

# **Impact of COVID-19 on Food Security - Visualization Dashboard**

*Project Report*

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*Project ID: SPS\_PRO\_224*

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# **1. INTRODUCTION**

## **1.1 Overview**

Alarmed by a potential rise in food insecurity during the COVID-19 pandemic, many countries and organizations are mounting special efforts to keep agriculture safely running as an essential business, markets well supplied in affordable and nutritious food, and consumers still able to access and purchase food despite movement restrictions and income losses.

## **1.2 Purpose**

The COVID-19 pandemic has limited the amount of agricultural produce from the rural farms reaching to the urban markets. The essential things needed for the farmers to produce good crops like fertilizers, pesticides, insecticides, etc. has also been cut off due to the shutdown of the industries that manufacture them. So there is a need in the food industry to predict if the food that is being produced is sufficient for an average individual, the amount of food that is available per person to survive the pandemic and also the future implications of the pandemic on the agricultural produce for the next 5 years.

## **2. LITERATURE SURVEY**

### **2.1 Existing Problem**

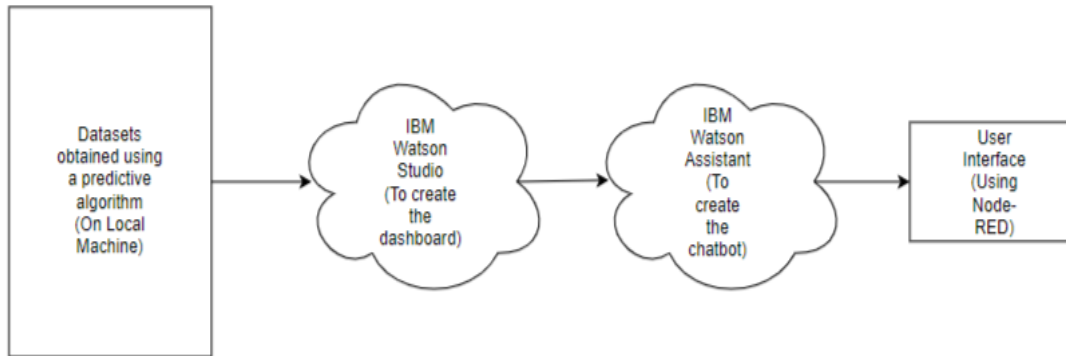
There have been many pandemics in the past, but due to lack of technology at that point of time there were no accurate solutions for this problem. In this day and age, with advanced technologies still there is lack of a widely available food security predictor. With lockdown restrictions hindering agricultural production, the unavailability of a predictor to predict the impact of COVID-19 pandemic on food security is a major problem.

### **2.2 Proposed Solution**

The proposed solution consists of a user interface comprising of two tabs. One of the tabs consists of a visualization dashboard which in turn consists of two tabs- Before COVID-19 and After COVID-19. These tabs predict the impact of COVID-19 on agricultural parameters like Production Quantity, Import Quantity, Export Quantity, Area Harvested, Food Availability per Capita, etc. with the help of a machine learning algorithm called Elastic Net. This tab contains interactive data players and graphs. The next tab in the user interface is a chatbot that can answer basic questions regarding the impact of COVID-19 on food security, food demand, food supply, food prices; minimizing the impact of the pandemic on food security; future impacts of the pandemic and some general food safety tips.

# 3. THEORETICAL ANALYSIS

## 3.1 Block Diagram



## 3.2 Hardware/ Software Designing

The software designing consists of four phases:

- i. Prediction of values
- ii. Creation of dashboard
- iii. Creation of chatbot
- iv. Designing the user interface

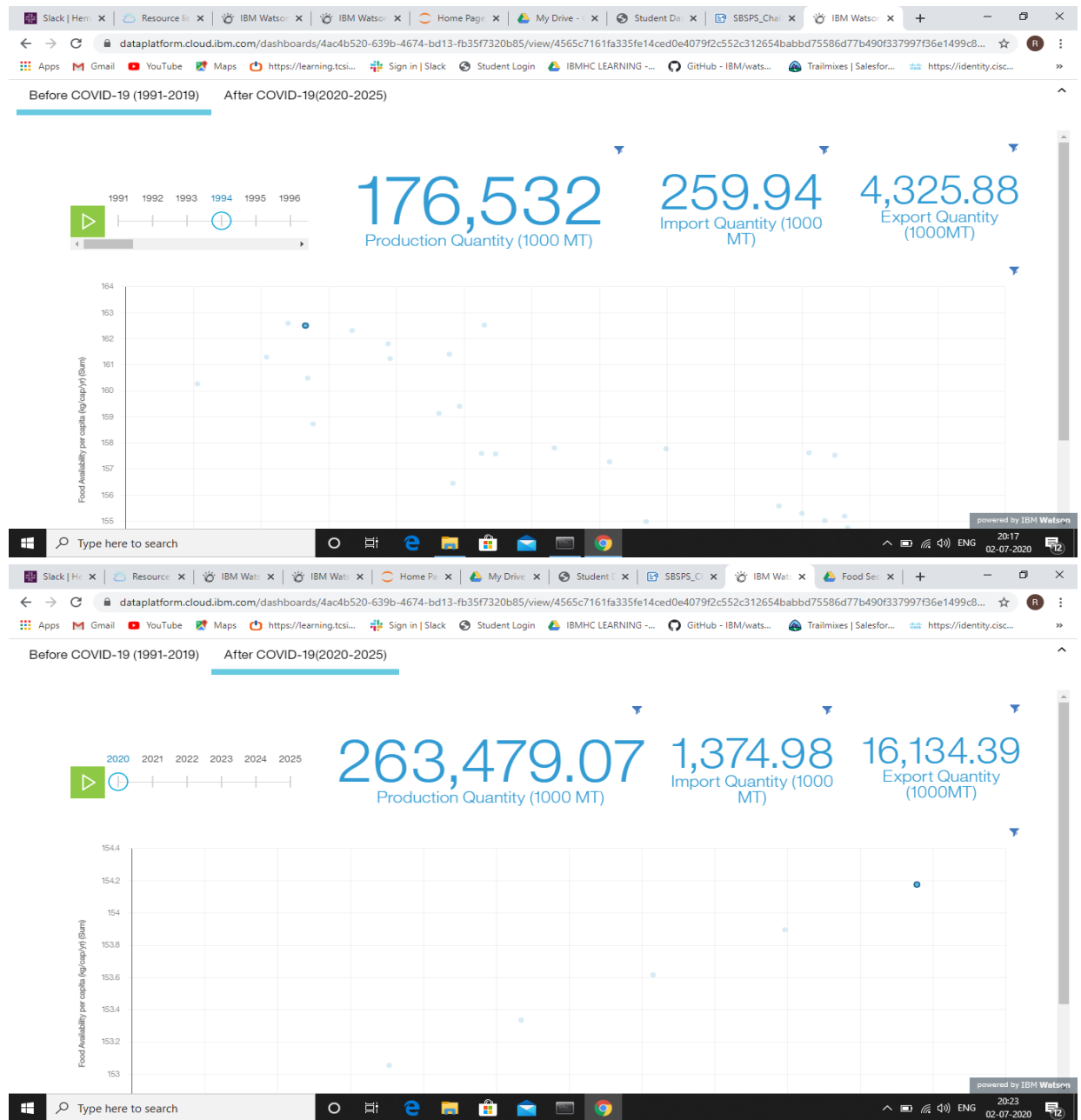
## i. Prediction of values

The screenshot shows a Microsoft Excel spreadsheet titled "Food\_Security\_Dataset.csv". The spreadsheet contains a table with the following data:

Year	Area Harv	Productio	Import Qu	Export Qu	Food Availability per capita (kg/cap/yr)
1991	101579	160567	354.82	1357.15	160.27
1992	101022	170775	3419.77	881.73	161.3
1993	101683	173973	456.87	1156.24	162.6
1994	101621	176532	259.94	4325.88	162.51
1995	100897	176854	256.87	4770.66	160.49
1996	101778	183435	2009.77	3960.52	162.32
1997	101802	188763	2485.05	4544.1	161.81
1998	102498	189047	1719.31	2595.25	161.24
1999	103750	197813	2048.17	1993.78	161.41
2000	104081	199321	262.25	4096.11	159.41
2001	101850	202976	220.89	9369.74	162.53
2002	96101	177665	193.6	8160.14	158.73
2003	100279	198327	213.62	8187.06	156.45
2004	99644	196263	212.25	8005.56	159.14
2005	101421	202581	583.21	5692.49	157.6
2006	101173	204638	6675.63	6927.34	157.58
2007	102955	221482	1823.69	6922.58	157.28
2008	103345	226900	37.24	6064.57	154.98
2009	99404	213325	207.36	5181.68	157.81
2010	102262	229832	211.7	8062.36	157.78
2011	102824	245139	13.91	16509.4	154.6
2012	99684	250976	53.39	24759.71	157.62
2013	101501	254786	49.46	21889.38	157.53
2014	100976	256231	179.31	14986.56	155.19

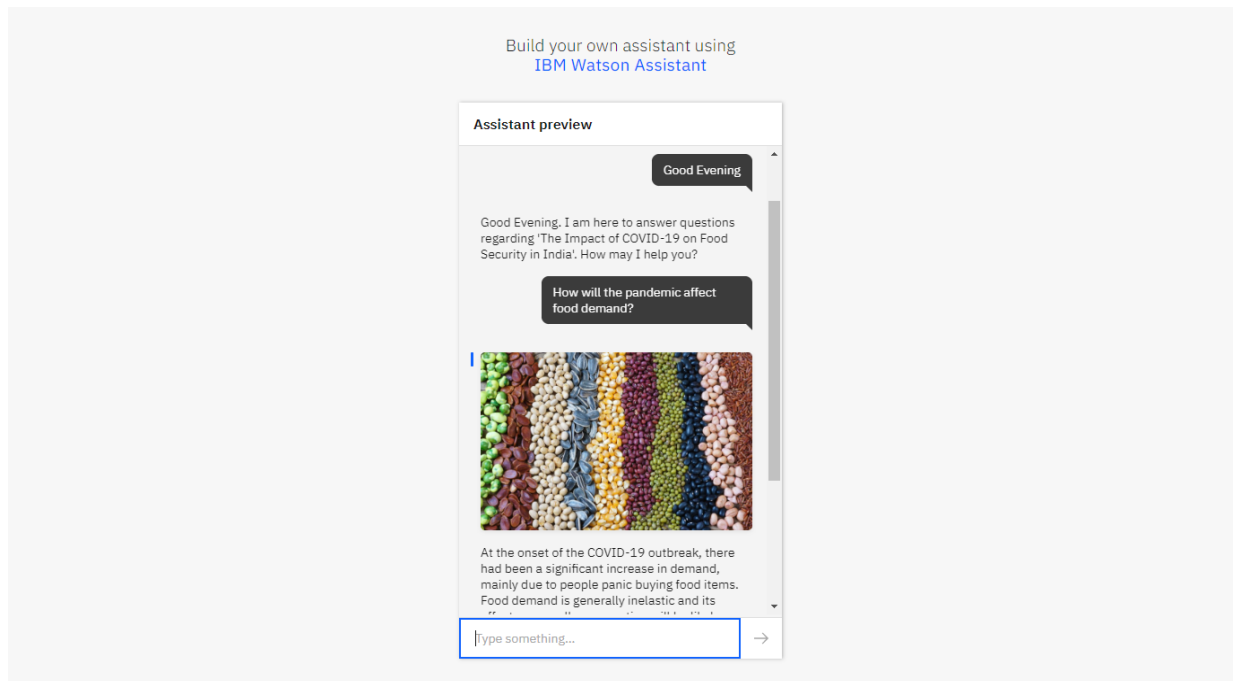
The dataset has been downloaded from the website of United States Department of Agriculture's International Food Security page. The dataset has been manually cleaned and it contains information about agricultural produces for the years 1991-2014. The data for the rest of the years (2015-2025) has been predicted on the local machine using five jupyter notebooks using Elastic Net regression algorithm. the predicted data have been stored in a csv file on the local machine. The predicted data along with the existing dataset has been combined and then divided into two different csv files representing Before COVID-19 and After COVID-19.

## ii. Creating the dashboard



For the creation of the dashboard a IBM Cognos Analytics and an IBM Watson Studio service instance has been created. The datasets from the previous phase are imported into the studio and a dashboard has been created by associating it with the Cognos instance.

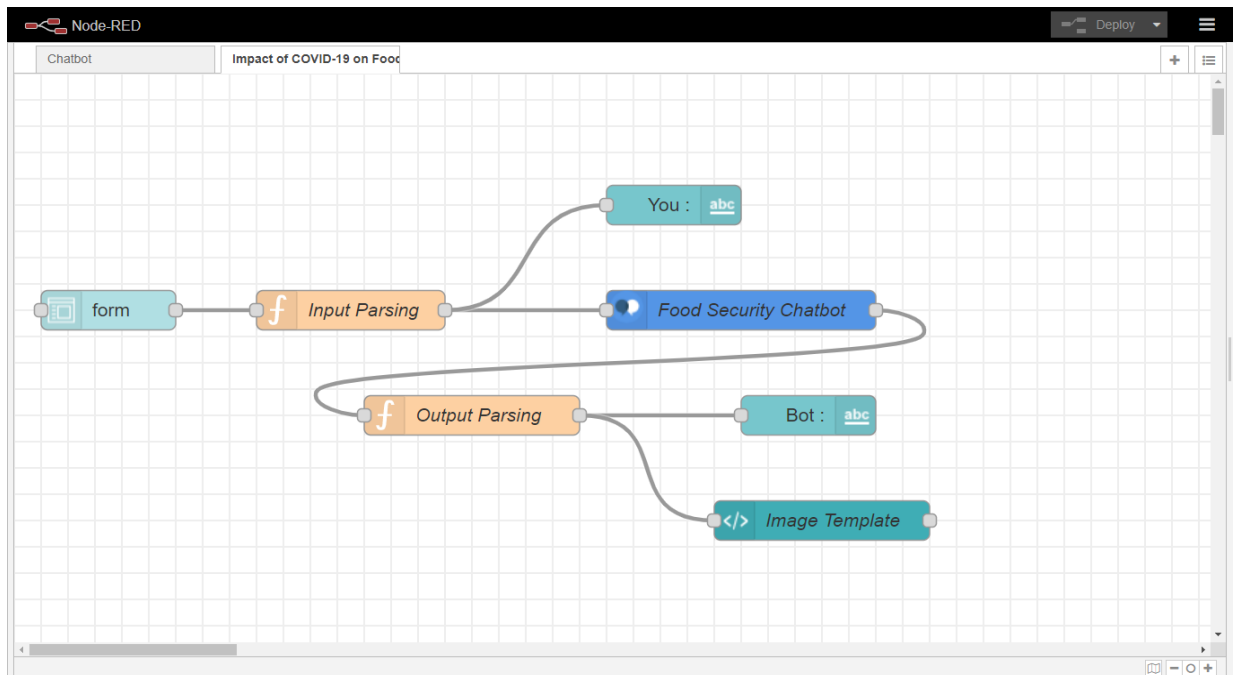
### iii. Creating the chatbot



For the creation of the chatbot an IBM Watson Assistant service instance has been created. The necessary intents and entities have been created to configure the dialog flow using the nodes in the dialog skill. An assistant has been created that has been linked together with the dialog skill.



#### iv. Designing the user interface

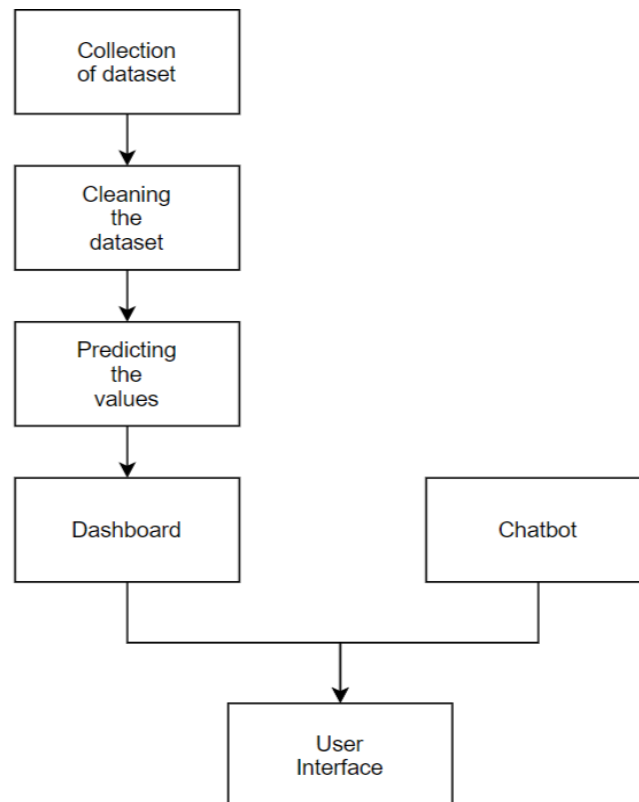


For designing the user interface an instance of Node-RED cloud foundry app has been created. The required nodes have been downloaded and a flow has been configured. The user interface contains two tabs - one tab containing a link to the visualization dashboard and another tab containing the chatbot.

## 4. EXPERIMENTAL INVESTIGATIONS

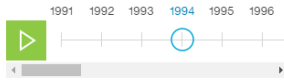
The predictive algorithm shows that for the next five years the pandemic might have a negative impact on the agricultural produce and also the food availability capita per year. The chatbot provides various reasons for the impact of the pandemic on food security and also tips to minimize the impact of COVID-19 on food security.

## 5. FLOWCHART



## 6. RESULT

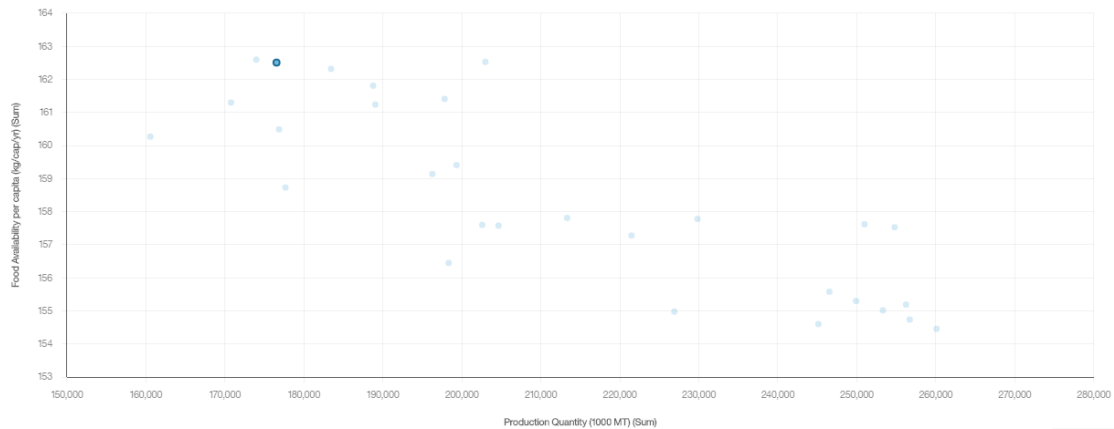
Before COVID-19 (1991-2019) After COVID-19(2020-2025)



176,532  
Production Quantity (1000 MT)

259.94  
Import Quantity (1000 MT)

4,325.88  
Export Quantity (1000MT)



Chatbot

Visualization Dashboard

Chatbot

Food Security Chatbot



Enter your message \*

How will COVID-19 affect food security?

SEND

RESET

You : How will COVID-19 affect food security?

We risk a looming food crisis unless measures are taken fast to protect the most vulnerable, keep global food supply chains alive and mitigate the pandemic's impacts across the food system. Border closures, quarantines, and market, supply chain and trade disruptions are restricting people's access to sufficient/diverse and

Bot nutritious sources of food, especially in

## 7. ADVANTAGES & DISADVANTAGES

- **Advantages**

- i. There is no predictive model available on the internet for predicting the impact of the pandemic on food security.
- ii. The dashboard has an interactive interface to slide through different years.
- iii. The chatbot provides reasons for the impact of the pandemic on food security and tips to minimize it.

- **Disadvantages**

- i. The dashboard shows the impact of COVID-19 on food security only for five years i.e. upto 2025.

## 8. APPLICATIONS

The dashboard can be used to visualize the predictions of the impact of COVID-19 on food security in the future. The chatbot can be used to find out the reasons for the impact of pandemic on food security as well as tips to minimize the impact.

## 9. CONCLUSION

In conclusion, the overall project provides the solution to the problem statement by creating a visualization dashboard as well as a chatbot to answer food security related questions.

## 10. FUTURE SCOPE

In future, with more accurate and specific datasets the predictions can be more accurate. Also, relevant changes can be made in the notebook to predict the parameters for even more years.

## 11. BIBLIOGRAPHY

- <https://www.ers.usda.gov/data-products/international-food-security/>
- <https://github.com/IBM/visualize-food-insecurity>
- [https://youtu.be/jgl\\_w05xB9g](https://youtu.be/jgl_w05xB9g)
- <https://quebit.com/askquebit/IBM/creating-a-simple-dashboard-in-cognos-analytics-11-0-0/>

# APPENDIX

## A. Source Code

- **Node-RED flow:**

```
[{"id":"91f05030.48c02","type":"tab","label":"Impact of COVID-19 on Food Security in India","disabled":false,"info":""},{ "id":"ea862461.9bcd8","type":"function","z":"91f05030.48c02","name":"Output Parsing","func":"if(msg.payload.output.generic[0].response_type==\\image\\"){\\n  msg.url = msg.payload.output.generic[0].source\\n  msg.payload = msg.payload.output.text[0];\\n}\\n}else{\\n  msg.url=\\\"https://blog.forumias.com/wp-content/uploads/2017/12/food.jpg\\\"\\nmsg.payload = msg.payload.output.text[0];\\n}\\nreturn msg;","outputs":1,"noerr":0,"x":340,"y":260,"wires":[["ac15af16.a5406","ad180bfe.e43a78"]]}, {"id":"415d3408.71c1dc","type":"function","z":"91f05030.48c02","name":"Input Parsing","func":"msg.payload=msg.payload.input;\\nreturn msg;","outputs":1,"noerr":0,"x":250,"y":180,"wires":[["6660239c.106bdc","e9207646.c21f38"]]}, {"id":"6660239c.106bdc","type":"watson-conversation-v1","z":"91f05030.48c02","name":"Food Security Chatbot","workspaceid":"e4baadee-cc48-4204-b831-f860989df0c5","multiuser":false,"context":true,"empty-payload":false,"service-endpoint":"https://api.eu-gb.assistant.watson.cloud.ibm.com/instances/ffa8fb d4-f68d-4d37-bff9-911a3dc58064","timeout":"","optout-learning":false,"x":540,"y":180,"wires":[["ea862461.9bcd8"]]}, {"id":"ac15af16.a5406","type":"ui_text","z":"91f05030.48c02","group":"15d7c73d.8e3799","order":4,"width":7,"height":8,"name":"","label":"Bot :","format":"{{msg.payload}}","layout":"row-spread","x":590,"y":260,"wires":[]}, {"id":"e9207646.c21f38","type":"ui_text","z":"91f05030.48c02","group":"15d7c73d.8e3799","order":3,"width":7,"height":1,"n
```

```

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[]]}, {"id":"15d7c73d.8e3799","type":"ui_group","z":"","name":"Food
Security
Chatbot","tab":"8926d3a2.cabec","order":1,"disp":true,"width":7,"c
ollapse":false}, {"id":"8926d3a2.cabec","type":"ui_tab","z":"","name":
"Chatbot","icon":"dashboard","disabled":false,"hidden":false}]

```

- **Drive link for dashboard and chatbot flow:**

[https://drive.google.com/drive/folders/1JC\\_ITo\\_3OY9XfL9pQVPTTw25nALBbz0Q?usp=sharing](https://drive.google.com/drive/folders/1JC_ITo_3OY9XfL9pQVPTTw25nALBbz0Q?usp=sharing)

- **Drive link for datasets and notebooks:**

[https://drive.google.com/drive/folders/1Lsggq\\_Wlm1jAHtf-7Xx5nC56KfuTREGq?usp=sharing](https://drive.google.com/drive/folders/1Lsggq_Wlm1jAHtf-7Xx5nC56KfuTREGq?usp=sharing)