ITAcademy - Data Science amb Python

Sprint 4, Tasca 2: Visualització de múltiples variables

In [1]:

```
import numpy as np
import pandas as pd

import matplotlib as mpl
import matplotlib.pyplot as plt
import seaborn as sns

%matplotlib inline
```

Exercici 1: Exploració i visualització del dataset tips.csv

Informació sobre el dataset

Aquest dataset va aparèixer per primer cop en la següent publicació:

```
Bryant, P. G. and Smith, M (1995) Practical Data Analysis: Case Studies in Business
Statistics. Homewood, IL: Richard D. Irwin Publishing
```

També es troba disponible a travès del paquet Seaborn, pel qual l'importarem.

In [2]:

```
tips = sns.load_dataset("tips")
tips.head()
```

Out[2]:

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

Aquest dataset està compost per les següents variables:

1. **total_bill** - Compte total en dòlars
2. **tip** - Propina en dòlars
3. **sex** - Gènere de la persona que paga el compte
4. **smoker** - Presència de fumadors en el grup de comensals
5. **day** - Dia de la setmana
6. **time** - Moment del dia
7. **size** - Tamany del grup de comensals

In [3]:

```
tips.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 244 entries, 0 to 243
Data columns (total 7 columns):
 #   Column      Non-Null Count  Dtype   
---  ------      --------------  -----   
 0   total_bill  244 non-null    float64 
 1   tip         244 non-null    float64 
 2   sex         244 non-null    category
 3   smoker      244 non-null    category
 4   day         244 non-null    category
 5   time        244 non-null    category
 6   size        244 non-null    int64   
dtypes: category(4), float64(2), int64(1)
memory usage: 7.4 KB
```

Descripció de les variables cualitatives

In [4]:

```
for column in tips.select_dtypes(include=['category']):
    print(tips[column].value_counts())
```

```
Male      157
Female     87
Name: sex, dtype: int64
No     151
Yes     93
Name: smoker, dtype: int64
Sat     87
Sun     76
Thur    62
Fri     19
Name: day, dtype: int64
Dinner    176
Lunch      68
Name: time, dtype: int64
```

In [5]:

```
tips.describe(include=['category'])
```

Out[5]:

	sex	smoker	day	time
count	244	244	244	244
unique	2	2	4	2
top	Male	No	Sat	Dinner
freq	157	151	87	176

La proporció d'homes és considerablemente major a la de dones, així com la de fumadors respecte als no fumadors. De la mateixa manera, tenim més del doble d'observacions realitzades durant l'hora de sopar que durant el dinar. Per altra banda, en comparació amb la resta de dies, tenim poques observacions realitzades en divendres.

Descripció de les variables cuantitatives

In [6]:

```
tips.describe(include="number")
```

Out[6]:

	total_bill	tip	size
count	244.000000	244.000000	244.000000
mean	19.785943	2.998279	2.569672

	total_bill	tip	size
std	8.902412	1.383638	0.951100
min	3.070000	1.000000	1.000000
25%	13.347500	2.000000	2.000000
50%	17.795000	2.900000	2.000000
75%	24.127500	3.562500	3.000000
max	50.810000	10.000000	6.000000

Exploració del dataset

In [7]:

```python
sns.set_theme(style="darkgrid", palette="deep")
```

Propina segons el tamany del grup

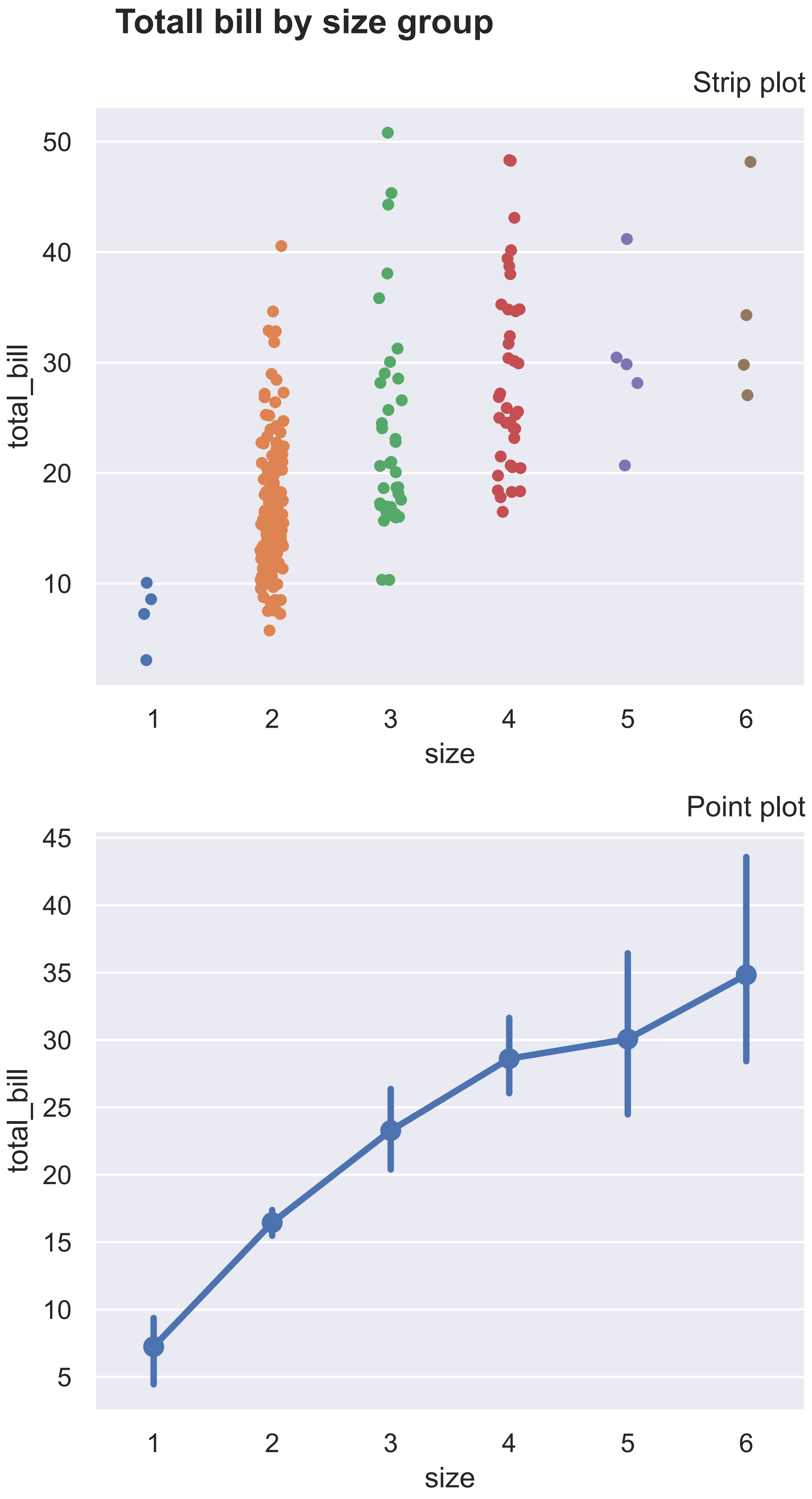
In [34]:

```python
# Size (cualitativa) i total_bill (quantitativa)
fig, (ax1, ax2) = plt.subplots(2,1 , figsize=(5, 9))

sns.stripplot(ax=ax1, data=tips, x="size", y="total_bill")
sns.pointplot(ax=ax2, data=tips, x="size", y="total_bill")

plt.suptitle("Totall bill by size group", x=0.38, fontweight="bold")
ax1.set_title("Strip plot", loc="right")
ax2.set_title("Point plot", loc="right")

plt.tight_layout()
plt.savefig("tips - graph1")
plt.show()
```



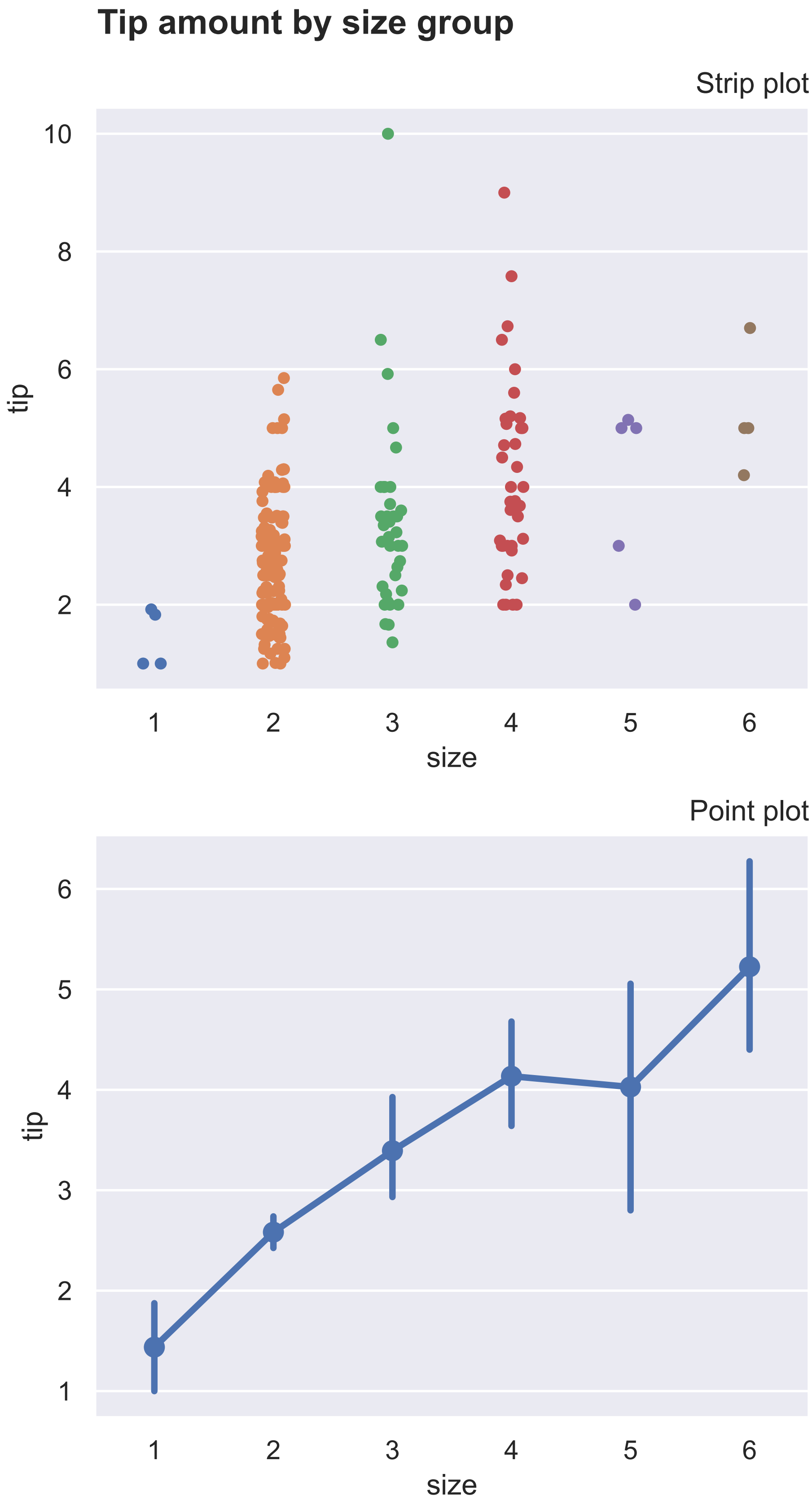
In [35]:

```
# Size (cualitativa) i tip (quantitativa)
fig, (ax1, ax2) = plt.subplots(2,1 , figsize=(5, 9))

sns.stripplot(ax=ax1, data=tips, x="size", y="tip")
sns.pointplot(ax=ax2, data=tips, x="size", y="tip")

plt.suptitle("Tip amount by size group", x=0.38, fontweight="bold")
ax1.set_title("Strip plot", loc="right")
ax2.set_title("Point plot", loc="right")

plt.tight_layout()
plt.savefig("tips - graph2")
plt.show()
```

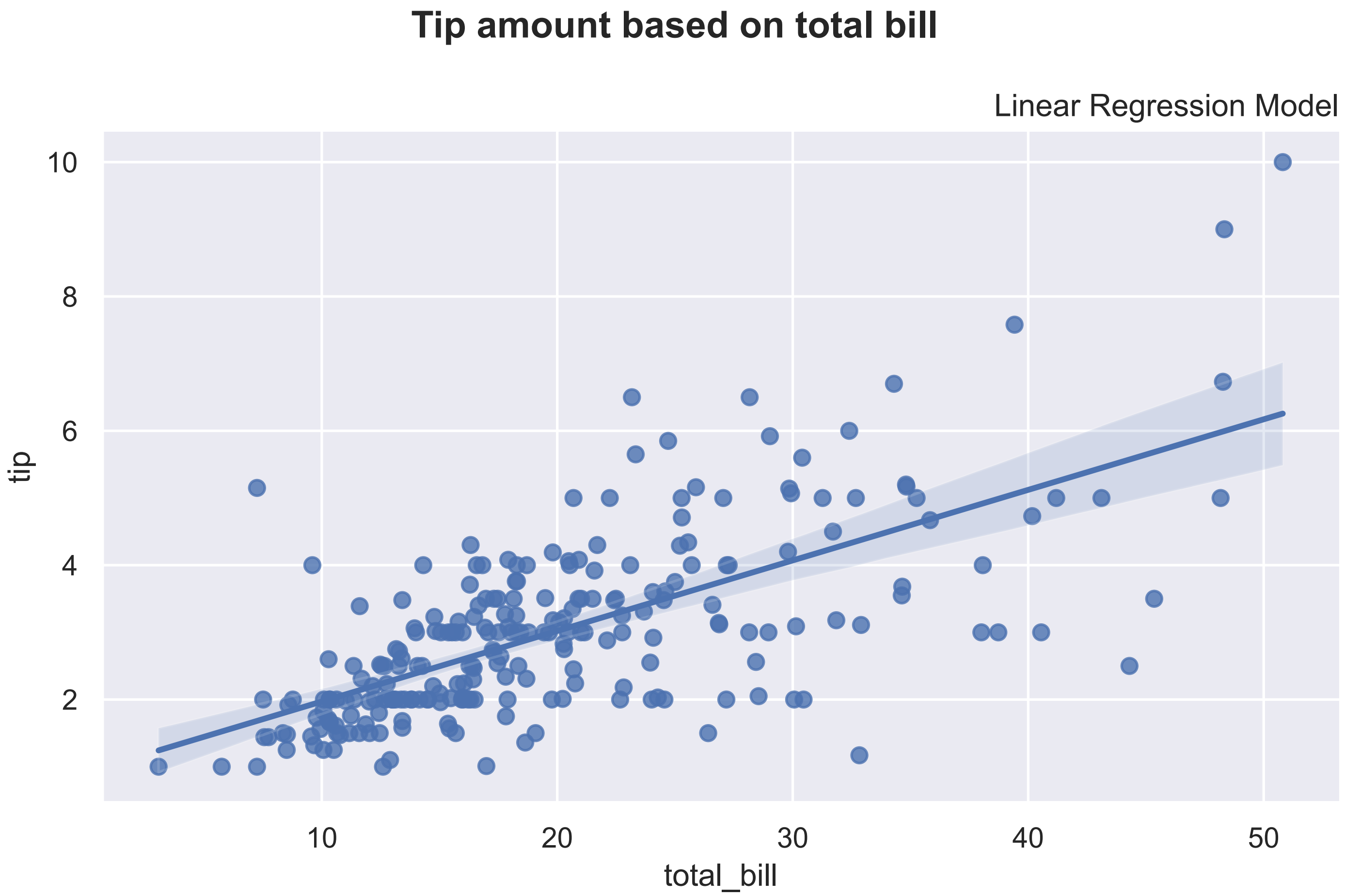


Relació entre propina i compte total

In [36]:

```
sns.lmplot(data=tips, x="total_bill", y="tip",
           aspect=1.5)

plt.suptitle("Tip amount based on total bill", fontweight="bold")
plt.title("Linear Regression Model", loc="right")
plt.tight_layout()
plt.savefig("tips - graph3")
plt.show()
```



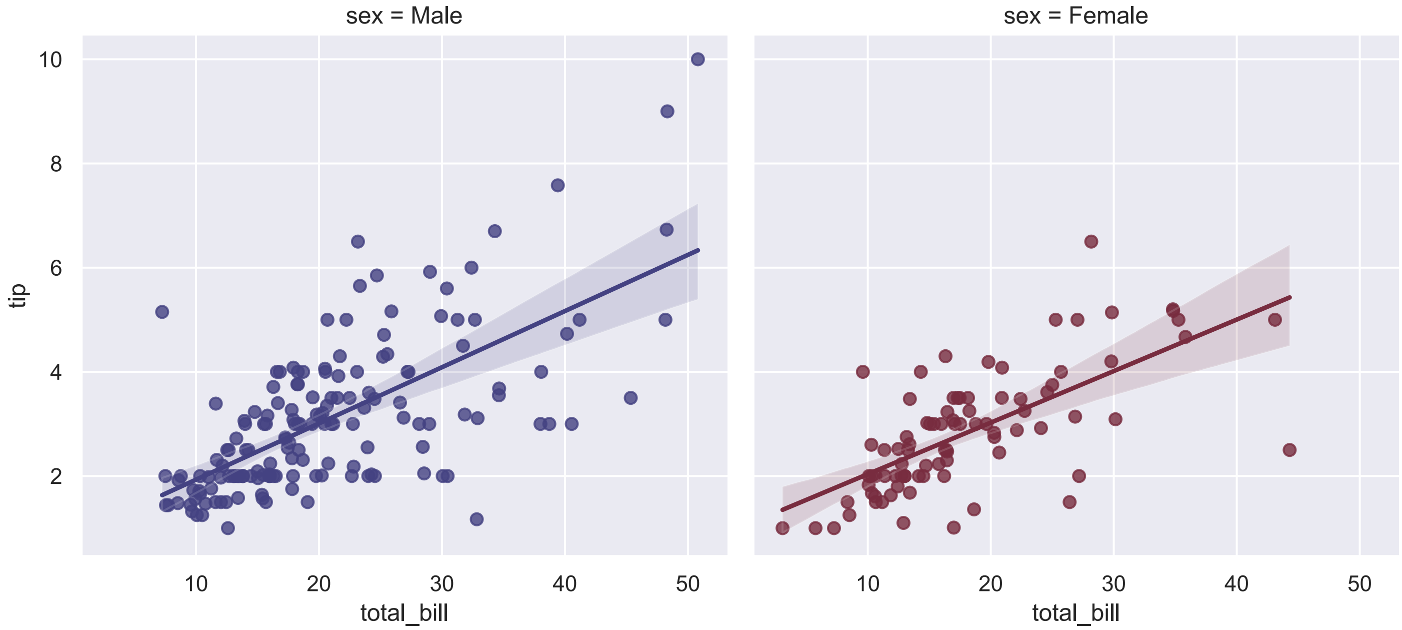
In [37]:

```
# Afegim una tercera variable qualitativa: sex
sns.lmplot(data=tips, x="total_bill", y="tip",
           hue="sex", col="sex",
           palette="icefire")

plt.suptitle("Tip amount based on total bill", fontweight="bold")

plt.tight_layout()
plt.savefig("tips - graph3")
plt.show()
```

Tip amount based on total bill



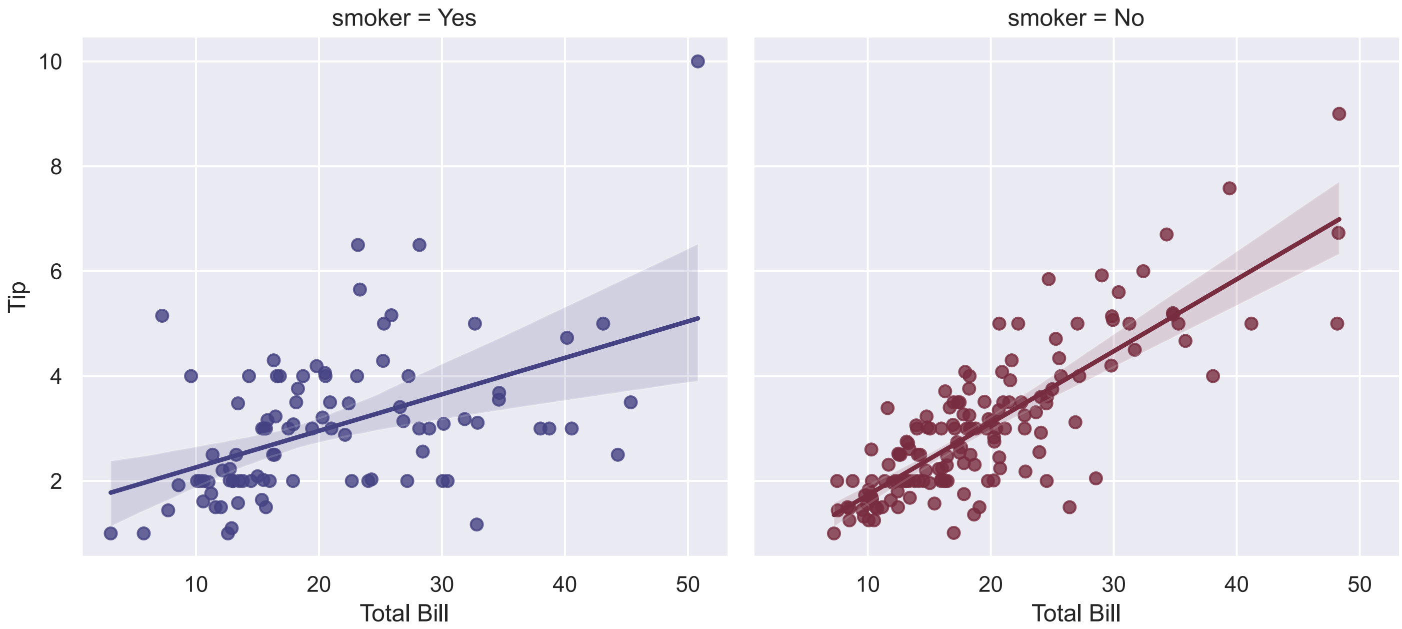
In [38]:

```python
# Afegim una tercera variable qualitativa: smoker
g = sns.lmplot(data=tips, x="total_bill", y="tip",
           hue="smoker", col="smoker",
           palette="icefire")

plt.suptitle("Tip amount based on total bill", fontweight="bold")
g.set_axis_labels("Total Bill", "Tip")

plt.tight_layout()
plt.savefig("tips - graph4")
plt.show()
```

Tip amount based on total bill

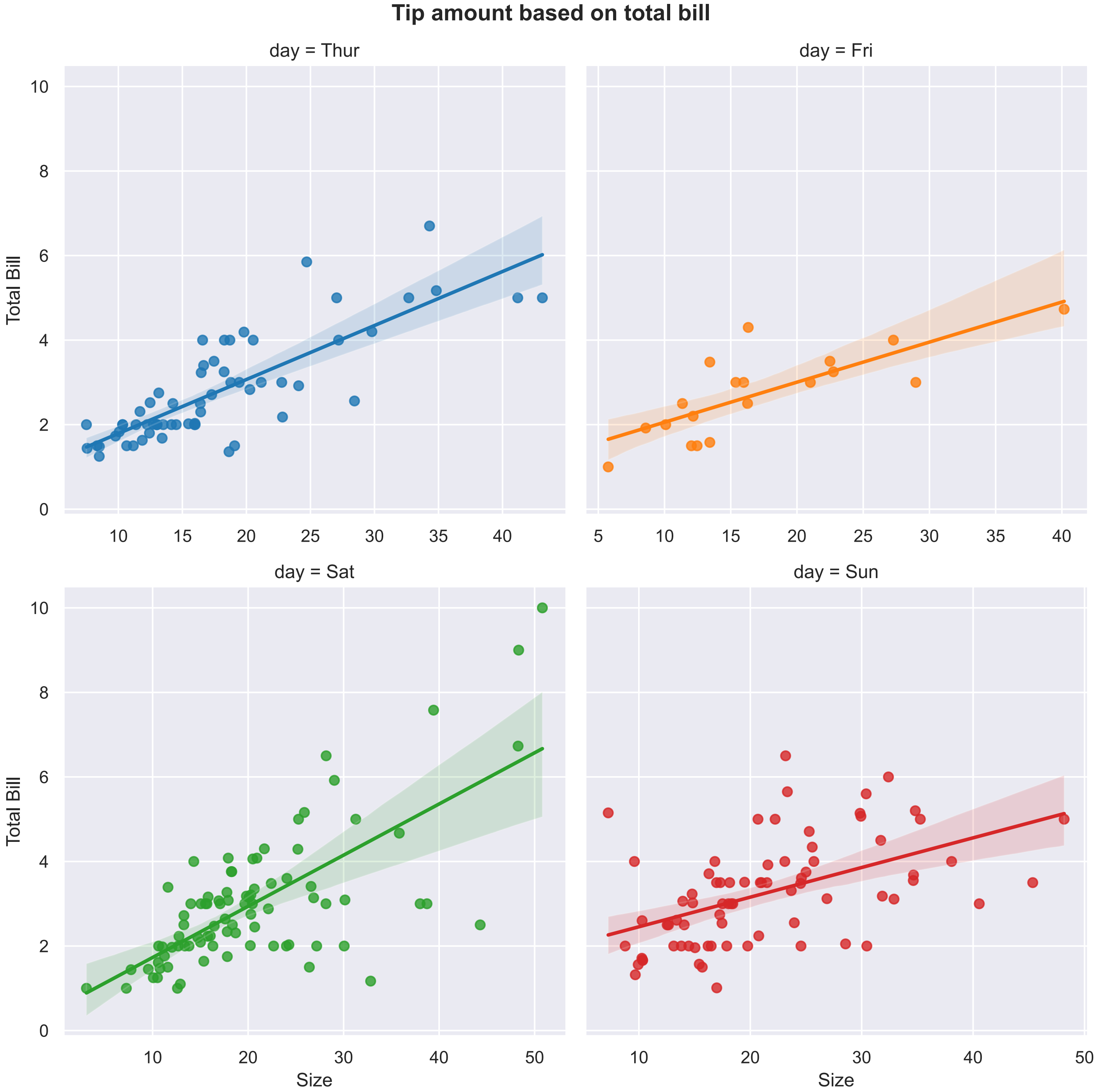


In [39]:

```python
# Afegim una tercera variable qualitativa: day
g= sns.lmplot(data=tips, x="total_bill", y="tip",
              hue="day", col="day", col_wrap=2,
              facet_kws=dict(sharex=False),
              palette="tab10")
```

```
plt.suptitle("Tip amount based on total bill", fontweight="bold")
g.set_axis_labels("Size", "Total Bill")

plt.tight_layout()
plt.savefig("tips - graph5")
plt.show()
```



In [40]:

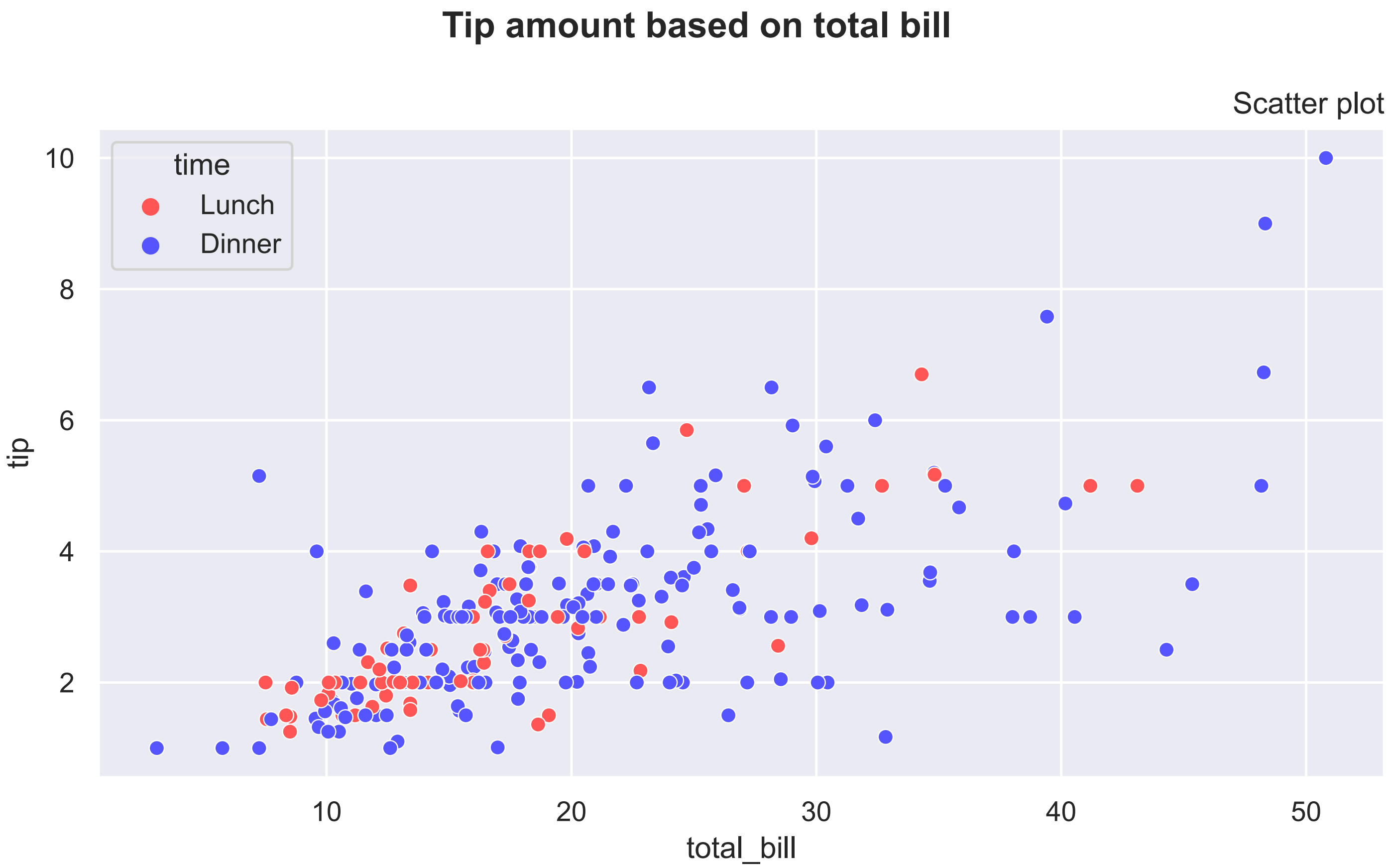
```
# Afegim una tercera variable: time

fig, ax = plt.subplots(figsize=(8, 5))

sns.scatterplot(data=tips, x="total_bill", y="tip",
                hue="time", ax=ax, palette="seismic_r")

plt.suptitle("Tip amount based on total bill", fontweight="bold")
plt.title("Scatter plot", loc="right")

plt.tight_layout()
plt.savefig("tips - graph6")
plt.show()
```



In [41]:

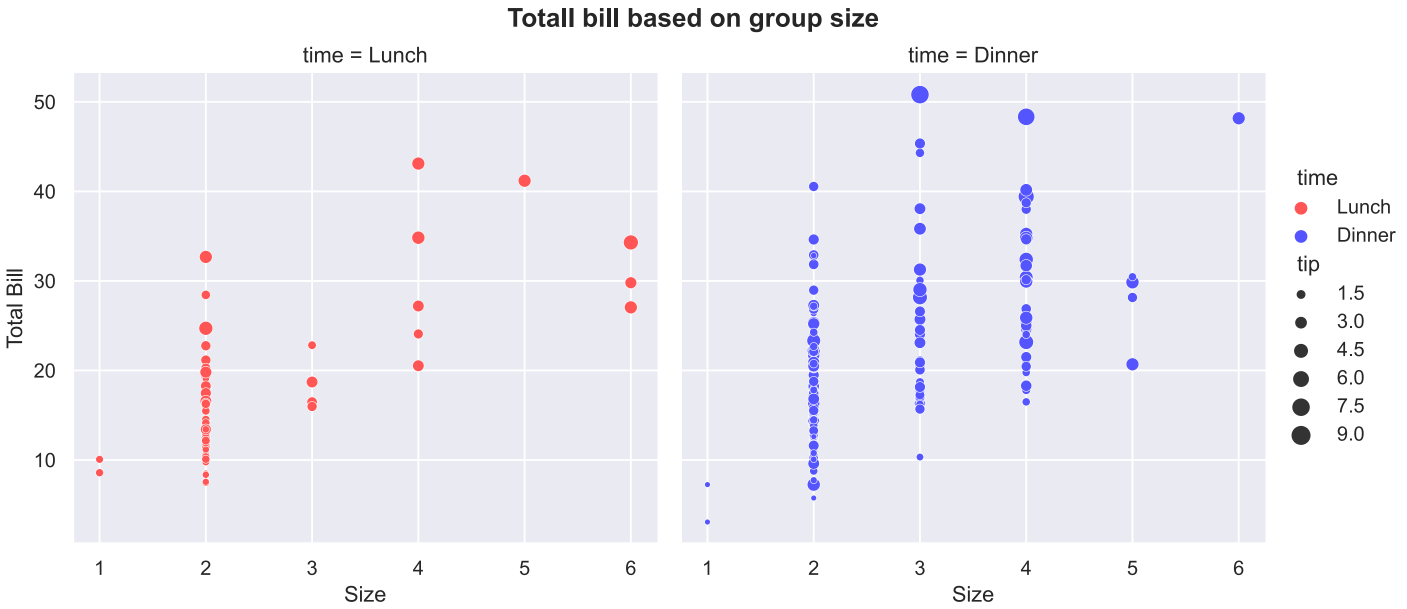
```
# Dues variables cualitatives (size, time) i dues quantitative (tip, total bill)

g = sns.relplot(data=tips, x="size", y="total_bill",
            hue="time", col="time",
            size="tip", sizes=(10,100),
            kind="scatter", palette="seismic_r")

plt.suptitle("Totall bill based on group size", fontweight="bold",
              x=0.5, y=0.95)

g.figure.subplots_adjust(top=0.85)
g.set_axis_labels("Size", "Total Bill")

plt.savefig("tips - graph7")
plt.show()
```



Exercici 2: Exploració i visualització del dataset movies.dat

Preparació del dataset

In [16]:

```
movies = pd.read_csv("movies.dat", sep="::", header=None,
                     names=["ID","Title", "Genre"],
                     encoding="latin-1", engine="python")
movies.head()
```

Out[16]:

	ID	Title	Genre
0	1	Toy Story (1995)	Animation|Children's|Comedy
1	2	Jumanji (1995)	Adventure|Children's|Fantasy
2	3	Grumpier Old Men (1995)	Comedy|Romance
3	4	Waiting to Exhale (1995)	Comedy|Drama
4	5	Father of the Bride Part II (1995)	Comedy

In [17]:

```
movies.drop("ID", axis=1, inplace=True)
```

Out[17]:

	Title	Genre
0	Toy Story (1995)	Animation|Children's|Comedy
1	Jumanji (1995)	Adventure|Children's|Fantasy
2	Grumpier Old Men (1995)	Comedy|Romance
3	Waiting to Exhale (1995)	Comedy|Drama
4	Father of the Bride Part II (1995)	Comedy
...	...	...
3878	Meet the Parents (2000)	Comedy
3879	Requiem for a Dream (2000)	Drama
3880	Tigerland (2000)	Drama

	Title	Genre
3881	Two Family House (2000)	Drama
3882	Contender, The (2000)	Drama|Thriller

3883 rows × 2 columns

In [18]:

```
movies['Year'] = movies['Title'].str.extract(r'\((\d{4})\)')
movies.replace('\(\d{4}\)', '', regex=True, inplace=True)
movies['Year'] = pd.to_numeric(movies['Year'])
movies.head()
```

Out[18]:

	Title	Genre	Year
0	Toy Story	Animation|Children's|Comedy	1995
1	Jumanji	Adventure|Children's|Fantasy	1995
2	Grumpier Old Men	Comedy|Romance	1995
3	Waiting to Exhale	Comedy|Drama	1995
4	Father of the Bride Part II	Comedy	1995

In [19]:

```
genres = [string.split("|") for string in movies.Genre]
genres_list = [item for sublist in [string.split("|") for string in movies.Genre] for iter
genres_list = pd.unique(genres_list)
genres_list.sort()
```

In [20]:

```
df_genres = pd.DataFrame(np.zeros((len(movies), len(genres_list))), columns=genres_list, c
df_genres
```

Out[20]:

	Action	Adventure	Animation	Children's	Comedy	Crime	Documentary	Drama	Fantasy	Film-Noir	Horror	M
0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	
3878	0	0	0	0	0	0	0	0	0	0	0	
3879	0	0	0	0	0	0	0	0	0	0	0	
3880	0	0	0	0	0	0	0	0	0	0	0	
3881	0	0	0	0	0	0	0	0	0	0	0	
3882	0	0	0	0	0	0	0	0	0	0	0	

3883 rows × 18 columns

In [21]:

```
for i, gen in enumerate(movies.Genre):
    indices = df_genres.columns.get_indexer(gen.split("|"))
    df_genres.iloc[i, indices] = 1

df_genres
```

Out[21]:

	Action	Adventure	Animation	Children's	Comedy	Crime	Documentary	Drama	Fantasy	Film-Noir	Horror	M
0	0	0	1	1	1	0	0	0	0	0	0	
1	0	1	0	1	0	0	0	0	1	0	0	
2	0	0	0	0	1	0	0	0	0	0	0	
3	0	0	0	0	1	0	0	1	0	0	0	
4	0	0	0	0	1	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	
3878	0	0	0	0	1	0	0	0	0	0	0	
3879	0	0	0	0	0	0	0	1	0	0	0	
3880	0	0	0	0	0	0	0	1	0	0	0	
3881	0	0	0	0	0	0	0	1	0	0	0	
3882	0	0	0	0	0	0	0	1	0	0	0	

3883 rows × 18 columns

In [22]:

```
movies = movies.join(df_genres)
movies.drop("Genre", axis=1, inplace=True)
movies.head()
```

Out[22]:

	Title	Year	Action	Adventure	Animation	Children's	Comedy	Crime	Documentary	Drama	Fantasy	Film-Noi
0	Toy Story	1995	0	0	1	1	1	0	0	0	0	0
1	Jumanji	1995	0	1	0	1	0	0	0	0	1	0
2	Grumpier Old Men	1995	0	0	0	0	1	0	0	0	0	0
3	Waiting to Exhale	1995	0	0	0	0	1	0	0	1	0	0
4	Father of the Bride Part II	1995	0	0	0	0	1	0	0	0	0	0

In [23]:

```
movies.shape
```

Out[23]:

```
(3883, 20)
```

In [24]:

```
movies.dtypes
```

Out[24]:

```
Title          object
Year            int64
Action          int32
Adventure       int32
Animation       int32
```

```
Children's       int32
Comedy           int32
Crime            int32
Documentary      int32
Drama            int32
Fantasy          int32
Film-Noir        int32
Horror           int32
Musical          int32
Mystery          int32
Romance          int32
Sci-Fi           int32
Thriller         int32
War              int32
Western          int32
dtype: object
```

Exploració del dataset

Pel·lícules per any

In [25]:

```
movies_per_year = movies["Year"].value_counts()
movies_per_year = movies_per_year.sort_index()
movies_per_year
```

Out[25]:

```
1919      3
1920      2
1921      1
1922      2
1923      3
       ...
1996    345
1997    315
1998    337
1999    283
2000    156
Name: Year, Length: 81, dtype: int64
```

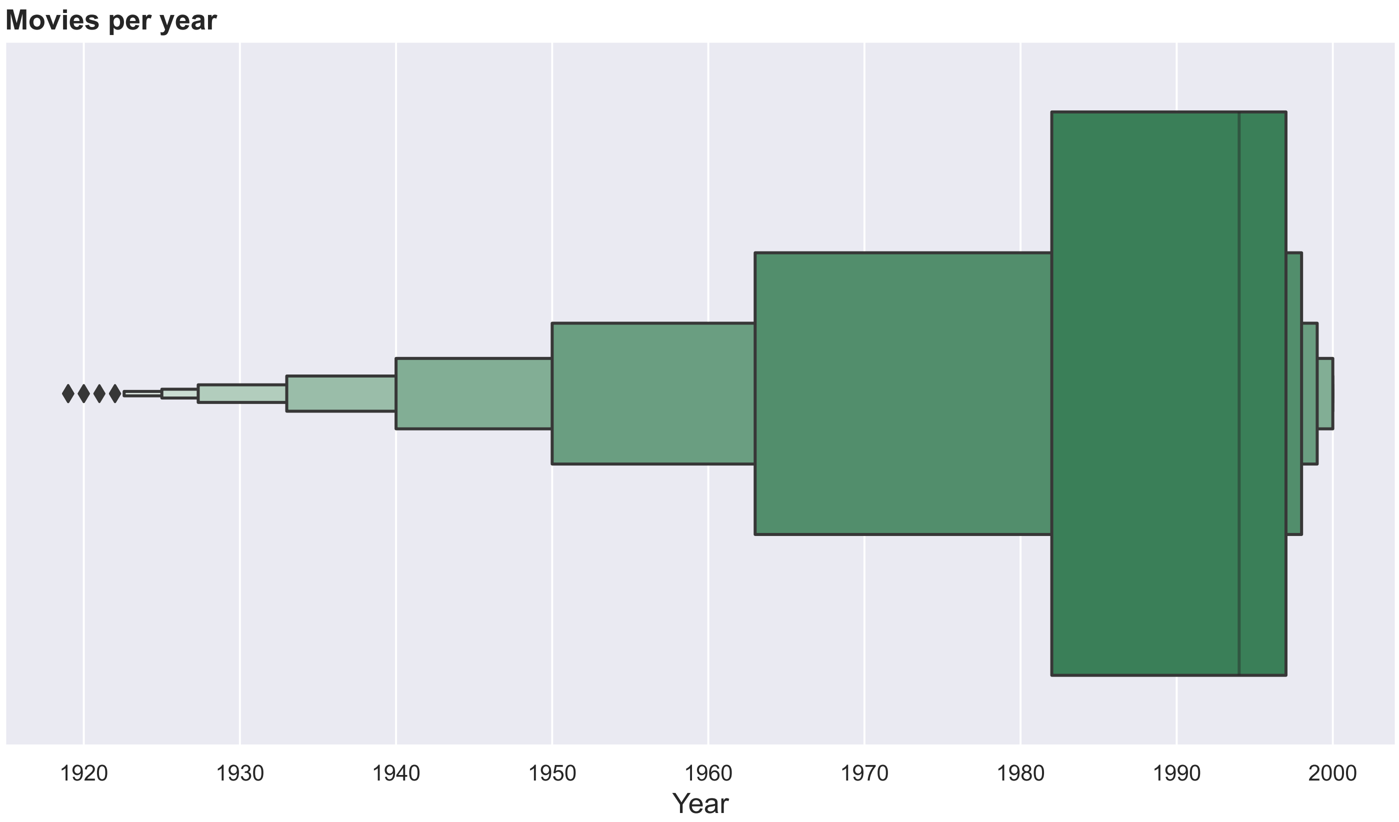
In [26]:

```
fig, ax = plt.subplots(figsize=(10,6))

sns.boxenplot(data=movies, x="Year", ax=ax,
              color="seagreen")

plt.title("Movies per year", fontweight="bold", loc="left", size=14)
ax.set_xlabel("Year", size=14)

plt.tight_layout()
plt.savefig("movies - graph1")
plt.show()
```



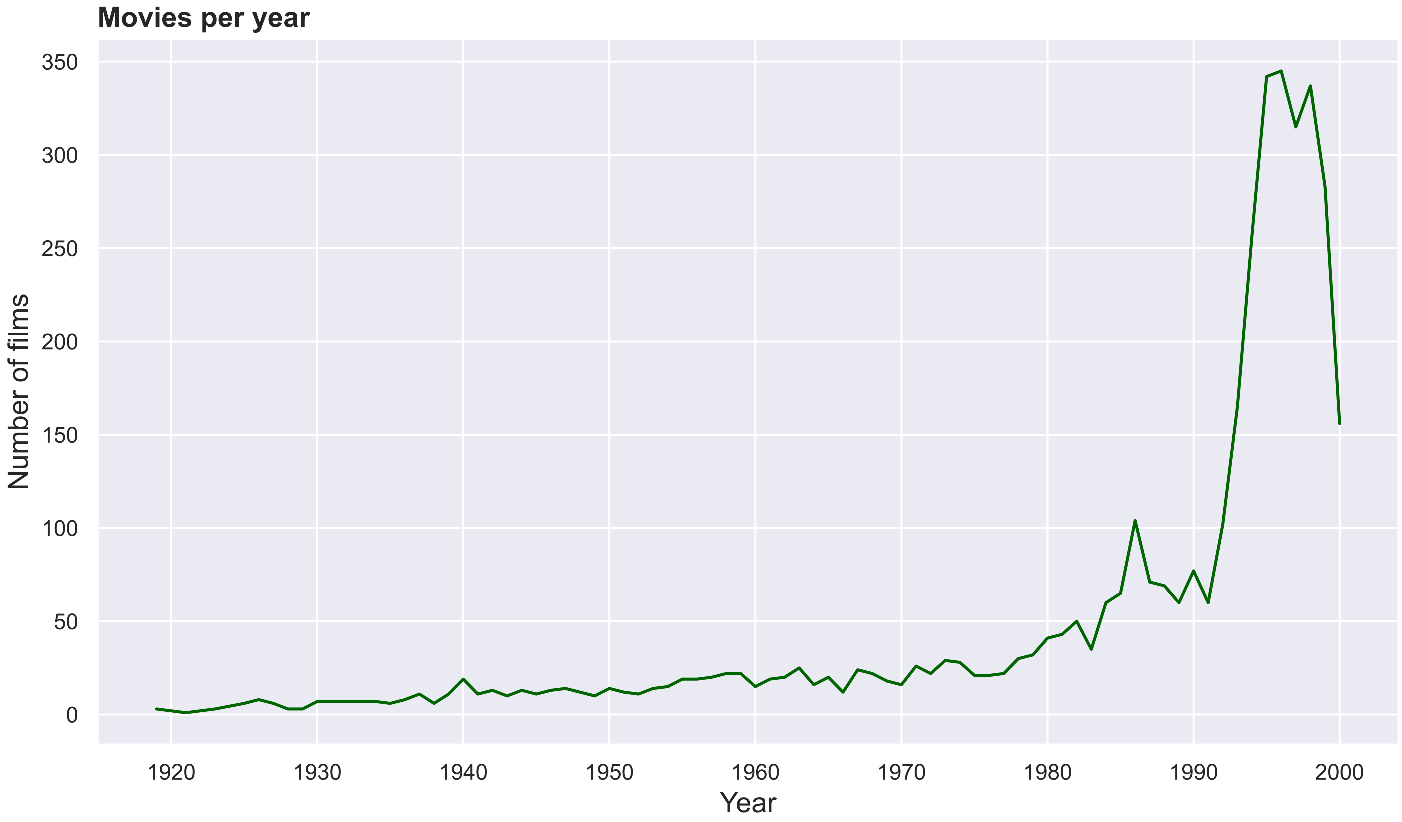
In [42]:

```
fig, ax = plt.subplots(figsize=(10,6))

sns.lineplot(data=movies_per_year, x=movies_per_year.index, y=movies_per_year.values,
             color="darkgreen", ax=ax)

plt.title("Movies per year", fontweight="bold", loc="left", size=14)
ax.set_xlabel("Year", size=14)
ax.set_ylabel("Number of films", size=14)

plt.tight_layout()
plt.savefig("movies - graph2")
plt.show()
```



Pel·lícules per gènere

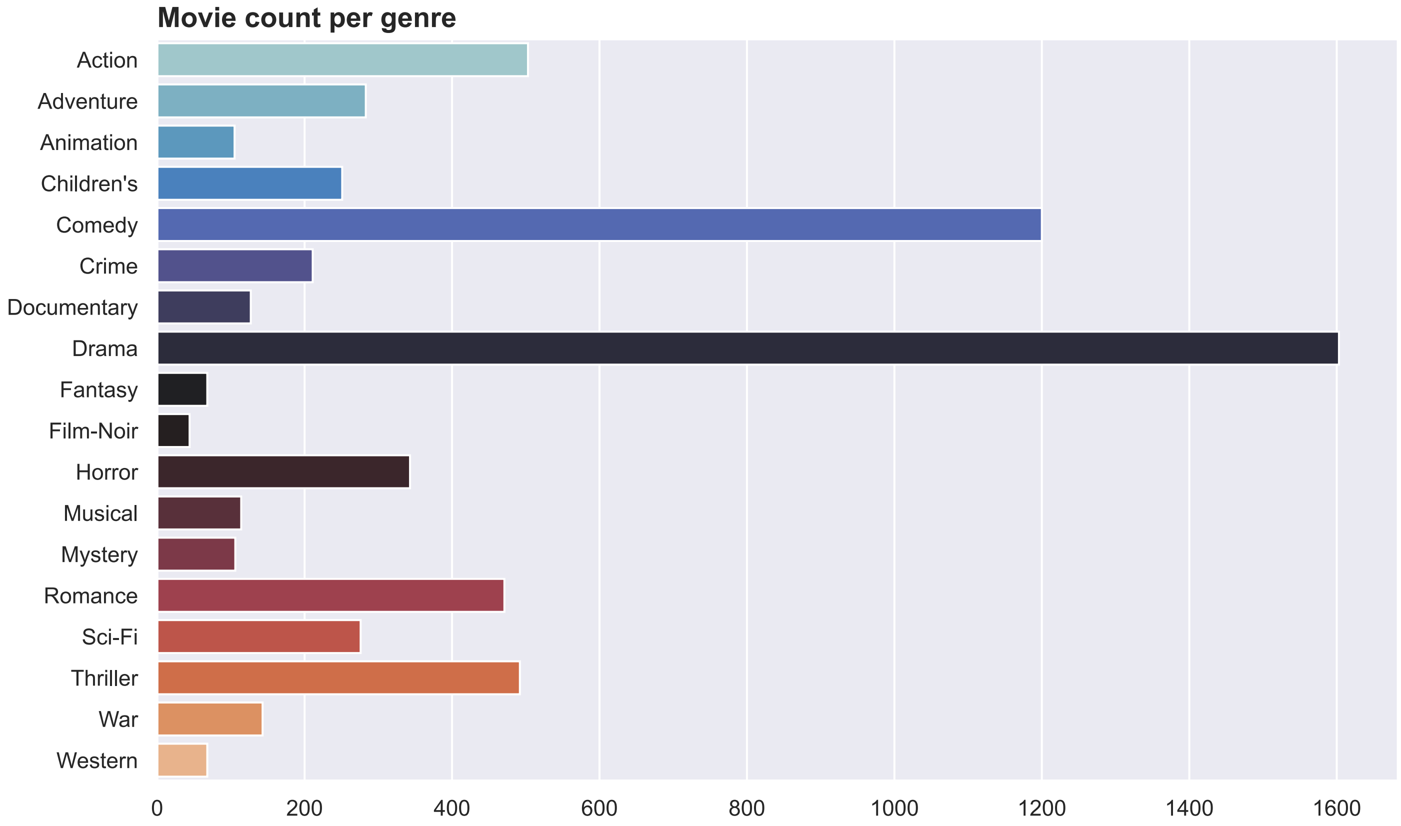
In [43]:

```
fig, ax = plt.subplots(figsize=(10,6))

sns.barplot(x=df_genres.sum(axis=0), y=df_genres.sum(axis=0).index,
            ax=ax, orient="h", palette="icefire")

plt.title("Movie count per genre", fontweight="bold", loc="left", size=14)

plt.tight_layout()
plt.savefig("movies - graph3")
plt.show()
```



In [29]:

```
# Afegim la columna Ngenres amb el nombre de gèneres de cada pel·lícula
movies["Ngenres"] = movies.iloc[:, 2:].sum(axis=1)
movies[["Ngenres", "Title"]].groupby("Ngenres").count()
```

Out[29]:

	Title
Ngenres	
1	2025
2	1322
3	421
4	100
5	14
6	1

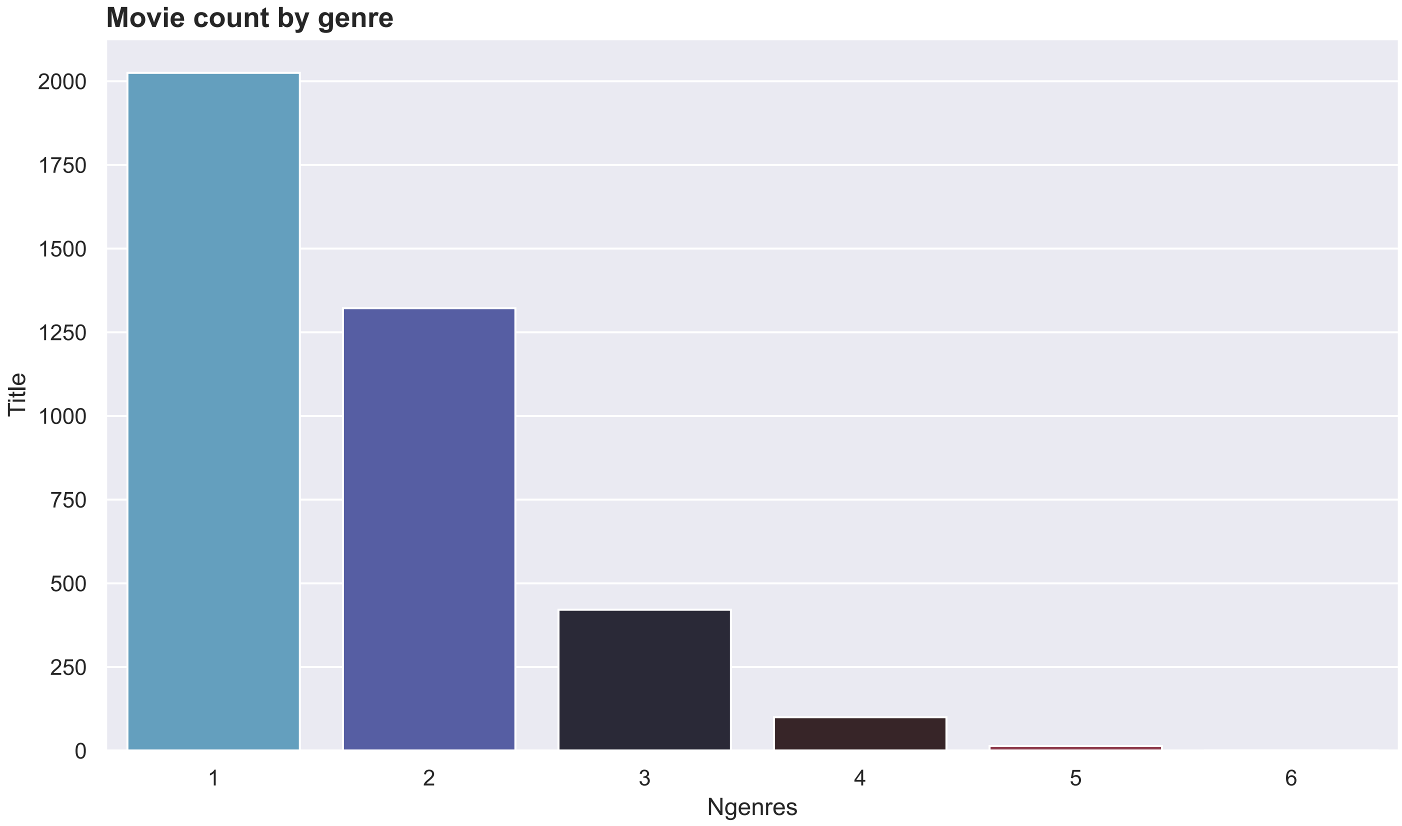
In [44]:

```
fig, ax = plt.subplots(figsize=(10,6))

sns.barplot(x=movies.groupby(["Ngenres"]).count().index, y=movies.groupby(["Ngenres"]).cou
            ax=ax, palette="icefire")

plt.title("Movie count by genre", fontweight="bold", loc="left", size=14)

plt.tight_layout()
plt.savefig("movies - graph4")
plt.show()
```



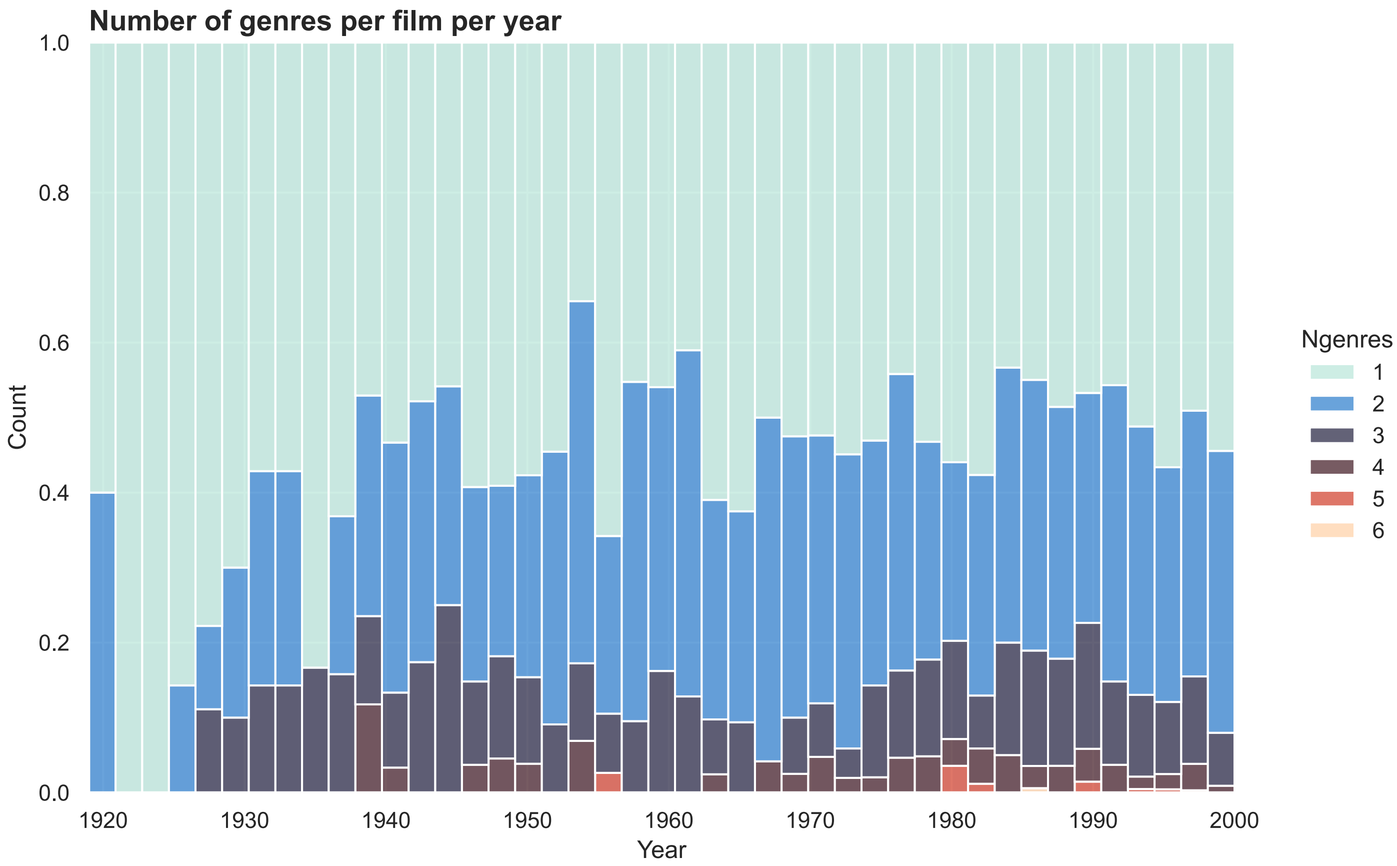
Evolució del gèneres per any

In [45]:

```
sns.displot(data=movies, x="Year", kind="hist",
            hue="Ngenres", multiple="fill",
            height=6, aspect=1.5, palette="icefire")

plt.title("Number of genres per film per year", fontweight="bold", loc="left", size=14)

plt.savefig("movies - graph5")
plt.show()
```



In [32]:

```
genres_per_year = movies.drop("Ngenres", axis=1).melt(id_vars=["Title", "Year"])
genres_per_year = genres_per_year[genres_per_year["value"] != 0]
genres_per_year = genres_per_year.groupby(["Year", "variable"]).count()
genres_per_year.unstack(level=0, fill_value=0)
```

Out[32]:

										Title	...					
Year	**1919**	**1920**	**1921**	**1922**	**1923**	**1925**	**1926**	**1927**	**1928**	**1929**	**...**	**1991**	**1992**	**1993**	**1994**	**1995**
variable																
Action	1	0	1	0	0	0	0	0	0	0	...	6	21	25	32	45
Adventure	1	0	0	0	0	0	1	0	0	0	...	4	3	10	15	25
Animation	0	0	0	0	0	0	0	0	0	0	...	2	3	4	5	8
Children's	0	0	0	0	0	0	0	0	0	0	...	3	7	12	20	22
Comedy	1	2	0	0	2	3	1	2	3	0	...	24	37	47	96	89
Crime	0	0	0	0	0	0	1	0	0	0	...	1	10	8	9	18
Documentary	0	0	0	0	0	0	0	0	0	0	...	1	1	5	11	22
Drama	2	0	0	1	1	3	4	4	0	1	...	26	38	81	121	158
Fantasy	0	0	0	0	0	0	0	0	0	0	...	3	1	3	5	4
Film-Noir	0	0	0	0	0	0	0	0	0	0	...	0	0	1	0	1
Horror	0	0	0	1	0	0	0	0	0	0	...	3	12	9	13	16
Musical	0	0	0	0	0	0	0	0	0	1	...	2	3	3	2	4
Mystery	0	0	0	0	0	0	0	0	0	0	...	4	2	7	3	8
Romance	0	0	0	0	0	0	0	2	0	0	...	9	14	18	37	50

										Title	...					
Year	**1919**	**1920**	**1921**	**1922**	**1923**	**1925**	**1926**	**1927**	**1928**	**1929**	**...**	**1991**	**1992**	**1993**	**1994**	**1995**
variable																
Sci-Fi	0	0	0	0	0	0	1	0	0	0	...	6	8	11	8	18
Thriller	0	0	0	0	0	0	1	0	0	1	...	7	14	22	31	43
War	0	0	0	0	0	1	0	1	0	0	...	1	3	5	7	12
Western	0	0	0	0	0	0	0	0	0	0	...	0	1	2	6	4

18 rows × 162 columns

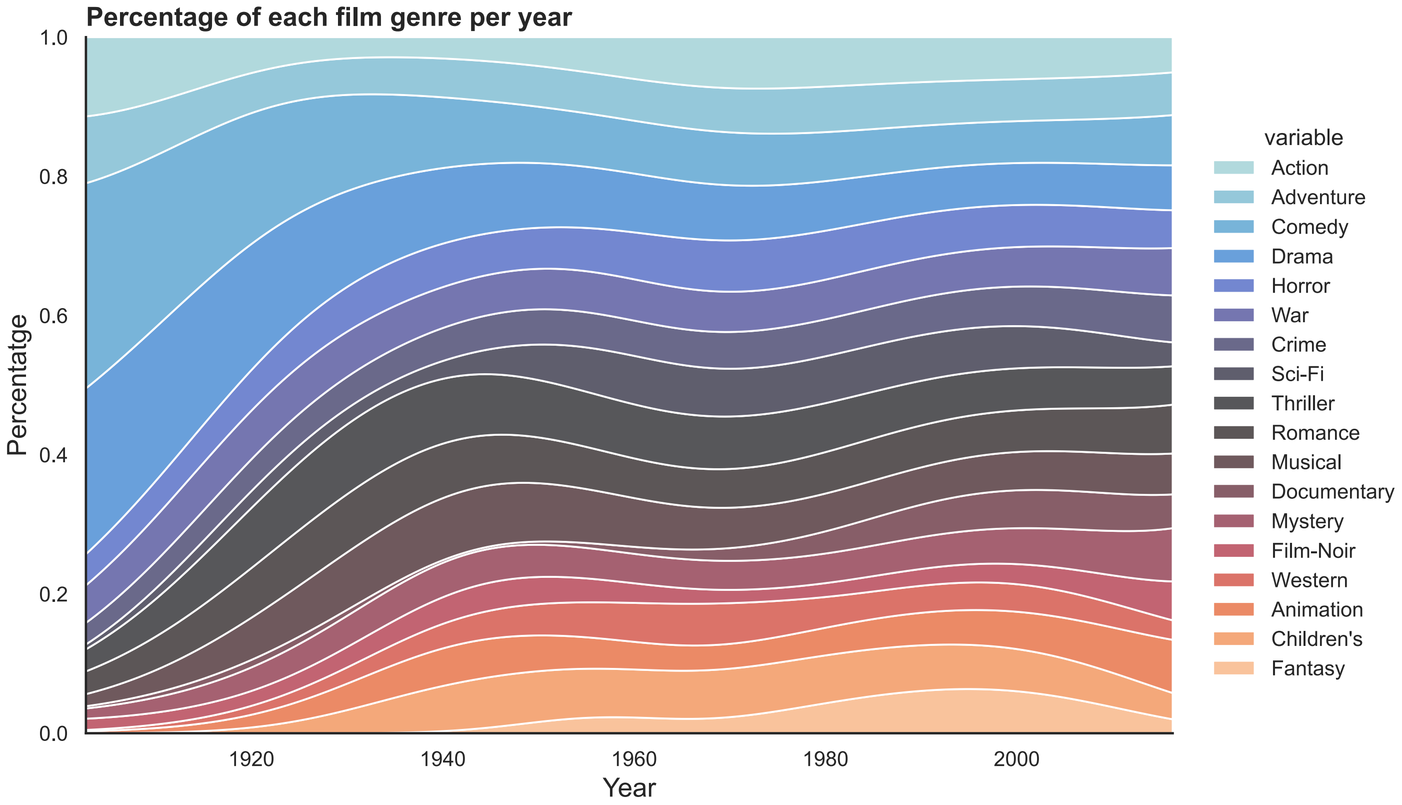
In [46]:

```
with sns.axes_style("white"):

    sns.displot(data=genres_per_year, x="Year", hue="variable",
                kind="kde", multiple="fill",
                height=6, aspect=1.5, palette="icefire")

    plt.title("Percentage of each film genre per year", fontweight="bold", loc="left", siz
    plt.xlabel("Year", size=14)
    plt.ylabel("Percentatge", size=14)

    plt.savefig("movies - graph6")
    plt.show()
```


Percentage of each film genre per year
Percentatge
Year
variable
Action
Adventure
Comedy
Drama
Horror
War
Crime
Sci-Fi
Thriller
Romance
Musical
Documentary
Mystery
Film-Noir
Western
Animation
Children's
Fantasy