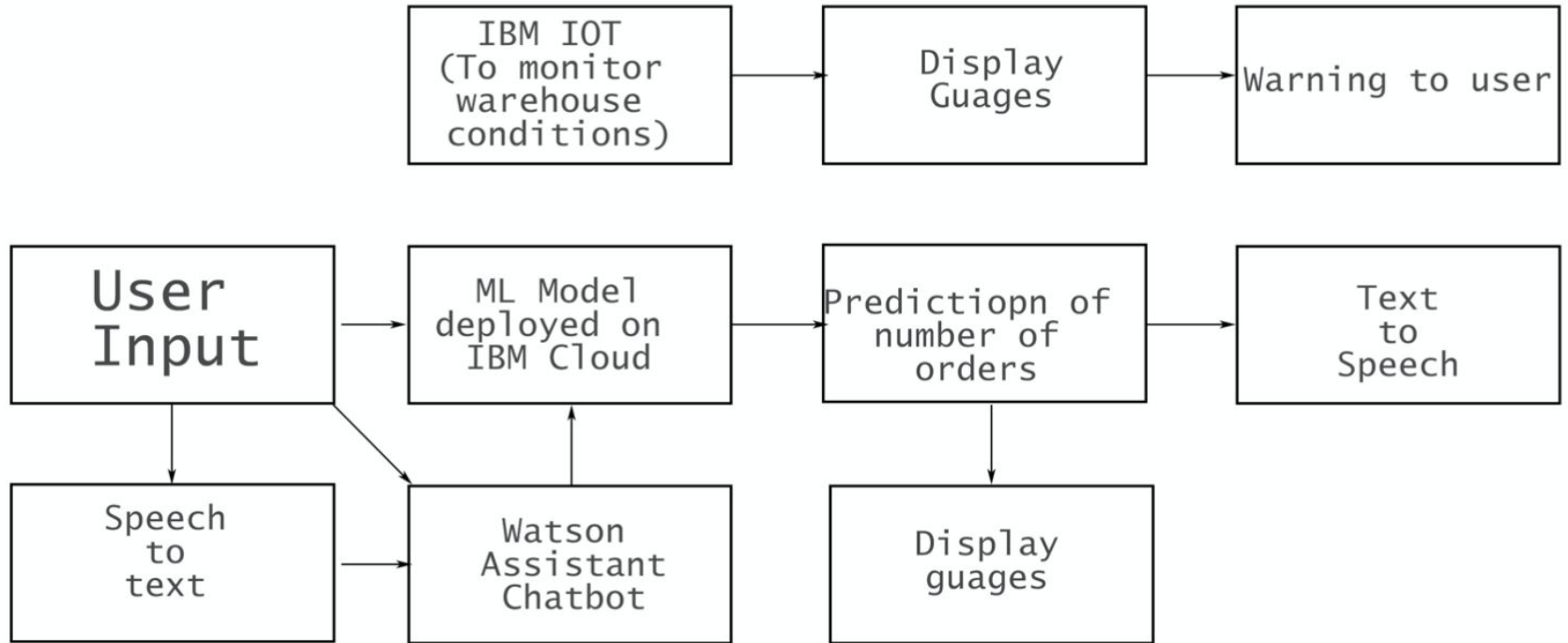
1. **Ask** Watson to record details
2. **Preview** whether whether the details are right
3. **Click** Predict

Week	0
Center	12345
Meal	234
Checkout Price	346.98
Base Price	200
Email Promotion	0
Home Page Feature	0

UI Demo

How does it work?

FLOWCHART



How was it made?

Gathering and Reviewing Dataset

Food Demand Forecast Challenge Dataset from Kaggle.

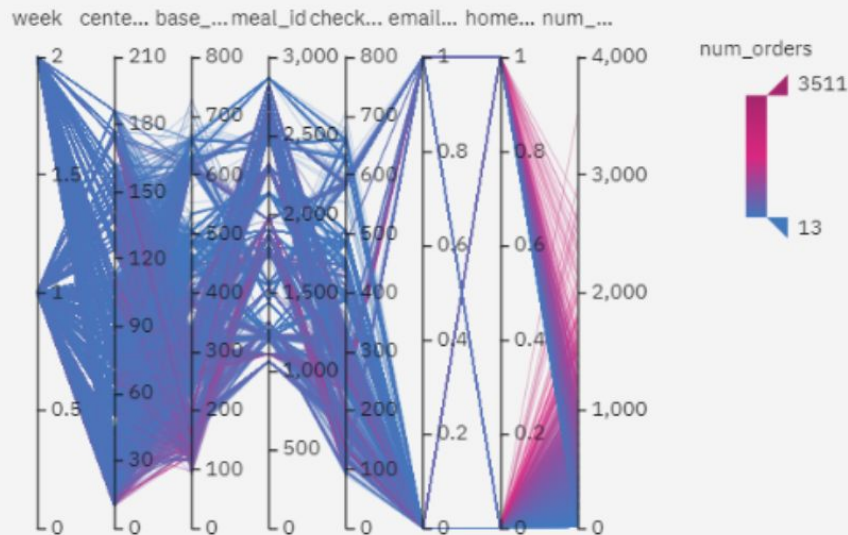
- 457K Train data
- 32.6K Test data

Order details with columns from the image were used for training. The dataset also contains Fulfilment center and Meal details as a lookup table.

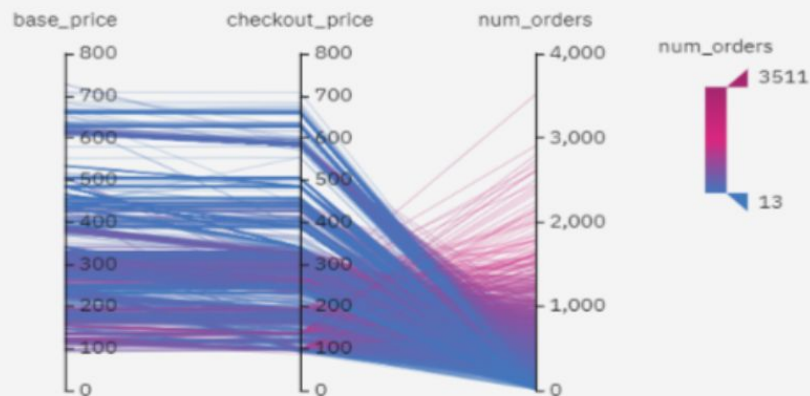
Week
Fulfilment Centre
Meal
Checkout Price
Base Price
Promotion Email
Homepage feature
Number of orders (target)

Preprocessing and Analysing Data

Parallel data visualization



Base price + checkout price vs num orders

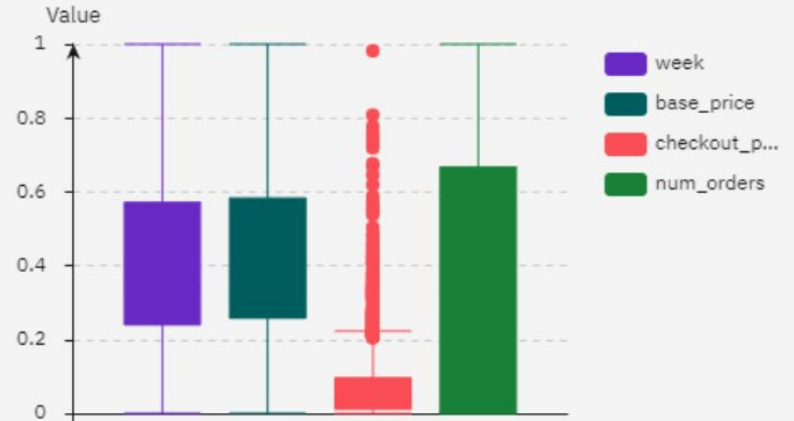


Preprocessing and Analysing Data

Scatter plot checkout price vs num orders



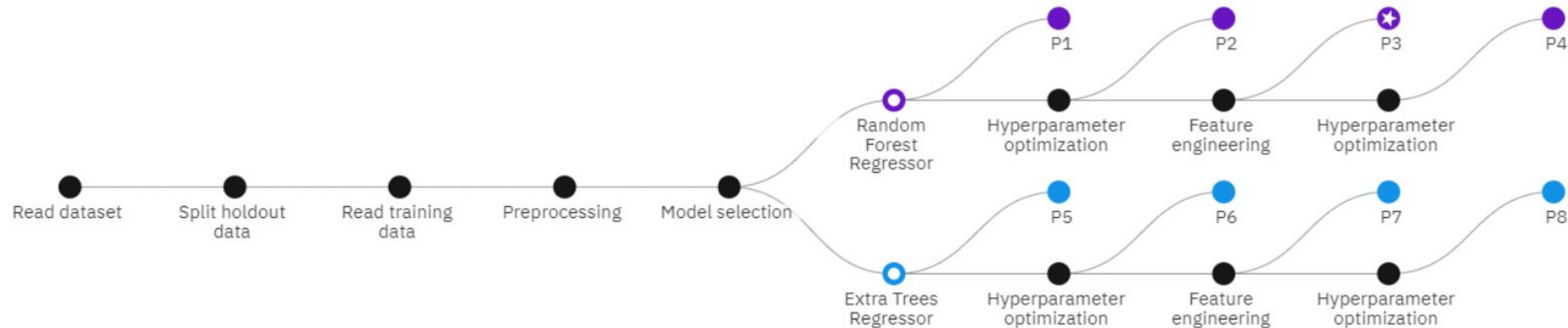
Normalized Boxplot











Studying different ML models

Progress map ⓘ

Prediction column: **num_orders**



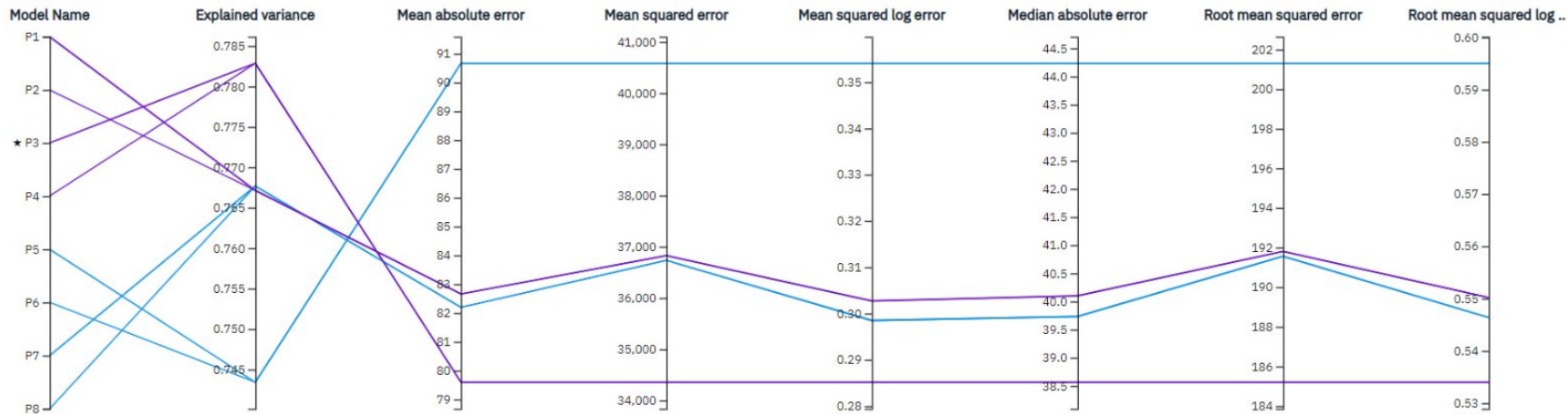
Studying different ML models

Rank	↑	Name	Algorithm	RMSE (Optimized)	Enhancements
★ 1		Pipeline 3	 Random Forest Regressor	185.202	HPO-1 FE
2		Pipeline 4	 Random Forest Regressor	185.202	HPO-1 FE HPO-2
3		Pipeline 7	 Extra Trees Regressor	191.555	HPO-1 FE
4		Pipeline 8	 Extra Trees Regressor	191.555	HPO-1 FE HPO-2
5		Pipeline 1	 Random Forest Regressor	191.800	None
6		Pipeline 2	 Random Forest Regressor	191.800	HPO-1
7		Pipeline 5	 Extra Trees Regressor	201.305	None
8		Pipeline 6	 Extra Trees Regressor	201.305	HPO-1

Model Optimisation

Metric chart ⓘ

Prediction column: **num_orders**



Using IBM Cloud for everything

We challenged ourselves to use IBM Cloud technologies for everything.

- Watson Machine Learning
- Watson Assistant
- Watson Text to Speech
- Watson Speech to Text
- Internet of Things
- NodeRED
- Watson Studio
- IBM CognosDashboard

Using IBM Cloud for everything

Assistant preview

Hello. How can I help you?

Good Morning

Good Morning

Enter Parameters

The parameters required are: week, center id, meal id, checkout price, base price, email for promotion (1 or 0), homepage featured (1 or 0)

week = 1

week = 1 successfully recorded

meal id = 55

meal id = 55 successfully recorded

checkout price 136.83

Type something...



Watson IoT Sensor Simulator

3434

Temperature

17°C



swipe left/right for more



Relationship map

Swap view ⇌



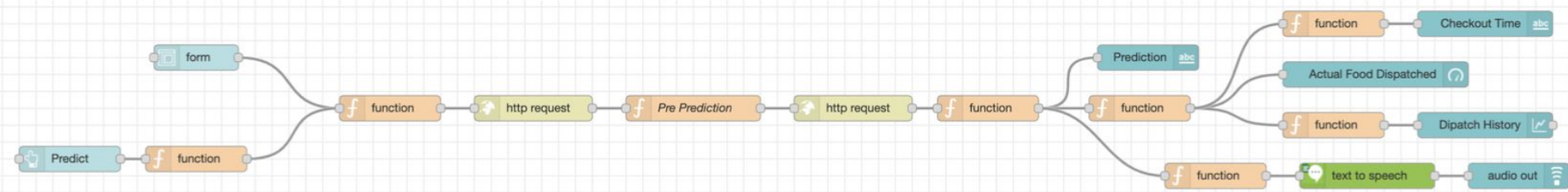
Experiment completed ✓

8 PIPELINES GENERATED

8 pipelines generated from algorithms. See pipeline leaderboard below for more detail.

Time elapsed: 4 hours

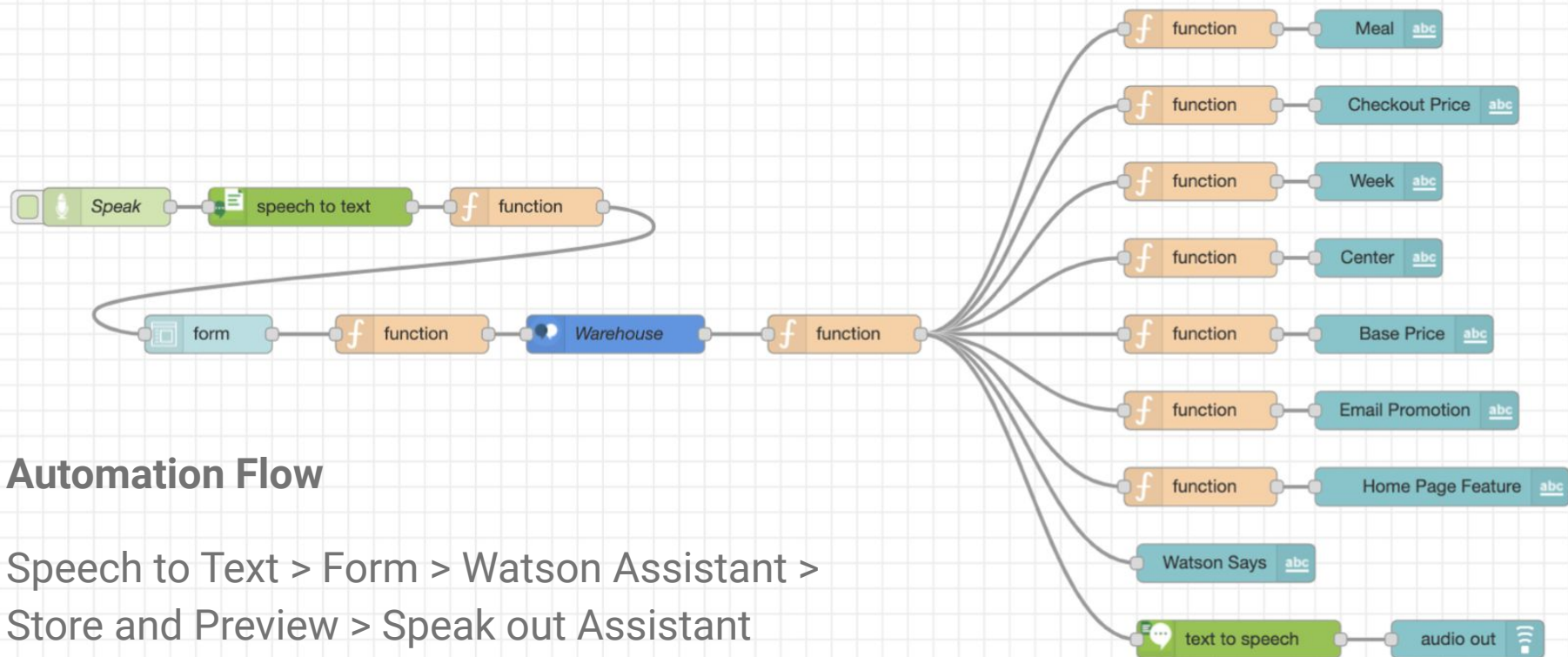
Developing using Node-RED



Demand Prediction Flow

Form > Request ML Model with data > Display and speak out the prediction >
Simulate the dispatch in Gauge > Add point to the History Graph

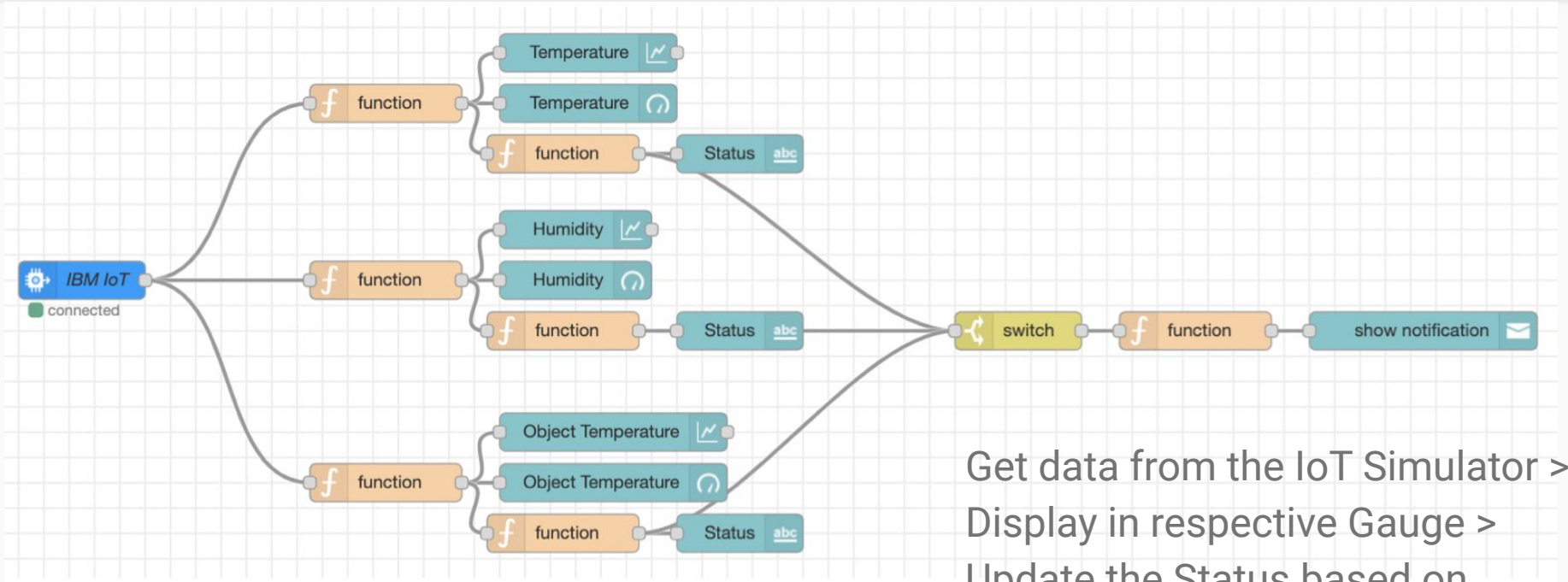
Developing using Node-RED



Automation Flow

Speech to Text > Form > Watson Assistant >
Store and Preview > Speak out Assistant
output

Developing using Node-RED



IoT Flow

Get data from the IoT Simulator >
Display in respective Gauge >
Update the Status based on
threshold > If perishable, display
Notification

Why is it good?

Advantages

1. Prepare for the demand
2. Reduce losses and Increase Profits
3. Reduce wastage of perishable food items
4. Reduce other costs and efforts
5. Share predictions with rest of the supply chain

Problem Solved 🤩