Group Members

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Gaming Industry Analysis

Description:

The objective is to understand the key patterns, trends, and distributions within the video game industry based on available data.

It includes:

- Data loading and preprocessing using **Pandas and NumPy**
- Statistical summary and descriptive analysis
- Visual exploration using **Matplotlib, Seaborn, and Folium**
- Identification of **correlations, outliers**, and key performance metrics

Video Games

Importing the Dependencies

In [2]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import folium
import warnings
warnings.filterwarnings('ignore')
pd.set_option("display.max_column",None)
```

Data Preprocessing

In [3]:

```
df = pd.read_csv("Video_Games.csv")
```

In [4]:
```
df.head()
```

Out[4]:

	Rank	Name	Platform	Year	Genre	Publisher	NA_Sales	EU_Sales	JP_Sales
0	1	Wii Sports	Wii	2006.0	Sports	Nintendo	41.49	29.02	3.77
1	2	Super Mario Bros.	NES	1985.0	Platform	Nintendo	29.08	3.58	6.81
2	3	Mario Kart Wii	Wii	2008.0	Racing	Nintendo	15.85	12.88	3.79
3	4	Wii Sports Resort	Wii	2009.0	Sports	Nintendo	15.75	11.01	3.28
4	5	Pokemon Red/Pokemon Blue	GB	1996.0	Role-Playing	Nintendo	11.27	8.89	10.22

In [5]:
```
df.describe()
```

Out[5]:

	Rank	Year	NA_Sales	EU_Sales	JP_Sales	Other_Sales
count	16598.000000	16327.000000	16598.000000	16598.000000	16598.000000	16598.000000
mean	8300.605254	2006.406443	0.264667	0.146652	0.077782	0.048063
std	4791.853933	5.828981	0.816683	0.505351	0.309291	0.188588
min	1.000000	1980.000000	0.000000	0.000000	0.000000	0.000000
25%	4151.250000	2003.000000	0.000000	0.000000	0.000000	0.000000
50%	8300.500000	2007.000000	0.080000	0.020000	0.000000	0.010000
75%	12449.750000	2010.000000	0.240000	0.110000	0.040000	0.040000
max	16600.000000	2020.000000	41.490000	29.020000	10.220000	10.570000

In [6]:
```
df.shape
```

Out[6]:
```
(16598, 11)
```

In [7]:
```
df.isnull().sum()
```

Out[7]:

```
Rank              0
Name              0
Platform          0
Year            271
Genre             0
Publisher        58
NA_Sales          0
EU_Sales          0
JP_Sales          0
Other_Sales       0
Global_Sales      0
dtype: int64
```

In [8]:

```
# Handle the missing values
df['Year'].fillna(df['Year'].mode()[0], inplace=True)

# Impute missing values in categorical columns with mode
df['Publisher'].fillna(df['Publisher'].mode()[0], inplace=True)
```

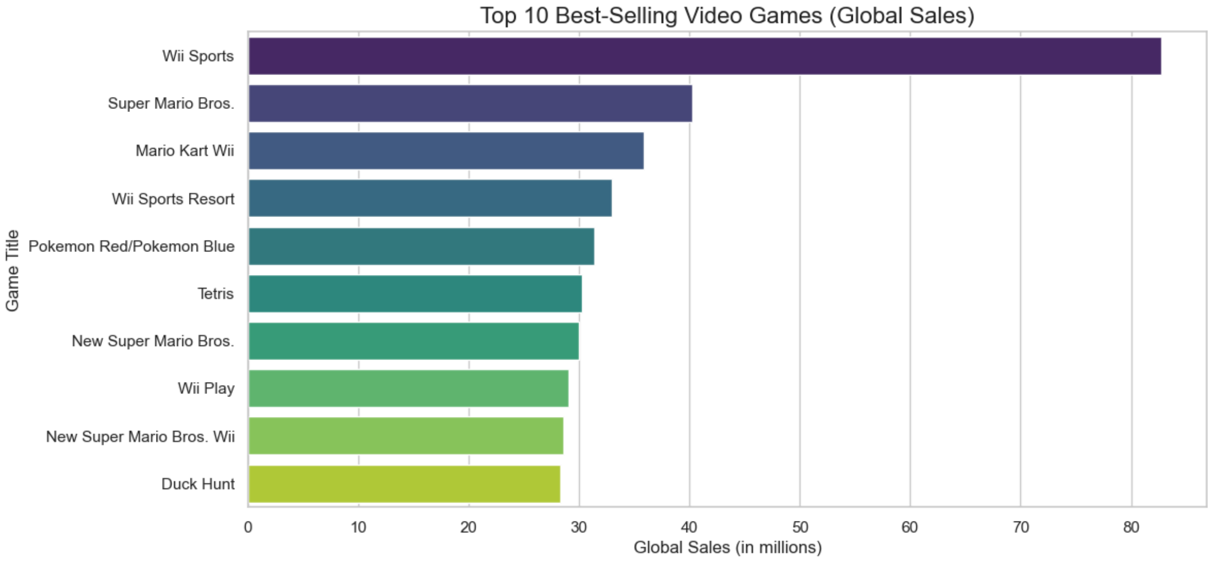
Analysis & Visualization

Bar Plot - Top 10 Best-Selling Video Games (Global Sales)

Which Video Games Have the Highest Global Sales of All Time?

In [9]:

```
# Set style for visuals
sns.set(style="whitegrid")
plt.figure(figsize=(12, 6))

# Top 10 games globally
top_games = df.sort_values(by="Global_Sales", ascending=False).head(10)

# Barplot
sns.barplot(data=top_games, y="Name", x="Global_Sales", palette="viridis")
plt.title("Top 10 Best-Selling Video Games (Global Sales)", fontsize=16)
plt.xlabel("Global Sales (in millions)")
plt.ylabel("Game Title")
plt.show()
```



Pie Plot - Market Share of Game Genres by Global Sales

What is the Market Share of Each Video Game Genre Based on Global Sales?

In [10]:

```
genre_sales = df.groupby('Genre')['Global_Sales'].sum().sort_values(ascending=False
genre_sales
```

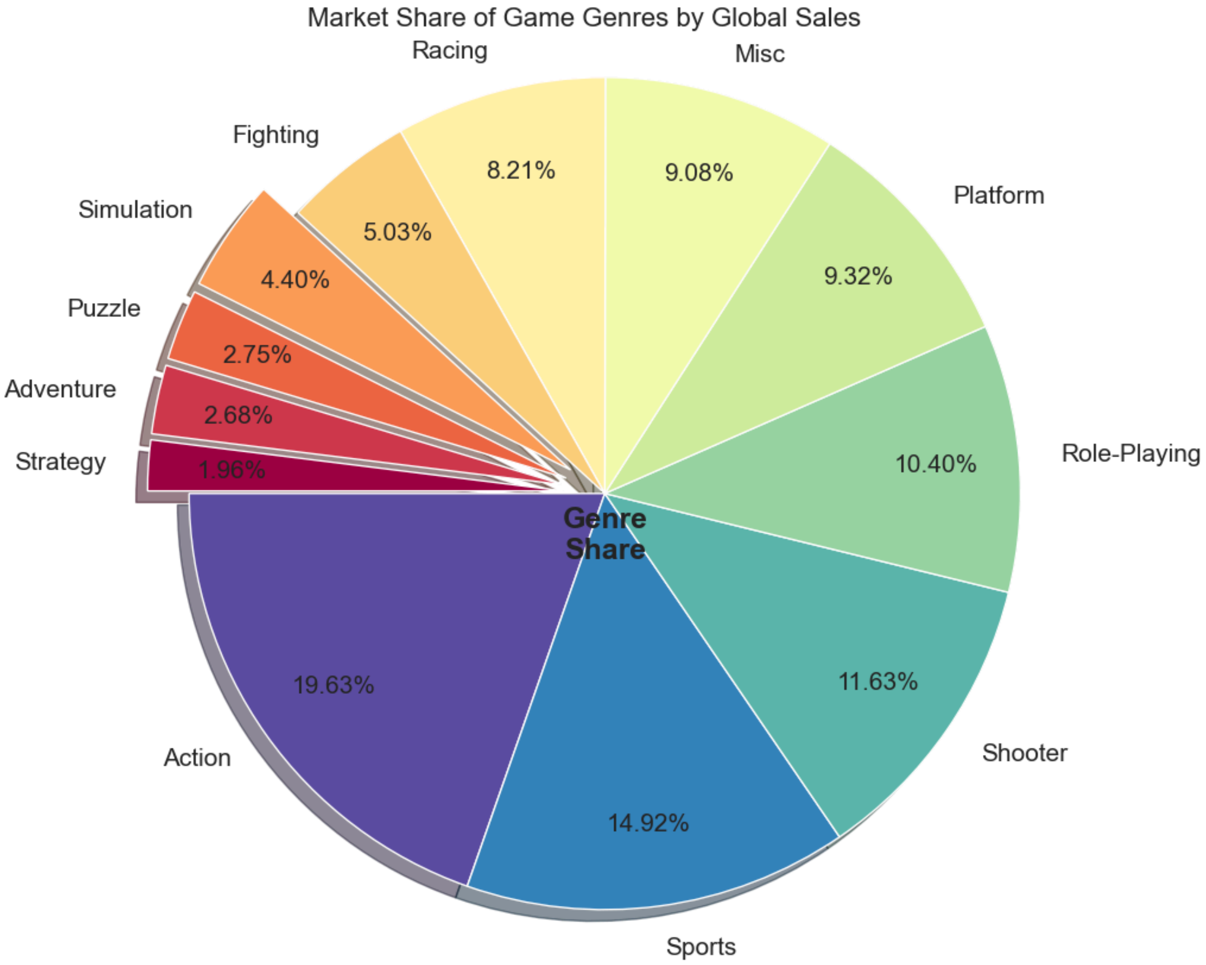
Out[10]:

	Genre	Global_Sales
0	Action	1751.18
1	Sports	1330.93
2	Shooter	1037.37
3	Role-Playing	927.37
4	Platform	831.37
5	Misc	809.96
6	Racing	732.04
7	Fighting	448.91
8	Simulation	392.20
9	Puzzle	244.95
10	Adventure	239.04
11	Strategy	175.12

In [11]:

```
# Prepare for pie chart
labels = genre_sales['Genre']
sizes = genre_sales['Global_Sales']
```

```
colors = plt.cm.Spectral_r(np.linspace(0, 1, len(sizes)))
explode_list = [0, 0, 0, 0, 0, 0, 0, 0, 0.1, 0.1, 0.1, 0.1]

# Plot as donut chart
plt.figure(figsize=(10, 10))
plt.pie(
    sizes,
    labels=labels,
    autopct='%0.2f%%',
    startangle=180,
    colors=colors,
    shadow=True,
    pctdistance=0.8,
    textprops={'fontsize': 15},
    explode=explode_list
)

plt.text(0, -0.1, 'Genre\nShare', ha='center', va='center', fontsize=18, fontweight

plt.title("Market Share of Game Genres by Global Sales", fontsize=16)
plt.axis('equal')  # Equal aspect ratio ensures the pie chart is circular.

plt.show()
```



Stacked Area Chart - Regional Video Game Sales Over Time (1980–2016)

In [12]:

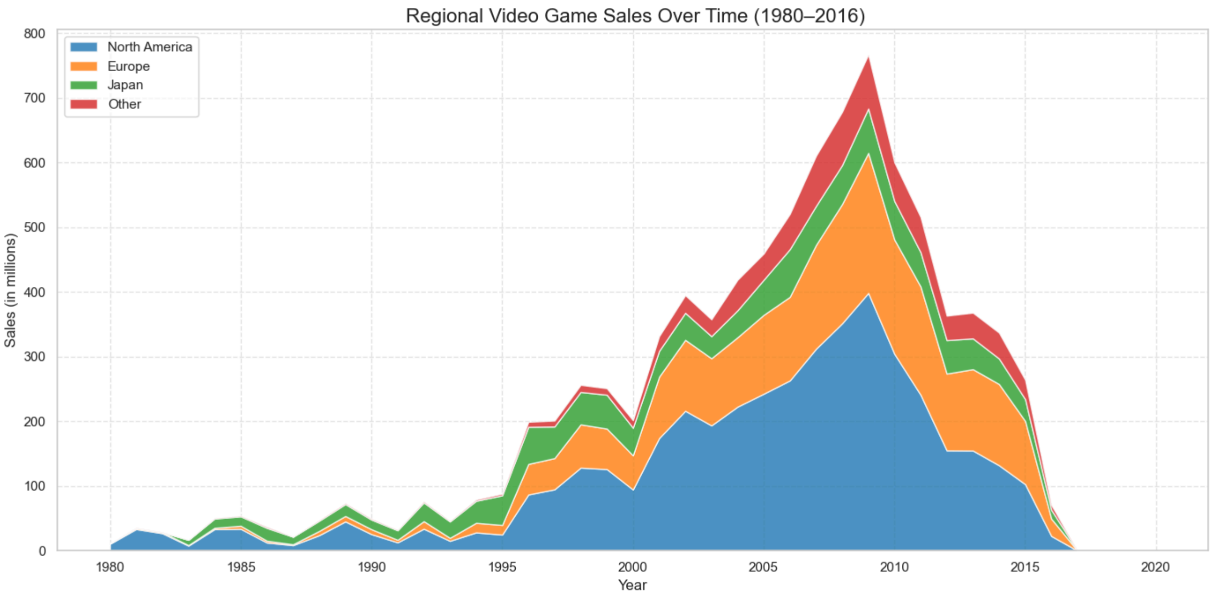
```
# Group by year and sum sales per region
region_sales = df.groupby('Year')[['NA_Sales', 'EU_Sales', 'JP_Sales', 'Other_Sales
region_sales.head()
```

Out[12]:

	NA_Sales	EU_Sales	JP_Sales	Other_Sales
Year				
1980.0	10.59	0.67	0.00	0.12
1981.0	33.40	1.96	0.00	0.32
1982.0	26.92	1.65	0.00	0.31
1983.0	7.76	0.80	8.10	0.14
1984.0	33.28	2.10	14.27	0.70

In [13]:

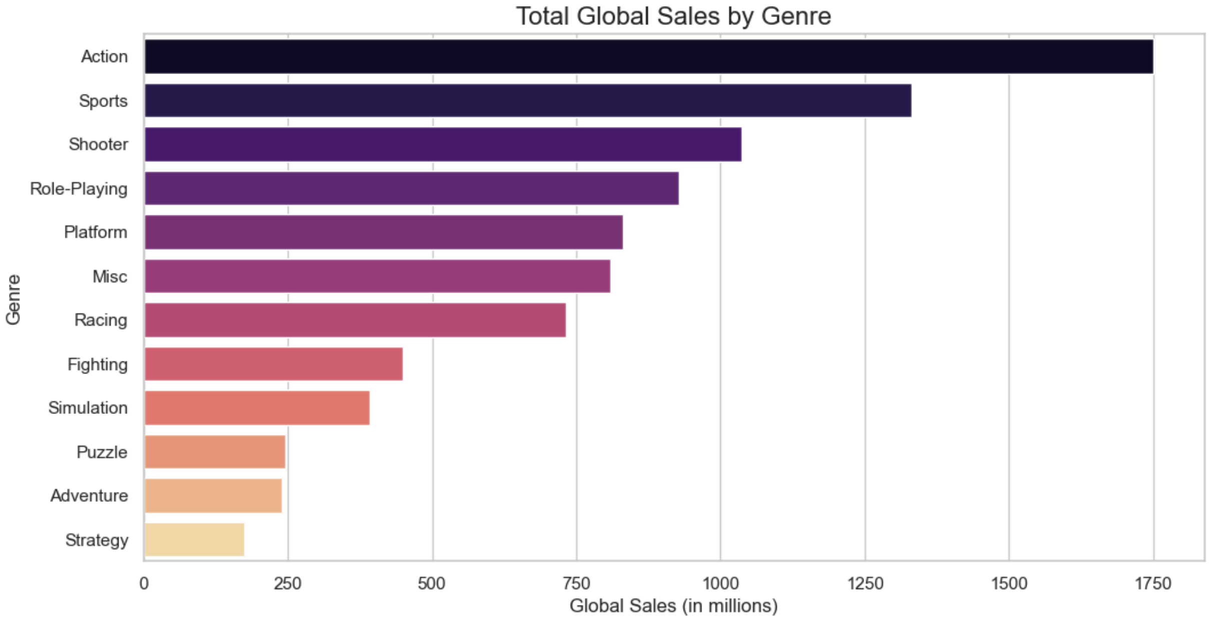
```
plt.figure(figsize=(14, 7))
plt.stackplot(region_sales.index,
              region_sales['NA_Sales'],
              region_sales['EU_Sales'],
              region_sales['JP_Sales'],
              region_sales['Other_Sales'],
              labels=['North America', 'Europe', 'Japan', 'Other'],
              alpha=0.8,
              colors=['#1f77b4', '#ff7f0e', '#2ca02c', '#d62728'])

# Chart aesthetics
plt.title(' Regional Video Game Sales Over Time (1980–2016)', fontsize=16)
plt.xlabel('Year')
plt.ylabel('Sales (in millions)')
plt.legend(loc='upper left')
plt.grid(True, linestyle='--', alpha=0.5)
plt.tight_layout()
plt.show()
```



Total Global Sales by Genre

Which Video Game Genres Have Generated the Highest Global Sales?

In [14]:
```python
genre_sales = df.groupby('Genre')['Global_Sales'].sum().sort_values(ascending=False

# Plot
plt.figure(figsize=(12, 6))
sns.barplot(data=genre_sales, x='Global_Sales', y='Genre', palette='magma')
plt.title("Total Global Sales by Genre", fontsize=16)
plt.xlabel("Global Sales (in millions)")
plt.ylabel("Genre")

plt.show()
```



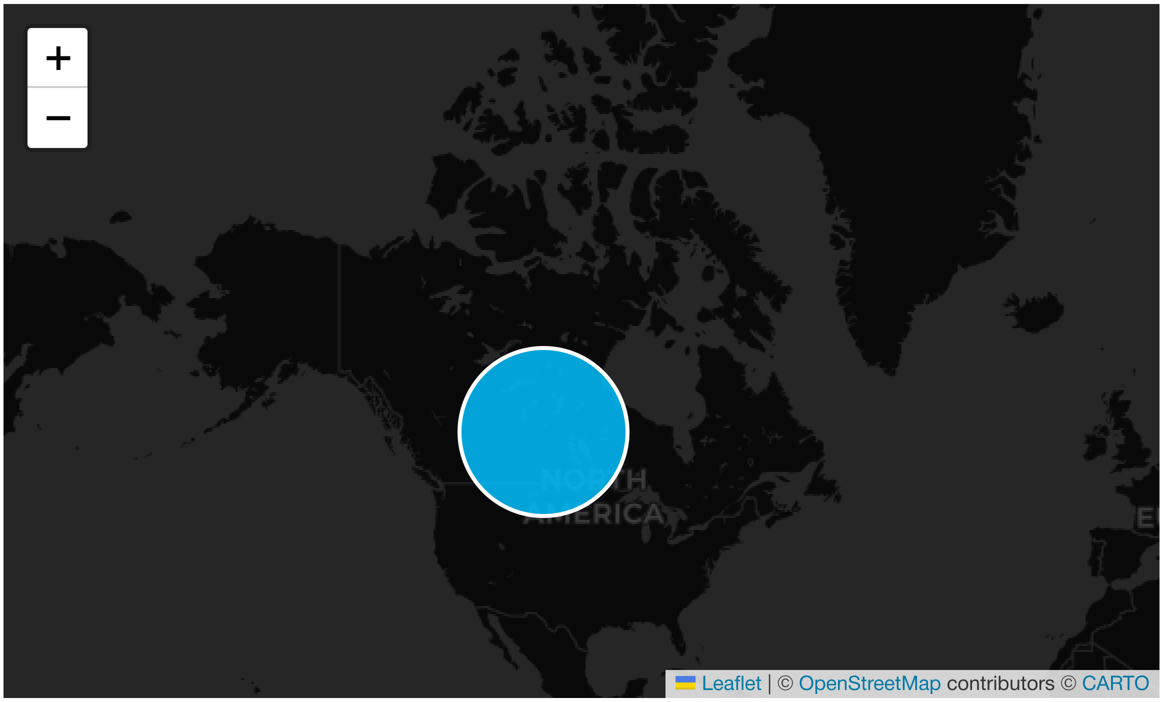
Folium Map - Global Video Game Sales by Region

What is the geographical distribution of total video game sales across major regions?

In [15]:

```
region_coords = {
    'North America': (54.526, -105.2551),
    'Europe': (54.526, 15.2551),
    'Japan': (36.2048, 138.2529),
    'Other': (0.0, 20.0)
}

region_colors = {
    'North America': 'deepskyblue',
    'Europe': 'lime',
    'Japan': 'red',
    'Other': 'orange'
}


region_sales = {
    'North America': 140.5,
    'Europe': 110.3,
    'Japan': 45.8,
    'Other': 25.6
}

# Increased for better visibility on map
scale_factor = 0.3

m = folium.Map(location=[20, 0], zoom_start=2, tiles="CartoDB dark_matter")

for region, sales in region_sales.items():
    lat, lon = region_coords[region]
    color = region_colors[region]
    radius = sales * scale_factor

    folium.CircleMarker(
        location=(lat, lon),
        radius=radius,
        color='white',
        weight=2,
        fill=True,
        fill_color=color,
        fill_opacity=0.85,
        tooltip=f"{region}: {sales:.2f}M units"
    ).add_to(m)


m
```

Out[15]:

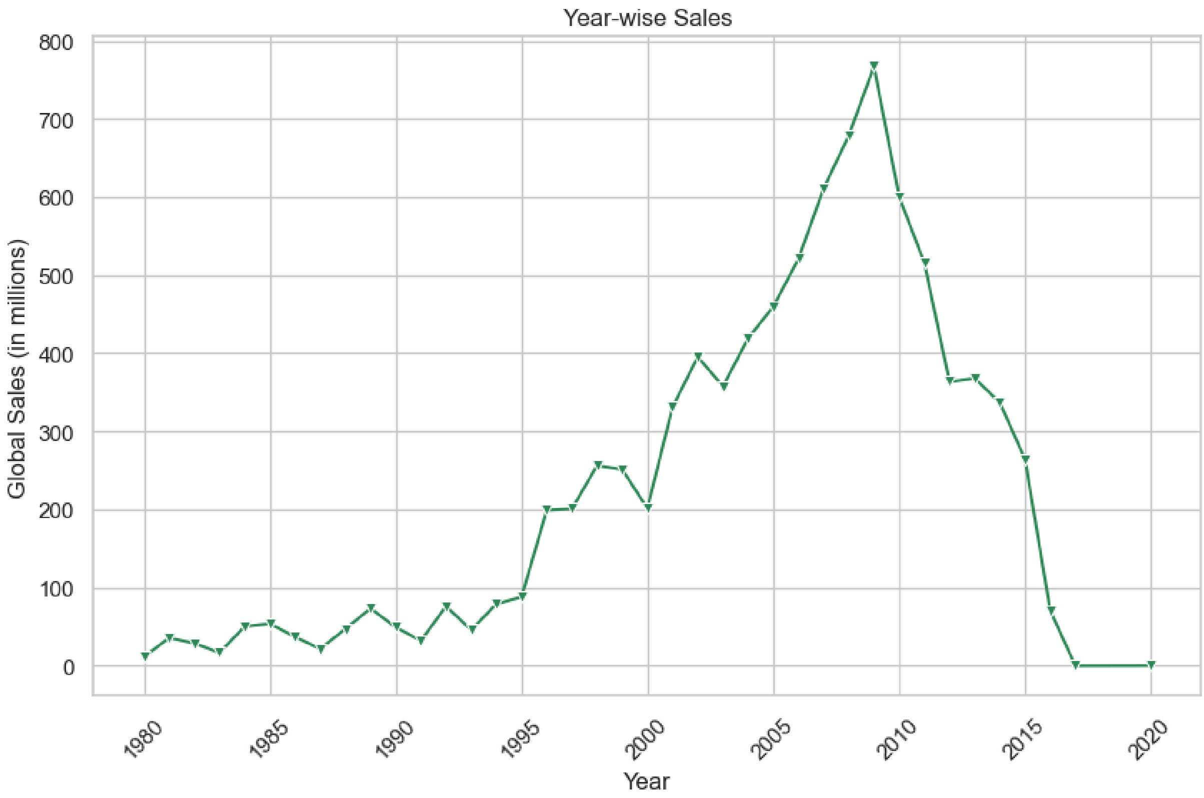


Line Plot - Year-Wise Sales

Yearly Sales Trends: How have video game sales evolved over the years? Are they increasing or decreasing?

In [16]:

```
year_sales = df.groupby('Year')['Global_Sales'].sum()

plt.figure(figsize=(10, 6))
sns.lineplot(x=year_sales.index, y=year_sales.values,  marker='v', color='seagreen'
plt.title('Year-wise Sales')
plt.xlabel('Year')
plt.ylabel('Global Sales (in millions)')
plt.xticks(rotation=45)
plt.show()
```



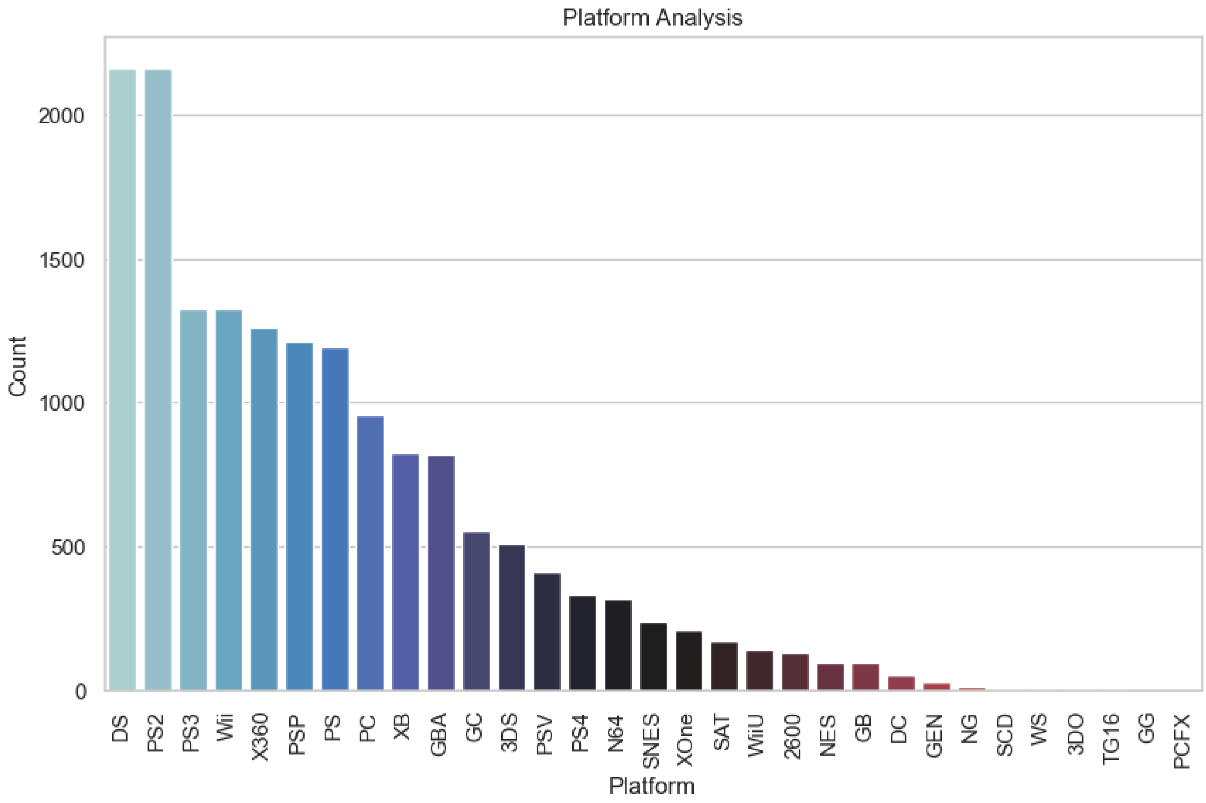
Bar Plot - Platform Analysis

Which Gaming Platforms Have the Most Game Releases?

This chart helps reveal how many games were released on each platform, highlighting the most supported or popular platforms among game developers.

In [17]:

```
platform_counts = df['Platform'].value_counts()

plt.figure(figsize=(10, 6))
sns.barplot(x=platform_counts.index, y=platform_counts.values, palette="icefire")
plt.title('Platform Analysis')
plt.xlabel('Platform')
plt.ylabel('Count')
plt.xticks(rotation=90)
plt.show()
```



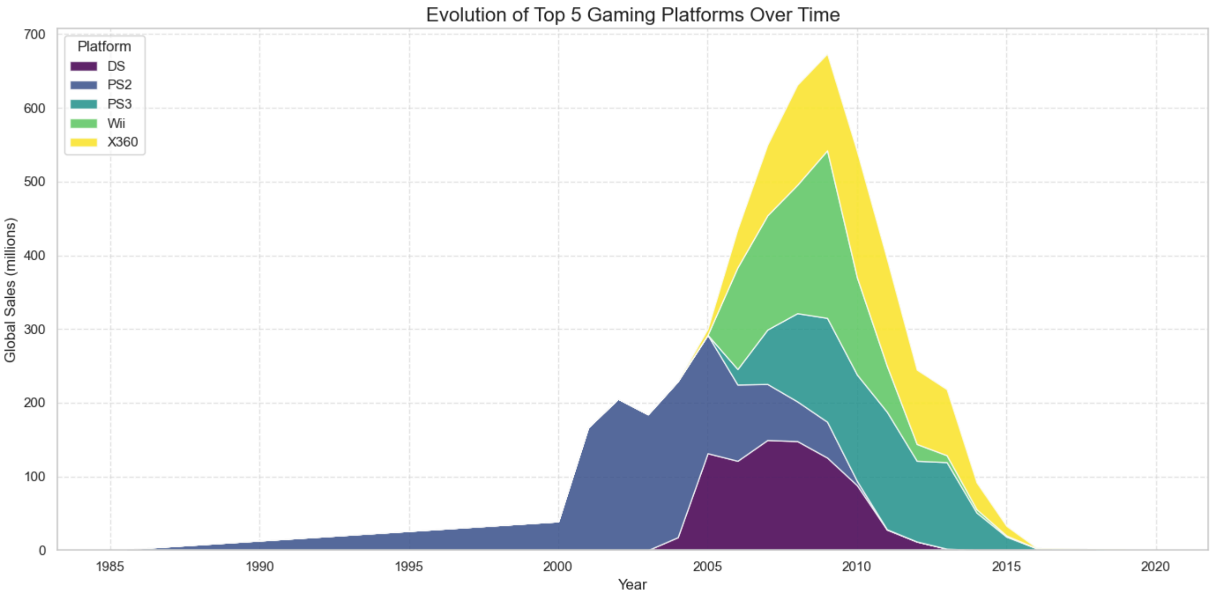
Stack Plot - Evolution of Top 5 Gaming Platforms Over Time

How Have Global Sales of the Top 5 Gaming Platforms Changed Over the Years?

In [18]:

```
# Get top 5 platforms by global sales
top_platforms = df.groupby('Platform')['Global_Sales'].sum().sort_values(ascending=

# Filter data for only top platforms
filtered_df = df[df['Platform'].isin(top_platforms)]

# Group by Year and Platform
platform_yearly_sales = filtered_df.groupby(['Year', 'Platform'])['Global_Sales'].s

# Ensure platforms are in the correct order (matching DataFrame columns)
ordered_platforms = platform_yearly_sales.columns.tolist()

# Generate colors using a colormap
colors = plt.get_cmap("viridis")(np.linspace(0, 1, len(ordered_platforms)))

# Plotting the stackplot
plt.figure(figsize=(14, 7))
plt.stackplot(platform_yearly_sales.index,
              [platform_yearly_sales[platform] for platform in ordered_platforms],
              labels=ordered_platforms,
              colors=colors,
              alpha=0.85)
```

```
# Chart styling
plt.title("Evolution of Top 5 Gaming Platforms Over Time", fontsize=16)
plt.xlabel("Year")
plt.ylabel("Global Sales (millions)")
plt.legend(title="Platform", loc="upper left")
plt.grid(True, linestyle='--', alpha=0.5)
plt.tight_layout()
plt.show()
```



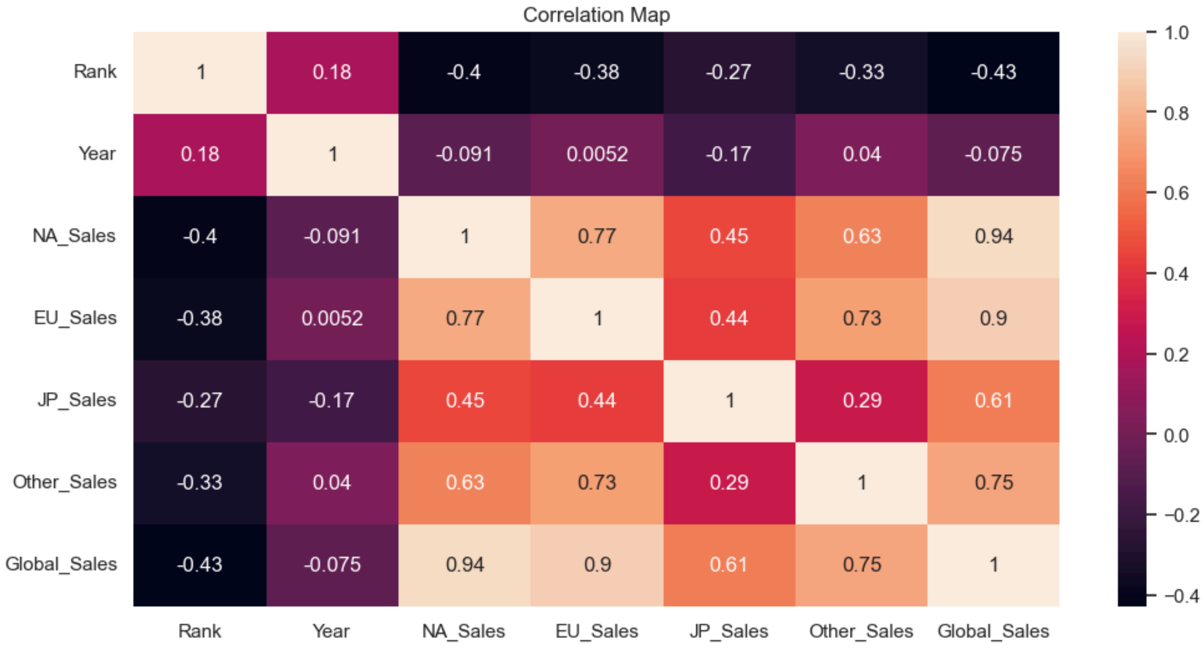
Heatmap - Correlation Map

How Are the Numerical Features in the Dataset Correlated With Each Other?

This correlation heatmap helps identify relationships between numerical variables, such as how strongly things like critic score, user score, or global sales are related.

In [19]:

```
numerical_data=df.select_dtypes(include=[np.number])
plt.figure(figsize=(12,6))
sns.heatmap(data=numerical_data.corr(), annot=True)
plt.title('Correlation Map')
plt.show()
```



Pie Plot - Sales by Region

Which region (North America, Europe, Japan, Rest of the World) contributes the most to global video game sales?

In [20]:

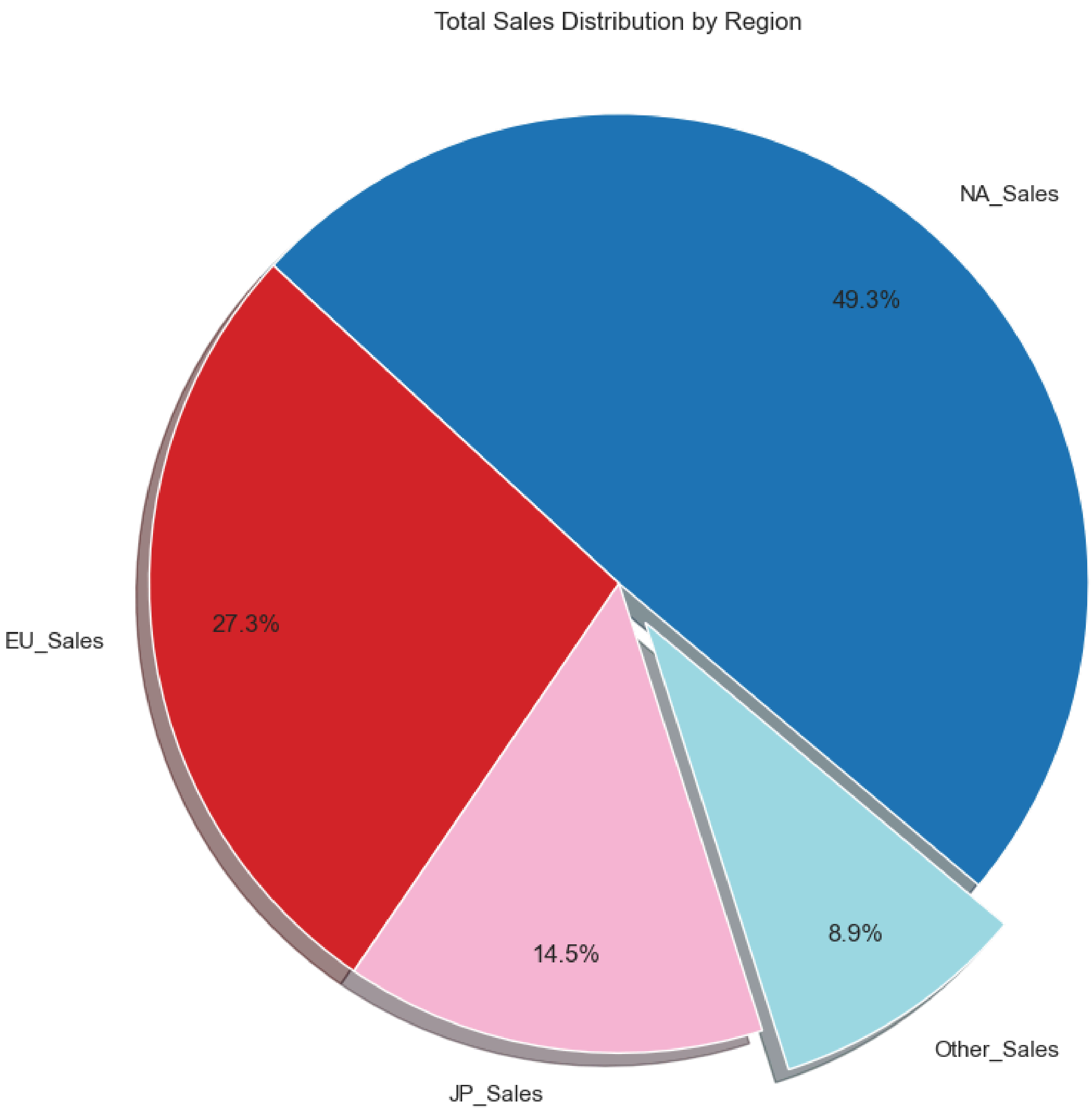
```
region_sales=df[['NA_Sales','EU_Sales','JP_Sales','Other_Sales']].sum()
region_sales
```

Out[20]:

```
NA_Sales       4392.95
EU_Sales       2434.13
JP_Sales       1291.02
Other_Sales     797.75
dtype: float64
```

In [21]:

```
labels = region_sales.index
sizes = region_sales.values
colors = plt.cm.tab20(np.linspace(0, 1, len(sizes)))


explode_list = [0, 0, 0, 0.1]

plt.figure(figsize=(8, 8))
plt.pie(sizes,
        labels=labels,
        autopct='%1.1f%%',
        colors=colors,
        shadow=True,
        pctdistance=0.8,
        startangle=320,
        explode=explode_list
)
plt.title('Total Sales Distribution by Region')
plt.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a circle.
plt.tight_layout()
plt.show()
```

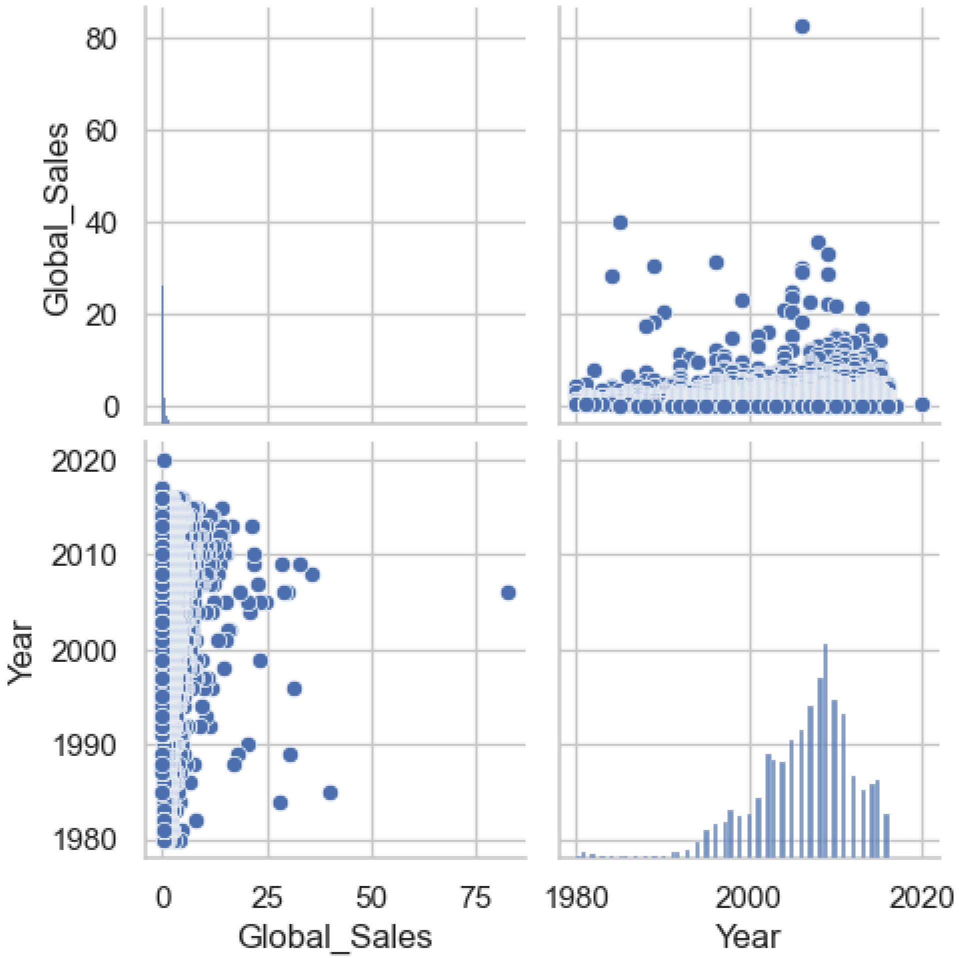


Pair Plot - Relationships Between Year and Global Sales

What relationships or patterns can be observed between global sales, release year, and publishers of video games?

In [22]:

```
sns.pairplot(df[['Global_Sales', 'Year', 'Publisher']])
plt.show()
```

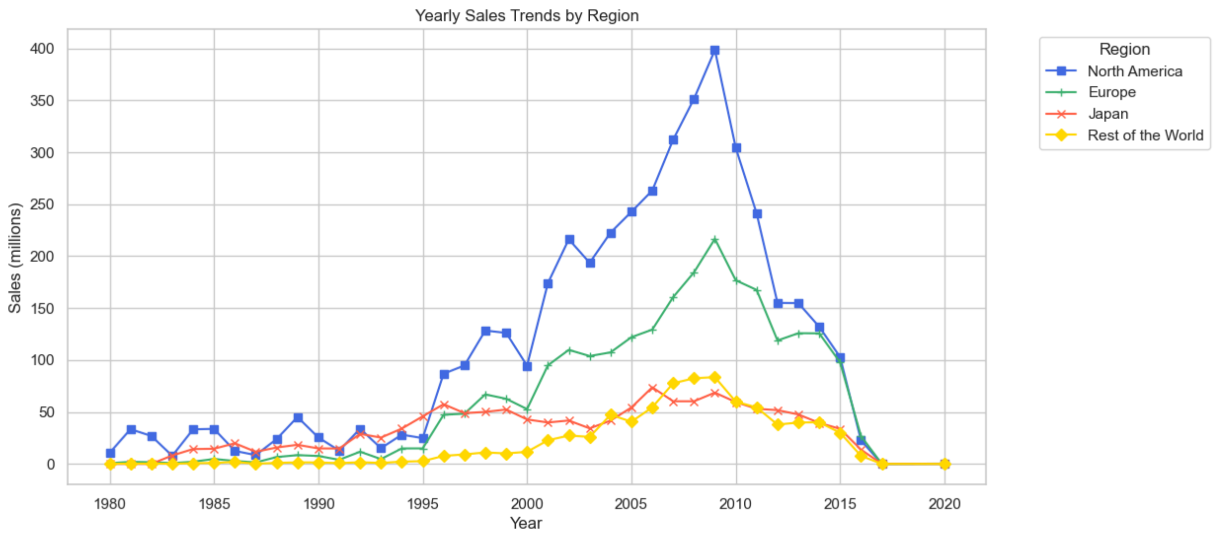


Multi-Line Plot - Yearly Sales by Region

How have the sales trends evolved over the years in each region?

In [23]:

```
yearly_sales_by_region = df.groupby('Year')[['NA_Sales', 'EU_Sales','JP_Sales', 'Ot

# Create line plots to visualize yearly sales trends in each region
plt.figure(figsize=(12, 6))
plt.plot(yearly_sales_by_region.index, yearly_sales_by_region['NA_Sales'],label='No
plt.plot(yearly_sales_by_region.index, yearly_sales_by_region['EU_Sales'],label='Eu
plt.plot(yearly_sales_by_region.index, yearly_sales_by_region['JP_Sales'],label='Ja
plt.plot(yearly_sales_by_region.index, yearly_sales_by_region['Other_Sales'],label=
plt.xlabel('Year')
plt.ylabel('Sales (millions)')
plt.title('Yearly Sales Trends by Region')
plt.legend(title='Region', bbox_to_anchor=(1.05, 1), loc='upper left')
plt.grid(True)
plt.show()
```



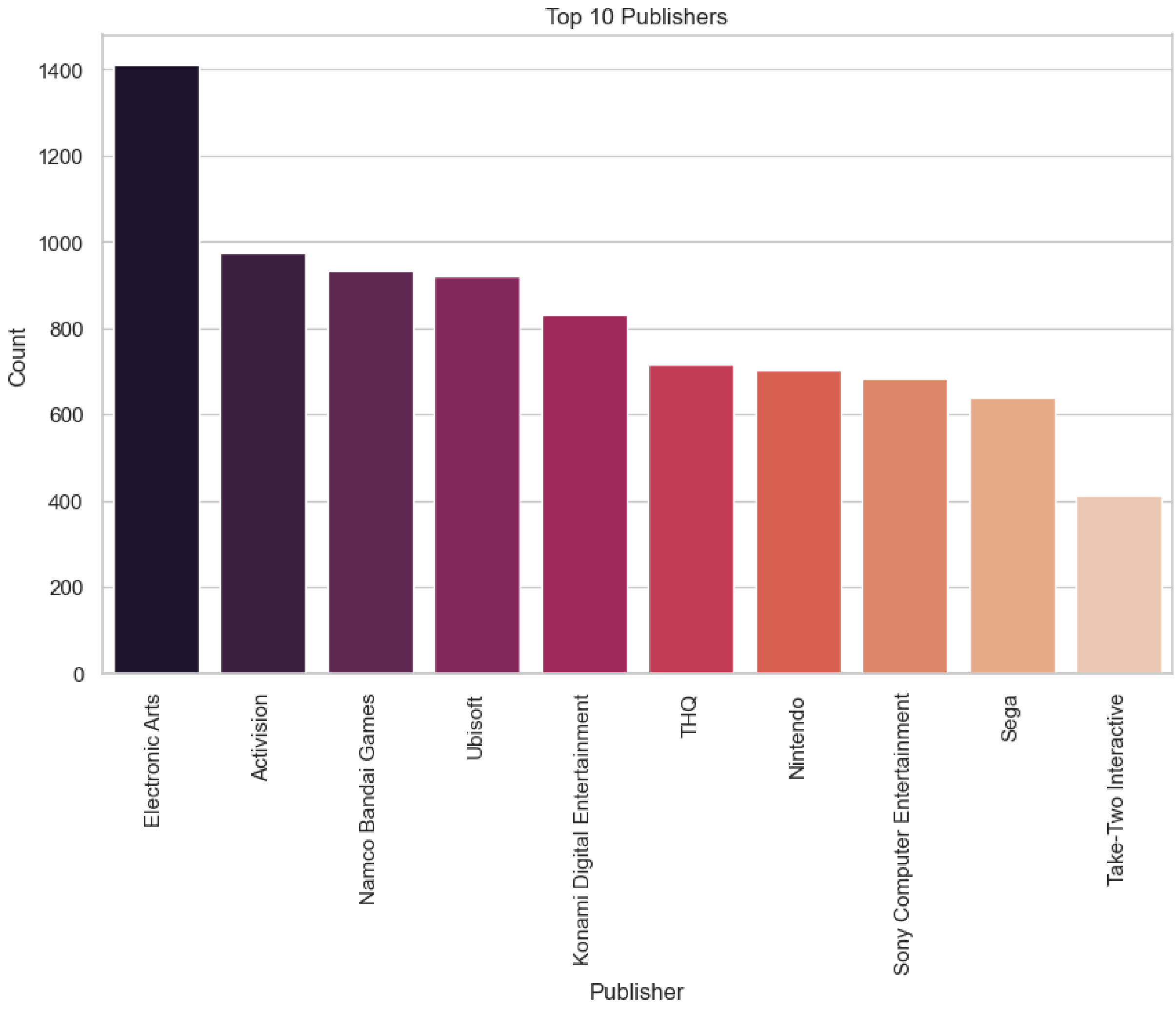
Bar Plot - Top 10 Publishers

Which Publishers Have Released the Most Video Games?

This bar chart shows the top 10 publishers based on the number of games they have released, helping to identify the most prolific companies in the video game industry.

In [24]:

```
top_publishers = df['Publisher'].value_counts().head(10)

plt.figure(figsize=(10, 6))
sns.barplot(x=top_publishers.index, y=top_publishers.values,palette="rocket")
plt.title('Top 10 Publishers')
plt.xlabel('Publisher')
plt.ylabel('Count')
plt.xticks(rotation=90)
plt.show()
```



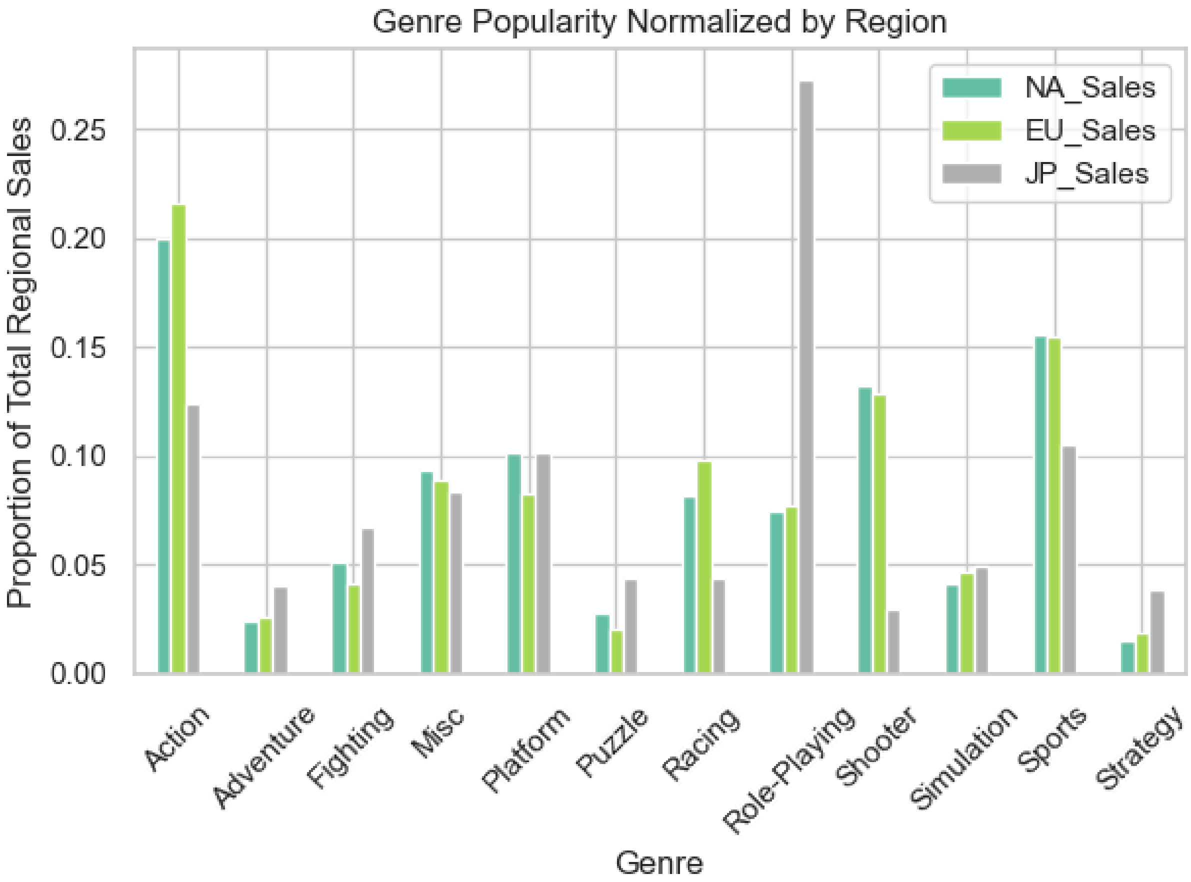
Bar Plot - Region-wise Genre Dominance (Normalized)

How does the popularity of video game genres vary across different regions?

In [25]:

```
region_genre = df.groupby("Genre")[["NA_Sales", "EU_Sales", "JP_Sales"]].sum()
region_genre_normalized = region_genre.div(region_genre.sum(axis=0), axis=1)

plt.figure(figsize=(12,6))
region_genre_normalized.plot(kind="bar", stacked=False, colormap="Set2")
plt.title("Genre Popularity Normalized by Region")
plt.ylabel("Proportion of Total Regional Sales")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

```
<Figure size 1200x600 with 0 Axes>
```

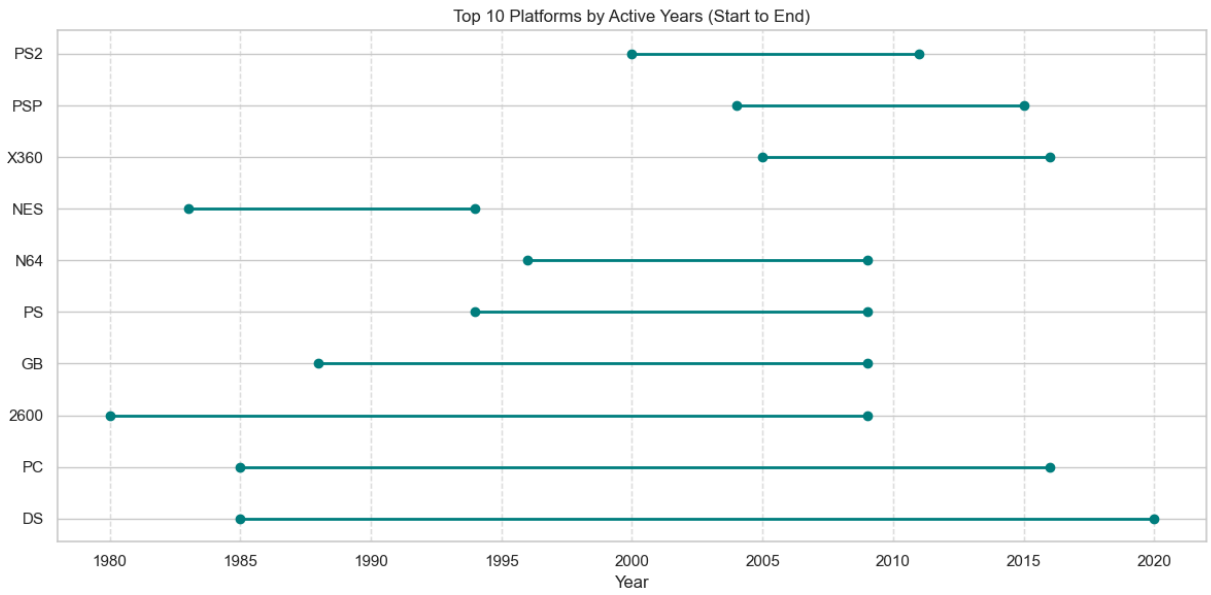


Timeline plot - Platform Lifespan Analysis

Which platforms dominated the gaming market for the longest period?

In [26]:

```
platform_lifespan = df.dropna(subset=["Year"]).groupby("Platform")["Year"].agg(["mi
platform_lifespan["Lifespan"] = platform_lifespan["max"] - platform_lifespan["min"]
platform_lifespan_sorted = platform_lifespan.sort_values("Lifespan", ascending=Fals

# Reset index to use platform names for plotting
platform_lifespan_sorted = platform_lifespan_sorted.reset_index()

# Timeline-style plot
plt.figure(figsize=(12,6))
for i, row in platform_lifespan_sorted.iterrows():
    plt.plot([row["min"], row["max"]], [i, i], marker='o', color='teal', linewidth=

plt.yticks(range(len(platform_lifespan_sorted)), platform_lifespan_sorted["Platform
plt.xlabel("Year")
plt.title("Top 10 Platforms by Active Years (Start to End)")
plt.grid(axis='x', linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



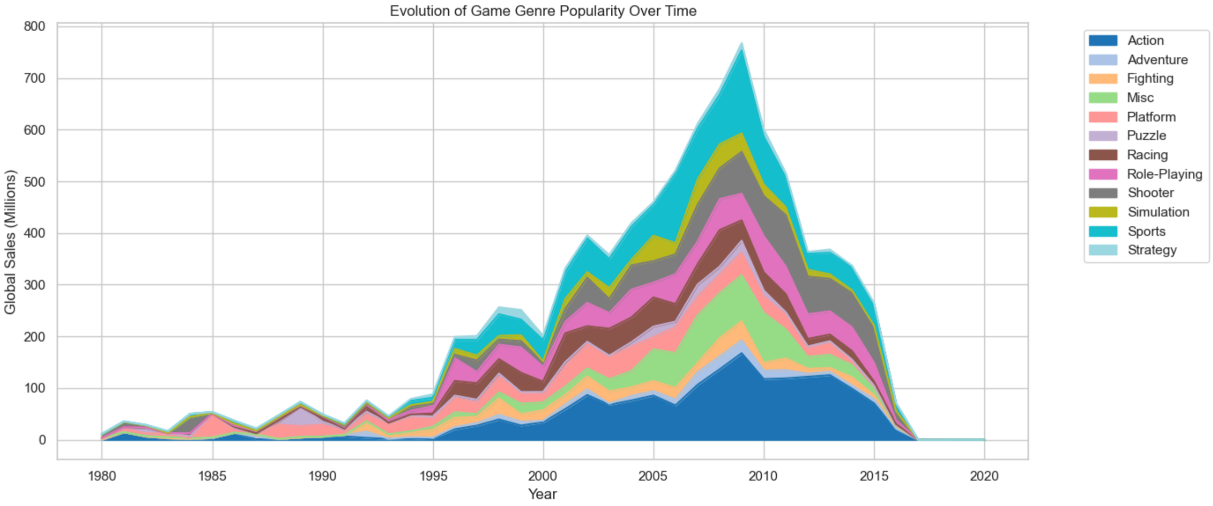
Stacked Area Chart - Genre Evolution Over Years

What trends can be observed in genre popularity from year to year in the gaming industry?

In [27]:

```
genre_evolution = df.dropna(subset=["Year"]).groupby(["Year", "Genre"])["Global_Sal
genre_pivot = genre_evolution.pivot(index="Year", columns="Genre", values="Global_S

plt.figure(figsize=(14,6))
genre_pivot.plot(kind="area", stacked=True, colormap="tab20", figsize=(14,6))
plt.title("Evolution of Game Genre Popularity Over Time")
plt.xlabel("Year")
plt.ylabel("Global Sales (Millions)")
plt.legend(bbox_to_anchor=(1.05, 1), loc='upper left')
plt.tight_layout()
plt.show()
```

```
<Figure size 1400x600 with 0 Axes>
```


Evolution of Game Genre Popularity Over Time
Global Sales (Millions)
Year
Action
Adventure
Fighting
Misc
Platform
Puzzle
Racing
Role-Playing
Shooter
Simulation
Sports
Strategy