Structured Data Assignment

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GUVI

002

Problem Statement

Problem Statement: "Optimizing User Engagement in a Healthcare Application"

The drop-off rates in a healthcare application indicate a significant loss of user engagement. Understanding the events leading to drop-offs is crucial for improving user retention and satisfaction.

Objectives

To analyze event frequencies leading to drop-offs and develop strategies to enhance user engagement.

Identify the most common events preceding drop-offs.

Predict the likelihood of a drop-off based on user behavior.

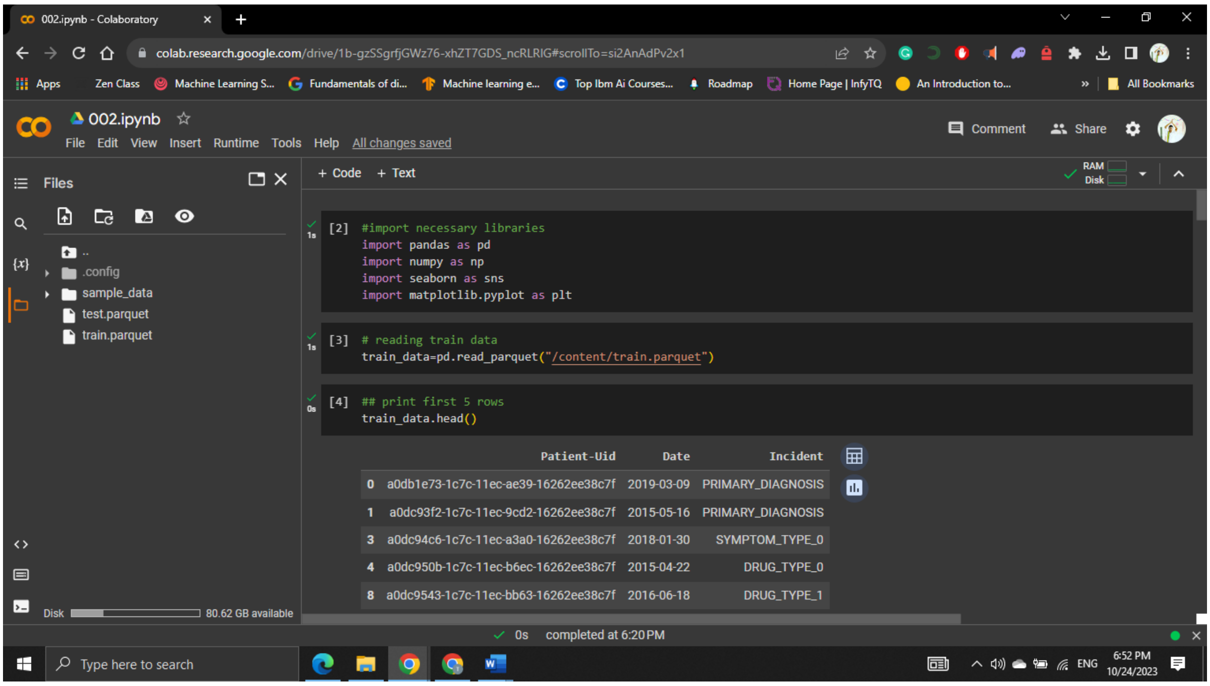
Implement user-centric improvements to reduce drop-offs.

Potential Applications of Problem Statement

Healthcare Applications: Improve user engagement and adherence to treatment plans.

E-Commerce Platforms: Enhance customer retention by understanding drop-off patterns.

Mobile Games: Increase player retention through targeted gameplay enhancements.



```
[2] #import necessary libraries
    import pandas as pd
    import numpy as np
    import seaborn as sns
    import matplotlib.pyplot as plt
```

```
[3] # reading train data
    train_data=pd.read_parquet("/content/train.parquet")
```

```
[4] ## print first 5 rows
    train_data.head()
```

	Patient-Uid	Date	Incident
0	a0db1e73-1c7c-11ec-ae39-16262ee38c7f	2019-03-09	PRIMARY_DIAGNOSIS
1	a0dc93f2-1c7c-11ec-9cd2-16262ee38c7f	2015-05-16	PRIMARY_DIAGNOSIS
3	a0dc94c6-1c7c-11ec-a3a0-16262ee38c7f	2018-01-30	SYMPTOM_TYPE_0
4	a0dc950b-1c7c-11ec-b6ec-16262ee38c7f	2015-04-22	DRUG_TYPE_0
8	a0dc9543-1c7c-11ec-bb63-16262ee38c7f	2016-06-18	DRUG_TYPE_1

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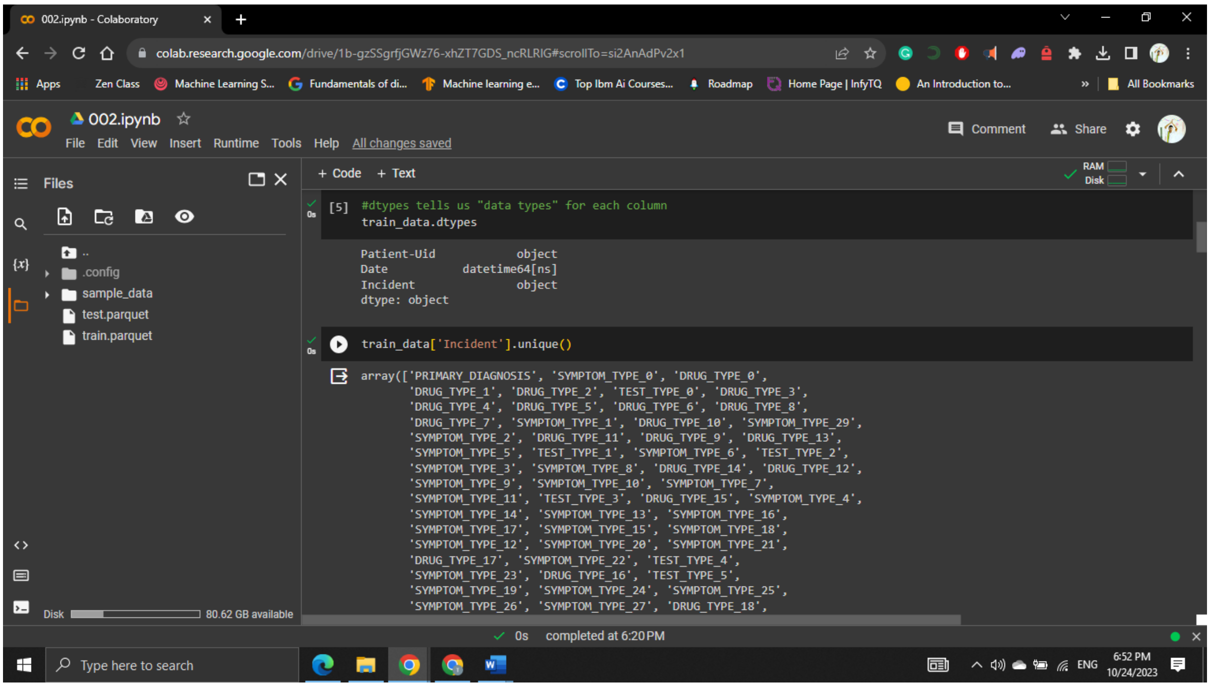

```
[5] #dtypes tells us "data types" for each column
    train_data.dtypes

    Patient-Uid             object
    Date            datetime64[ns]
    Incident                object
    dtype: object
```

```
train_data['Incident'].unique()

array(['PRIMARY_DIAGNOSIS', 'SYMPTOM_TYPE_0', 'DRUG_TYPE_0',
       'DRUG_TYPE_1', 'DRUG_TYPE_2', 'TEST_TYPE_0', 'DRUG_TYPE_3',
       'DRUG_TYPE_4', 'DRUG_TYPE_5', 'DRUG_TYPE_6', 'DRUG_TYPE_8',
       'DRUG_TYPE_7', 'SYMPTOM_TYPE_1', 'DRUG_TYPE_10', 'SYMPTOM_TYPE_29',
       'SYMPTOM_TYPE_2', 'DRUG_TYPE_11', 'DRUG_TYPE_9', 'DRUG_TYPE_13',
       'SYMPTOM_TYPE_5', 'TEST_TYPE_1', 'SYMPTOM_TYPE_6', 'TEST_TYPE_2',
       'SYMPTOM_TYPE_3', 'SYMPTOM_TYPE_8', 'DRUG_TYPE_14', 'DRUG_TYPE_12',
       'SYMPTOM_TYPE_9', 'SYMPTOM_TYPE_10', 'SYMPTOM_TYPE_7',
       'SYMPTOM_TYPE_11', 'TEST_TYPE_3', 'DRUG_TYPE_15', 'SYMPTOM_TYPE_4',
       'SYMPTOM_TYPE_14', 'SYMPTOM_TYPE_13', 'SYMPTOM_TYPE_16',
       'SYMPTOM_TYPE_17', 'SYMPTOM_TYPE_15', 'SYMPTOM_TYPE_18',
       'SYMPTOM_TYPE_12', 'SYMPTOM_TYPE_20', 'SYMPTOM_TYPE_21',
       'DRUG_TYPE_17', 'SYMPTOM_TYPE_22', 'TEST_TYPE_4',
       'SYMPTOM_TYPE_23', 'DRUG_TYPE_16', 'TEST_TYPE_5',
       'SYMPTOM_TYPE_19', 'SYMPTOM_TYPE_24', 'SYMPTOM_TYPE_25',
       'SYMPTOM_TYPE_26', 'SYMPTOM_TYPE_27', 'DRUG_TYPE_18',
```

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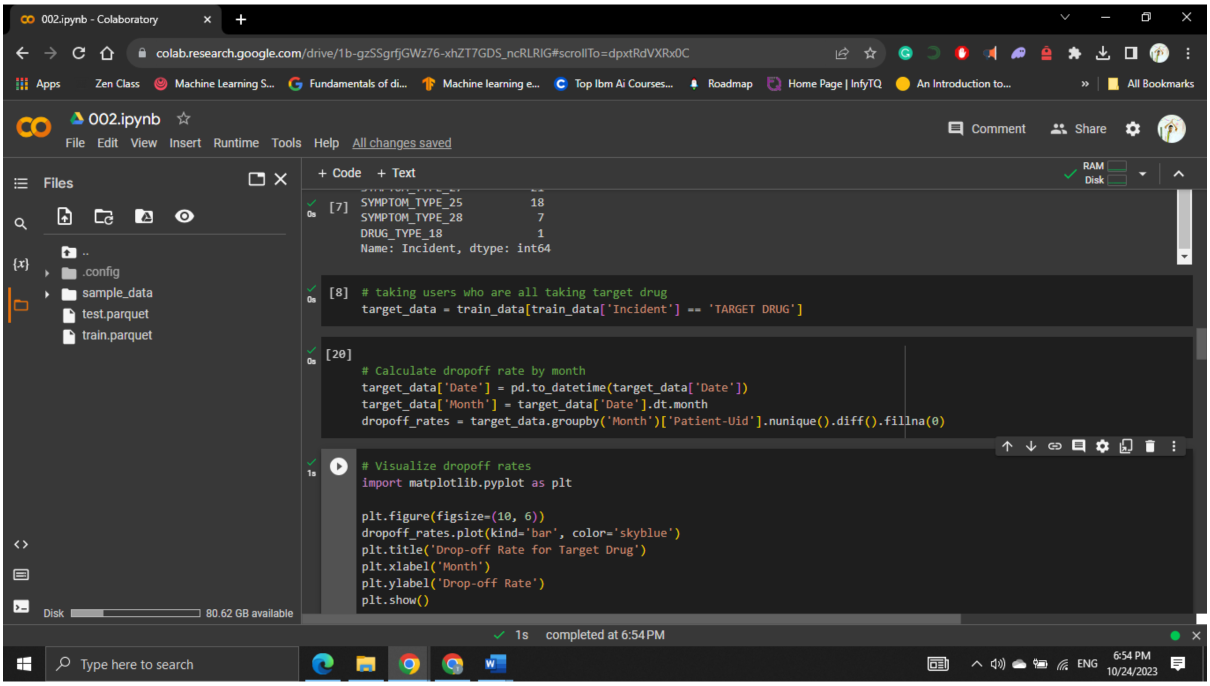


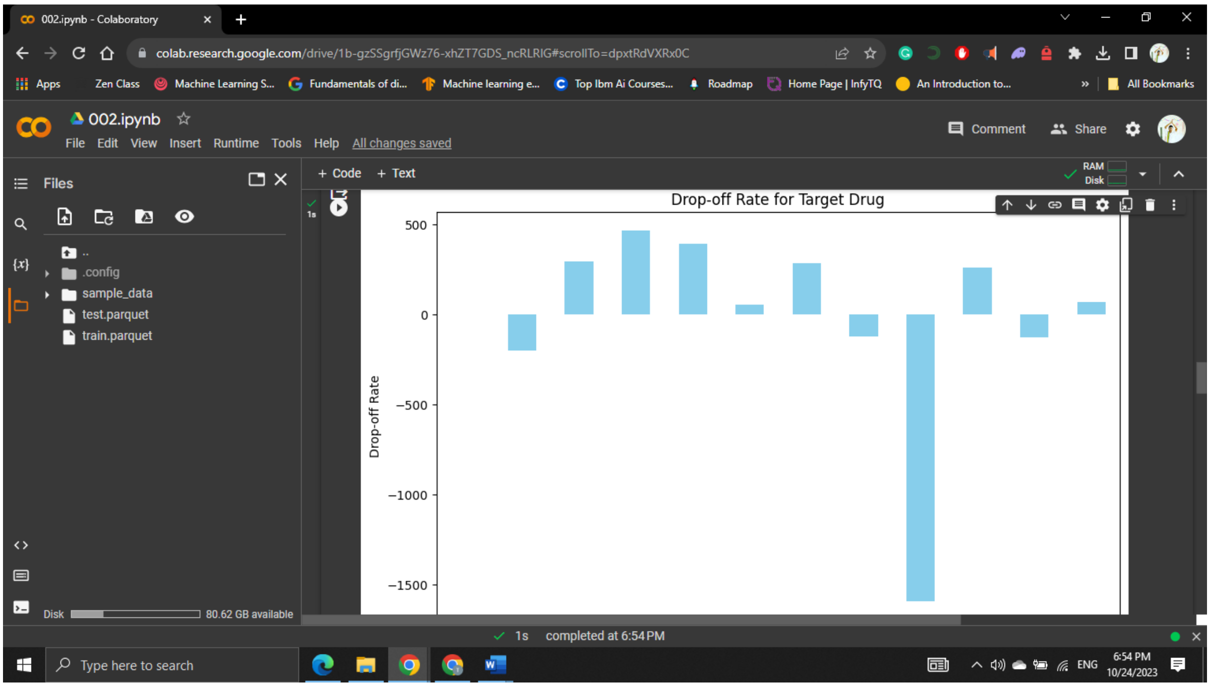
```
SYMPTOM_TYPE_25         18
SYMPTOM_TYPE_28          7
DRUG_TYPE_18             1
Name: Incident, dtype: int64
```

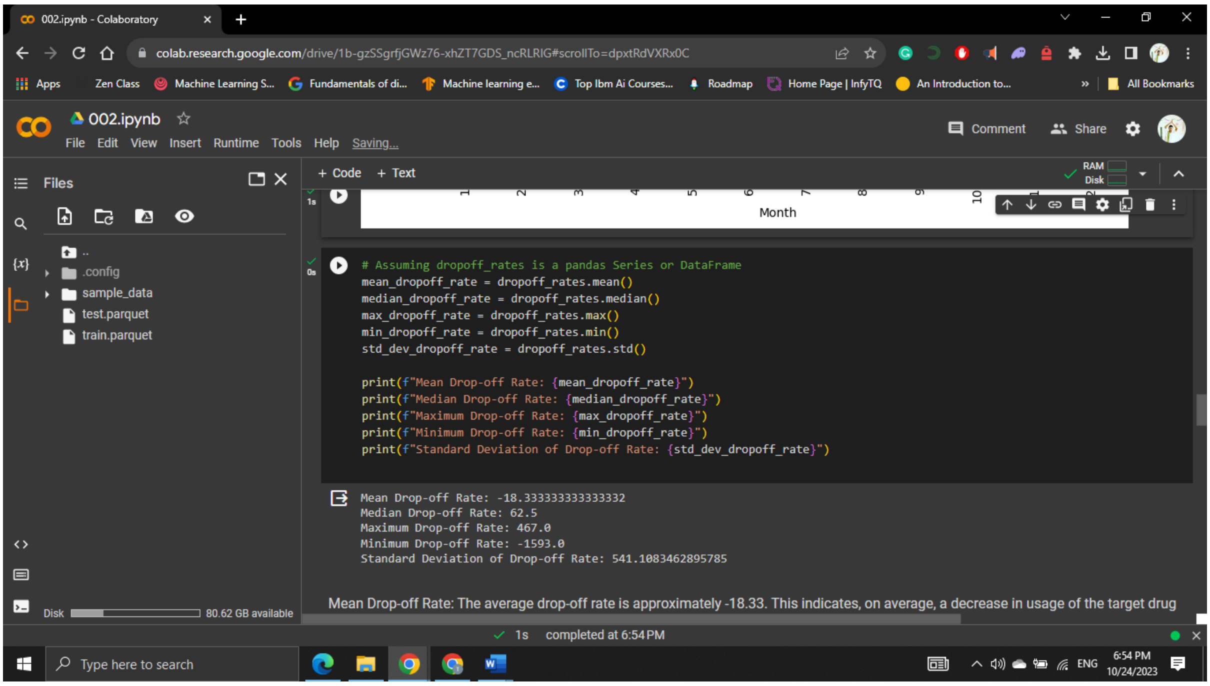
```
[8] # taking users who are all taking target drug
    target_data = train_data[train_data['Incident'] == 'TARGET DRUG']
```

```
[20]
    # Calculate dropoff rate by month
    target_data['Date'] = pd.to_datetime(target_data['Date'])
    target_data['Month'] = target_data['Date'].dt.month
    dropoff_rates = target_data.groupby('Month')['Patient-Uid'].nunique().diff().fillna(0)
```

```
# Visualize dropoff rates
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 6))
dropoff_rates.plot(kind='bar', color='skyblue')
plt.title('Drop-off Rate for Target Drug')
plt.xlabel('Month')
plt.ylabel('Drop-off Rate')
plt.show()
```



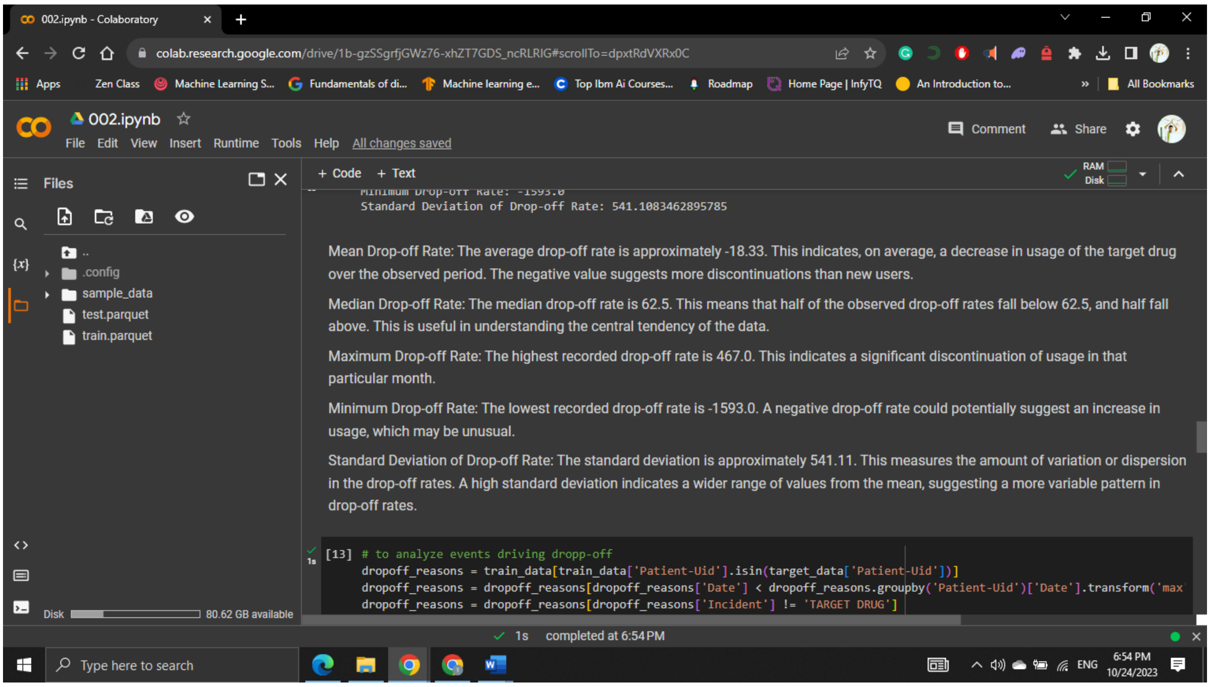


```
# Assuming dropoff_rates is a pandas Series or DataFrame
mean_dropoff_rate = dropoff_rates.mean()
median_dropoff_rate = dropoff_rates.median()
max_dropoff_rate = dropoff_rates.max()
min_dropoff_rate = dropoff_rates.min()
std_dev_dropoff_rate = dropoff_rates.std()

print(f"Mean Drop-off Rate: {mean_dropoff_rate}")
print(f"Median Drop-off Rate: {median_dropoff_rate}")
print(f"Maximum Drop-off Rate: {max_dropoff_rate}")
print(f"Minimum Drop-off Rate: {min_dropoff_rate}")
print(f"Standard Deviation of Drop-off Rate: {std_dev_dropoff_rate}")
```

```
Mean Drop-off Rate: -18.333333333333332
Median Drop-off Rate: 62.5
Maximum Drop-off Rate: 467.0
Minimum Drop-off Rate: -1593.0
Standard Deviation of Drop-off Rate: 541.1083462895785
```

Mean Drop-off Rate: The average drop-off rate is approximately -18.33. This indicates, on average, a decrease in usage of the target drug



```
Minimum Drop-off Rate: -1593.0
Standard Deviation of Drop-off Rate: 541.1083462895785
```

Mean Drop-off Rate: The average drop-off rate is approximately -18.33. This indicates, on average, a decrease in usage of the target drug over the observed period. The negative value suggests more discontinuations than new users.

Median Drop-off Rate: The median drop-off rate is 62.5. This means that half of the observed drop-off rates fall below 62.5, and half fall above. This is useful in understanding the central tendency of the data.

Maximum Drop-off Rate: The highest recorded drop-off rate is 467.0. This indicates a significant discontinuation of usage in that particular month.

Minimum Drop-off Rate: The lowest recorded drop-off rate is -1593.0. A negative drop-off rate could potentially suggest an increase in usage, which may be unusual.

Standard Deviation of Drop-off Rate: The standard deviation is approximately 541.11. This measures the amount of variation or dispersion in the drop-off rates. A high standard deviation indicates a wider range of values from the mean, suggesting a more variable pattern in drop-off rates.

```
[13] # to analyze events driving dropp-off
     dropoff_reasons = train_data[train_data['Patient-Uid'].isin(target_data['Patient-Uid'])]
     dropoff_reasons = dropoff_reasons[dropoff_reasons['Date'] < dropoff_reasons.groupby('Patient-Uid')['Date'].transform('max
     dropoff_reasons = dropoff_reasons[dropoff_reasons['Incident'] != 'TARGET DRUG']
```

Mean Drop-off Rate: The average drop-off rate is approximately -18.33. This indicates, on average, a decrease in usage of the target drug over the observed period. The negative value suggests more discontinuations than new users.

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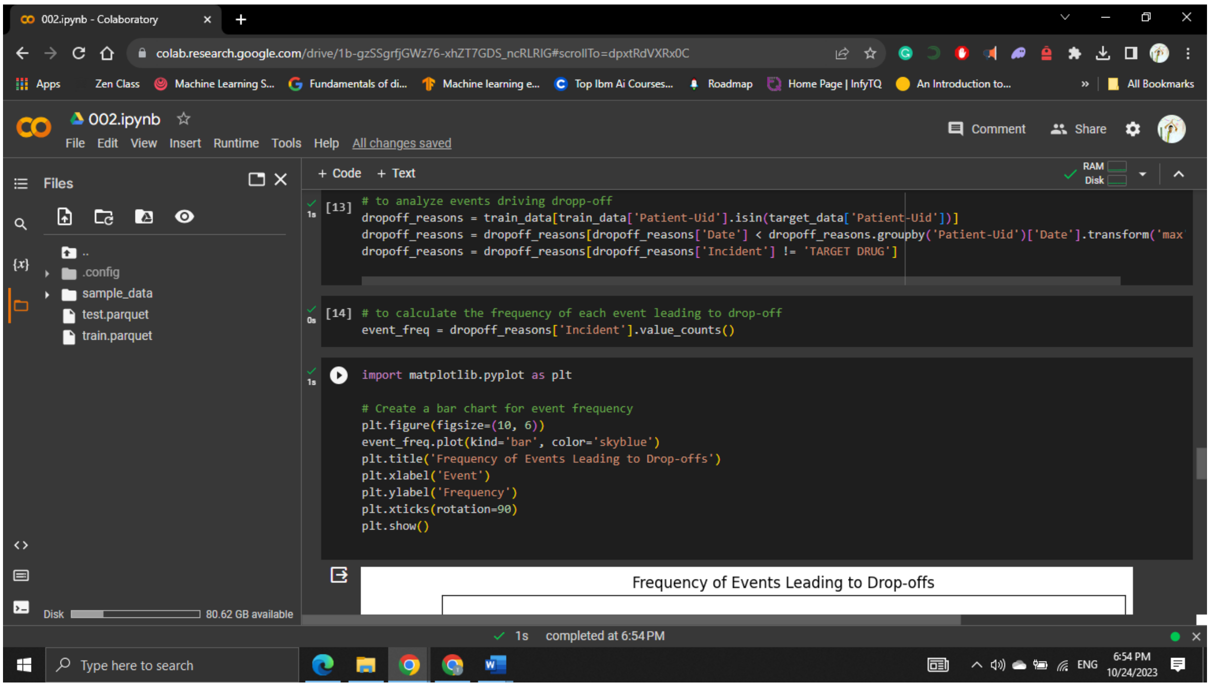

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```

```
[14] # to calculate the frequency of each event leading to drop-off
     event_freq = dropoff_reasons['Incident'].value_counts()
```

```
import matplotlib.pyplot as plt

# Create a bar chart for event frequency
plt.figure(figsize=(10, 6))
event_freq.plot(kind='bar', color='skyblue')
plt.title('Frequency of Events Leading to Drop-offs')
plt.xlabel('Event')
plt.ylabel('Frequency')
plt.xticks(rotation=90)
plt.show()
```

Frequency of Events Leading to Drop-offs

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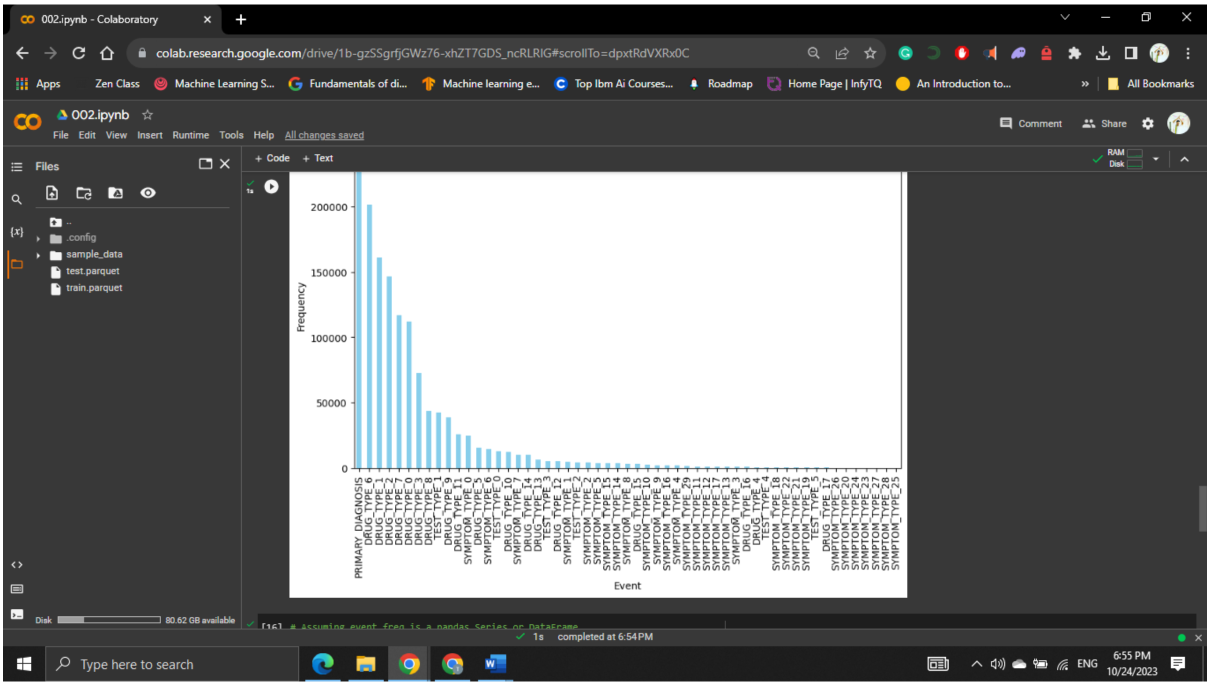

```
[16] # Assuming event_freq is a pandas Series or DataFrame
```

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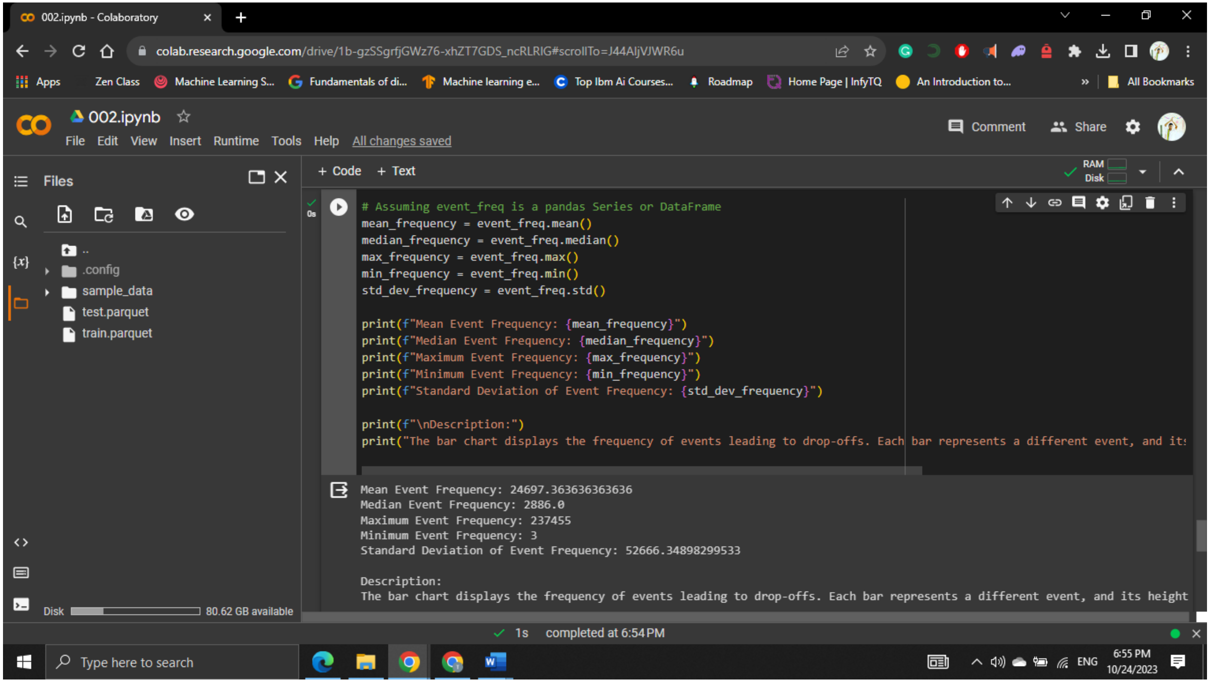

```
# Assuming event_freq is a pandas Series or DataFrame
mean_frequency = event_freq.mean()
median_frequency = event_freq.median()
max_frequency = event_freq.max()
min_frequency = event_freq.min()
std_dev_frequency = event_freq.std()

print(f"Mean Event Frequency: {mean_frequency}")
print(f"Median Event Frequency: {median_frequency}")
print(f"Maximum Event Frequency: {max_frequency}")
print(f"Minimum Event Frequency: {min_frequency}")
print(f"Standard Deviation of Event Frequency: {std_dev_frequency}")

print(f"\nDescription:")
print("The bar chart displays the frequency of events leading to drop-offs. Each bar represents a different event, and it:
```

```
Mean Event Frequency: 24697.363636363636
Median Event Frequency: 2886.0
Maximum Event Frequency: 237455
Minimum Event Frequency: 3
Standard Deviation of Event Frequency: 52666.34898299533

Description:
The bar chart displays the frequency of events leading to drop-offs. Each bar represents a different event, and its height
```

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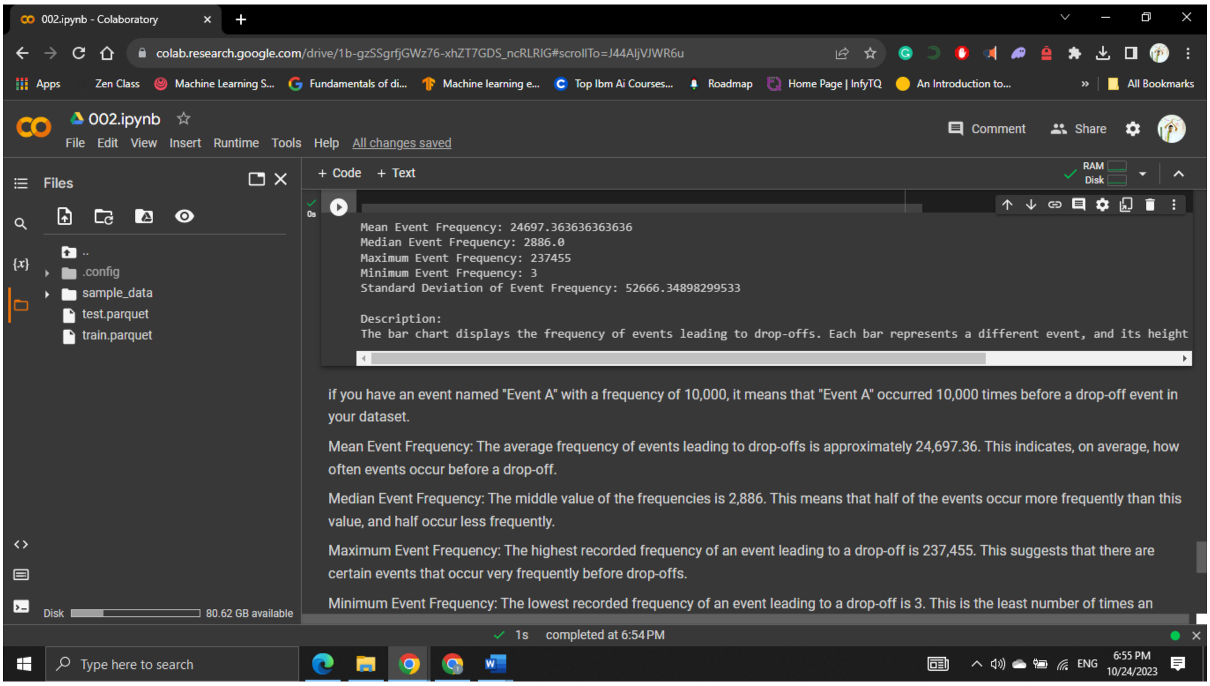

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Description:
The bar chart displays the frequency of events leading to drop-offs. Each bar represents a different event, and its height
```

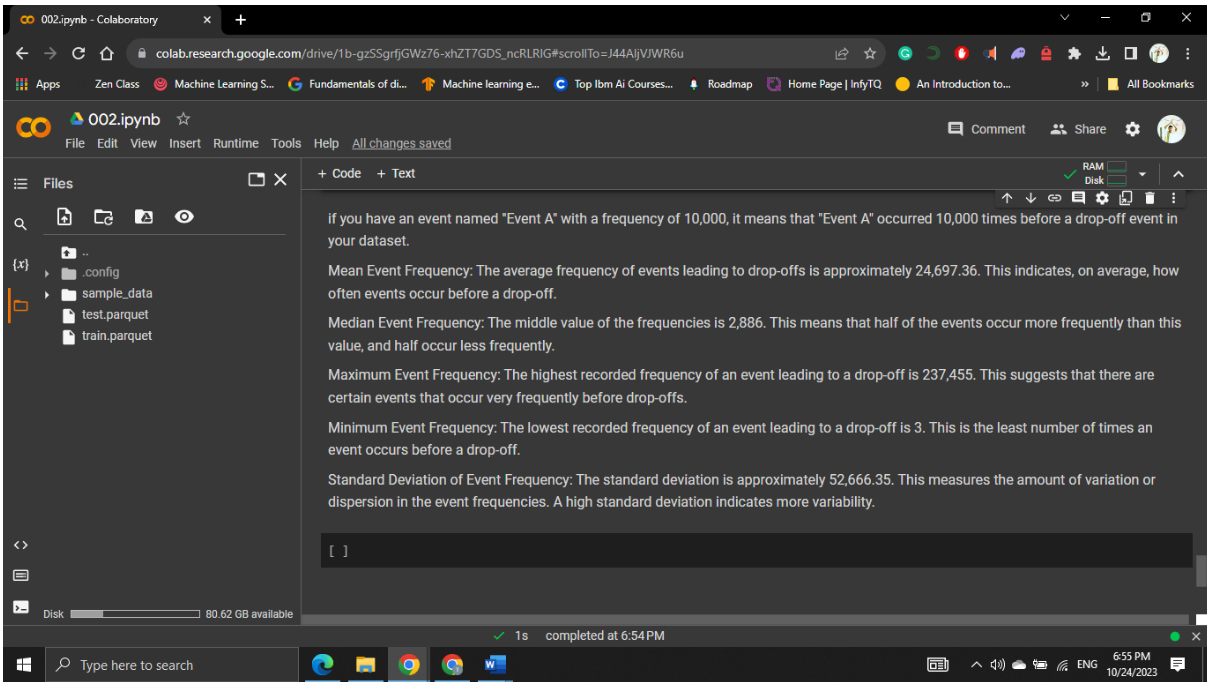
if you have an event named "Event A" with a frequency of 10,000, it means that "Event A" occurred 10,000 times before a drop-off event in your dataset.

Mean Event Frequency: The average frequency of events leading to drop-offs is approximately 24,697.36. This indicates, on average, how often events occur before a drop-off.

Median Event Frequency: The middle value of the frequencies is 2,886. This means that half of the events occur more frequently than this value, and half occur less frequently.

Maximum Event Frequency: The highest recorded frequency of an event leading to a drop-off is 237,455. This suggests that there are certain events that occur very frequently before drop-offs.

Minimum Event Frequency: The lowest recorded frequency of an event leading to a drop-off is 3. This is the least number of times an



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Standard Deviation of Event Frequency: The standard deviation is approximately 52,666.35. This measures the amount of variation or dispersion in the event frequencies. A high standard deviation indicates more variability.

```
[ ]
```

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References

Starmer, J. (2022). The Statquest illustrated guide to machine learning!!!: master the concepts, one full-color picture at a time, from the basics all the way to neural networks. BAM!.