Task 1: User Engagement Analysis for 'Why is the Tower of God Show So Popular?'
- Imaginary user data analyzed (e.g., page views, average time spent, bounce rate).
- Key Findings: Trends identified from user engagement metrics.
- Visualizations: Bar graphs and pie charts illustrating engagement metrics.
- Recommendations: Two strategies suggested to increase average time spent on the page.

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

# Load the data
df = pd.read_csv("C:\\Users\\khush\\Downloads\\
tower_of_god_user_data_large.csv")

#Check for Missing Values
print("Missing Values:\n", df.isnull().sum())
```

```
Missing Values:
 Date                            0
Page_Views                       0
Average_Time_Spent_(Minutes)     0
Bounce_Rate (%)                  0
dtype: int64
```

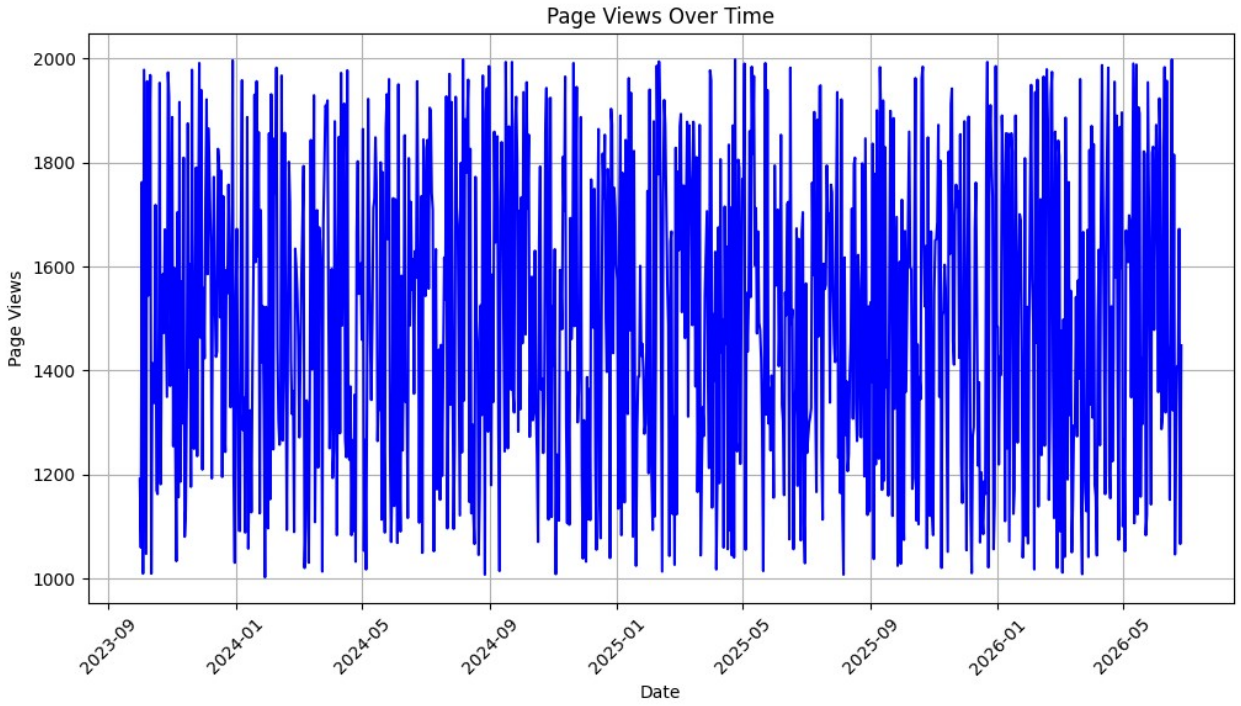
```
#Check Data Types
print("\nData Types:\n", df.dtypes)
```

```
Data Types:
 Date                              object
Page_Views                         int64
Average_Time_Spent_(Minutes)     float64
Bounce_Rate (%)                    int64
dtype: object
```

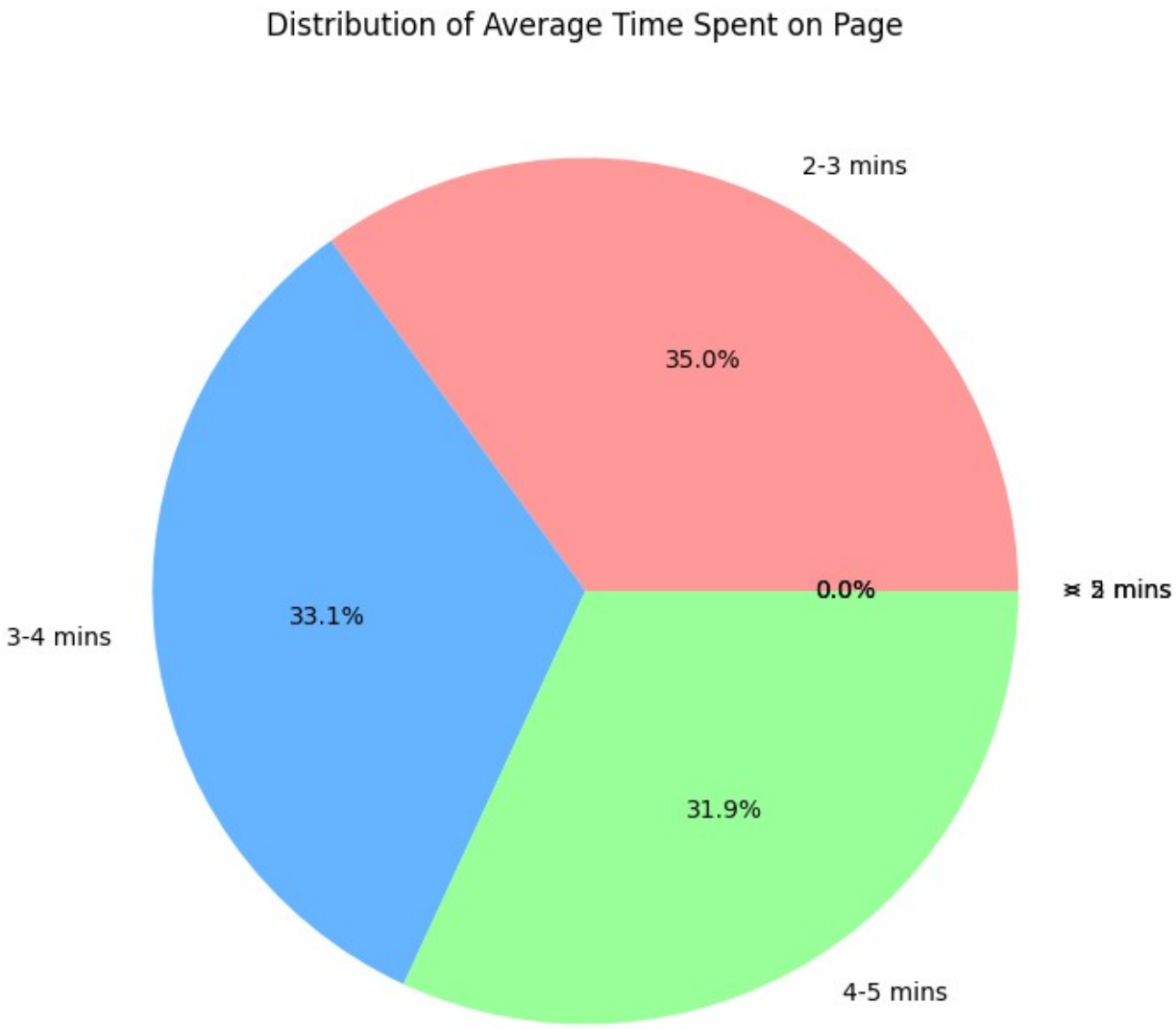
```
#Remove Duplicates
df.drop_duplicates(inplace=True)

#Inspect Data
print("\nData Sample:\n", df.head())
```

```
Data Sample:
         date  page_views  average_time_spent_(minutes)
bounce_rate_(%)
0  2023-10-01        1191                          2.98
59
1  2023-10-02        1059                          2.73
48
2  2023-10-03        1762                          4.22
55
3  2023-10-04        1009                          2.53
52
4  2023-10-05        1978                          2.19
53
```

```
# Convert the 'date' column to datetime format for better handling
df['date'] = pd.to_datetime(df['date'])

# Visualize Page Views Over Time
plt.figure(figsize=(12, 6))
plt.plot(df['date'], df['page_views'], color='blue')
plt.title('Page Views Over Time')
plt.xlabel('Date')
plt.ylabel('Page Views')
plt.xticks(rotation=45)
plt.grid(True)
plt.show()
```

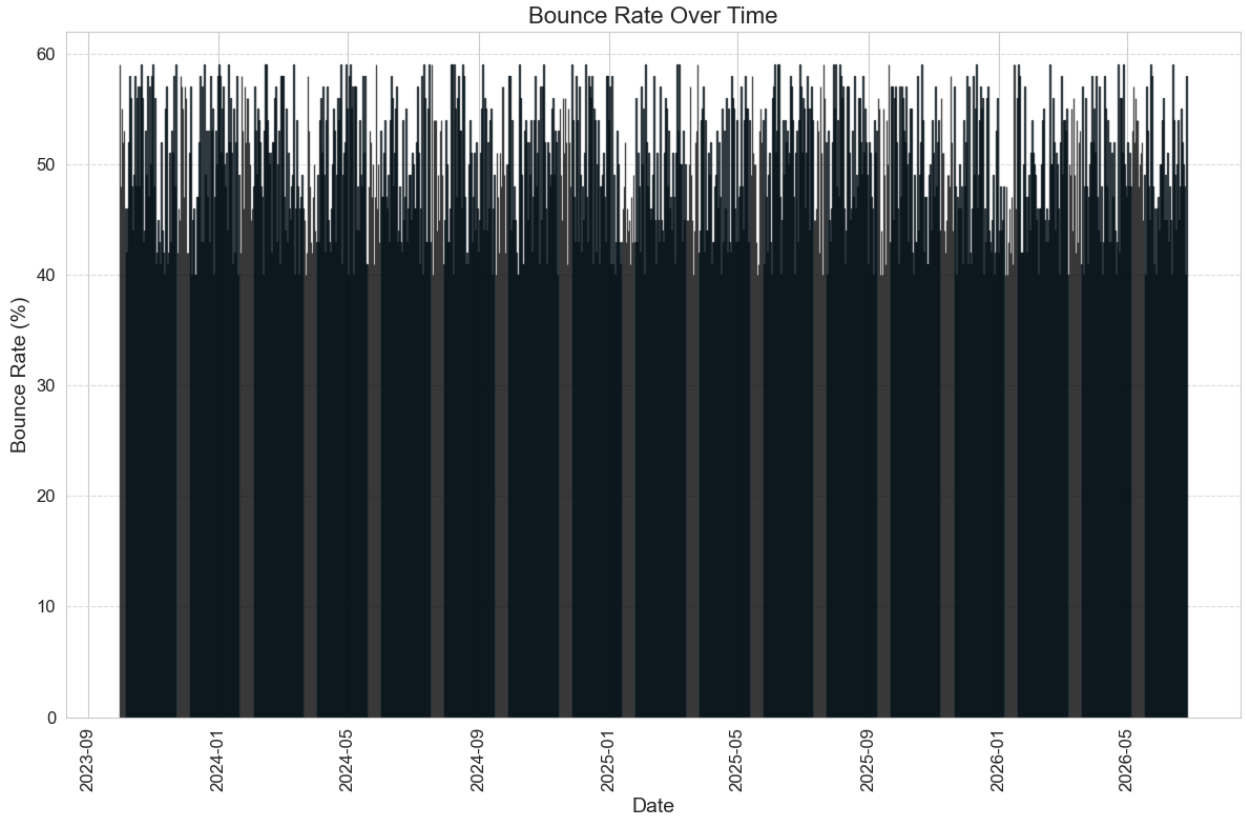



```
# Categorize Average Time Spent into bins for pie chart visualization
time_spent_bins = [0, 2, 3, 4, 5, 6]
labels = ['< 2 mins', '2-3 mins', '3-4 mins', '4-5 mins', '> 5 mins']
df['time_spent_category'] = pd.cut(df['average_time_spent_(minutes)'],
bins=time_spent_bins, labels=labels, include_lowest=True)

# Pie Chart of Average Time Spent
time_spent_distribution = df['time_spent_category'].value_counts()
plt.figure(figsize=(8, 8))
plt.pie(time_spent_distribution, labels=time_spent_distribution.index,
autopct='%1.1f%%', colors=['#ff9999','#66b3ff','#99ff99','#ffcc99',
'#c2c2f0'])
plt.title('Distribution of Average Time Spent on Page')
plt.show()
```

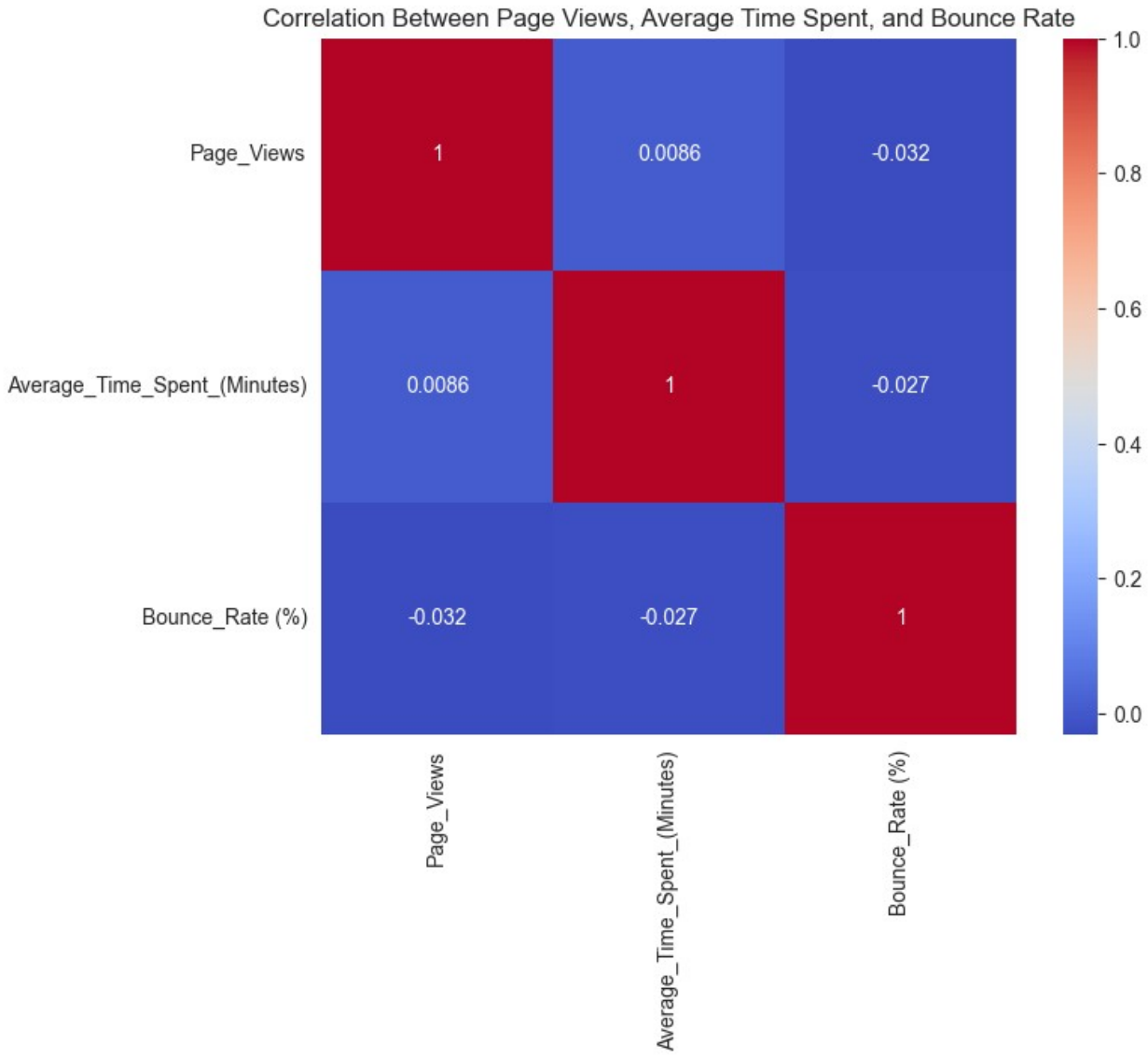



```
# Convert 'Date' column to datetime
df['Date'] = pd.to_datetime(df['Date'], dayfirst=True)

# Create a bar plot of bounce rate over time
plt.figure(figsize=(12,8))
sns.set_style('whitegrid')
plt.bar(df['Date'], df['Bounce_Rate (%)'], color='#3498db',
edgecolor='black', alpha=0.7)
plt.xlabel('Date', fontsize=14)
plt.ylabel('Bounce Rate (%)', fontsize=14)
plt.title('Bounce Rate Over Time', fontsize=16)
plt.xticks(rotation=90, fontsize=12)
plt.yticks(fontsize=12)
```

```
plt.tight_layout()
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```




```
# Create a heatmap to identify correlation between page views, average time spent, and bounce rate
corr_matrix = df[['Page_Views', 'Average_Time_Spent_(Minutes)', 'Bounce_Rate (%)']].corr()
plt.figure(figsize=(8,6))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', square=True)
plt.title('Correlation Between Page Views, Average Time Spent, and Bounce Rate')
plt.show()
```



Strategies to Increase Average Time Spent:

1.Add Interactive Elements:
Include interactive features like quizzes (e.g., "Which Tower of God character are you?") or discussion sections to increase engagement and encourage users to stay on the page longer.

2.Enrich Content with Multimedia:
Embed video reviews or exclusive interviews with the creators of "Tower of God" to offer more value and keep readers interested.