Project Report Template

1 INTRODUCTION

1.1 Overview

A brief description about your project

1.2 Purpose

The use of this project. What can be achieved using this.

2 Problem Definition & Design Thinking

2.1 Empathy Map

Paste the empathy map screenshot

2.2 Ideation & Brainstorming Map

Paste the Ideation & brainstorming map screenshot

3 RESULT

Final findings (Output) of the project along with screenshots.

4 ADVANTAGES & DISADVANTAGES

List of advantages and disadvantages of the proposed solution

5 APPLICATIONS

The areas where this solution can be applied

6 CONCLUSION

Conclusion summarizing the entire work and findings.

7 FUTURE SCOPE

Enhancements that can be made in the future.

8 APPENDIX

A. Source Code

Attach the code for the solution built.

1 INTRODUCTION

1.1 Overview

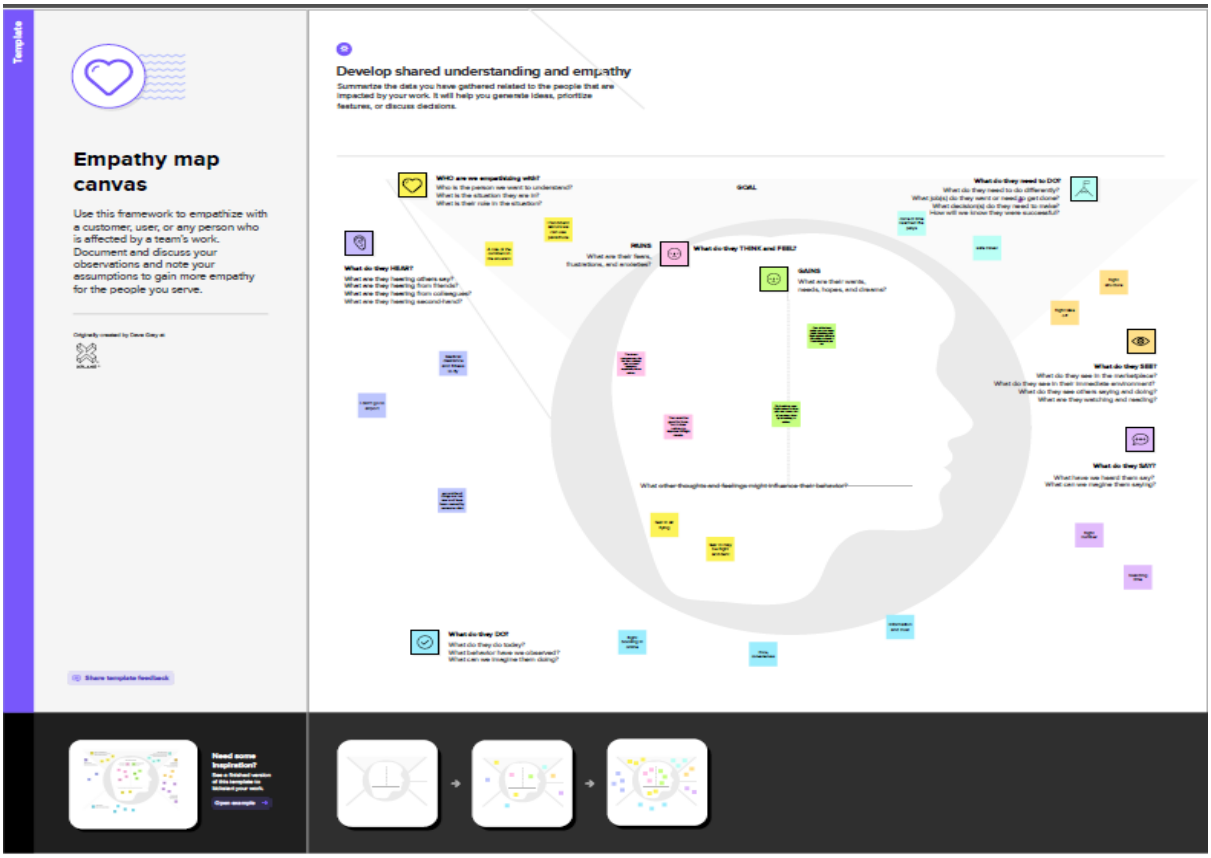
- People who work frequently travel through flight will have better knowledge on best discount and right timeto buy the ticket.
- They will increase the price when people travel more.
- Estimating the highestprices of the airlines data for the route is collected with features such as Duration, Source, Destination,Arrival and Departure.

1.2 Purpose

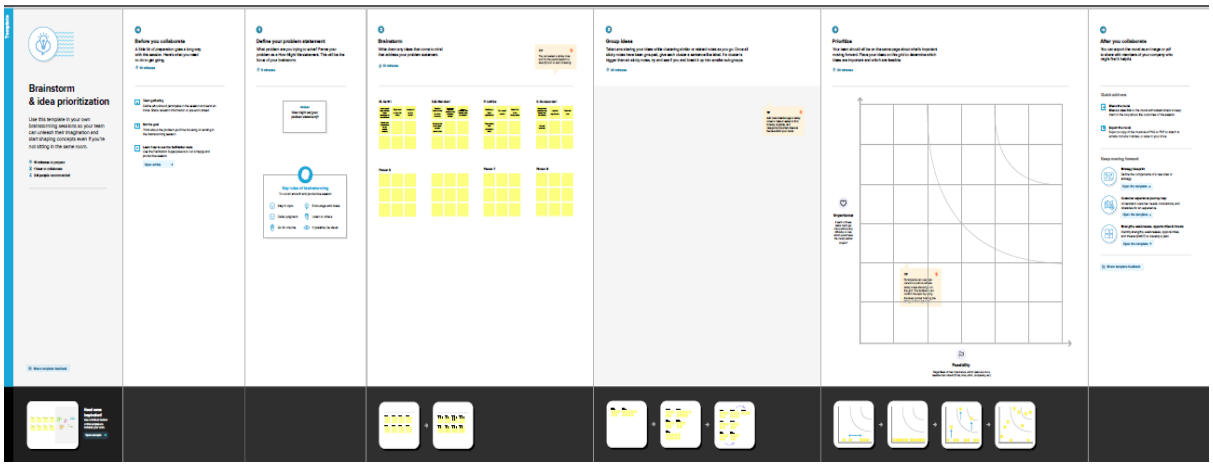
- For the business purpose many airline companies change prices according to the seasons or time duration.
- we have implemented flight price prediction for users by using KNN, decisiontree and random forest algorithms.
- Random Forest shows the best accuracy of 80% for predicting the flight price.
- Also, we have done correlation tests and metrics for the statistical analysis.

2 Problem Definition & Design Thinking

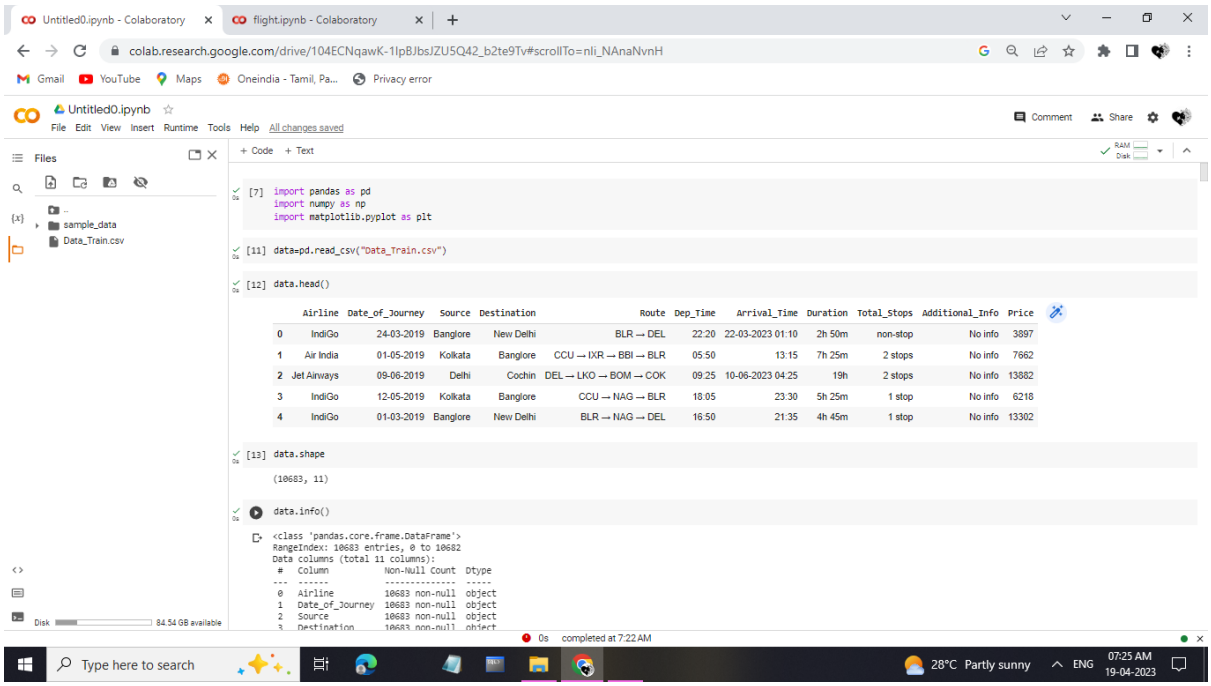
2.1 Empathy Map



2.2 Ideation & Brainstorming Map



3 RESULT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Share
Files
sample_data
Data_Train.csv
+ Code + Text
[7] import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
[11] data=pd.read_csv("Data_Train.csv")
[12] data.head()
Airline Date_of_Journey Source Destination Route Dep_Time Arrival_Time Duration Total_Stops Additional_Info Price
0 IndiGo 24-03-2019 Banglore New Delhi BLR → DEL 22:20 22-03-2023 01:10 2h 50m non-stop No info 3897
1 Air India 01-05-2019 Kolkata Banglore CCU → IXR → BBI → BLR 05:50 13:15 7h 25m 2 stops No info 7662
2 Jet Airways 09-06-2019 Delhi Cochin DEL → LKO → BOM → COK 09:25 10-06-2023 04:25 19h 2 stops No info 13882
3 IndiGo 12-05-2019 Kolkata Banglore CCU → NAG → BLR 18:05 23:30 5h 25m 1 stop No info 6218
4 IndiGo 01-03-2019 Banglore New Delhi BLR → NAG → DEL 16:50 21:35 4h 45m 1 stop No info 13302
[13] data.shape
(10683, 11)
data.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 11 columns):
Column Non-Null Count Dtype
0 Airline 10683 non-null object
1 Date_of_Journey 10683 non-null object
2 Source 10683 non-null object
3 Destination 10683 non-null object
Disk 84.54 GB available
0s completed at 7:22 AM
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28°C Partly sunny
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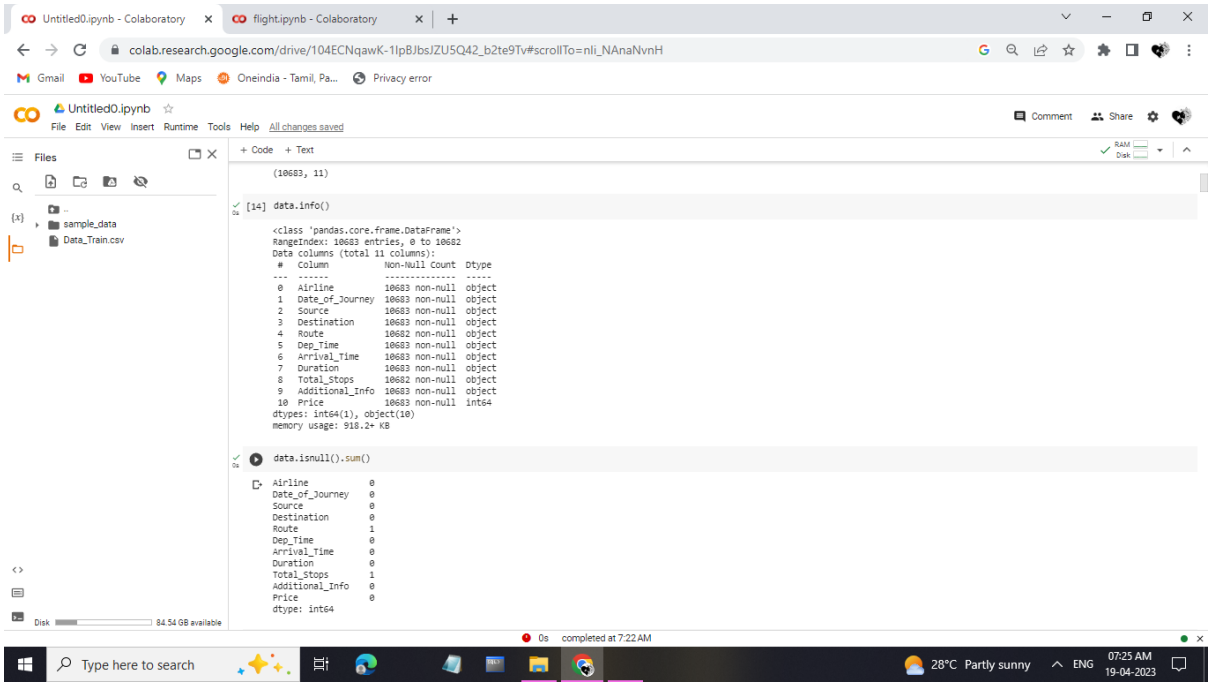
07:25 AM
19-04-2023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sample_data
Data_Train.csv
+ Code + Text
(10683, 11)
[14] data.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 11 columns):
Column Non-Null Count Dtype
0 Airline 10683 non-null object
1 Date_of_Journey 10683 non-null object
2 Source 10683 non-null object
3 Destination 10683 non-null object
4 Route 10682 non-null object
5 Dep_Time 10683 non-null object
6 Arrival_Time 10683 non-null object
7 Duration 10683 non-null object
8 Total_Stops 10682 non-null object
9 Additional_Info 10683 non-null object
10 Price 10683 non-null int64
dtypes: int64(1), object(10)
memory usage: 918.2+ KB
data.isnull().sum()
Airline 0
Date_of_Journey 0
Source 0
Destination 0
Route 1
Dep_Time 0
Arrival_Time 0
Duration 0
Total_Stops 1
Additional_Info 0
Price 0
dtype: int64
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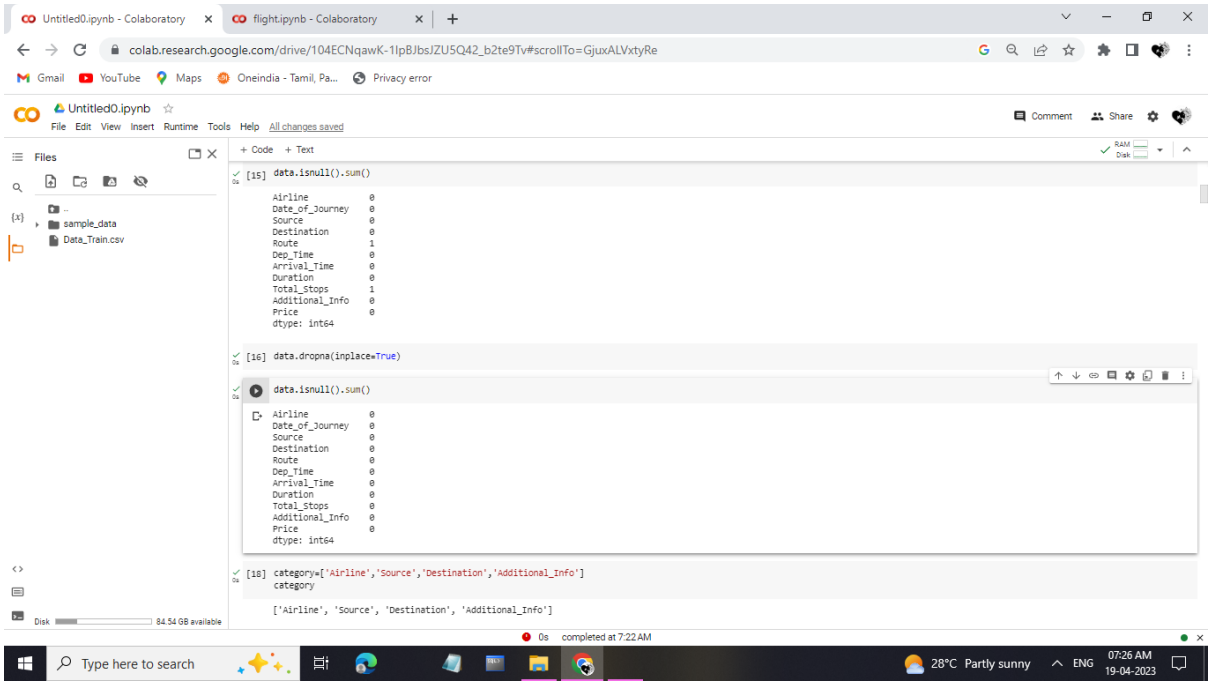
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File Edit View Insert Runtime Tools Help All changes saved
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Files
sample_data
Data_Train.csv
+ Code + Text
[15] data.isnull().sum()
Airline 0
Date_of_Journey 0
Source 0
Destination 0
Route 1
Dep_Time 0
Arrival_Time 0
Duration 0
Total_Stops 1
Additional_Info 0
Price 0
dtype: int64
[16] data.dropna(inplace=True)
data.isnull().sum()
Airline 0
Date_of_Journey 0
Source 0
Destination 0
Route 0
Dep_Time 0
Arrival_Time 0
Duration 0
Total_Stops 0
Additional_Info 0
Price 0
dtype: int64
[18] category=['Airline','Source','Destination','Additional_Info']
category
['Airline', 'Source', 'Destination', 'Additional_Info']
Disk 84.54 GB available
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07:26 AM
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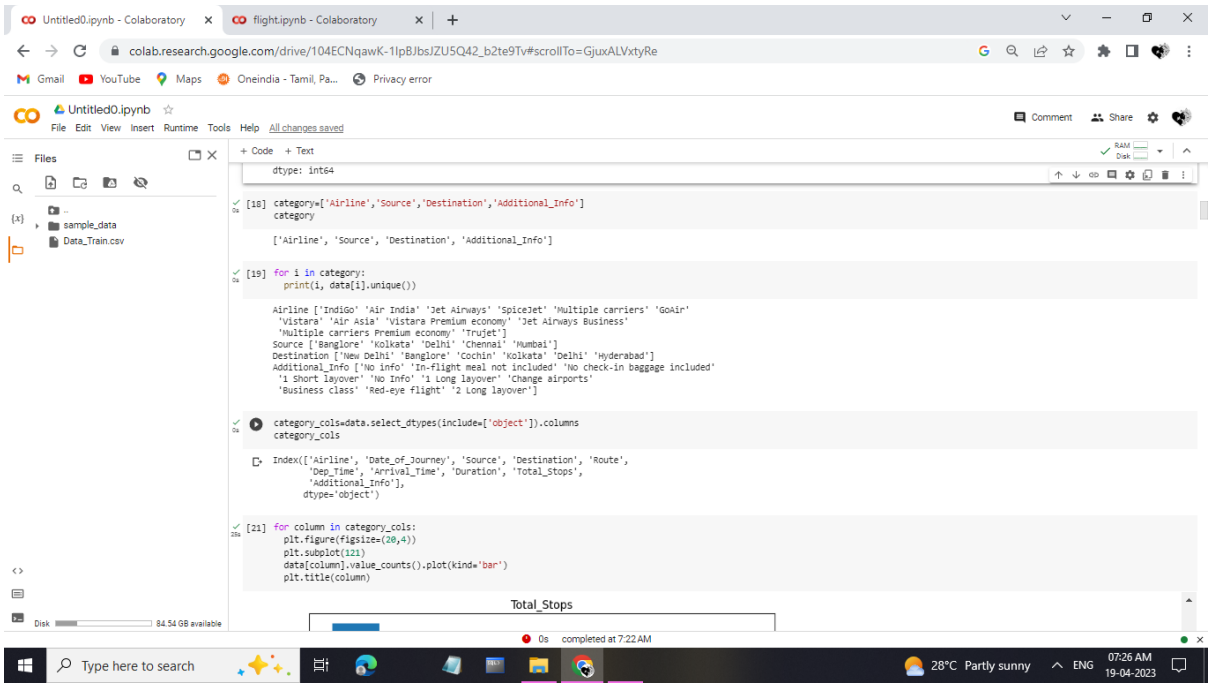
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sample_data
Data_Train.csv
+ Code + Text
dtype: int64
[18] category=['Airline','Source','Destination','Additional_Info']
category
['Airline', 'Source', 'Destination', 'Additional_Info']
[19] for i in category:
print(i, data[i].unique())
Airline ['IndiGo' 'Air India' 'Jet Airways' 'SpiceJet' 'Multiple carriers' 'GoAir'
'Vistara' 'Air Asia' 'Vistara Premium economy' 'Jet Airways Business'
'Multiple carriers Premium economy' 'Trujet']
Source ['Banglore' 'Kolkata' 'Delhi' 'Chennai' 'Mumbai']
Destination ['New Delhi' 'Banglore' 'Cochin' 'Kolkata' 'Delhi' 'Hyderabad']
Additional_Info ['No info' 'In-flight meal not included' 'No check-in baggage included'
'1 Short layover' 'No Info' '1 Long layover' 'Change airports'
'Business class' 'Red-eye flight' '2 Long layover']
category_cols=data.select_dtypes(include=['object']).columns
category_cols
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops',
'Additional_Info'],
dtype='object')
[21] for column in category_cols:
plt.figure(figsize=(20,4))
plt.subplot(121)
data[column].value_counts().plot(kind='bar')
plt.title(column)
Total_Stops
Disk 84.54 GB available
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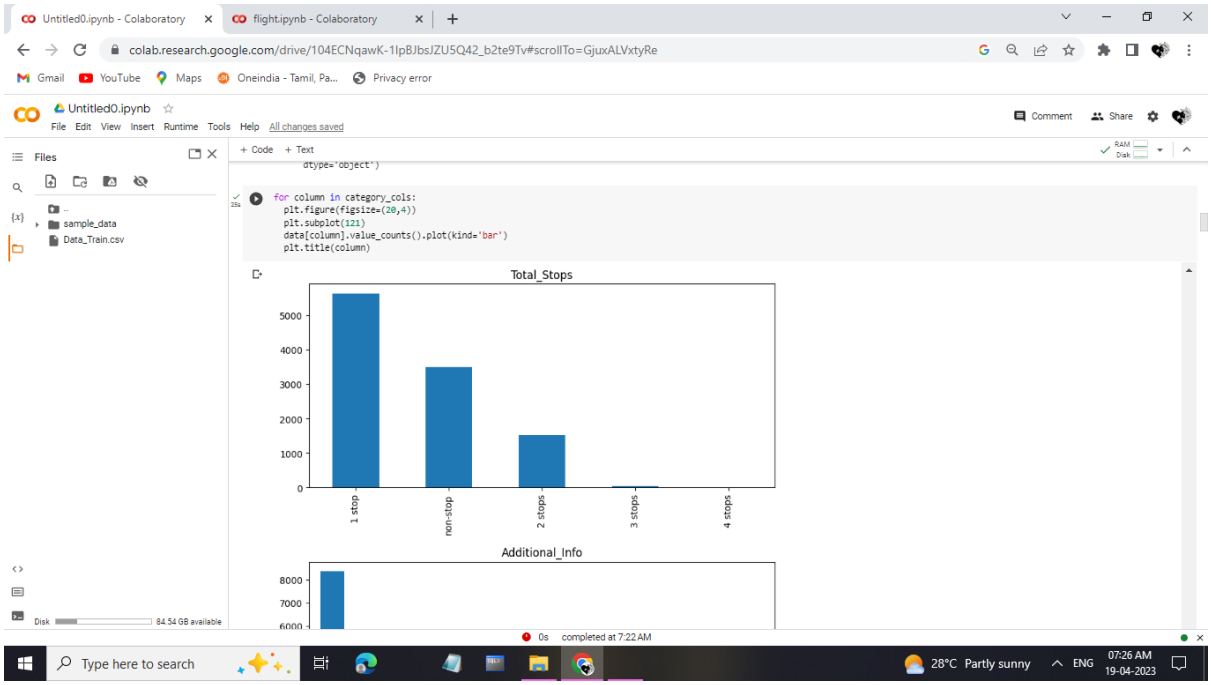
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for column in category_cols:
plt.figure(figsize=(20,4))
plt.subplot(121)
data[column].value_counts().plot(kind='bar')
plt.title(column)
Total_Stops
1 stop
non-stop
2 stops
3 stops
4 stops
Additional_Info
0s completed at 7:22 AM
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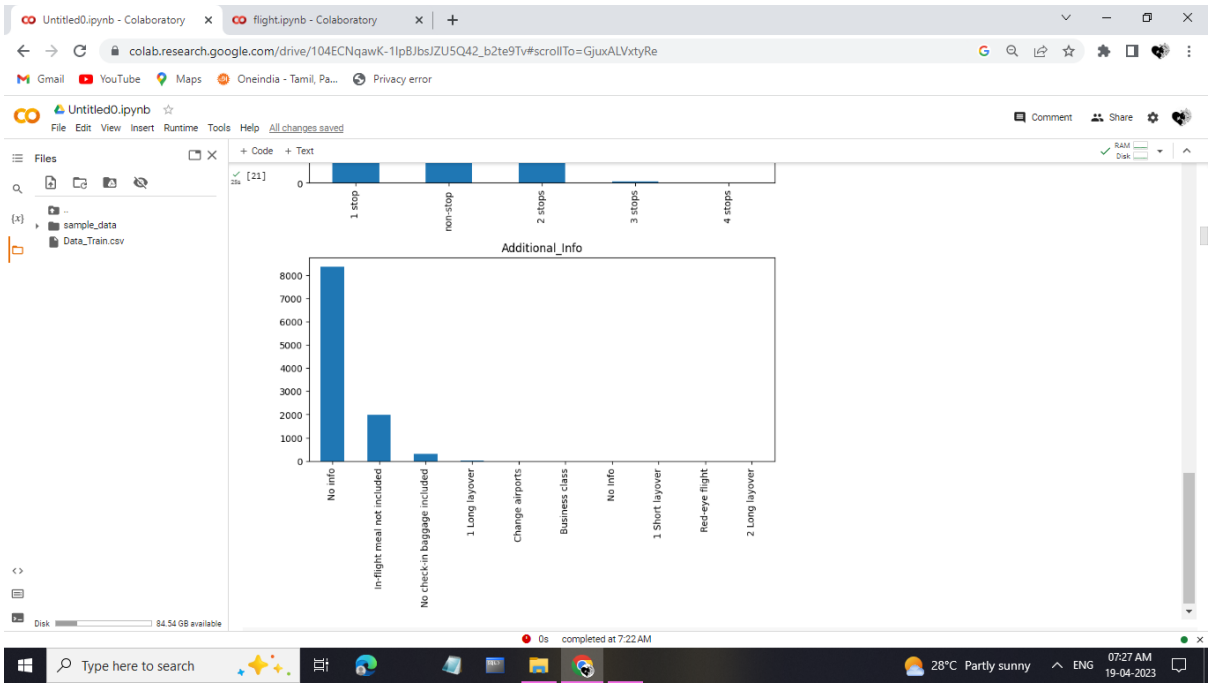
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Data_Train.csv
+ Code + Text
[21]
1 stop
non-stop
2 stops
3 stops
4 stops
Additional_Info
No info
In-flight meal not included
No check-in baggage included
1 Long layover
Change airports
Business class
No info
1 Short layover
Red-eye flight
2 Long layover
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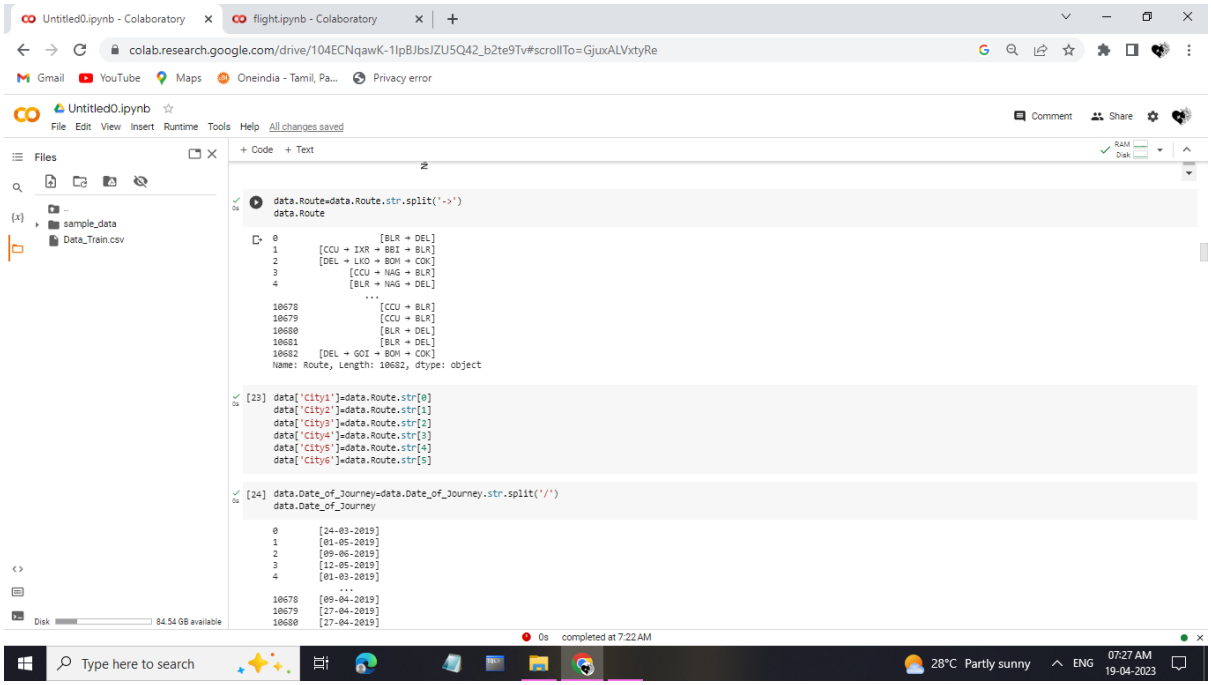
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Data_Train.csv
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data.Route=data.Route.str.split('->')
data.Route
0 [BLR → DEL]
1 [CCU → IXR → BBI → BLR]
2 [DEL → LKO → BOM → COK]
3 [CCU → NAG → BLR]
4 [BLR → NAG → DEL]
10678 [CCU → BLR]
10679 [CCU → BLR]
10680 [BLR → DEL]
10681 [BLR → DEL]
10682 [DEL → GOI → BOM → COK]
Name: Route, Length: 10682, dtype: object
[23] data['City1']=data.Route.str[0]
data['City2']=data.Route.str[1]
data['City3']=data.Route.str[2]
data['City4']=data.Route.str[3]
data['City5']=data.Route.str[4]
data['City6']=data.Route.str[5]
[24] data.Date_of_Journey=data.Date_of_Journey.str.split('/')
data.Date_of_Journey
0 [24-03-2019]
1 [01-05-2019]
2 [09-06-2019]
3 [12-05-2019]
4 [01-03-2019]
10678 [09-04-2019]
10679 [27-04-2019]
10680 [27-04-2019]
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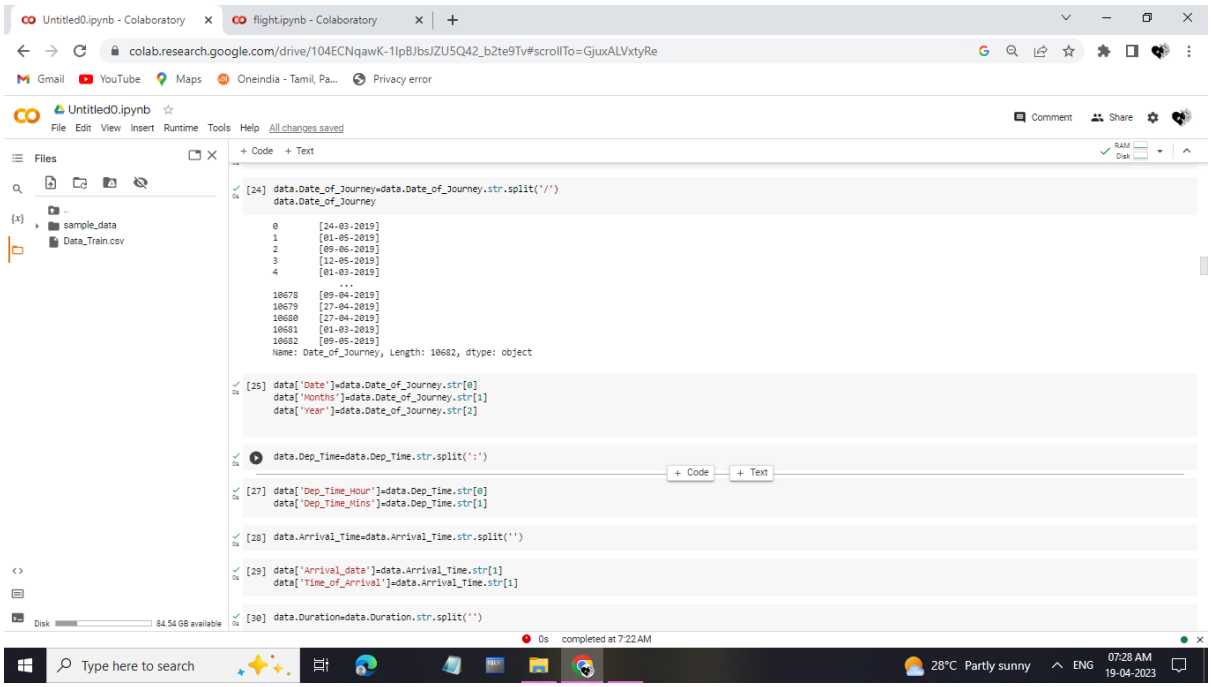
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sample_data
Data_Train.csv
+ Code + Text
[24] data.Date_of_Journey=data.Date_of_Journey.str.split('/')
data.Date_of_Journey
0 [24-03-2019]
1 [01-05-2019]
2 [09-06-2019]
3 [12-05-2019]
4 [01-03-2019]
10678 [09-04-2019]
10679 [27-04-2019]
10680 [27-04-2019]
10681 [01-03-2019]
10682 [09-05-2019]
Name: Date_of_Journey, Length: 10682, dtype: object
[25] data['Date']=data.Date_of_Journey.str[0]
data['Months']=data.Date_of_Journey.str[1]
data['Year']=data.Date_of_Journey.str[2]
data.Dep_Time=data.Dep_Time.str.split(':')
+ Code + Text
[27] data['Dep_Time_Hour']=data.Dep_Time.str[0]
data['Dep_Time_Mins']=data.Dep_Time.str[1]
[28] data.Arrival_Time=data.Arrival_Time.str.split('')
[29] data['Arrival_data']=data.Arrival_Time.str[1]
data['Time_of_Arrival']=data.Arrival_Time.str[1]
[30] data.Duration=data.Duration.str.split('')
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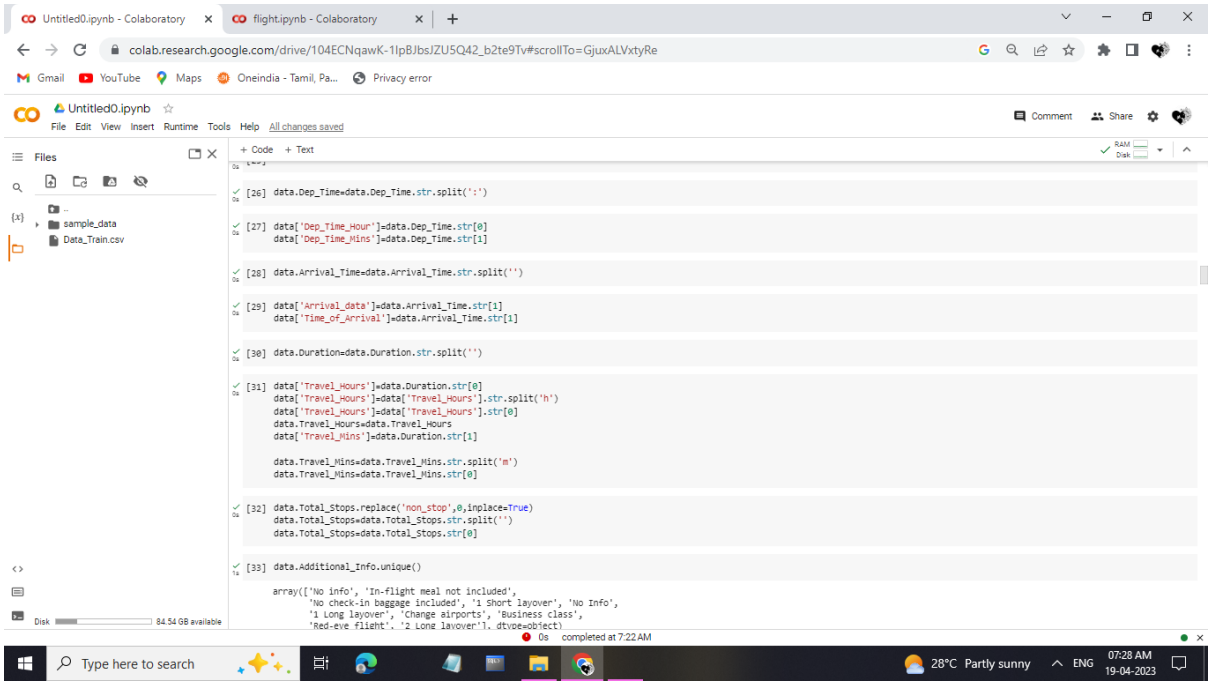
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sample_data
Data_Train.csv
+ Code + Text
[26] data.Dep_Time=data.Dep_Time.str.split(':')
[27] data['Dep_Time_Hour']=data.Dep_Time.str[0]
data['Dep_Time_Mins']=data.Dep_Time.str[1]
[28] data.Arrival_Time=data.Arrival_Time.str.split('')
[29] data['Arrival_data']=data.Arrival_Time.str[1]
data['Time_of_Arrival']=data.Arrival_Time.str[1]
[30] data.Duration=data.Duration.str.split('')
[31] data['Travel_Hours']=data.Duration.str[0]
data['Travel_Hours']=data['Travel_Hours'].str.split('h')
data['Travel_Hours']=data['Travel_Hours'].str[0]
data.Travel_Hours=data.Travel_Hours
data['Travel_Mins']=data.Duration.str[1]
data.Travel_Mins=data.Travel_Mins.str.split('m')
data.Travel_Mins=data.Travel_Mins.str[0]
[32] data.Total_Stops.replace('non_stop',0,inplace=True)
data.Total_Stops=data.Total_Stops.str.split('')
data.Total_Stops=data.Total_Stops.str[0]
[33] data.Additional_Info.unique()
array(['No info', 'In-flight meal not included',
'No check-in baggage included', '1 Short layover', 'No Info',
'1 Long layover', 'Change airports', 'Business class',
'Red-eye flight', '2 Long layover'], dtype=object)
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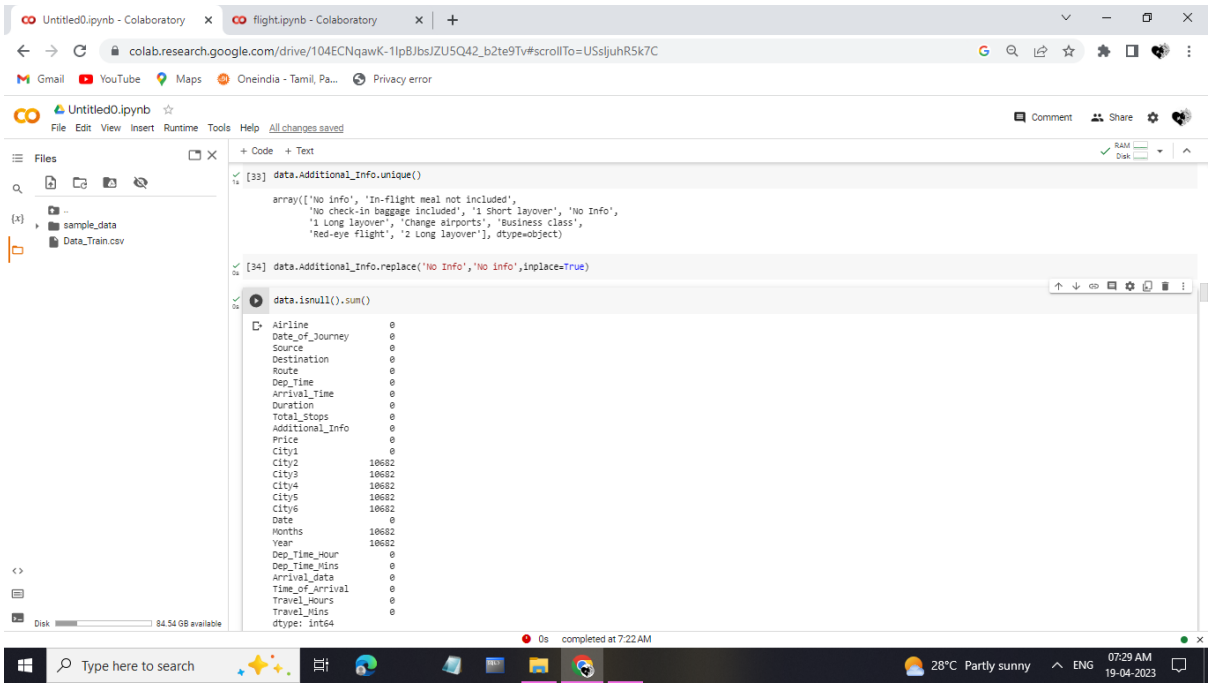
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sample_data
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[33] data.Additional_Info.unique()
array(['No info', 'In-flight meal not included',
'No check-in baggage included', '1 Short layover', 'No Info',
'1 Long layover', 'Change airports', 'Business class',
'Red-eye flight', '2 Long layover'], dtype=object)
[34] data.Additional_Info.replace('No Info','No info',inplace=True)
data.isnull().sum()
Airline 0
Date_of_Journey 0
Source 0
Destination 0
Route 0
Dep_Time 0
Arrival_Time 0
Duration 0
Total_Stops 0
Additional_Info 0
Price 0
City1 0
City2 10682
City3 10682
City4 10682
City5 10682
City6 10682
Date 0
Months 10682
Year 10682
Dep_Time_Hour 0
Dep_Time_Mins 0
Arrival_data 0
Time_of_Arrival 0
Travel_Hours 0
Travel_Mins 0
dtype: int64
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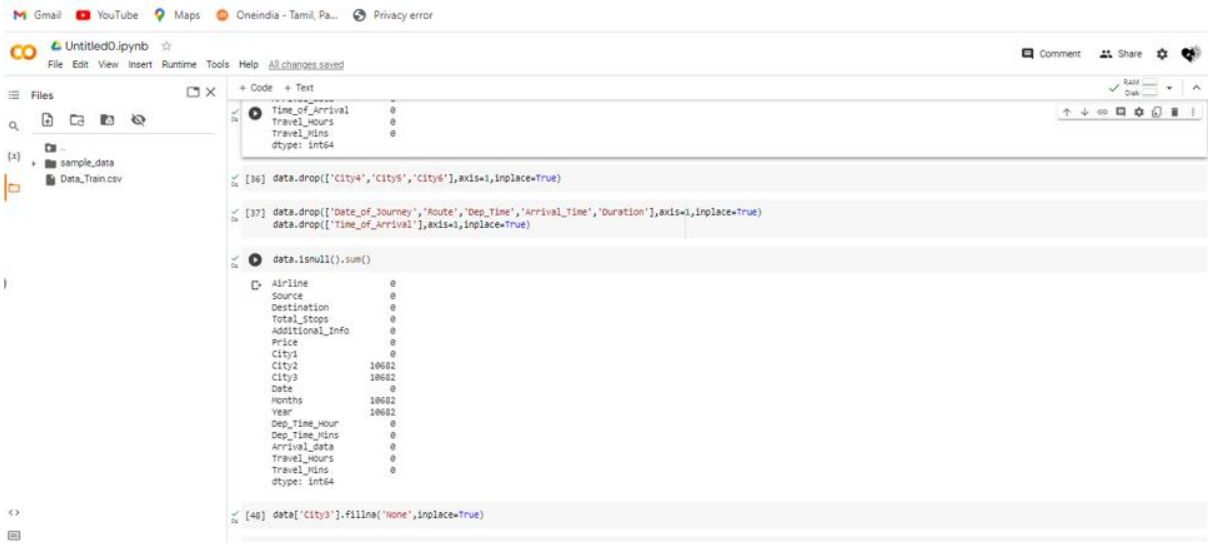
Gmail YouTube Maps Oneindia - Tamil, Pa... Privacy error
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File Edit View Insert Runtime Tools Help All changes saved
Comment Share
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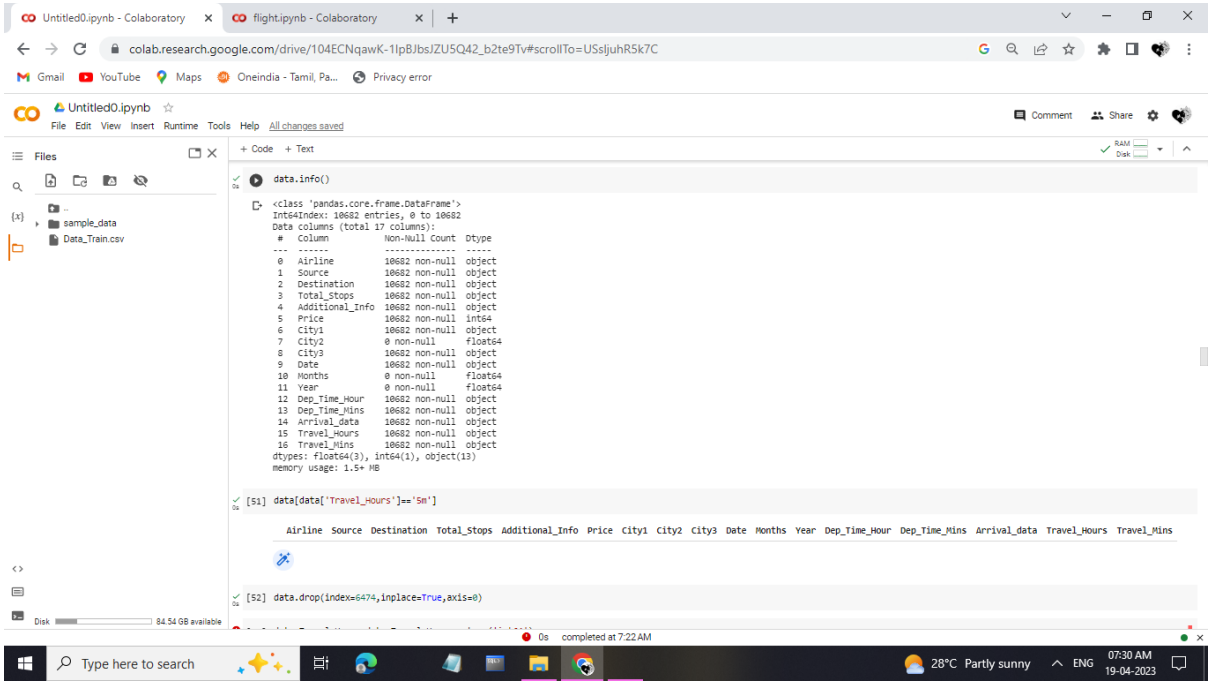
sample_data
Data_Train.csv
+ Code + Text
Time_of_Arrival 0
Travel_Hours 0
Travel_Mins 0
dtype: int64
[36] data.drop(['City4','City5','City6'],axis=1,inplace=True)
[37] data.drop(['Date_of_Journey','Route','Dep_Time','Arrival_Time','Duration'],axis=1,inplace=True)
data.drop(['Time_of_Arrival'],axis=1,inplace=True)
data.isnull().sum()
Airline 0
Source 0
Destination 0
Total_Stops 0
Additional_Info 0
Price 0
City1 0
City2 10682
City3 10682
Date 0
Months 10682
Year 10682
Dep_Time_Hour 0
Dep_Time_Mins 0
Arrival_data 0
Travel_Hours 0
Travel_Mins 0
dtype: int64
[48] data['City3'].fillna('None',inplace=True)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colab.research.google.com/drive/104ECNqawK-1IpBJbsJZU5Q42_b2te9Tv#scrollTo=USsljuhR5k7C
Gmail YouTube Maps Oneindia - Tamil, Pa... Privacy error
Untitled0.ipynb
File Edit View Insert Runtime Tools Help All changes saved
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Files
sample_data
Data_Train.csv
+ Code + Text
data.info()
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10682 entries, 0 to 10682
Data columns (total 17 columns):
Column Non-Null Count Dtype
0 Airline 10682 non-null object
1 Source 10682 non-null object
2 Destination 10682 non-null object
3 Total_Stops 10682 non-null object
4 Additional_Info 10682 non-null object
5 Price 10682 non-null int64
6 City1 10682 non-null object
7 City2 0 non-null float64
8 City3 10682 non-null object
9 Date 10682 non-null object
10 Months 0 non-null float64
11 Year 0 non-null float64
12 Dep_Time_Hour 10682 non-null object
13 Dep_Time_Mins 10682 non-null object
14 Arrival_data 10682 non-null object
15 Travel_Hours 10682 non-null object
16 Travel_Mins 10682 non-null object
dtypes: float64(3), int64(1), object(13)
memory usage: 1.5+ MB
[51] data[data['Travel_Hours']=='5m']
Airline Source Destination Total_Stops Additional_Info Price City1 City2 City3 Date Months Year Dep_Time_Hour Dep_Time_Mins Arrival_data Travel_Hours Travel_Mins
[52] data.drop(index=6474,inplace=True,axis=0)
Disk 84.54 GB available
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19-04-2023

sample_data
Data_Train.csv

```
[63] import tensorflow as tf
     from tensorflow import keras
     from tensorflow.keras.layers import Dense, Activation, Dropout
     from tensorflow.keras.optimizers import Adam
```

```
[66] model=keras.Sequential()
     model.add(Dense(7,activation ='relu',input_dim=11))
     model.add(Dense(7,activation='relu'))
     model.add(Dense(1,activation='linear'))
     model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense (Dense)               (None, 7)                 84

 dense_1 (Dense)             (None, 7)                 56

 dense_2 (Dense)             (None, 1)                 8

=================================================================
Total params: 148
Trainable params: 148
Non-trainable params: 0
_________________________________________________________________
```

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sample_data
Data_Train.csv

```
[57] plt.figure(figsize=(15,8))
     sns.distplot(data.Price)
```

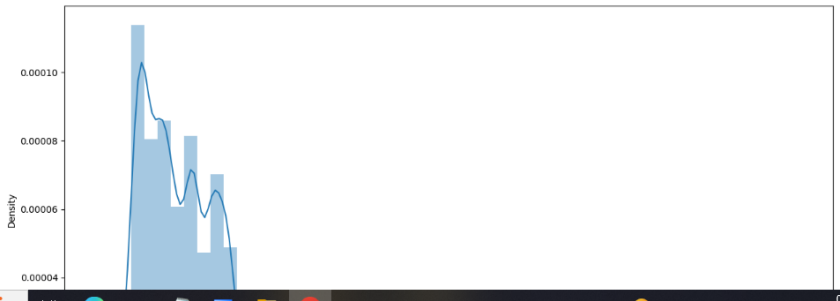
```
<ipython-input-57-102ce9297ea4>:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data.Price)
<Axes: xlabel='Price', ylabel='Density'>
```



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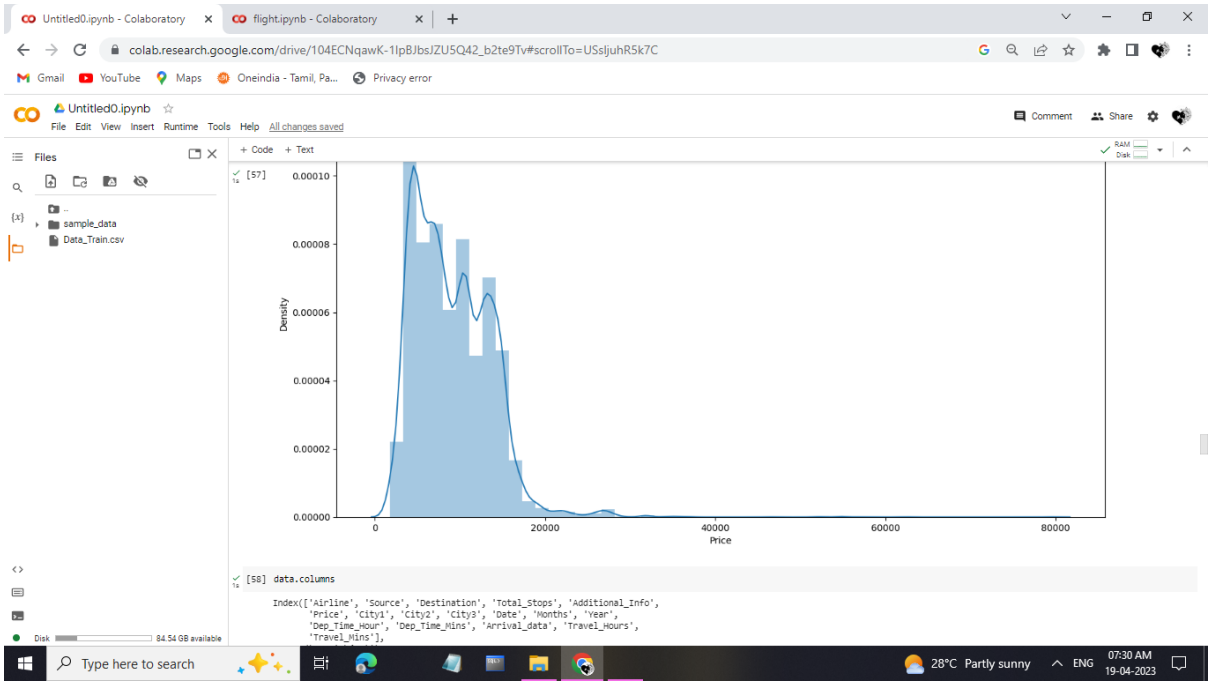
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[57]
Density
Price
0.00010
0.00008
0.00006
0.00004
0.00002
0.00000
0
20000
40000
60000
80000
[58] data.columns
Index(['Airline', 'Source', 'Destination', 'Total_Stops', 'Additional_Info',
'Price', 'City1', 'City2', 'City3', 'Date', 'Months', 'Year',
'Dep_Time_Hour', 'Dep_Time_Mins', 'Arrival_data', 'Travel_Hours',
'Travel_Mins'],
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sample_data
Data_Train.csv
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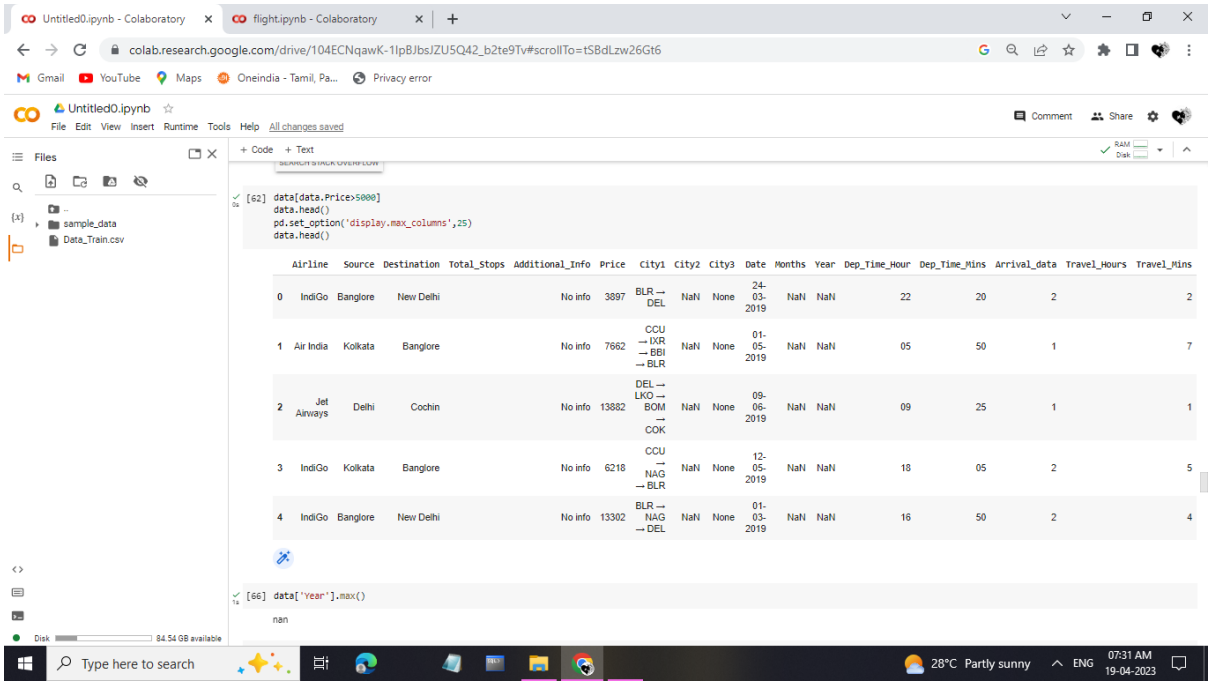
[58] Index(['Airline', 'Source', 'Destination', 'Total_Stops', 'Additional_Info',
'Price', 'City1', 'City2', 'City3', 'Date', 'Months', 'Year',
'Dep_Time_Hour', 'Dep_Time_Mins', 'Arrival_data', 'Travel_Hours',
'Travel_Mins'],
dtype='object')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sample_data
Data_Train.csv
+ Code + Text
[62] data[data.Price>5000]
data.head()
pd.set_option('display.max_columns',25)
data.head()
Airline Source Destination Total_Stops Additional_Info Price City1 City2 City3 Date Months Year Dep_Time_Hour Dep_Time_Mins Arrival_data Travel_Hours Travel_Mins
0 IndiGo Banglore New Delhi No info 3897 BLR → DEL NaN None 24-03-2019 NaN NaN 22 20 2 2
1 Air India Kolkata Banglore No info 7662 CCU → IXR → BBI → BLR NaN None 01-05-2019 NaN NaN 05 50 1 7
2 Jet Airways Delhi Cochin No info 13882 DEL → LKO → BOM → COK NaN None 09-06-2019 NaN NaN 09 25 1 1
3 IndiGo Kolkata Banglore No info 6218 CCU → NAG → BLR NaN None 12-05-2019 NaN NaN 18 05 2 5
4 IndiGo Banglore New Delhi No info 13302 BLR → NAG → DEL NaN None 01-03-2019 NaN NaN 16 50 2 4
[66] data['Year'].max()
nan
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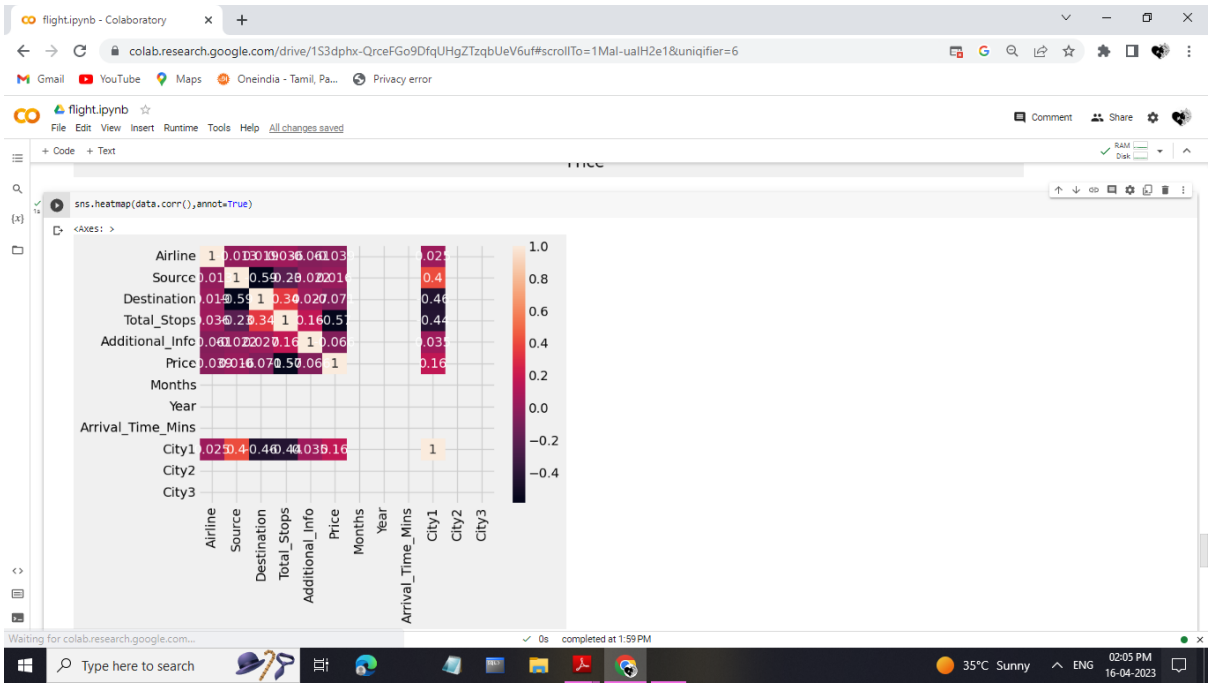
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sns.heatmap(data.corr(),annot=True)
<Axes: >
Airline
Source
Destination
Total_Stops
Additional_Info
Price
Months
Year
Arrival_Time_Mins
City1
City2
City3
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
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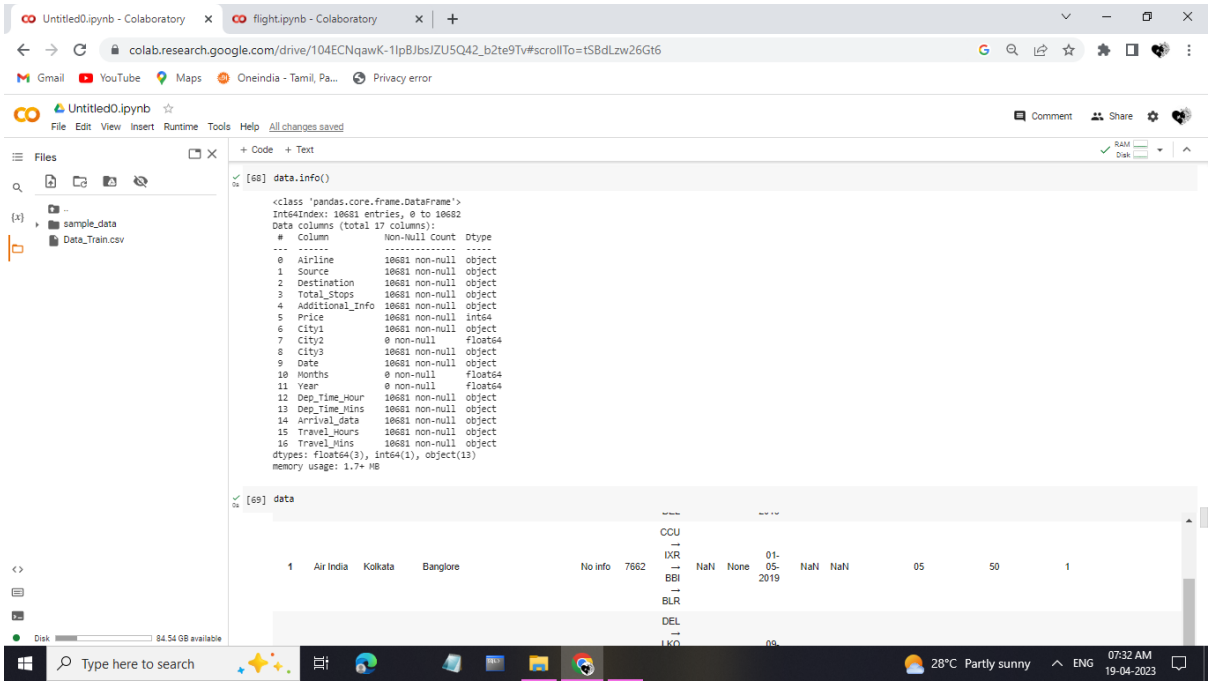
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sample_data
Data_Train.csv
+ Code + Text
[68] data.info()
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10681 entries, 0 to 10682
Data columns (total 17 columns):
Column Non-Null Count Dtype
0 Airline 10681 non-null object
1 Source 10681 non-null object
2 Destination 10681 non-null object
3 Total_Stops 10681 non-null object
4 Additional_Info 10681 non-null object
5 Price 10681 non-null int64
6 City1 10681 non-null object
7 City2 0 non-null float64
8 City3 10681 non-null object
9 Date 10681 non-null object
10 Months 0 non-null float64
11 Year 0 non-null float64
12 Dep_Time_Hour 10681 non-null object
13 Dep_Time_Mins 10681 non-null object
14 Arrival_data 10681 non-null object
15 Travel_Hours 10681 non-null object
16 Travel_Mins 10681 non-null object
dtypes: float64(3), int64(1), object(13)
memory usage: 1.7+ MB
[69] data
1 Air India Kolkata Banglore No info 7662 CCU → IXR → BBI → BLR NaN None 01-05-2019 NaN NaN 05 50 1
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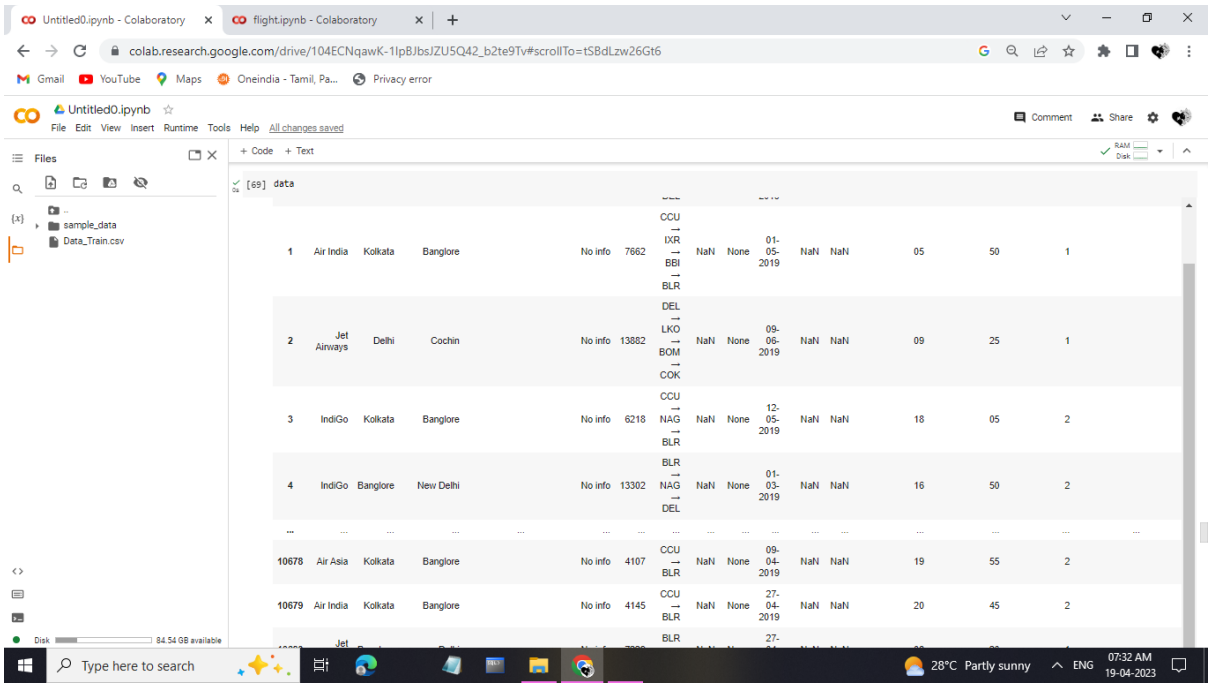
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sample_data
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[69] data
1 Air India Kolkata Banglore No info 7662 CCU → IXR → BBI → BLR NaN None 01-05-2019 NaN NaN 05 50 1
2 Jet Airways Delhi Cochin No info 13882 DEL → LKO → BOM → COK NaN None 09-06-2019 NaN NaN 09 25 1
3 IndiGo Kolkata Banglore No info 6218 CCU → NAG → BLR NaN None 12-05-2019 NaN NaN 18 05 2
4 IndiGo Banglore New Delhi No info 13302 BLR → NAG → DEL NaN None 01-03-2019 NaN NaN 16 50 2
10678 Air Asia Kolkata Banglore No info 4107 CCU → BLR NaN None 09-04-2019 NaN NaN 19 55 2
10679 Air India Kolkata Banglore No info 4145 CCU → BLR NaN None 27-04-2019 NaN NaN 20 45 2
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Data_Train.csv

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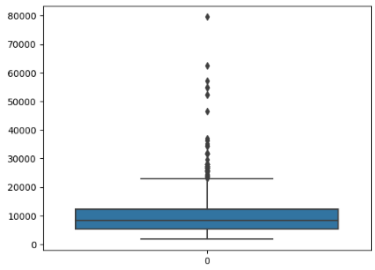
```
[72] import seaborn as sns
     sns.boxplot(data['Price'])
```




```
[73] from sklearn.preprocessing import LabelEncoder
     le=LabelEncoder()
```

```
[74] data.Airline=le.fit_transform(data.Airline)
     data.Source=le.fit_transform(data.Source)
     data.Destination=le.fit_transform(data.Destination)
     data.Total_Stops=le.fit_transform(data.Total_Stops)
     data.City1=le.fit_transform(data.City1)
     data.City2=le.fit_transform(data.City2)
```

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sample_data

Data_Train.csv

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```
[73] from sklearn.preprocessing import LabelEncoder
     le=LabelEncoder()
```

```
data.Airline=le.fit_transform(data.Airline)
data.Source=le.fit_transform(data.Source)
data.Destination=le.fit_transform(data.Destination)
data.Total_Stops=le.fit_transform(data.Total_Stops)
data.City1=le.fit_transform(data.City1)
data.City2=le.fit_transform(data.City2)
data.City3=le.fit_transform(data.City3)
data.Additional_Info=le.fit_transform(data.Additional_Info)
data.head()
```

	Airline	Source	Destination	Total_Stops	Additional_Info	Price	City1	City2	City3	Date	Months	Year	Dep_Time_Hour	Dep_Time_Mins	Arrival_data	Travel_Hours	Travel_Mins
0	3	0	5	0	7	3897	18	0	0	24-03-2019	NaN	NaN	22	20	2		2
1	1	3	0	0	7	7662	84	0	0	01-05-2019	NaN	NaN	05	50	1		7
2	4	2	1	0	7	13882	118	0	0	09-06-2019	NaN	NaN	09	25	1		1
3	3	3	0	0	7	6218	91	0	0	12-05-2019	NaN	NaN	18	05	2		5
4	3	0	5	0	7	13302	29	0	0	01-03-2019	NaN	NaN	16	50	2		4

```
from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
```

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4 ADVANTAGES & DISADVANTAGES

Advantages:

- Easy to book tickets.
- Saves time and money.
- Provides every information about flight.
- 24/7 customer support through chat and calls.
- Mobile Availability.

Disadvantages:

- You need internet access. Reliable internet access is required to check reservations and add bookings that are made over the phone.
- You need to be ready for an influx of new customers.
- Not all online booking systems are created equal.

5 APPLICATIONS

- In this section, we will be building a web application that is integrated to the model we built.
- A UI isprovided for the uses where he has to enter the values for predictions.
- The enter values are given to the saved model and prediction is showcased on the UI.

- **This section has the following tasks**

  - ❖ Building HTML Pages
  - ❖ Building server side script
  - ❖ Run the web application

6 CONCLUSION

- Justify the creation of a national research program focused on the needs of airport operators;

- Reveal how such a program can play a role in helping airport operators meet the many demands of federal agencies, state governments, local communities, and airport users; and

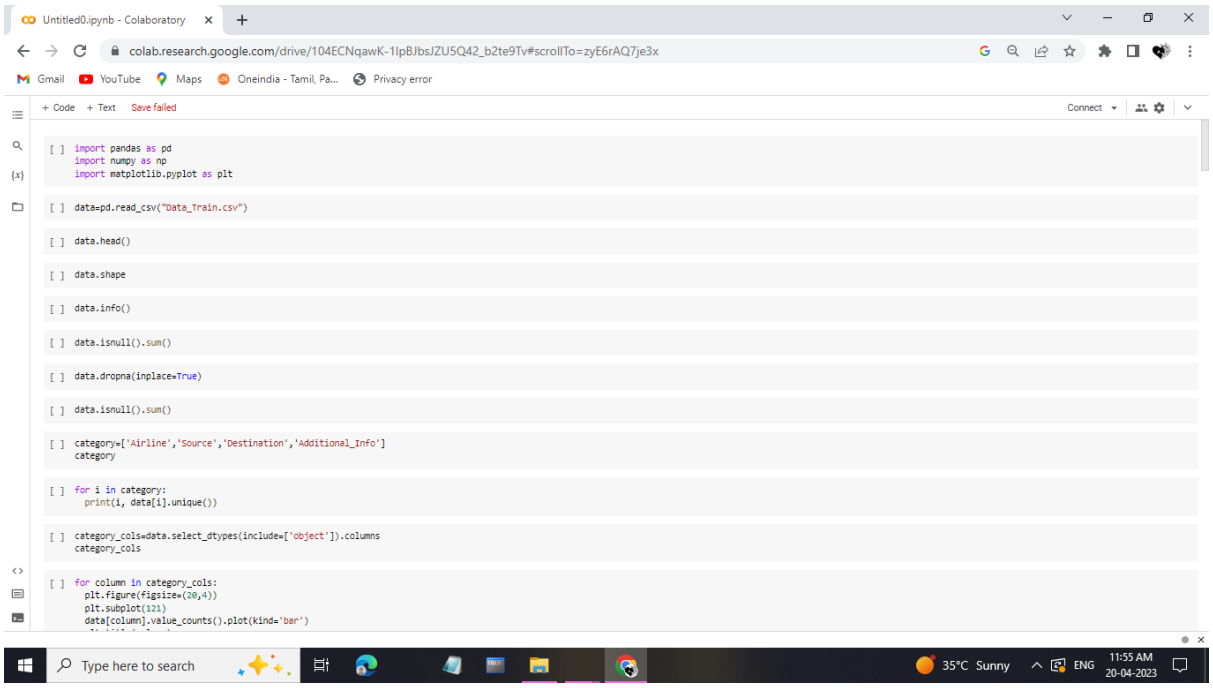
- Provide guidance on governing, funding, and administering an airport research program.

7 FUTURE SCOPE

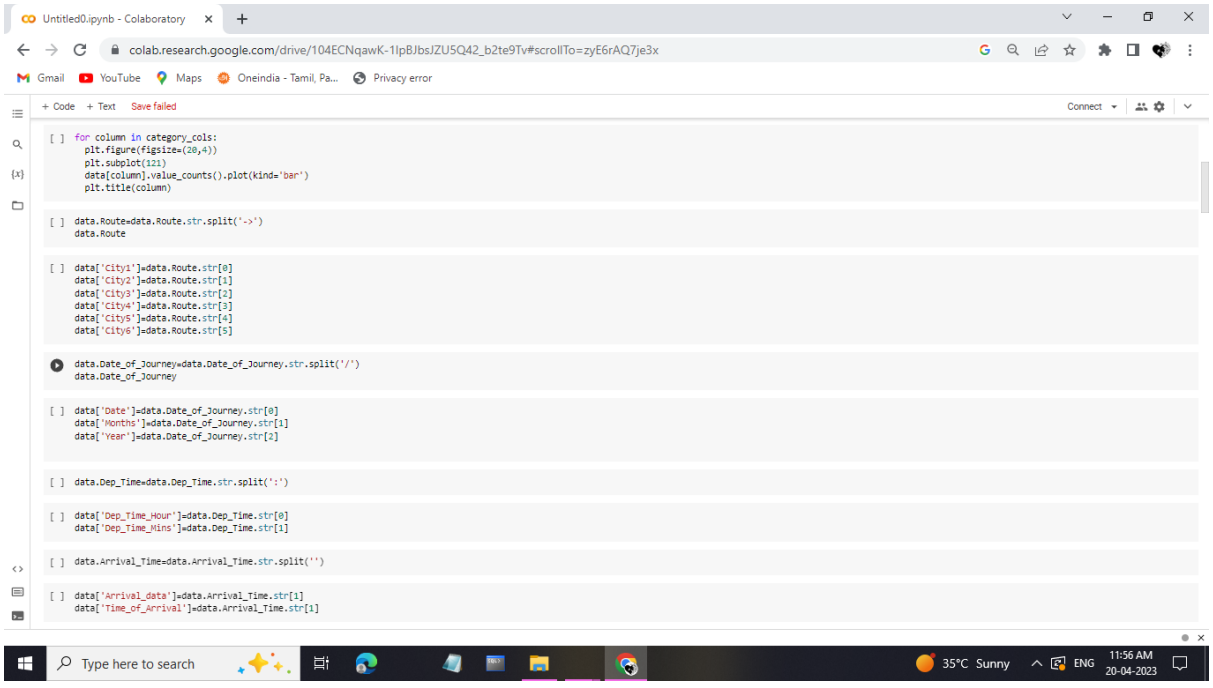
Emerging technologies are reshaping with robotics, artificial intelligence, the internet of things, unmanned aircraft systems and the push for hybrid and electric airplanes – just to name a few. Alternative fuels can significantly change the current scenario of aviation in support of the environmental protection.

8.APPENDIX

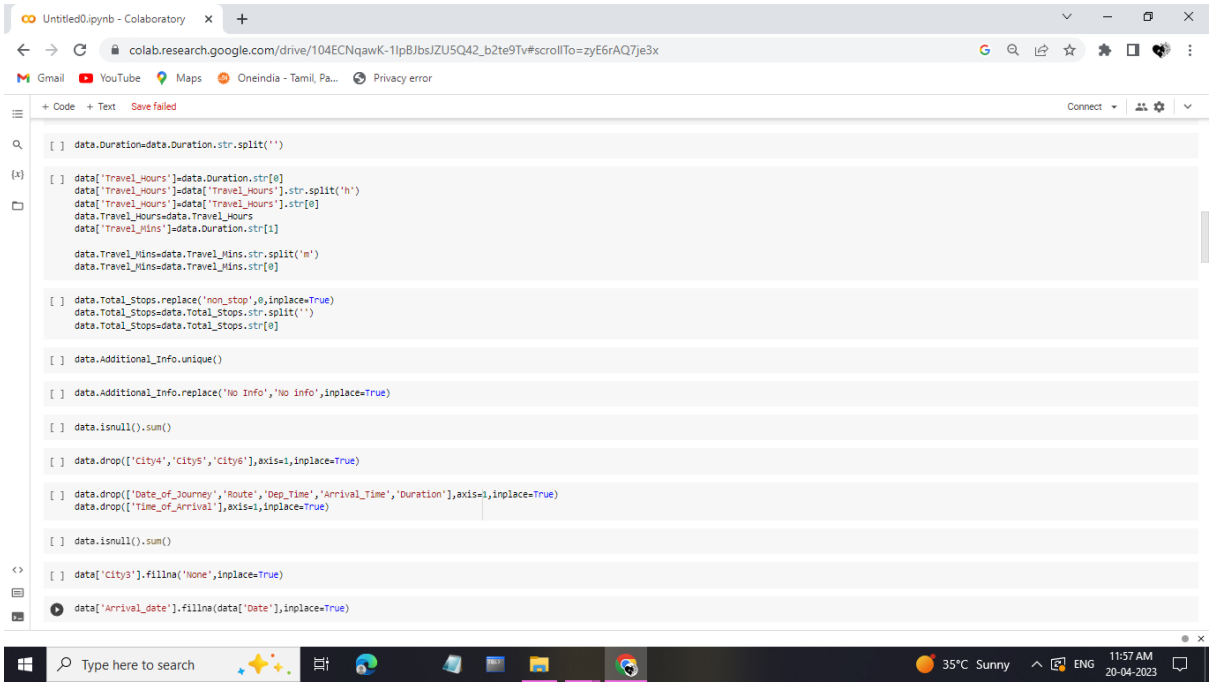
A. Source Code



```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

data=pd.read_csv("Data_Train.csv")

data.head()

data.shape

data.info()

data.isnull().sum()

data.dropna(inplace=True)

data.isnull().sum()

category=['Airline','Source','Destination','Additional_Info']
category

for i in category:
    print(i, data[i].unique())

category_cols=data.select_dtypes(include=['object']).columns
category_cols

for column in category_cols:
    plt.figure(figsize=(20,4))
    plt.subplot(121)
    data[column].value_counts().plot(kind='bar')
```



```
for column in category_cols:
    plt.figure(figsize=(20,4))
    plt.subplot(121)
    data[column].value_counts().plot(kind='bar')
    plt.title(column)

data.Route=data.Route.str.split('->')
data.Route

data['City1']=data.Route.str[0]
data['City2']=data.Route.str[1]
data['City3']=data.Route.str[2]
data['City4']=data.Route.str[3]
data['City5']=data.Route.str[4]
data['City6']=data.Route.str[5]

data.Date_of_Journey=data.Date_of_Journey.str.split('/')
data.Date_of_Journey

data['Date']=data.Date_of_Journey.str[0]
data['Months']=data.Date_of_Journey.str[1]
data['Year']=data.Date_of_Journey.str[2]

data.Dep_Time=data.Dep_Time.str.split(':')

data['Dep_Time_Hour']=data.Dep_Time.str[0]
data['Dep_Time_Mins']=data.Dep_Time.str[1]

data.Arrival_Time=data.Arrival_Time.str.split('')

data['Arrival_data']=data.Arrival_Time.str[1]
data['Time_of_Arrival']=data.Arrival_Time.str[1]
```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[ ] data.Duration=data.Duration.str.split('')
[ ] data['Travel_Hours']=data.Duration.str[0]
data['Travel_Hours']=data['Travel_Hours'].str.split('h')
data['Travel_Hours']=data['Travel_Hours'].str[0]
data.Travel_Hours=data.Travel_Hours
data['Travel_Mins']=data.Duration.str[1]
data.Travel_Mins=data.Travel_Mins.str.split('m')
data.Travel_Mins=data.Travel_Mins.str[0]
[ ] data.Total_Stops.replace('non_stop',0,inplace=True)
data.Total_Stops=data.Total_Stops.str.split('')
data.Total_Stops=data.Total_Stops.str[0]
[ ] data.Additional_Info.unique()
[ ] data.Additional_Info.replace('No Info','No info',inplace=True)
[ ] data.isnull().sum()
[ ] data.drop(['City4','City5','City6'],axis=1,inplace=True)
[ ] data.drop(['Date_of_Journey','Route','Dep_Time','Arrival_Time','Duration'],axis=1,inplace=True)
data.drop(['Time_of_Arrival'],axis=1,inplace=True)
[ ] data.isnull().sum()
[ ] data['City3'].fillna('None',inplace=True)
data['Arrival_date'].fillna(data['Date'],inplace=True)
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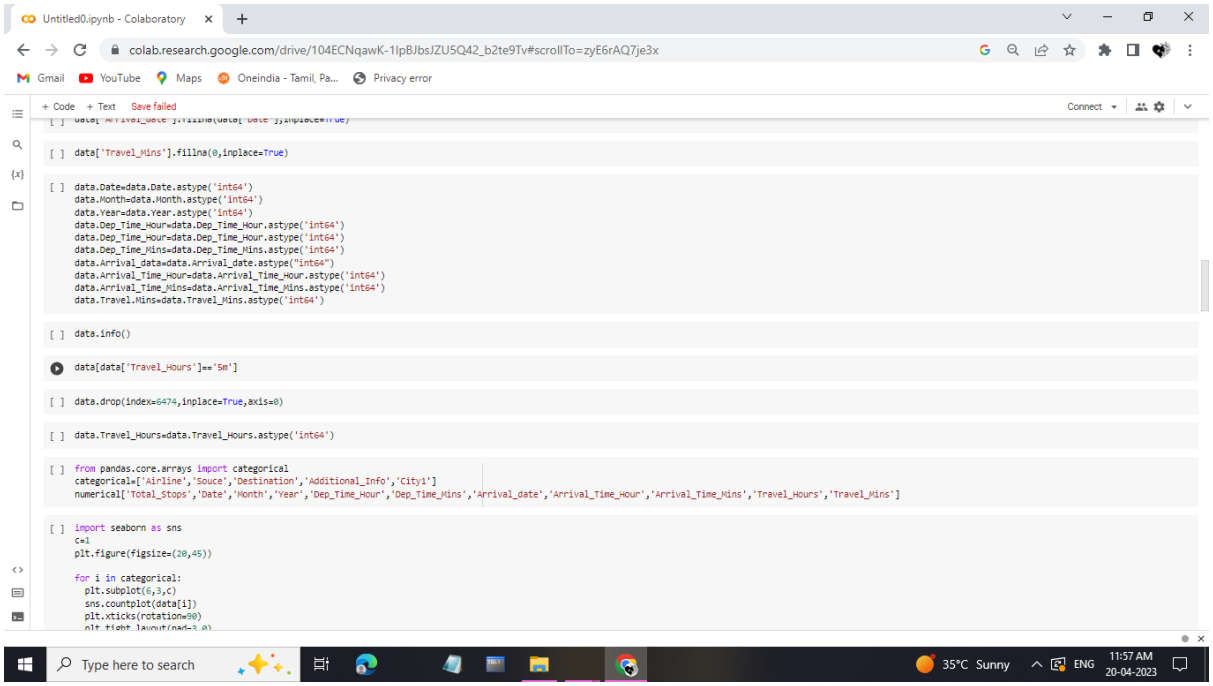
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YouTube
Maps
Oneindia - Tamil, Pa...
Privacy error
+ Code
+ Text
Save failed
Connect
[ ] data['Travel_Mins'].fillna(0,inplace=True)
[ ] data.Date=data.Date.astype('int64')
data.Month=data.Month.astype('int64')
data.Year=data.Year.astype('int64')
data.Dep_Time_Hour=data.Dep_Time_Hour.astype('int64')
data.Dep_Time_Hour=data.Dep_Time_Hour.astype('int64')
data.Dep_Time_Mins=data.Dep_Time_Mins.astype('int64')
data.Arrival_data=data.Arrival_date.astype("int64")
data.Arrival_Time_Hour=data.Arrival_Time_Hour.astype('int64')
data.Arrival_Time_Mins=data.Arrival_Time_Mins.astype('int64')
data.Travel.Mins=data.Travel_Mins.astype('int64')
[ ] data.info()
data[data['Travel_Hours']=='5m']
[ ] data.drop(index=6474,inplace=True,axis=0)
[ ] data.Travel_Hours=data.Travel_Hours.astype('int64')
[ ] from pandas.core.arrays import categorical
categorical=['Airline','Souce','Destination','Additional_Info','City1']
numerical['Total_Stops','Date','Month','Year','Dep_Time_Hour','Dep_Time_Mins','Arrival_date','Arrival_Time_Hour','Arrival_Time_Mins','Travel_Hours','Travel_Mins']
[ ] import seaborn as sns
c=1
plt.figure(figsize=(20,45))
for i in categorical:
plt.subplot(6,3,c)
sns.countplot(data[i])
plt.xticks(rotation=90)
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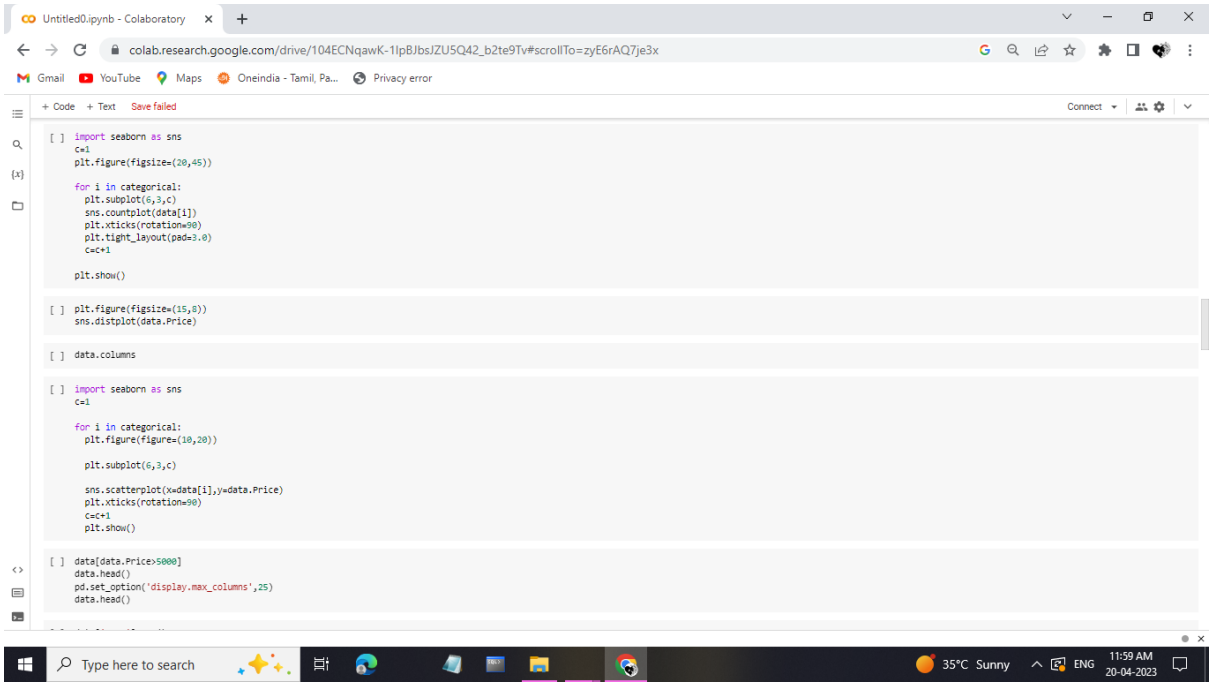
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import seaborn as sns
c=1
plt.figure(figsize=(20,45))
for i in categorical:
plt.subplot(6,3,c)
sns.countplot(data[i])
plt.xticks(rotation=90)
plt.tight_layout(pad=3.0)
c=c+1
plt.show()
plt.figure(figsize=(15,8))
sns.distplot(data.Price)
data.columns
import seaborn as sns
c=1
for i in categorical:
plt.figure(figure=(10,20))
plt.subplot(6,3,c)
sns.scatterplot(x=data[i],y=data.Price)
plt.xticks(rotation=90)
c=c+1
plt.show()
data[data.Price>5000]
data.head()
pd.set_option('display.max_columns',25)
data.head()
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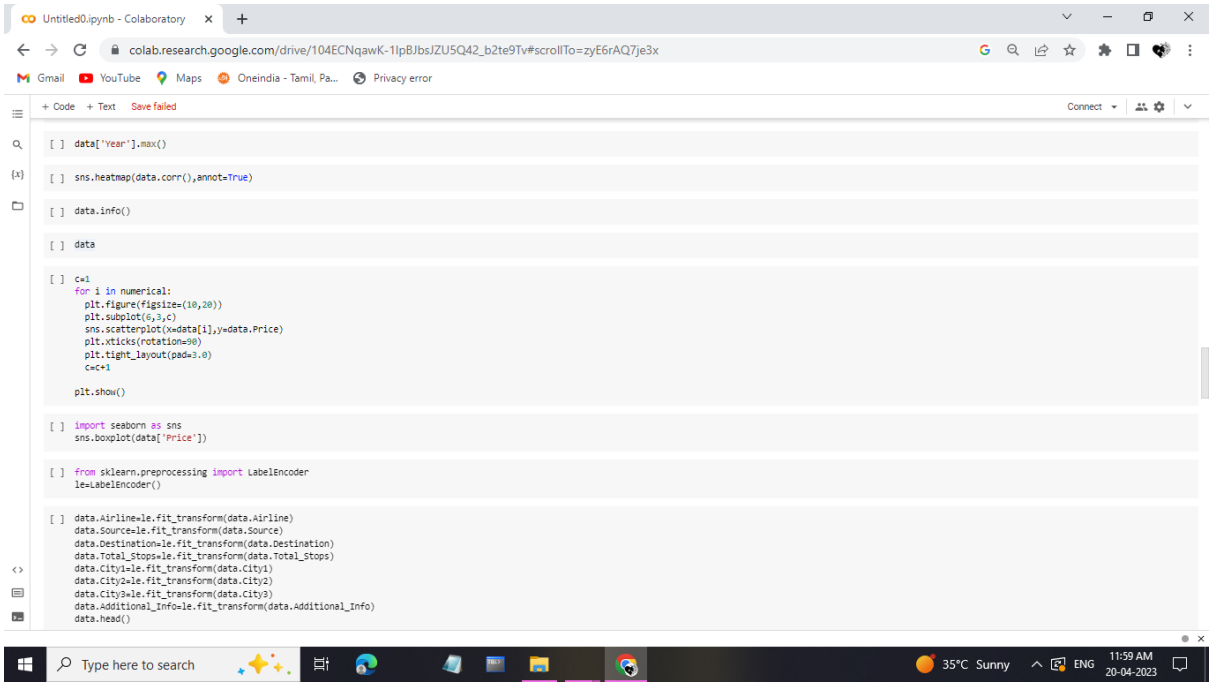
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data['Year'].max()
sns.heatmap(data.corr(),annot=True)
data.info()
data
c=1
for i in numerical:
plt.figure(figsize=(10,20))
plt.subplot(6,3,c)
sns.scatterplot(x=data[i],y=data.Price)
plt.xticks(rotation=90)
plt.tight_layout(pad=3.0)
c=c+1
plt.show()
import seaborn as sns
sns.boxplot(data['Price'])
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
data.Airline=le.fit_transform(data.Airline)
data.Source=le.fit_transform(data.Source)
data.Destination=le.fit_transform(data.Destination)
data.Total_Stops=le.fit_transform(data.Total_Stops)
data.City1=le.fit_transform(data.City1)
data.City2=le.fit_transform(data.City2)
data.City3=le.fit_transform(data.City3)
data.Additional_Info=le.fit_transform(data.Additional_Info)
data.head()
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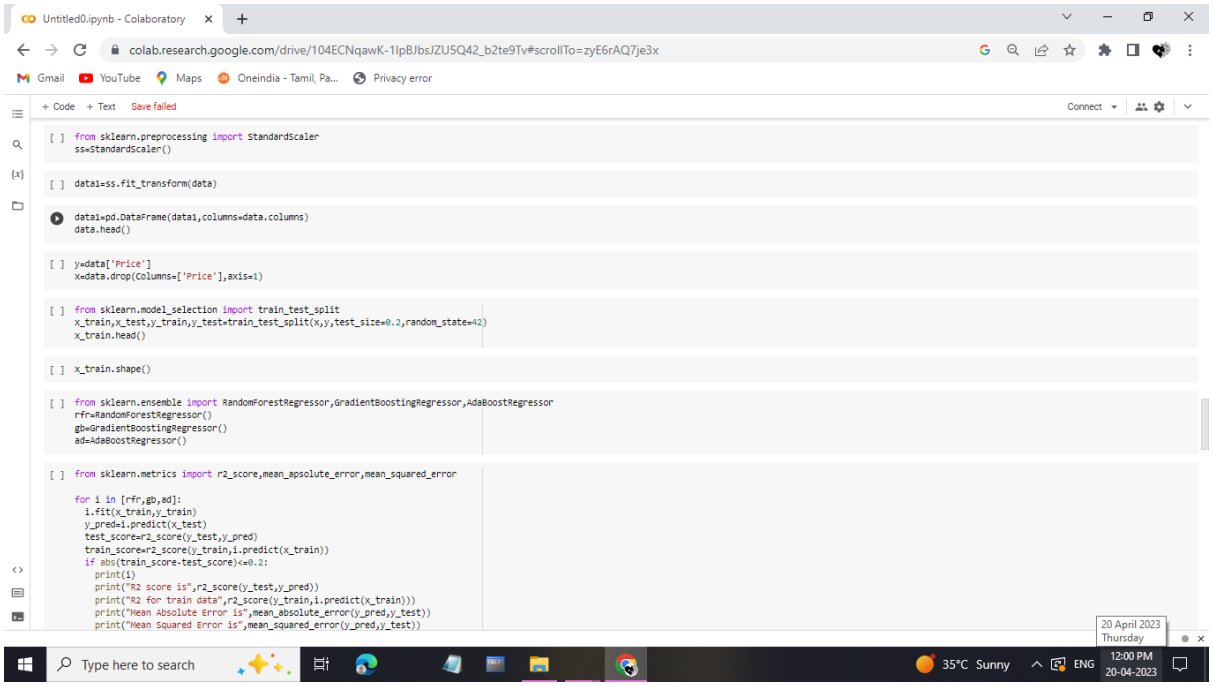
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[ ] from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
[ ] data1=ss.fit_transform(data)
data1=pd.DataFrame(data1,columns=data.columns)
data.head()
[ ] y=data['Price']
X=data.drop(Columns=['Price'],axis=1)
[ ] from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
x_train.head()
[ ] x_train.shape()
[ ] from sklearn.ensemble import RandomForestRegressor,GradientBoostingRegressor,AdaBoostRegressor
rfr=RandomForestRegressor()
gb=GradientBoostingRegressor()
ad=AdaBoostRegressor()
[ ] from sklearn.metrics import r2_score,mean_apsolute_error,mean_squared_error
for i in [rfr,gb,ad]:
i.fit(x_train,y_train)
y_pred=i.predict(x_test)
test_score=r2_score(y_test,y_pred)
train_score=r2_score(y_train,i.predict(x_train))
if abs(train_score-test_score)<=0.2:
print(i)
print("R2 score is",r2_score(y_test,y_pred))
print("R2 for train data",r2_score(y_train,i.predict(x_train)))
print("Mean Absolute Error is",mean_absolute_error(y_pred,y_test))
print("Mean Squared Error is",mean_squared_error(y_pred,y_test))
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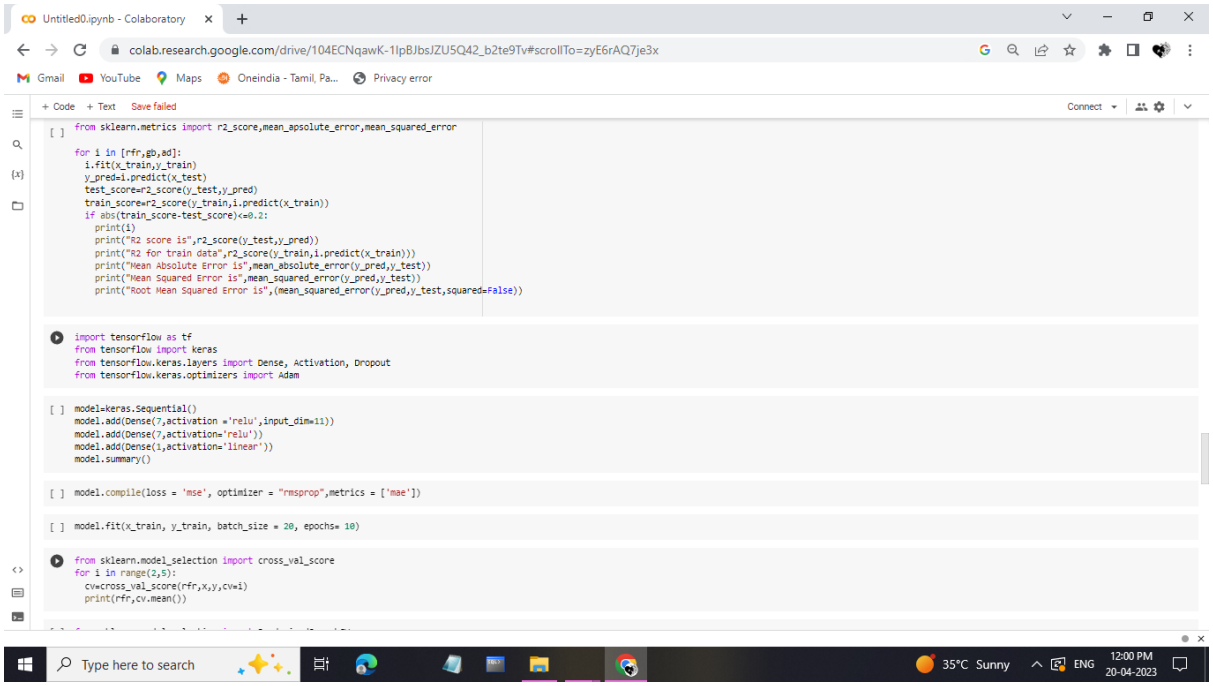
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[ ] from sklearn.metrics import r2_score,mean_apsolute_error,mean_squared_error
for i in [rfr,gb,ad]:
i.fit(x_train,y_train)
y_pred=i.predict(x_test)
test_score=r2_score(y_test,y_pred)
train_score=r2_score(y_train,i.predict(x_train))
if abs(train_score-test_score)<=0.2:
print(i)
print("R2 score is",r2_score(y_test,y_pred))
print("R2 for train data",r2_score(y_train,i.predict(x_train)))
print("Mean Absolute Error is",mean_absolute_error(y_pred,y_test))
print("Mean Squared Error is",mean_squared_error(y_pred,y_test))
print("Root Mean Squared Error is",(mean_squared_error(y_pred,y_test,squared=False))
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.layers import Dense, Activation, Dropout
from tensorflow.keras.optimizers import Adam
[ ] model=keras.Sequential()
model.add(Dense(7,activation ='relu',input_dim=11))
model.add(Dense(7,activation='relu'))
model.add(Dense(1,activation='linear'))
model.summary()
[ ] model.compile(loss = 'mse', optimizer = "rmsprop",metrics = ['mae'])
[ ] model.fit(x_train, y_train, batch_size = 20, epochs= 10)
from sklearn.model_selection import cross_val_score
for i in range(2,5):
cv=cross_val_score(rfr,x,y,cv=i)
print(rfr,cv.mean())
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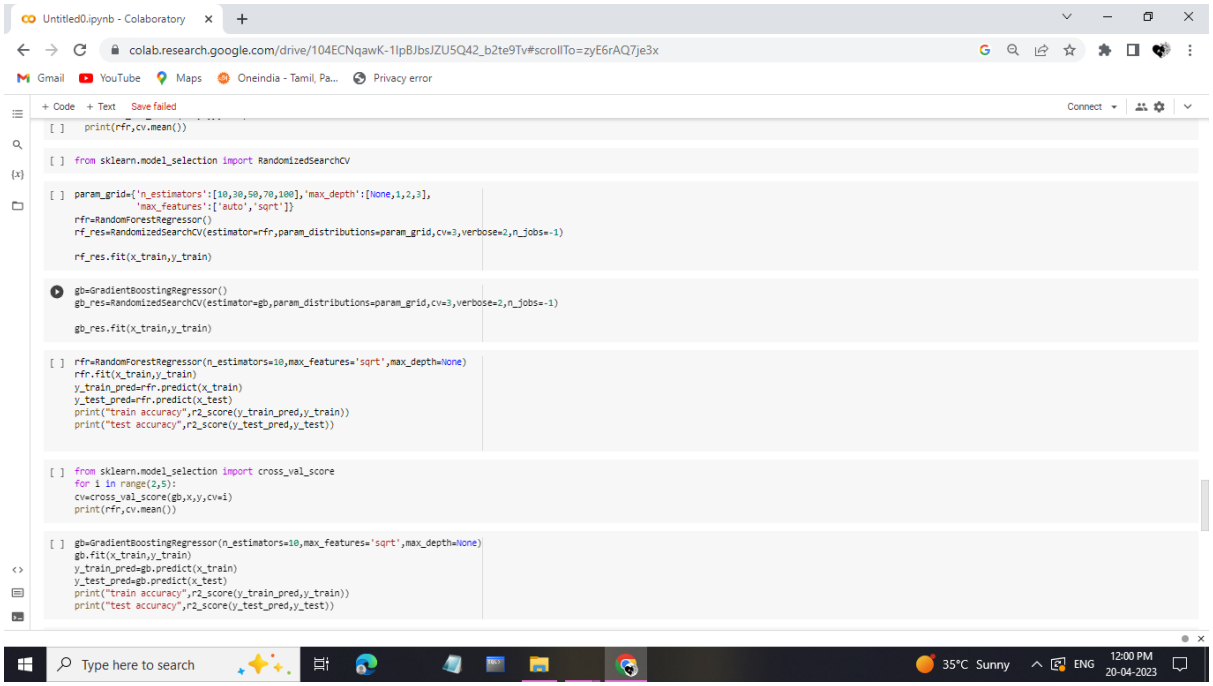
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print(rfr,cv.mean())
from sklearn.model_selection import RandomizedSearchCV
param_grid={'n_estimators':[10,30,50,70,100],'max_depth':[None,1,2,3],
'max_features':['auto','sqrt']}
rfr=RandomForestRegressor()
rf_res=RandomizedSearchCV(estimator=rfr,param_distributions=param_grid,cv=3,verbose=2,n_jobs=-1)
rf_res.fit(x_train,y_train)
gb=GradientBoostingRegressor()
gb_res=RandomizedSearchCV(estimator=gb,param_distributions=param_grid,cv=3,verbose=2,n_jobs=-1)
gb_res.fit(x_train,y_train)
rfr=RandomForestRegressor(n_estimators=10,max_features='sqrt',max_depth=None)
rfr.fit(x_train,y_train)
y_train_pred=rfr.predict(x_train)
y_test_pred=rfr.predict(x_test)
print("train accuracy",r2_score(y_train_pred,y_train))
print("test accuracy",r2_score(y_test_pred,y_test))
from sklearn.model_selection import cross_val_score
for i in range(2,5):
cv=cross_val_score(gb,x,y,cv=i)
print(rfr,cv.mean())
gb=GradientBoostingRegressor(n_estimators=10,max_features='sqrt',max_depth=None)
gb.fit(x_train,y_train)
y_train_pred=gb.predict(x_train)
y_test_pred=gb.predict(x_test)
print("train accuracy",r2_score(y_train_pred,y_train))
print("test accuracy",r2_score(y_test_pred,y_test))
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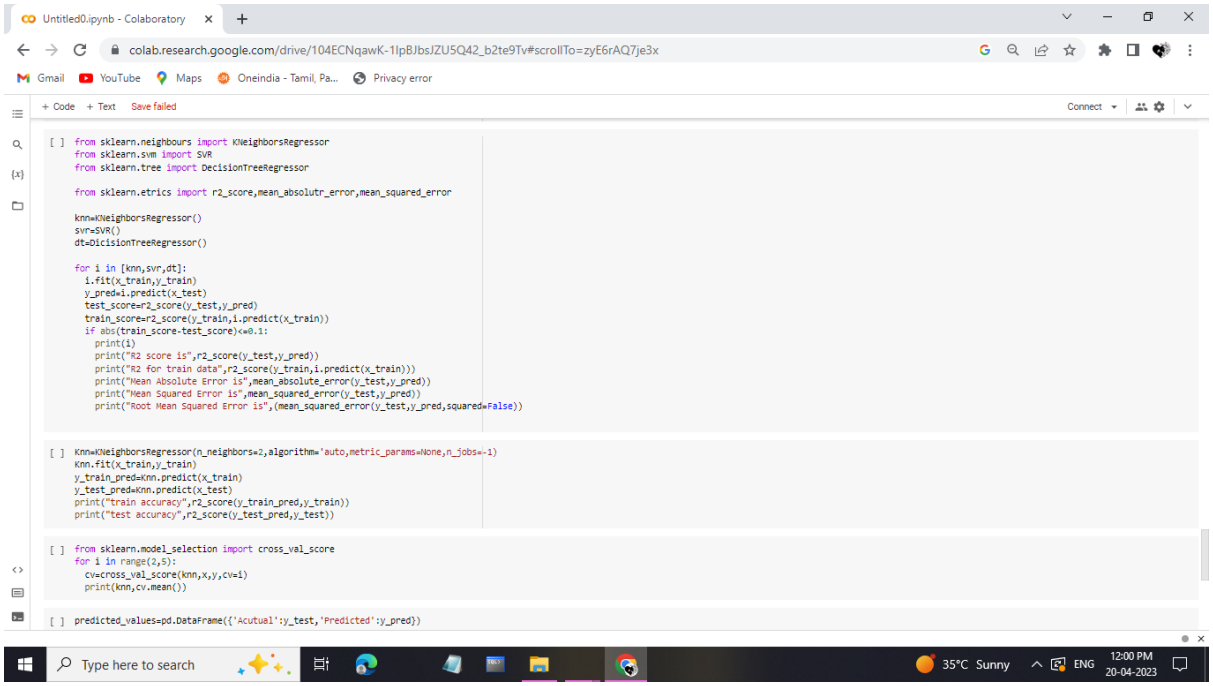
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from sklearn.neighbours import KNeighborsRegressor
from sklearn.svm import SVR
from sklearn.tree import DecisionTreeRegressor
from sklearn.etrics import r2_score,mean_absolutr_error,mean_squared_error
knn=KNeighborsRegressor()
svr=SVR()
dt=DicisionTreeRegressor()
for i in [knn,svr,dt]:
i.fit(x_train,y_train)
y_pred=i.predict(x_test)
test_score=r2_score(y_test,y_pred)
train_score=r2_score(y_train,i.predict(x_train))
if abs(train_score-test_score)<=0.1:
print(i)
print("R2 score is",r2_score(y_test,y_pred))
print("R2 for train data",r2_score(y_train,i.predict(x_train)))
print("Mean Absolute Error is",mean_absolute_error(y_test,y_pred))
print("Mean Squared Error is",mean_squared_error(y_test,y_pred))
print("Root Mean Squared Error is",(mean_squared_error(y_test,y_pred,squared=False))
Knn=KNeighborsRegressor(n_neighbors=2,algorithm='auto,metric_params=None,n_jobs=-1)
Knn.fit(x_train,y_train)
y_train_pred=Knn.predict(x_train)
y_test_pred=Knn.predict(x_test)
print("train accuracy",r2_score(y_train_pred,y_train))
print("test accuracy",r2_score(y_test_pred,y_test))
from sklearn.model_selection import cross_val_score
for i in range(2,5):
cv=cross_val_score(knn,x,y,cv=i)
print(knn,cv.mean())
predicted_values=pd.DataFrame({'Acutual':y_test,'Predicted':y_pred})
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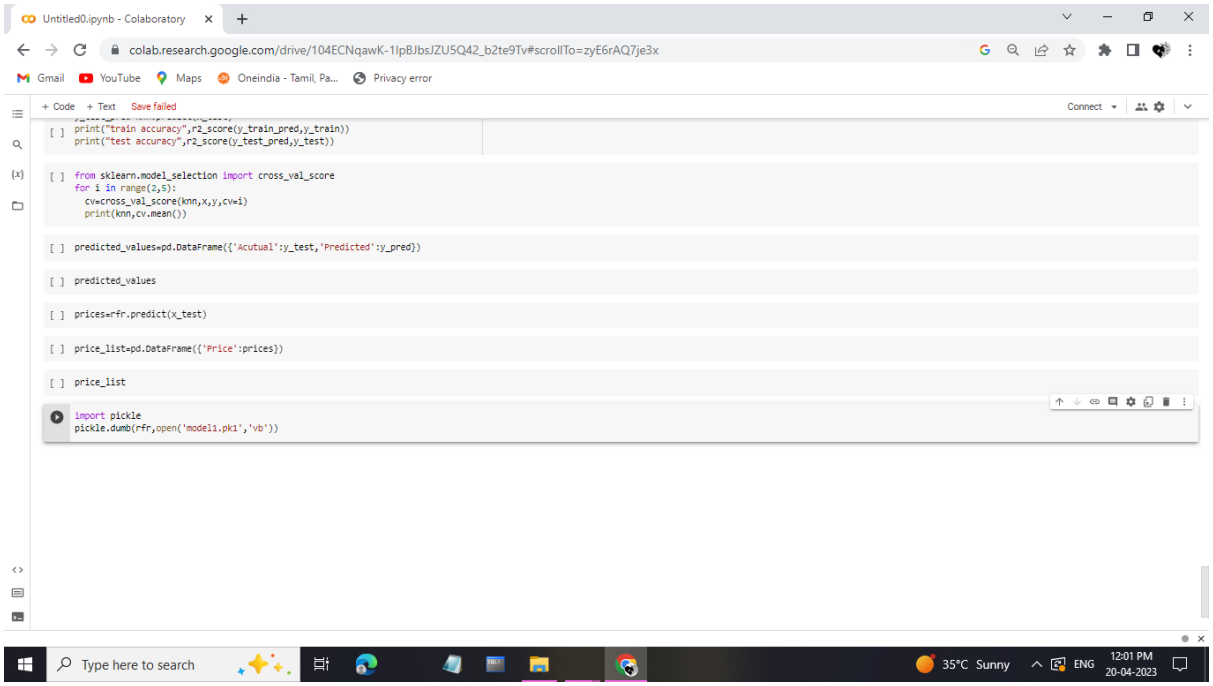
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print("train accuracy",r2_score(y_train_pred,y_train))
print("test accuracy",r2_score(y_test_pred,y_test))
from sklearn.model_selection import cross_val_score
for i in range(2,5):
cv=cross_val_score(knn,x,y,cv=i)
print(knn,cv.mean())
predicted_values=pd.DataFrame({'Acutual':y_test,'Predicted':y_pred})
predicted_values
prices=rfr.predict(x_test)
price_list=pd.DataFrame({'Price':prices})
price_list
import pickle
pickle.dumb(rfr,open('model1.pk1','vb'))
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