Untitled

April 10, 2025

[1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df = pd.read_csv("Railway_info.csv")
print("First 10 Rows:")
print(df.head(10))
print("\nData Info:")
print(df.info())
print("\nMissing Values:\n", df.isnull().sum())
```

```
First 10 Rows:
   Train_No    Train_Name           Source_Station_Name  \
0       107  SWV-MAO-VLNK                SAWANTWADI ROAD
1       108  VLNK-MAO-SWV                    MADGOAN JN.
2       128  MAO-KOP SPEC                    MADGOAN JN.
3       290  PALACE ON WH              DELHI-SAFDAR JANG
4       401  BSB BHARATDA                     AURANGABAD
5       421  LKO-SVDK FTR                    LUCKNOW JN.
6       422  SVDK-LKO FTR  SHRI MATA VAISHNO DEVI KATRA
7       477  FTR TRAIN NO                          SIRSA
8       502  RJPB-UMB FTR        RAJENDRANAGAR TERMINAL
9       504  PNBE-BTI FTR                     PATNA JN.

             Destination_Station_Name       days
0                         MADGOAN JN.   Saturday
1                      SAWANTWADI ROAD     Friday
2  CHHATRAPATI SHAHU MAHARAJ TERMINUS     Friday
3                    DELHI-SAFDAR JANG  Wednesday
4                        VARANASI JN.   Saturday
5         SHRI MATA VAISHNO DEVI KATRA    Tuesday
6                         LUCKNOW JN.     Monday
7                               SIRSA     Sunday
8                      AMBALA CANTT JN     Monday
9                         BATHINDA JN  Wednesday

Data Info:
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 11113 entries, 0 to 11112
Data columns (total 5 columns):
 #   Column                   Non-Null Count  Dtype 
---  ------                   --------------  ----- 
 0   Train_No                 11113 non-null  int64 
 1   Train_Name               11113 non-null  object
 2   Source_Station_Name      11113 non-null  object
 3   Destination_Station_Name  11113 non-null  object
 4   days                     11113 non-null  object
dtypes: int64(1), object(4)
memory usage: 434.2+ KB
None

Missing Values:
 Train_No                    0
Train_Name                   0
Source_Station_Name          0
Destination_Station_Name     0
days                         0
dtype: int64
```

[12]:
```python
# Task 1.2
num_trains = df['Train_No'].nunique()
num_unique_sources = df['Source_Station_Name'].nunique()
num_unique_destinations = df['Destination_Station_Name'].nunique()
most_common_source = df['Source_Station_Name'].value_counts().idxmax()
most_common_destination = df['Destination_Station_Name'].value_counts().idxmax()

print(f"\nTotal Unique Trains: {num_trains}")
print(f"Unique Source Stations: {num_unique_sources}")
print(f"Unique Destination Stations: {num_unique_destinations}")
print(f"Most Common Source Station: {most_common_source}")
print(f"Most Common Destination Station: {most_common_destination}")
```

```
Total Unique Trains: 11113
Unique Source Stations: 921
Unique Destination Stations: 924
Most Common Source Station: CST-MUMBAI
Most Common Destination Station: CST-MUMBAI
```

[13]:
```python
# Task 1.3:
df.dropna(inplace=True)
df['Source_Station_Name'] = df['Source_Station_Name'].str.upper()
df['Destination_Station_Name'] = df['Destination_Station_Name'].str.upper()
```

[14]:
```
# Task 2.1
saturday_trains = df[df['days'].str.lower() == 'saturday']
print("\nTrains Operating on Saturdays:\n", saturday_trains.head())
specific_station = 'DELHI'
from_specific_station = df[df['Source_Station_Name'].str.
 ↪contains(specific_station.upper())]
print(f"\nTrains from station containing '{specific_station}':\n",␣
 ↪from_specific_station.head())
```

```
Trains Operating on Saturdays:
     Train_No    Train_Name Source_Station_Name Destination_Station_Name  \
0         107  SWV-MAO-VLNK     SAWANTWADI ROAD               MADGOAN JN.
4         401  BSB BHARATDA           AURANGABAD             VARANASI JN.
21       1196  NGP-KRMI SPL      NAGPUR JN.(CR)                  KARMALI
28       1706   JBP-BDTS SF             JABALPUR          BANDRA TERMINUS
45       2834  SRC-RJT SF A     SANTRAGACHI JN.                   RAJKOT

        days Day_Category
0   Saturday      Weekend
4   Saturday      Weekend
21  Saturday      Weekend
28  Saturday      Weekend
45  Saturday      Weekend

Trains from station containing 'DELHI':
      Train_No        Train_Name Source_Station_Name  \
3          290      PALACE ON WH   DELHI-SAFDAR JANG
12       22439  SVDK VANDEBHARAT           NEW DELHI
24        1442      DSJ-KK MTY S   DELHI-SAFDAR JANG
62        4409      DLI-SVDK SPL           DELHI JN.
138       6412      DSJ-PAY EZHI   DELHI-SAFDAR JANG

         Destination_Station_Name       days Day_Category
3                DELHI-SAFDAR JANG  Wednesday      Weekday
12                 SHMATA VD KATRA     Friday      Weekday
24                          KHADKI    Tuesday      Weekday
62   SHRI MATA VAISHNO DEVI KATRA     Sunday      Weekend
138                     PAYYANUR     Friday      Weekday
```

[15]:
```
# Task 2.2
trains_per_station = df.groupby('Source_Station_Name')['Train_No'].count().
 ↪sort_values(ascending=False)
print("\nTrains Per Source Station:\n", trains_per_station)

avg_trains_per_day = df.groupby(['Source_Station_Name', 'days'])['Train_No'].
 ↪count().groupby('Source_Station_Name').mean()
```

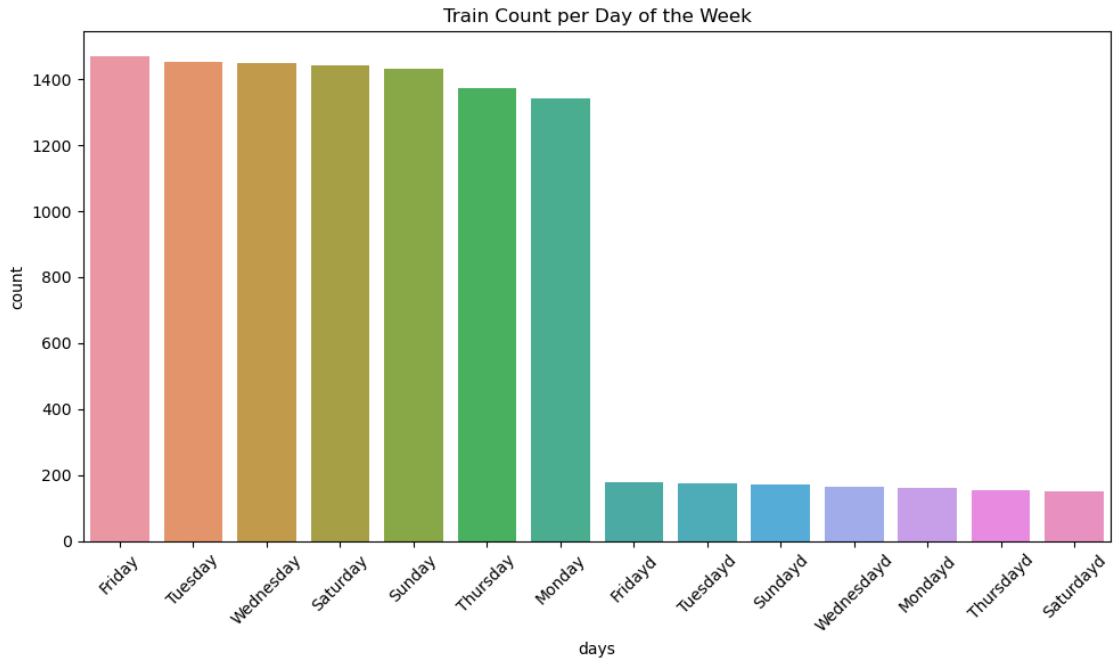
```
print("\nAverage Trains per Day per Station:\n", avg_trains_per_day)
```

```
Trains Per Source Station:
 Source_Station_Name
CST-MUMBAI           513
SEALDAH              372
CHENNAI BEACH        339
HOWRAH JN.           338
KALYAN JN            285
                    …
HOSPET JN.             1
SAWAI MADHOPUR JN      1
HAZARIBAGH ROAD        1
HATHRAS JN.            1
KENDUJHAR              1
Name: Train_No, Length: 921, dtype: int64

Average Trains per Day per Station:
 Source_Station_Name
ABHANPUR JN.      1.000000
ABOHAR            1.000000
ABU ROAD          1.000000
ACHHNERA JN.      1.000000
ADILABAD          1.250000
                    …
WARASEONI         1.000000
WARDHA JN.        1.000000
WHITE FIELD       1.000000
YAMUNA BRIDGE     1.000000
YESVANTPUR JN.    8.571429
Name: Train_No, Length: 921, dtype: float64
```

[16]:
```
# Task 2.3
def categorize_day(day):
    if day.lower() in ['saturday', 'sunday']:
        return 'Weekend'
    return 'Weekday'

df['Day_Category'] = df['days'].apply(categorize_day)
```

[17]:
```
# Task 3.1
plt.figure(figsize=(10, 6))
sns.countplot(x='days', data=df, order=df['days'].value_counts().index)
plt.title("Train Count per Day of the Week")
plt.xticks(rotation=45)
plt.tight_layout()
```

```
plt.show()
```



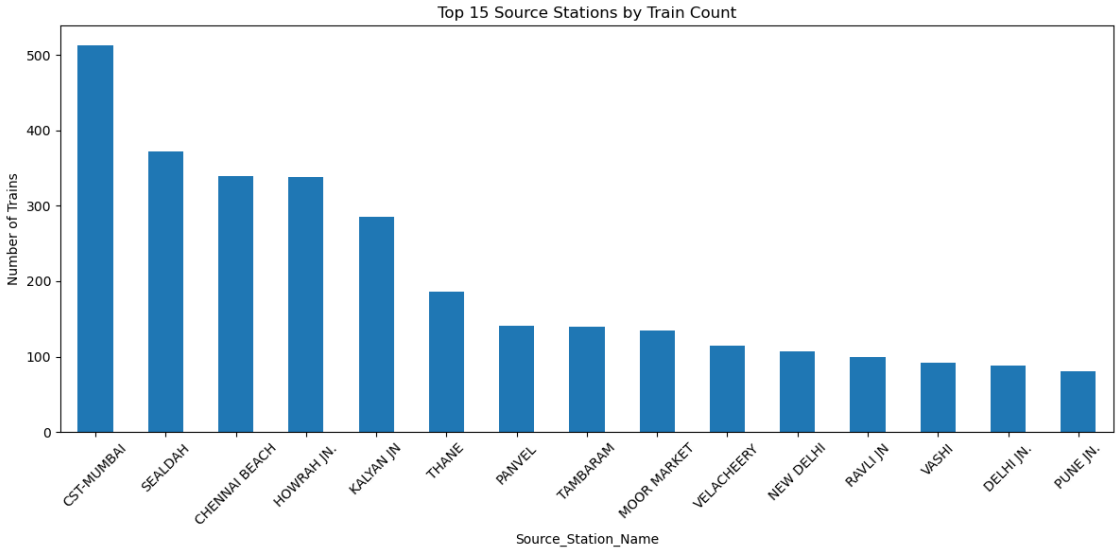
[9]:
```
top_routes = df.groupby(['Source_Station_Name',␣
 ↪'Destination_Station_Name'])['Train_No'].count().
 ↪sort_values(ascending=False).head(10)
print("\nTop 10 Source-Destination Routes:\n", top_routes)
```

```
Top 10 Source-Destination Routes:
 Source_Station_Name  Destination_Station_Name
TAMBARAM              CHENNAI BEACH              137
CHENNAI BEACH         TAMBARAM                   137
CST-MUMBAI            PANVEL                      94
PANVEL                CST-MUMBAI                  93
CST-MUMBAI            RAVLI JN                    90
RAVLI JN              CST-MUMBAI                  90
VELACHEERY            CHENNAI BEACH               89
CHENNAI BEACH         VELACHEERY                  87
CST-MUMBAI            THANE                       77
THANE                 CST-MUMBAI                  72
Name: Train_No, dtype: int64
```

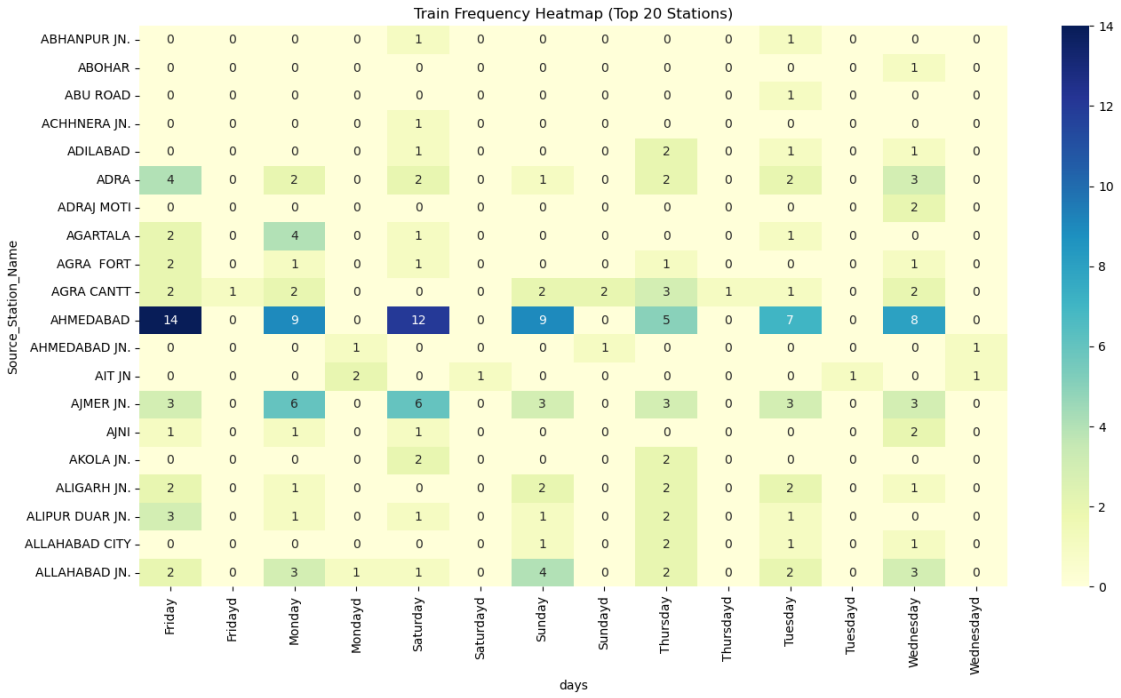
[18]:
```
# Task 3.2
day_counts = df['days'].value_counts()
print("\nTrain Frequency by Day:\n", day_counts)
```

```
Train Frequency by Day:
 days
Friday         1471
Tuesday        1454
Wednesday      1448
Saturday       1441
Sunday         1432
Thursday       1372
Monday         1342
Fridayd         178
Tuesdayd        174
Sundayd         170
Wednesdayd      164
Mondayd         161
Thursdayd       154
Saturdayd       152
Name: count, dtype: int64
```

[22]:
```
# Task 4.1
plt.figure(figsize=(12, 6))
trains_per_station.head(15).plot(kind='bar')
plt.title("Top 15 Source Stations by Train Count")
plt.ylabel("Number of Trains")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



[21]:
```
pivot_table = df.pivot_table(index='Source_Station_Name', columns='days',␣
↪values='Train_No', aggfunc='count', fill_value=0)
plt.figure(figsize=(14, 8))
sns.heatmap(pivot_table.head(20), cmap='YlGnBu', annot=True, fmt='d')
plt.title("Train Frequency Heatmap (Top 20 Stations)")
plt.tight_layout()
plt.show()
```



[ ]:
```

```