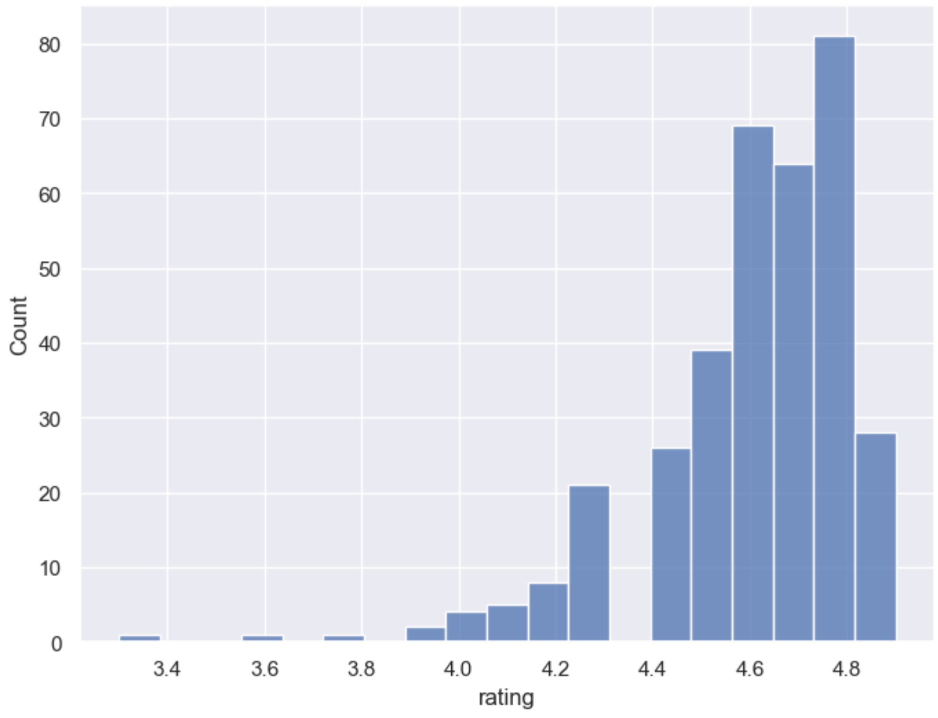
In [239]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
books = pd.read_csv("clean_books.csv")
```

In [240]:

```
sns.histplot(data=books , x='rating')
plt.show()
```



In [241]:

```
books.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 350 entries, 0 to 349
Data columns (total 5 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   name    350 non-null    object 
 1   author  350 non-null    object 
 2   rating  350 non-null    float64
 3   year    350 non-null    int64  
 4   genre   350 non-null    object 
dtypes: float64(1), int64(1), object(3)
memory usage: 13.8+ KB
```

In [242]:

```
books.value_counts("genre")
```

Out[242]:

```
genre
Non Fiction    179
Fiction        131
Childrens       40
dtype: int64
```

In [243]:

```
books['genre'].value_counts()
```

Out[243]:

```
Non Fiction    179
Fiction        131
Childrens       40
Name: genre, dtype: int64
```

In [244]:

```
books.value_counts("genre")
```

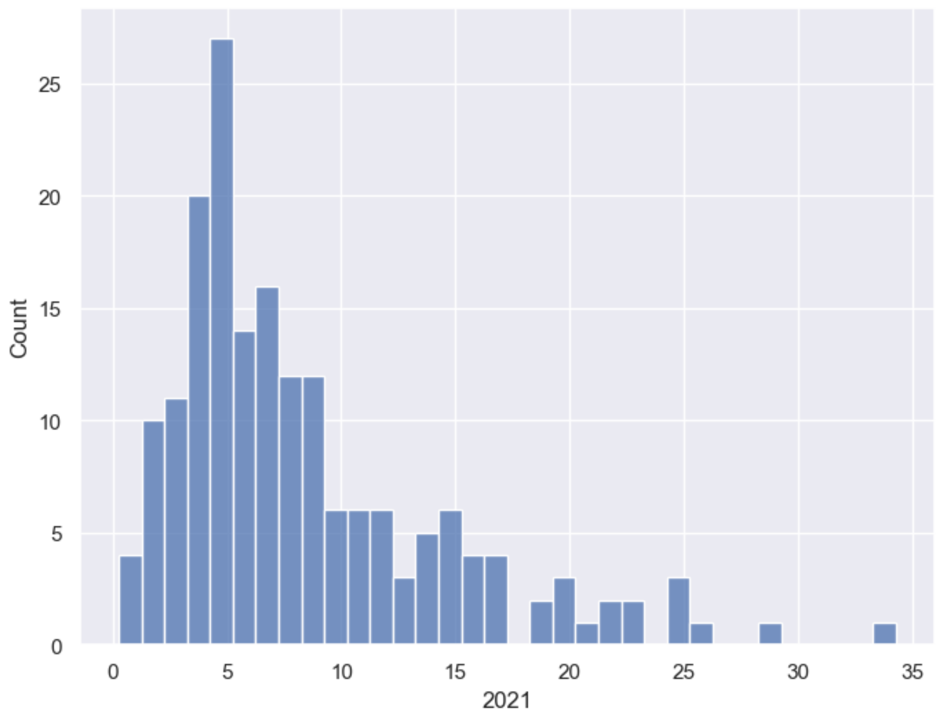
Out[244]:

```
genre
Non Fiction    179
Fiction        131
Childrens       40
dtype: int64
```

1

In [245]:

```
unemployment = pd.read_csv("clean_unemployment.csv")
sns.histplot(data=unemployment , x='2021' , binwidth = 1)
plt.show()
```



In [246]:

```
books.dtypes
```

Out[246]:

```
name       object
author     object
rating    float64
year        int64
genre      object
dtype: object
```

In [247]:

```
books["year"] = books["year"].astype(int)
books.dtypes
```

Out[247]:

```
name       object
author     object
rating    float64
year        int64
genre      object
dtype: object
```

Validating categorical data

In [248]:

```
books["genre"].isin(["Fiction" , "Non Fiction"])
```

Out[248]:

```
0       True
1       True
2       True
3       True
4      False
       ...
345     True
346     True
347     True
348     True
349    False
Name: genre, Length: 350, dtype: bool
```

In [249]:

```
books[books["genre"].isin(["Fiction", "Non Fiction"])].head()
```

Out[249]:

	name	author	rating	year	genre
0	10-Day Green Smoothie Cleanse	JJ Smith	4.7	2016	Non Fiction
1	11/22/63: A Novel	Stephen King	4.6	2011	Fiction
2	12 Rules for Life: An Antidote to Chaos	Jordan B. Peterson	4.7	2018	Non Fiction
3	1984 (Signet Classics)	George Orwell	4.7	2017	Fiction
5	A Dance with Dragons (A Song of Ice and Fire)	George R. R. Martin	4.4	2011	Fiction

In [250]:

```
books.select_dtypes("number").head()
```

Out[250]:

	rating	year
0	4.7	2016
1	4.6	2011
2	4.7	2018
3	4.7	2017
4	4.8	2019

In [251]:

```
books["year"].min()
```

Out[251]:

```
2009
```

In [252]:

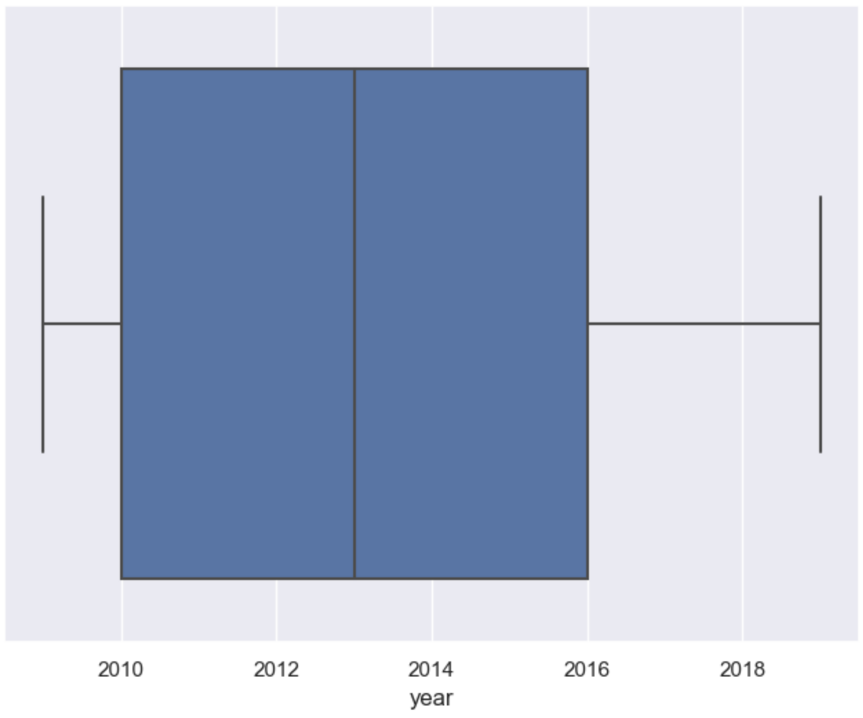
```
books["year"].max()
```

Out[252]:

```
2019
```

In [253]:

```
sns.boxplot(data=books , x = "year")
plt.show()
```

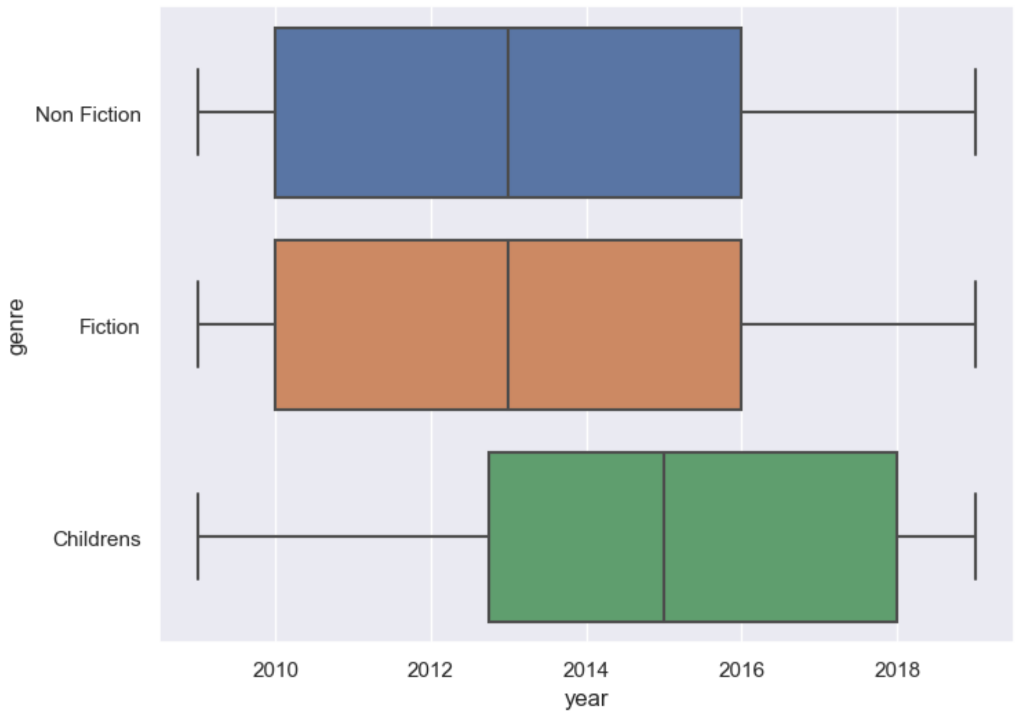


In [254]:

```
sns.boxplot(data = books , x="year" , y ="genre")
```

Out[254]:

```
<AxesSubplot:xlabel='year', ylabel='genre'>
```



2

In [255]:

```
unemployment = pd.read_csv("clean_unemployment.csv")
not_oceania = ~unemployment['continent'].isin(["Oceania"])
not_oceania
```

Out[255]:

```
0       True
1       True
2       True
3       True
4       True
       ...
177    False
178     True
179     True
180     True
181     True
Name: continent, Length: 182, dtype: bool
```

3

In [256]:

```
unemployment["2021"].min()

```

Out[256]:

```
0.26
```

In [257]:

```
unemployment["2021"].max()
```

Out[257]:

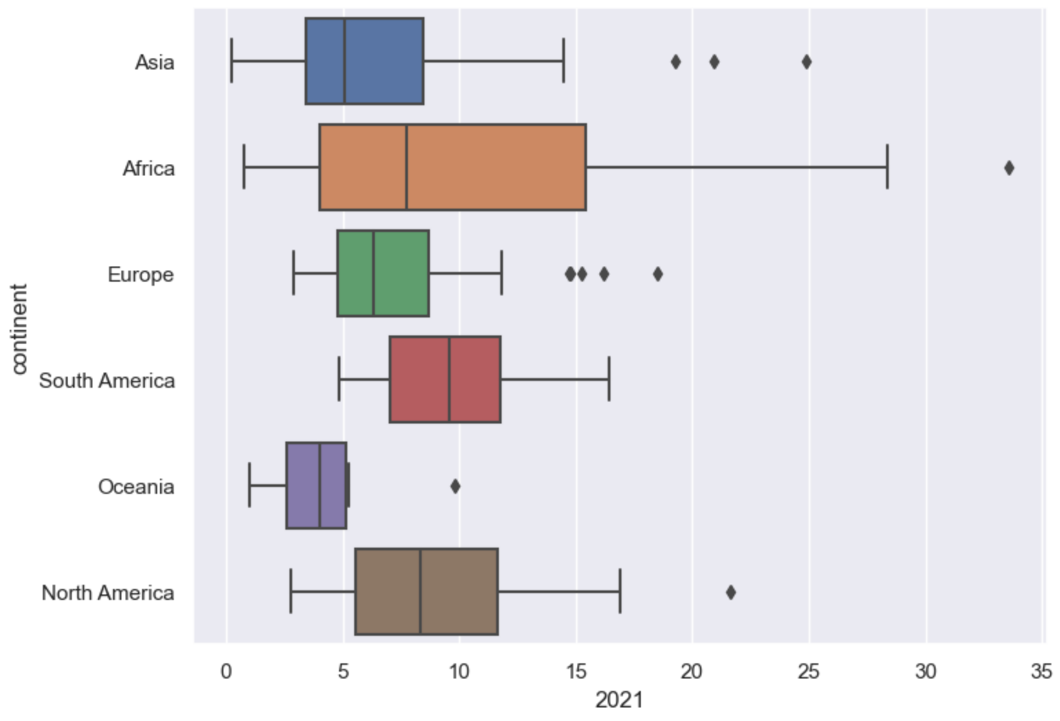
```
33.56
```

In [258]:

```
sns.boxplot(data=unemployment , x = "2021" , y="continent")
```

Out[258]:

```
<AxesSubplot:xlabel='2021', ylabel='continent'>
```



Exploring groups of data

In [259]:

```
books.groupby("genre").mean()
```

Out[259]:

genre	rating	year
Childrens	4.780000	2015.075000
Fiction	4.570229	2013.022901
Non Fiction	4.598324	2013.513966

In [260]:

```
books.agg(["mean" , "std"])
```

```
/var/folders/4j/bnvctt7152z615l6szd4m7wh0000gn/T/ipykernel_49443/1965544463.py:1: FutureWarning: ['name', 'au
thor', 'genre'] did not aggregate successfully. If any error is raised this will raise in a future version of
pandas. Drop these columns/ops to avoid this warning.
  books.agg(["mean" , "std"])
```

Out[260]:

	rating	year
mean	4.608571	2013.508571
std	0.226941	3.284711

In [261]:

```
books.agg({"rating": ["mean", "std"] , "year":["median"]})
```

Out[261]:

	rating	year
mean	4.608571	NaN
std	0.226941	NaN
median	NaN	2013.0

In [262]:

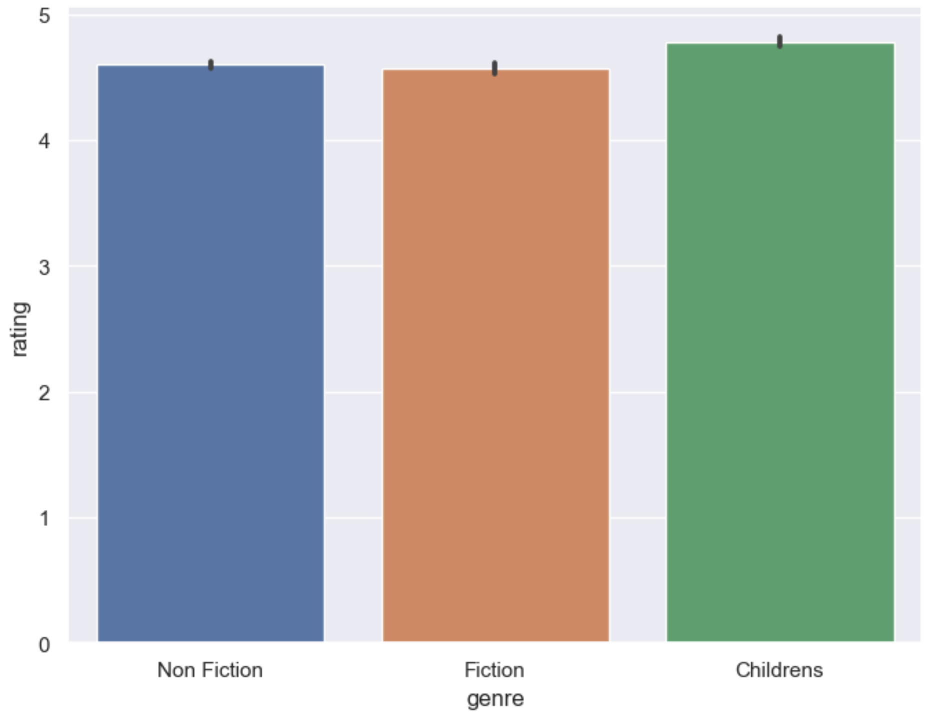
```
books.groupby("genre").agg(mean_rating=("rating", "mean"),
 std_rating = ("rating" , "std"),
 median_year =("year" , "median")
                          )
```

Out[262]:

genre	mean_rating	std_rating	median_year
Childrens	4.780000	0.122370	2015.0
Fiction	4.570229	0.281123	2013.0
Non Fiction	4.598324	0.179411	2013.0

In [263]:

```
sns.barplot(data=books, x = "genre" ,y = "rating")
plt.show()
```



4

In [264]:

```
unemployment.agg(["mean" , "std"])
```

```
/var/folders/4j/bnvctt7152z6l5l6szd4m7wh0000gn/T/ipykernel_49443/2501974079.py:1: FutureWarning: ['country_co
de', 'country_name', 'continent'] did not aggregate successfully. If any error is raised this will raise in a
future version of pandas. Drop these columns/ops to avoid this warning.
  unemployment.agg(["mean" , "std"])
```

Out[264]:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
mean	8.409286	8.315440	8.317967	8.344780	8.179670	8.058901	7.925879	7.668626	7.426429	7.243736	8.420934	8.390879
std	6.248887	6.266795	6.367270	6.416041	6.284241	6.161170	6.045439	5.902152	5.818915	5.696573	6.040915	6.067192

In [265]:

```python
unemployment.groupby("continent").agg(["mean" , "std"])
```

```
/var/folders/4j/bnvctt7152z61516szd4m7wh0000gn/T/ipykernel_49443/564087925.py:1: FutureWarning: ['country_cod
e', 'country_name'] did not aggregate successfully. If any error is raised this will raise in a future versio
n of pandas. Drop these columns/ops to avoid this warning.
  unemployment.groupby("continent").agg(["mean" , "std"])
```

Out[265]:

	2010		2011		2012		2013		2014		...	2017		2018
	mean	std	mean	std	mean	std	mean	std	mean	std	...	mean	std	mean
continent														
Africa	9.343585	7.411259	9.369245	7.401556	9.240755	7.264542	9.132453	7.309285	9.121321	7.291359	...	9.284528	7.407620	9.237925
Asia	6.240638	5.146175	5.942128	4.779575	5.835319	4.756904	5.852128	4.668405	5.853191	4.681301	...	6.171277	5.277201	6.090213
Europe	11.008205	6.392063	10.947949	6.539538	11.325641	7.003527	11.466667	6.969209	10.971282	6.759765	...	8.359744	5.177845	7.427436
North America	8.663333	5.115805	8.563333	5.377041	8.448889	5.495819	8.840556	6.081829	8.512222	5.801927	...	7.391111	5.326446	7.281111
Oceania	3.622500	2.054721	3.647500	2.008466	4.103750	2.723118	3.980000	2.640119	3.976250	2.659205	...	3.872500	2.492834	3.851250
South America	6.870833	2.807058	6.518333	2.801577	6.410833	2.936508	6.335000	2.808780	6.347500	2.834332	...	7.281667	3.398994	7.496667

6 rows × 24 columns

5

In [266]:

```python

continent_summary = unemployment.groupby("continent").agg(mean_rate_2021=("2021" , "mean"),
                                                          std_rate = ("2021" , "std"))
continent_summary

```

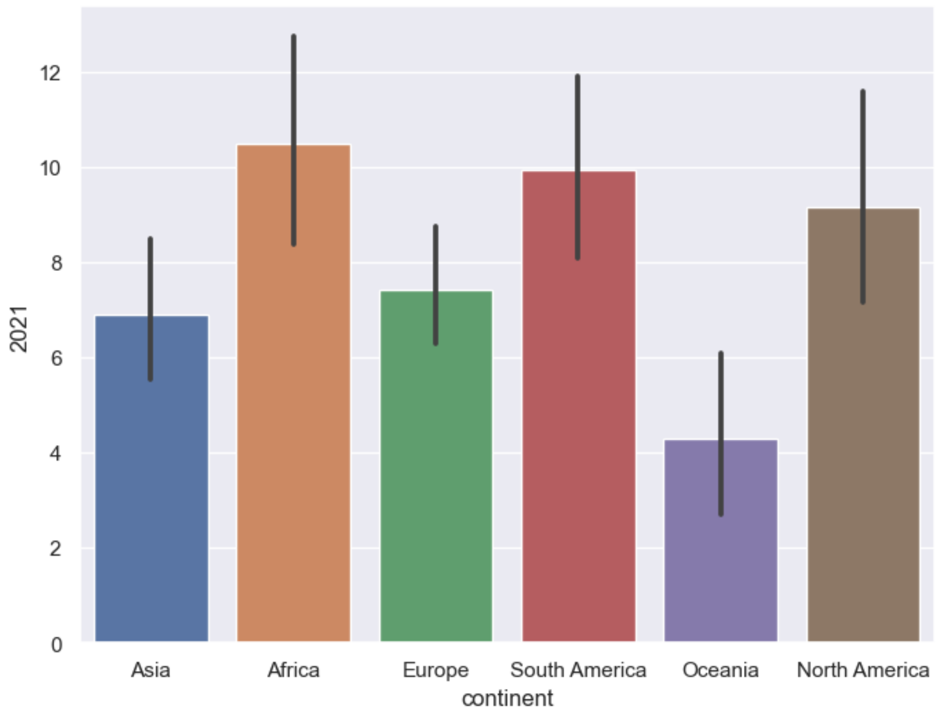
Out[266]:

	mean_rate_2021	std_rate
continent		
Africa	10.473585	8.131636
Asia	6.906170	5.414745
Europe	7.414872	3.947825
North America	9.155000	5.076482
Oceania	4.280000	2.671522
South America	9.924167	3.611624

6

In [267]:

```
sns.barplot(data=unemployment, x = "continent" ,y = "2021")
plt.show()
```



In [268]:

```
salaries = pd.read_csv("ds_salaries_clean.csv")

```

In [269]:

```
print(salaries.isna().sum())
```

```
Working_Year             0
Designation              0
Experience               0
Employment_Status        0
Employee_Location        0
Company_Size             0
Remote_Working_Ratio     0
Salary_USD               0
dtype: int64
```

In [270]:

```
threshold = len(salaries) * 0.05
print(threshold)
```

```
30.35
```

In [271]:

```
cols_to_drop = salaries.columns[salaries.isna().sum() <= threshold]
print(cols_to_drop)
```

```
Index(['Working_Year', 'Designation', 'Experience', 'Employment_Status',
       'Employee_Location', 'Company_Size', 'Remote_Working_Ratio',
       'Salary_USD'],
      dtype='object')
```

In [272]:

```
salaries.dropna(subset = cols_to_drop , inplace = True)
```

In [273]:

```
cols_with_missing_values = salaries.columns[salaries.isna().sum() > 0]
print(cols_with_missing_values)
```

```
Index([], dtype='object')
```

In [274]:

```
for col in cols_with_missing_values[:-1]:
    salaries[col].fillna(salaries[col].mode()[0])
```

In [275]:

```
print(salaries.isna().sum())
```

```
Working_Year            0
Designation             0
Experience              0
Employment_Status       0
Employee_Location       0
Company_Size            0
Remote_Working_Ratio    0
Salary_USD              0
dtype: int64
```

In [276]:

```
salaries_dict = salaries.groupby("Experience")["Salary_USD"].median().to_dict()
print(salaries_dict)
```

```
{'Entry': 53948.0, 'Executive': 163694.5, 'Mid': 73465.0, 'Senior': 129380.0}
```

In [277]:

```
salaries["Salary_USD"] = salaries["Salary_USD"].fillna(salaries["Experience"].map(salaries_dict))
print(salaries.isna().sum())
```

```
Working_Year            0
Designation             0
Experience              0
Employment_Status       0
Employee_Location       0
Company_Size            0
Remote_Working_Ratio    0
Salary_USD              0
dtype: int64
```

7

In [278]:

```
planes = pd.read_csv("Airlines_unclean.csv" , index_col = 0)
print(planes.isna().sum())
```

```
Airline            427
Date_of_Journey    322
Source             187
Destination        347
Route              256
Dep_Time           260
Arrival_Time       194
Duration           214
Total_Stops        212
Additional_Info    589
Price              616
dtype: int64
```

In [279]:

```
threshold = len(planes) * 0.05
print(threshold)
```

```
533.0
```

In [280]:

```
cols_to_drop = planes.columns[planes.isna().sum() <= threshold]
print(cols_to_drop)
```

```
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
       'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops'],
      dtype='object')
```

In [281]:

```
planes.dropna(subset = cols_to_drop , inplace = True)
```

In [282]:

```
cols_with_missing_values = planes.columns[planes.isna().sum() > 0]
print(cols_with_missing_values)
```

```
Index(['Additional_Info', 'Price'], dtype='object')
```

In [283]:

```
for col in cols_with_missing_values[:-1]:
    planes[col].fillna(planes[col].mode()[0])
```

In [284]:

```
print(planes.isna().sum())
```

```
Airline              0
Date_of_Journey      0
Source               0
Destination          0
Route                0
Dep_Time             0
Arrival_Time         0
Duration             0
Total_Stops          0
Additional_Info    300
Price              368
dtype: int64
```

Strategies for remaining missing data.

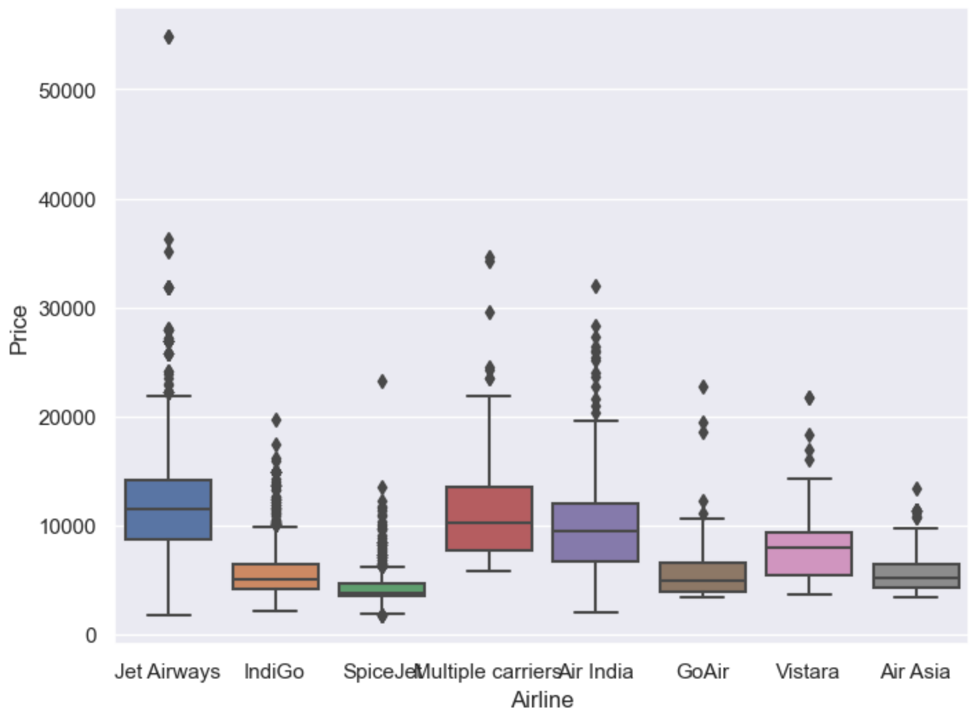
In [285]:

```
# Check the values of the Additional_Info column
print(planes["Additional_Info"].value_counts())

# Create a box plot of Price by Airline
sns.boxplot(data=planes, x='Airline', y='Price')
sns.set(rc={"figure.figsize":(8, 6)}) #width=8, #height=6
plt.show()

```

```
No info                         6399
In-flight meal not included     1525
No check-in baggage included     258
1 Long layover                    14
Change airports                    7
No Info                            2
Business class                     1
Red-eye flight                     1
2 Long layover                     1
Name: Additional_Info, dtype: int64
```



8

In [286]:

```
planes = planes.drop(columns = ['Additional_Info'])
planes_dict = planes.groupby("Airline")["Price"].median().to_dict()


print(planes_dict)

```

```
{'Air Asia': 5192.0, 'Air India': 9443.0, 'GoAir': 5003.5, 'IndiGo': 5054.0, 'Jet Airways': 11507.0, 'Multipl
e carriers': 10197.0, 'SpiceJet': 3873.0, 'Vistara': 8028.0}
```

In [287]:

```
planes["Price"] = planes["Price"].fillna(planes["Airline"].map(planes_dict))
print(planes.isna().sum())
```

```
Airline            0
Date_of_Journey    0
Source             0
Destination        0
Route              0
Dep_Time           0
Arrival_Time       0
Duration           0
Total_Stops        0
Price              0
dtype: int64
```

WORKING WITH CATEGORICAL DATA

In [288]:

```
salaries = pd.read_csv("ds_salaries_clean.csv")
print(salaries.select_dtypes("object").head())
```

```
                  Designation Experience Employment_Status Employee_Location  \
0              Data Scientist        Mid                FT                DE   
1   Machine Learning Scientist     Senior                FT                JP   
2           Big Data Engineer     Senior                FT                GB   
3        Product Data Analyst        Mid                FT                HN   
4    Machine Learning Engineer     Senior                FT                US   

  Company_Size  
0            L  
1            S  
2            M  
3            S  
4            L  
```

In [289]:

```
print(salaries["Designation"].value_counts())
```

```
Data Scientist                              143
Data Engineer                               132
Data Analyst                                 97
Machine Learning Engineer                    41
Research Scientist                           16
Data Science Manager                         12
Data Architect                               11
Big Data Engineer                             8
Machine Learning Scientist                    8
Principal Data Scientist                      7
AI Scientist                                  7
Data Science Consultant                       7
Director of Data Science                      7
Data Analytics Manager                        7
ML Engineer                                   6
Computer Vision Engineer                      6
BI Data Analyst                               6
Lead Data Engineer                            6
Data Engineering Manager                      5
Business Data Analyst                         5
Head of Data                                  5
Applied Data Scientist                        5
Applied Machine Learning Scientist            4
Head of Data Science                          4
Analytics Engineer                            4
Data Analytics Engineer                       4
Machine Learning Developer                    3
Machine Learning Infrastructure Engineer      3
Lead Data Scientist                           3
Computer Vision Software Engineer             3
Lead Data Analyst                             3
Data Science Engineer                         3
Principal Data Engineer                       3
Principal Data Analyst                        2
ETL Developer                                 2
Product Data Analyst                          2
Director of Data Engineering                  2
Financial Data Analyst                        2
Cloud Data Engineer                           2
Lead Machine Learning Engineer                1
NLP Engineer                                  1
Head of Machine Learning                      1
3D Computer Vision Researcher                 1
Data Specialist                               1
Staff Data Scientist                          1
Big Data Architect                            1
Finance Data Analyst                          1
Marketing Data Analyst                        1
Machine Learning Manager                      1
Data Analytics Lead                           1
Name: Designation, dtype: int64
```

In [290]:

```
print(salaries["Designation"].nunique())
```

```
50
```

In [291]:

```
salaries["Designation"].str.contains("Scientist")
```

Out[291]:

```
0       True
1       True
2      False
3      False
4      False
       ...  
602    False
603    False
604    False
605    False
606     True
Name: Designation, Length: 607, dtype: bool
```

In [292]:

```
salaries["Designation"].str.contains("Machine Learning|AI")
```

Out[292]:

```
0      False
1       True
2      False
3      False
4       True
       ...  
602    False
603    False
604    False
605    False
606     True
Name: Designation, Length: 607, dtype: bool
```

In [293]:

```
job_categories = ["Data Science", "Data Analytics" , "Data Engineering" , "Machine Learning", "Managerial", "Consultant
```

In [294]:

```
data_science = "Data Scientist|NLP"
data_analyst = "Ana;yst|Analytics"
data_engineer = "Data Engineer|ETL|Architect|Infrastructure"
ml_engineer = "Machine Learning|ML|Big Data|AI"
manager = "Manager|Head|Directore|Lead|Principal|Staff"
consultant = "Consultant|Freelance"
```

In [295]:

```
conditions = [
(salaries ["Designation"].str.contains(data_science)),
    (salaries["Designation"].str.contains(data_analyst)),
    (salaries["Designation"].str.contains(data_engineer)),
    (salaries["Designation"].str.contains(ml_engineer)),
    (salaries["Designation"].str.contains(manager)),
    (salaries["Designation"].str.contains(consultant))
]
conditions
```

Out[295]:

```
[0       True
 1      False
 2      False
 3      False
 4      False
        ...
 602    False
 603    False
 604    False
 605    False
 606    False
 Name: Designation, Length: 607, dtype: bool,
 0      False
 1      False
 2      False
 3      False
 4      False
        ...
 602    False
 603    False
 604    False
 605    False
 606    False
 Name: Designation, Length: 607, dtype: bool,
 0      False
 1      False
 2       True
 3      False
 4      False
        ...
 602     True
 603     True
 604    False
 605    False
 606    False
 Name: Designation, Length: 607, dtype: bool,
 0      False
 1       True
 2       True
 3      False
 4       True
        ...
 602    False
 603    False
 604    False
 605    False
 606     True
 Name: Designation, Length: 607, dtype: bool,
 0      False
 1      False
 2      False
 3      False
 4      False
        ...
 602    False
 603    False
 604    False
 605    False
 606    False
 Name: Designation, Length: 607, dtype: bool,
 0      False
 1      False
 2      False
 3      False
 4      False
        ...
 602    False
 603    False
 604    False
 605    False
 606    False
 Name: Designation, Length: 607, dtype: bool]
```

In [296]:

```
import numpy as np
salaries["Job_Category"] = np.select(conditions, job_categories, default = "Other")
salaries["Job_Category"]
```

Out[296]:

```
0           Data Science
1       Machine Learning
2       Data Engineering
3                  Other
4       Machine Learning
              ...
602     Data Engineering
603     Data Engineering
604                Other
605                Other
606     Machine Learning
Name: Job_Category, Length: 607, dtype: object
```

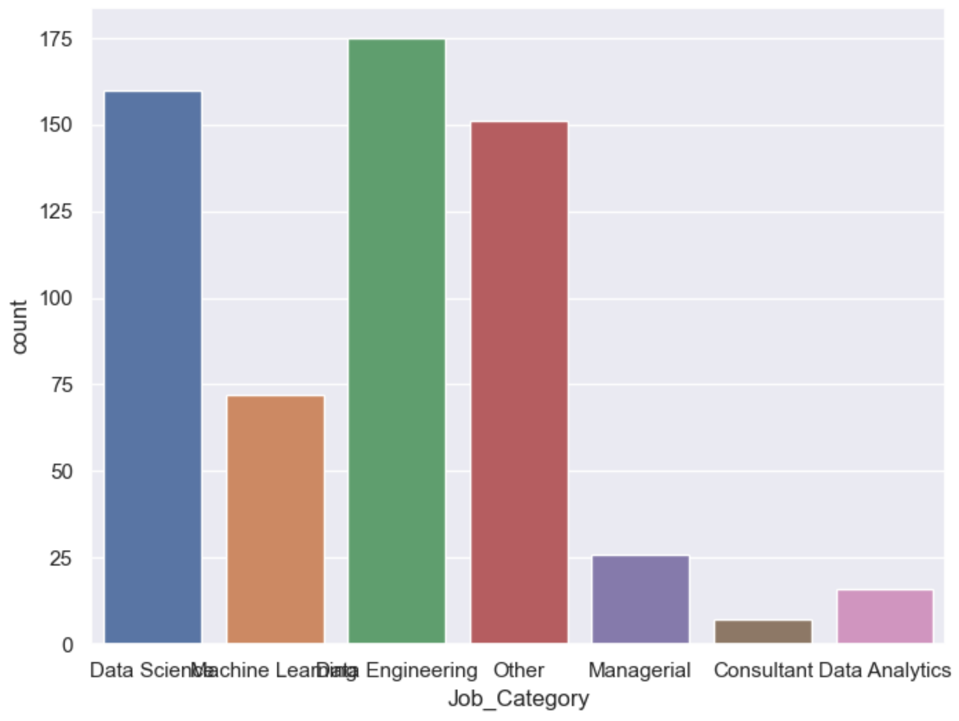
In [297]:

```
print(salaries[["Designation", "Job_Category"]].head())
```

```
                  Designation      Job_Category
0              Data Scientist      Data Science
1  Machine Learning Scientist  Machine Learning
2          Big Data Engineer  Data Engineering
3        Product Data Analyst             Other
4   Machine Learning Engineer  Machine Learning
```

In [298]:

```
sns.countplot(data=salaries, x="Job_Category")
plt.show()
```



In [299]:

```
# planes = pd.read_csv("Airlines_unclean.csv")
# non_numeric = planes.select_dtypes("object")
# for col in non_numeric.columns:
#     print(f"Number of unique values in {col} column: ", non_numeric[col].nunique())
```

In [300]:

```
# planes["Duration"].head()
```

9

In [301]:

```
import numpy as np
# values = ["0h", "1h" , "2h" , "3h" , "4h" ,"5h", "6h", "7h" , "8h","9h", "10h","11h","12h","13h","14h", "15h", "16h"]




short_flights = "0h|1h|2h|3h|4h"
medium_flights = "5h|6h|7h|8h|9h"
long_flights = "10h|11h|12h|13h|14h|15h|16h"

conditions = [
    (planes["Duration"].str.contains(short_flights)),
    (planes["Duration"].str.contains(medium_flights)),
    (planes["Duration"].str.contains(long_flights))
]

values = [short_flights, medium_flights, long_flights]


planes['Duration_Category'] = np.select(conditions, values, default='Other')
planes['Duration_Category']
# conditions
```

In [ ]:

```

```

In [ ]:

```

```

In [ ]:

```

```