📊 Introduction to Instagram Analytics

> Instagram plays a crucial role in digital presence, offering powerful tools for:

- 💼 **Business Promotion**
- 🎨 **Portfolio Building**
- 🎥 **Content Creation**
- 🧠 **Personal Branding**

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px

from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
from sklearn.linear_model import PassiveAggressiveRegressor
```

🖌️ Data Loading & Cleaning

> Initial step involving importing the dataset, handling missing values, and preparing data for analysis.

In [2]:
```
data = pd.read_csv("Instagram_reach_data.csv", encoding='latin1')

missing = data.isnull().sum()
dtypes = data.dtypes
summary = pd.DataFrame({
    'Missing Values': missing,
    'Data Type': dtypes
})
print(summary)
```

```
               Missing Values Data Type
Impressions                 0     int64
From Home                   0     int64
From Hashtags               0     int64
From Explore                0     int64
From Other                  0     int64
Saves                       0     int64
Comments                    0     int64
Shares                      0     int64
Likes                       0     int64
Profile Visits              0     int64
Follows                     0     int64
Caption                     0    object
Hashtags                    0    object
```

🔍 Analyzing Components

In social media analytics, impressions refer to the total number of times a piece of content is displayed, regardless of whether it was clicked or engaged with. One user can contribute multiple impressions if they see the post multiple times.

📊 Distribution Plots of Impressions

> **Based on insights from the following Instagram sections:**

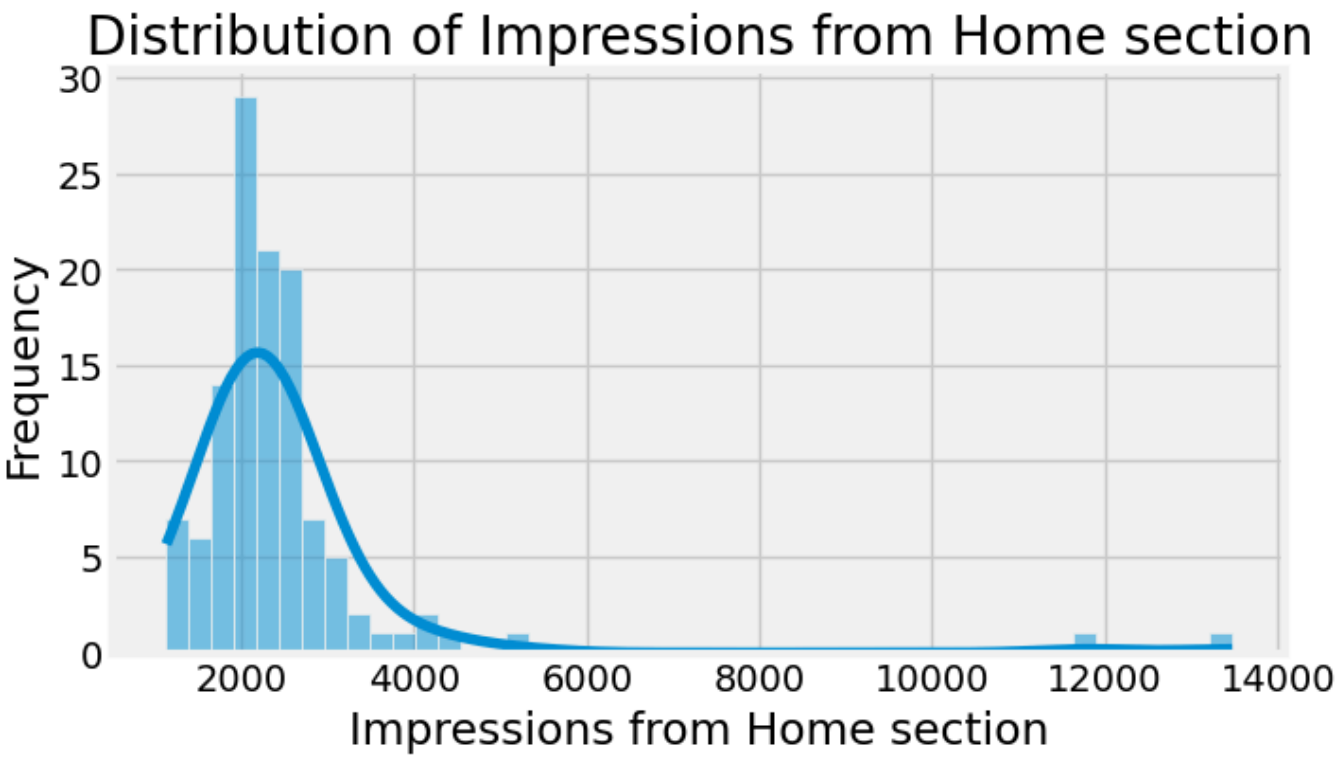
- 🏠 **Home**
- 🏷️ **Hashtag**
- 🔍 **Explore**

These plots visualize how impressions are distributed across each source, helping identify content reach patterns and potential outliers.

🏠 Home Feed Reach

In [3]:
```
# impression plot for home section

plt.figure(figsize=(8, 4))
plt.style.use('fivethirtyeight')
plt.title("Distribution of Impressions from Home section")
sns.histplot(data['From Home'], kde=True)  # Adding kde=True for a smoother distribution curv
plt.xlabel("Impressions from Home section")  # Adding a label for the x-axis
plt.ylabel("Frequency")  # Adding a label for the y-axis
plt.show()
```

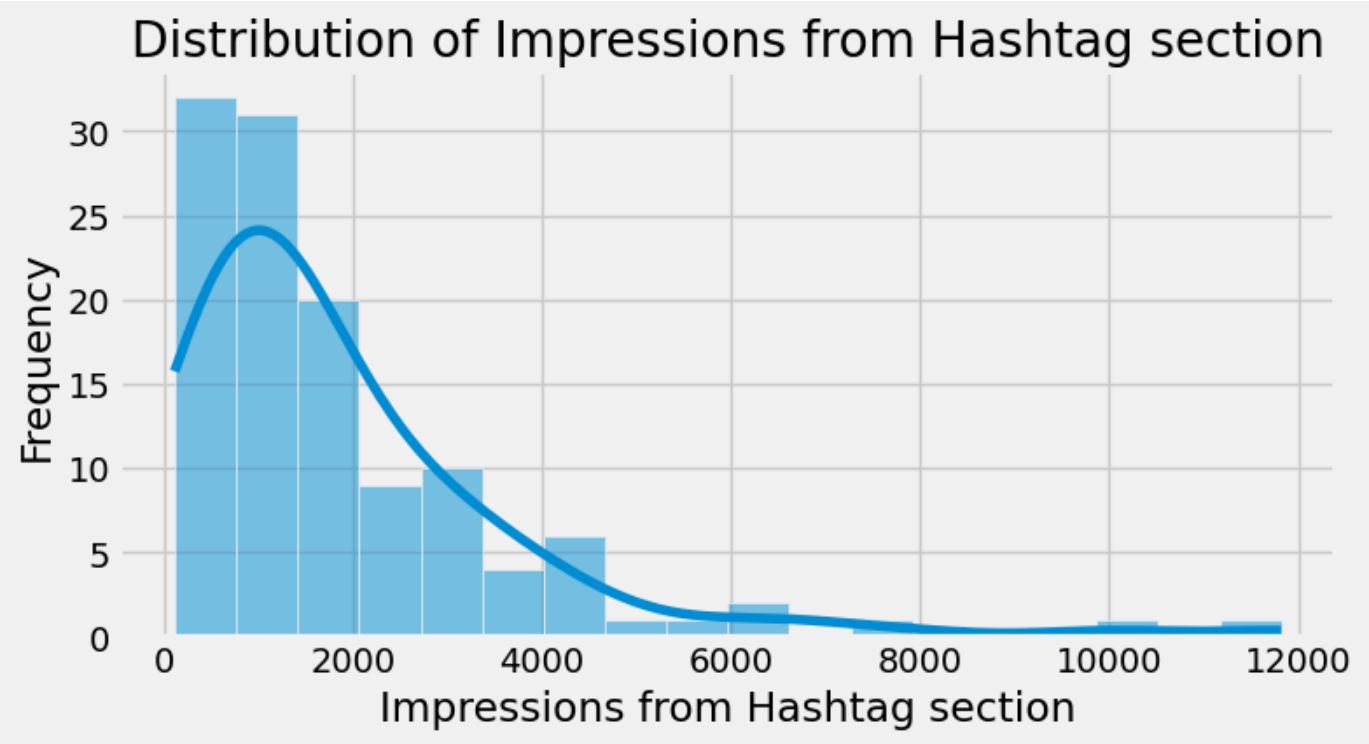


- 📊 **Right-skewed distribution**
- 🔼 Peak around **2000 impressions**
- 📉 Majority ranges between **1500–3000**
- 🚀 A few viral posts reached up to **~13k**

🏷️ Hashtag Performance

In [4]:
```
plt.figure(figsize=(8, 4))
plt.style.use('fivethirtyeight')
plt.title("Distribution of Impressions from Hashtag section")
sns.histplot(data['From Hashtags'], kde=True)  # Adding kde=True for a smoother distribution
plt.xlabel("Impressions from Hashtag section")  # Adding a label for the x-axis
```

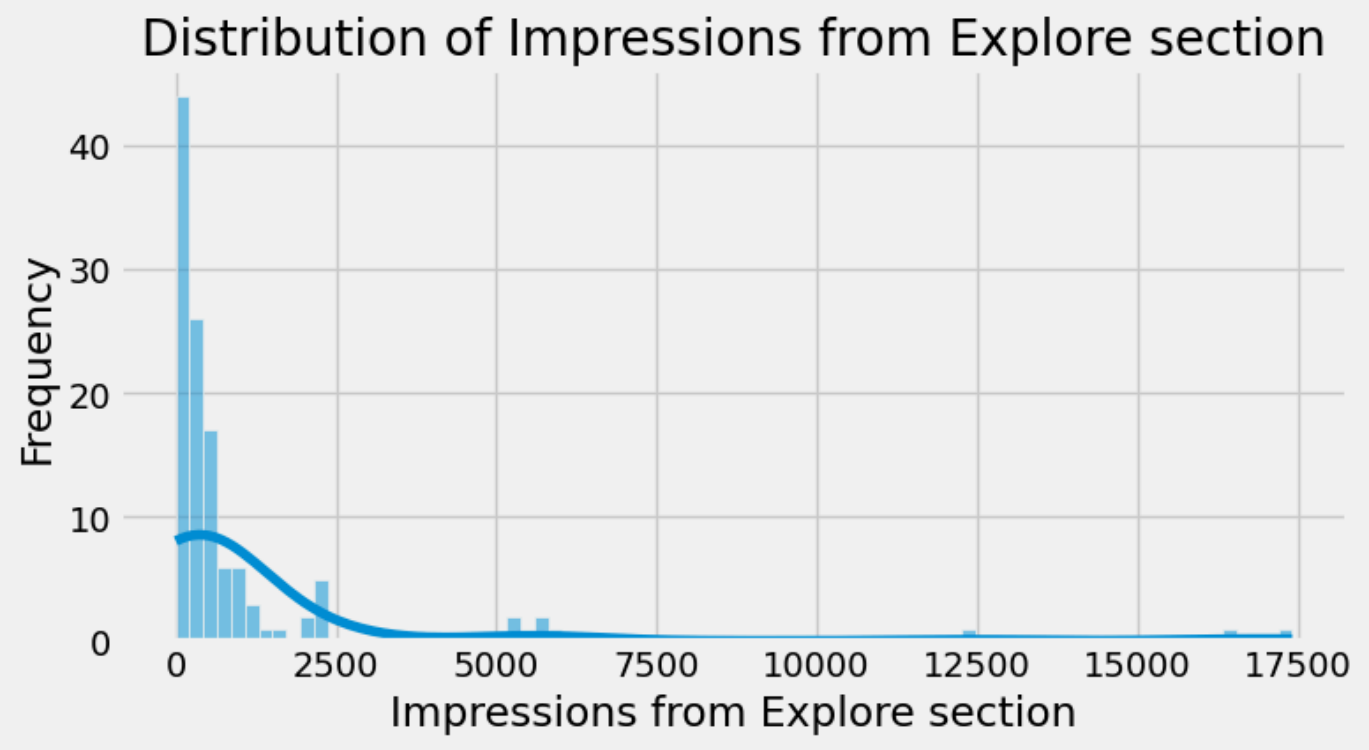
```
plt.ylabel("Frequency")  # Adding a label for the y-axis
plt.show()
```



- 📊 **Broader spread** than Home feed
- 🔄 Range: **500–3000 impressions**
- 📉 Long tail extending to **~12k**
- ⚠️ **More volatile** and inconsistent performance
- Effective use of hashtags can lead to significant reach in some cases.

🔍 Explore Section Impact

In [5]:
```
plt.figure(figsize=(8, 4))
plt.style.use('fivethirtyeight')
plt.title("Distribution of Impressions from Explore section")
sns.histplot(data['From Explore'], kde=True)  # Adding kde=True for a smoother distribution cu
plt.xlabel("Impressions from Explore section")  # Adding a label for the x-axis
plt.ylabel("Frequency")  # Adding a label for the y-axis
plt.show()
```



- 📊 **Highly skewed distribution**
- 📉 Most posts below **1000 impressions**
- 💥 Rare viral spikes up to **~17k**
- 🎲 **Least predictable** among all sources

📊 Source Distribution Summary

In [6]:
```
home = data["From Home"].sum()
hashtags = data["From Hashtags"].sum()
explore = data["From Explore"].sum()
other = data["From Other"].sum()

labels = ['From Home','From Hashtags','From Explore','Other']
values = [home, hashtags, explore, other]

fig = px.pie(data, values=values, names=labels,
             title='Impressions on Instagram Posts From Various Sources',
             hole=0.3,width=600, height=400)  # Adjusted dimensions for better visibility
fig.show()
```

- 🏠 **Home Feed**: **44.1%** — *Most consistent*
- 🏷️ **Hashtags**: **33.6%** — *Good potential*
- 🔍 **Explore**: **19.2%** — *Highest variance*
- 📁 **Others**: **3.05%** — *Minimal impact*

📐 Comparative Insights

- ✅ **Consistency**: `Home > Hashtag > Explore`
- 🚀 **Potential for High Reach**: `Explore > Hashtag > Home`
- 📈 **Distribution Spread**:
  - *Hashtag* — most balanced
  - *Explore* — most dispersed

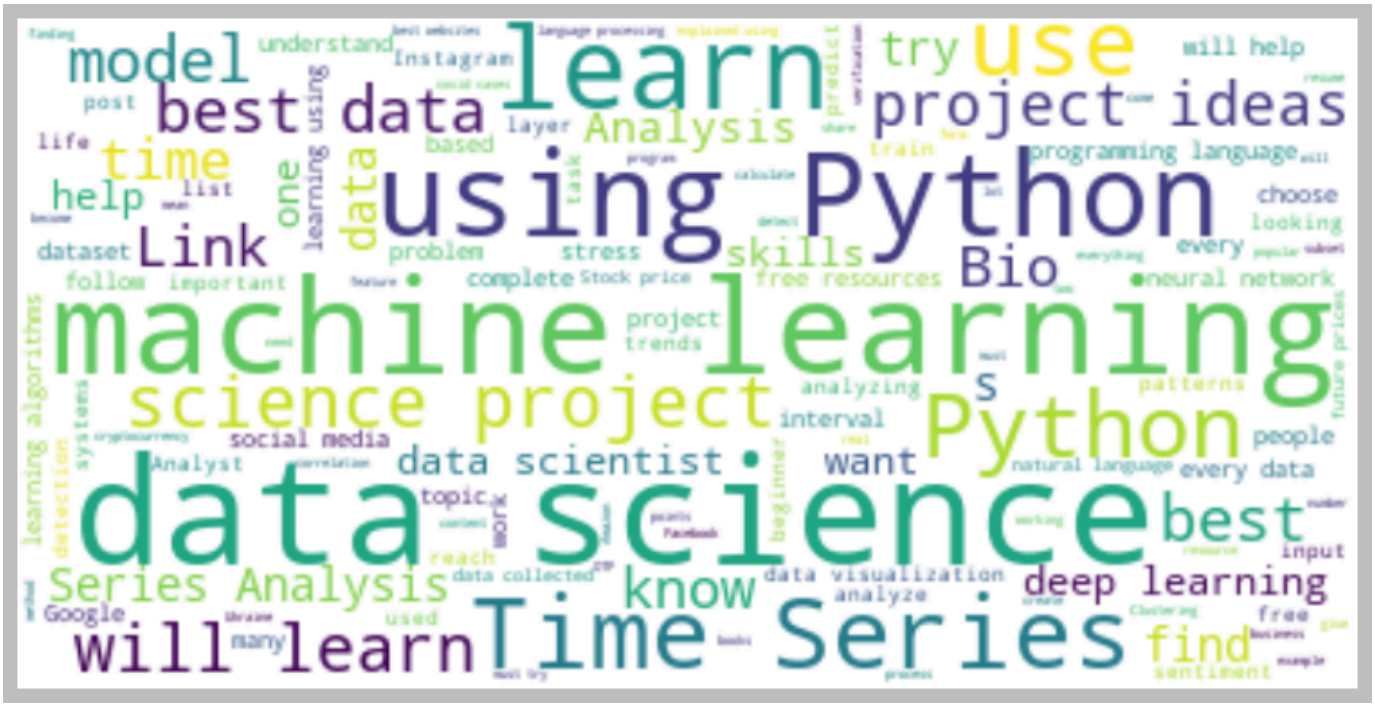
💡 Strategic Insight

- 🔁 **Home**: Driven by regular engagement
- 🏷️ **Hashtag**: Visibility improves with targeted usage
- 🔍 **Explore**: Rare but impactful exposure when reached

🔍 Analyzing Contents

✍️ Caption Analysis

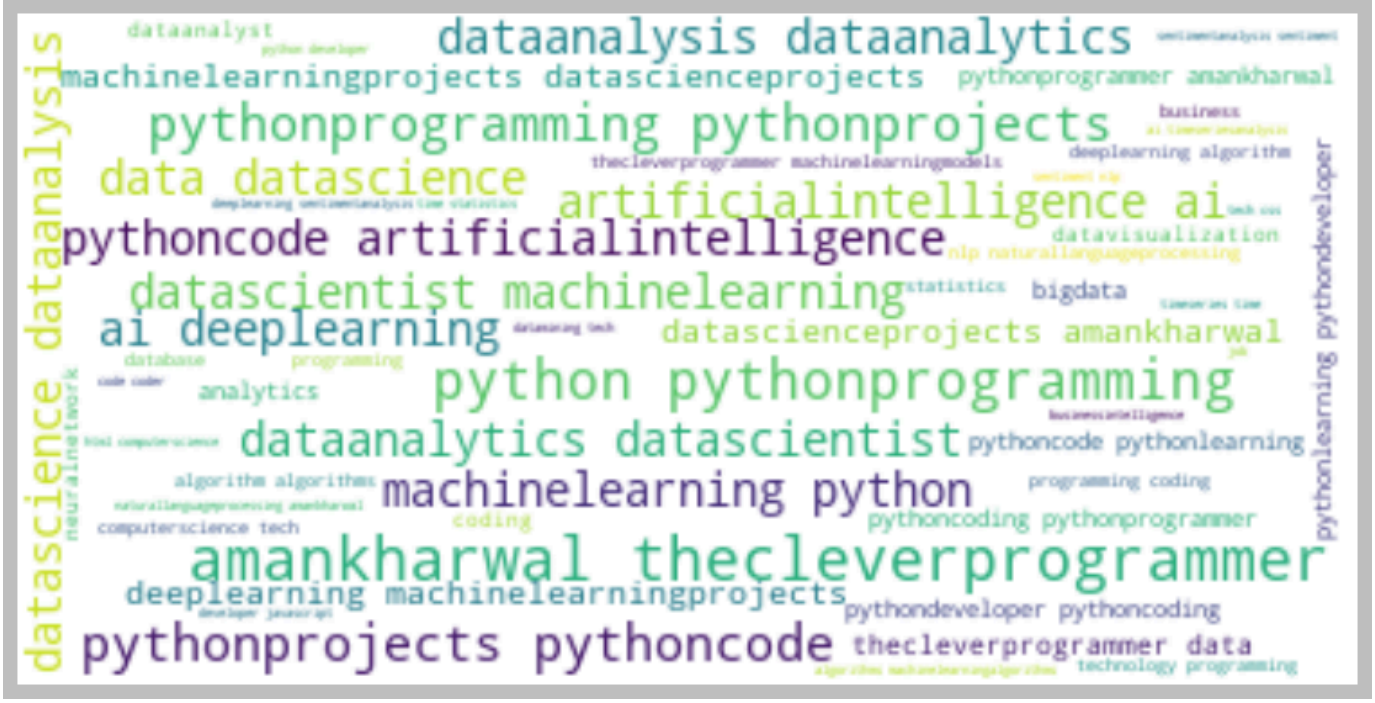
In [7]:
```
text = " ".join(i for i in data.Caption)
stopwords = set(STOPWORDS)
wordcloud = WordCloud(stopwords=stopwords, background_color="white").generate(text)
plt.style.use('classic')
plt.figure( figsize=(12,10))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.show()
```



- ☁️ **Word cloud** reveals most frequent topics
- 🔍 Key themes identified in content
- 💡 Strong focus on **data science** and **technology**

🏷️ Hashtag Strategy

In [8]:
```
text = " ".join(i for i in data.Hashtags)
stopwords = set(STOPWORDS)
wordcloud = WordCloud(stopwords=stopwords, background_color="white").generate(text)
plt.figure( figsize=(12,10))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.show()
```

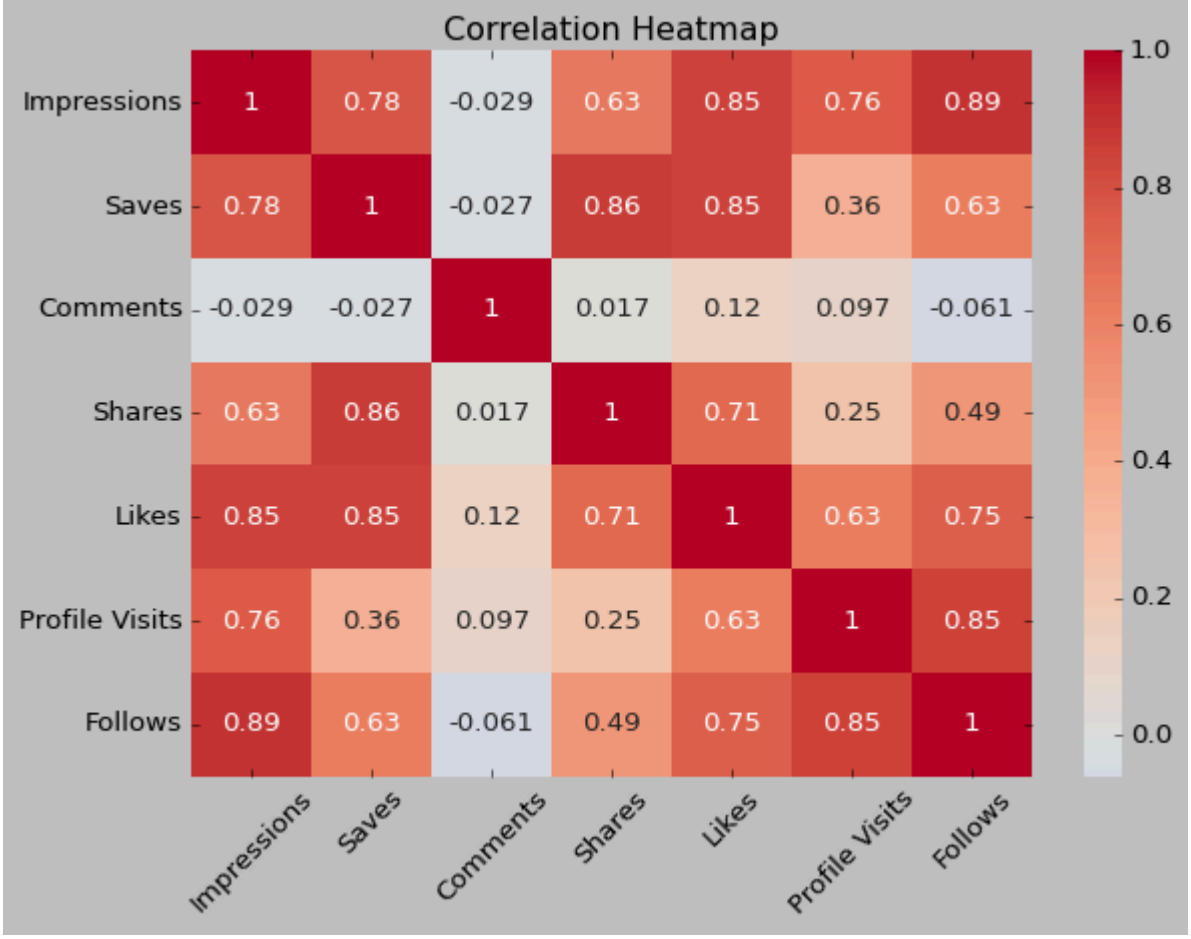


- 📌 Most **effective hashtags** highlighted
- 📈 Engagement **patterns identified**
- 🗂️ Noted performance variations across **categories**

🔍 Analyzing relationships

🤝 Relationship between the variables and Impression

In [9]:
```
correlation = data.select_dtypes(include=['int64', 'int32', 'int']).drop(columns=['From Home'
plt.figure(figsize=(8, 6))
sns.heatmap(correlation, annot=True, cmap='coolwarm', center=0)
plt.title('Correlation Heatmap')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



- 💔 **Comments, Follows, Profile visits & Saves** – *Strongest impact*
- 🔁 **Shares** – *Moderate influence*
- 💬 **Comments** – *Limited & negetive effect*

👍 Like–Reach Relationship

In [10]:
```
figure = px.scatter(data_frame = data, x="Impressions",
                    height=400, width=600,
                    y="Likes", size="Likes", trendline="ols",
                    title = "Relationship Between Likes and Impressions")
figure.show()
```

- 📈 **Strong positive correlation**
- 📊 Clear **linear relationship**
- 🔼 More **likes** lead to better **reach**

💬 Comment Impact

In [11]:
```
figure = px.scatter(data_frame = data, x="Impressions",
                    height=400, width=600,
                    y="Comments", size="Comments", trendline="ols",
                    title = "Relationship Between Comments and Impressions")
figure.show()
```

- 🔻 **Weak negative correlation**
- 🔵 **Bubble sizes** indicate frequency; most posts cluster under **10k impressions and 10 comments**
- 📈 **Outliers** with high impressions do **not** show proportional comment increase
- 🚫 Indicates **comments are not a strong driver** of reach

🔁 Share Analysis

In [12]:
```
figure = px.scatter(data_frame = data, x="Impressions",
                    height=400, width=600,
                    y="Shares", size="Shares", trendline="ols",
                    title = "Relationship Between Shares and Total Impressions")
figure.show()
```

- ➕ **Moderate positive correlation**
- 🌱 **Extends organic reach**
- 🚀 Acts as a **virality indicator**

🔍 Analyzing conversion rate

👤 Profile Visit Conversion

In [13]:
```
conversion_rate = (data["Follows"].sum() / data["Profile Visits"].sum()) * 100
print(f"Profile Visit to Follow Conversion Rate: {conversion_rate:.4f}%")
```

```
Profile Visit to Follow Conversion Rate: 41.0027%
```

- 🔁 **~41% conversion rate** (visits → follows)
- 📊 **Above industry average**
- ✅ Strong indicator of **content quality**

🔗 Visit–Follow Relationship

In [14]:
```
figure = px.scatter(data_frame = data, x="Profile Visits",
                    height=400, width=600,
                    y="Follows", size="Follows", trendline="ols",
                    title = "Relationship Between Profile Visits and Followers Gained")
figure.show()
```

- 📈 **Linear correlation** observed
- 🔁 Predictable **conversion pattern**
- 🌱 Reflects **sustainable growth**

📌 Key Findings

- **~45%** of reach comes from **followers**
- **33.6%** of reach is driven by **hashtags**
- A **linear relationship** exists between **likes** and **reach**
- **Comments** do **not significantly** affect reach
- The profile has an approx. **31% conversion rate** from **visits to follows**

📊 Analytical Insights Provided

- 🔍 **Content Performance**

- 🌐 **Reach Distribution & Patterns**
- 🤝 **Engagement Relationships**
- 🎯 **Follower Conversion Efficiency**

🚀 Growth Opportunities

- 📈 **Optimize Explore Section Reach**
- 🏷️ **Diversify and Test Hashtag Strategies**
- ⏰ **Refine Posting Times for Maximum Reach**
- 📊 **Analyze Engagement Behavior More Deeply**