WileyWinters_Week5_Assignment

February 18, 2024

0.0.1 Week 5 Assignment

- Wiley Winters
- MSDS 670 — Data Visualization
- 18-FEB-2024

0.0.2 Dataset Information

Dataset: Jobs and Salaries in Data Science Metadata: - `work_year`: Year in which data was recorded. - `job_title`: Specific title of the job role. - `job_category`: Classification of the job role into broader categories for easier analysis - `salary_currency`: Currency in which the salary is paid - `salary`: Annual gross salary of the role in the local currency - `salary_in_usd`: Annual gross salary in USD - `employee_residence`: Country of residence - `experience_level`: Classifies the professional experience level of the employee - `employment_type`: Specifies the type of employment such as *full-time*, *part-time*, *contract*, *etc* - `work_setting`: Work setting or environment such as *remote*, *in-person*, or *hybrid* - `company_location`: Country where the company is located - `company_size`: Size of the employer company categorized as *small (S)*, *medium (M)*, and *large (L)*

Formal Reference to Dataset

Qaasim, H. (2023, December). Jobs and Salaries in Data Science. Version 6. Retrieved December 25, 2023 from https://www.kaggle.com/datasets/hummaamqaasim/jobs-in-data/data

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Import required packages and libraries. Set global configuration items.

[1]:

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import matplotlib.ticker as mtick
from matplotlib import rcParams
import numpy as np

# Suppress Warnings
import warnings
warnings.filterwarnings('ignore')

# Set seaborn style and autoconfig
```

```
sns.set_style('whitegrid')
rcParams.update({'figure.autolayout': True})
```

Read dataset into a Pandas DataFrame

[2]:
```
jobs_df = pd.read_csv('data/jobs_in_data.csv')
jobs_df.sample(5)
```

[2]:
```
      work_year                       job_title               job_category  \
3799       2023            Data Science Manager  Data Science and Research
54         2023                Research Analyst  Data Science and Research
819        2023  Business Intelligence Engineer       BI and Visualization
6483       2023                  Data Scientist  Data Science and Research
2558       2023                  Data Scientist  Data Science and Research

     salary_currency  salary  salary_in_usd employee_residence  \
3799             USD  245100         245100      United States
54               USD   64000          64000      United States
819              USD  127000         127000             Canada
6483             USD  128750         128750      United States
2558             USD  100000         100000      United States

     experience_level employment_type work_setting company_location  \
3799           Senior       Full-time    In-person    United States
54        Entry-level       Full-time       Remote    United States
819            Senior       Full-time    In-person           Canada
6483        Mid-level       Full-time    In-person    United States
2558           Senior       Full-time    In-person    United States

     company_size
3799            M
54              M
819             M
6483            M
2558            M
```

[3]:
```
jobs_df.describe().T
```

[3]:
```
                count           mean           std      min       25%  \
work_year      9355.0    2022.760449      0.519470   2020.0    2023.0
salary         9355.0  149927.981293  63608.835387  14000.0  105200.0
salary_in_usd  9355.0  150299.495564  63177.372024  15000.0  105700.0

                    50%       75%       max
work_year        2023.0    2023.0    2023.0
salary         143860.0  187000.0  450000.0
salary_in_usd  143000.0  186723.0  450000.0
```

The dataset covers years from 2020 to 2023. In order to not double count some values. I will only work with 2023 data

Check some basic items to see if the dataset requires cleaning or not

[4]:

```python
print(jobs_df.info())
print('\nNaN Values:\n', jobs_df.isna().sum())
print('\nDuplicates: ', jobs_df.duplicated().sum())
print('\nSize: ', jobs_df.size)
print('\nDistribution:\n', jobs_df.describe().T)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9355 entries, 0 to 9354
Data columns (total 12 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   work_year           9355 non-null   int64
 1   job_title           9355 non-null   object
 2   job_category        9355 non-null   object
 3   salary_currency     9355 non-null   object
 4   salary              9355 non-null   int64
 5   salary_in_usd       9355 non-null   int64
 6   employee_residence  9355 non-null   object
 7   experience_level    9355 non-null   object
 8   employment_type     9355 non-null   object
 9   work_setting        9355 non-null   object
 10  company_location    9355 non-null   object
 11  company_size        9355 non-null   object
dtypes: int64(3), object(9)
memory usage: 877.2+ KB
None

NaN Values:
 work_year             0
job_title             0
job_category          0
salary_currency       0
salary                0
salary_in_usd         0
employee_residence    0
experience_level      0
employment_type       0
work_setting          0
company_location      0
company_size          0
dtype: int64

Duplicates:  4014
```

```
Size:  112260

Distribution:
                 count           mean           std      min       25%  \
work_year       9355.0    2022.760449      0.519470   2020.0    2023.0
salary          9355.0  149927.981293  63608.835387  14000.0  105200.0
salary_in_usd   9355.0  150299.495564  63177.372024  15000.0  105700.0

                    50%       75%       max
work_year        2023.0    2023.0    2023.0
salary         143860.0  187000.0  450000.0
salary_in_usd  143000.0  186723.0  450000.0
```

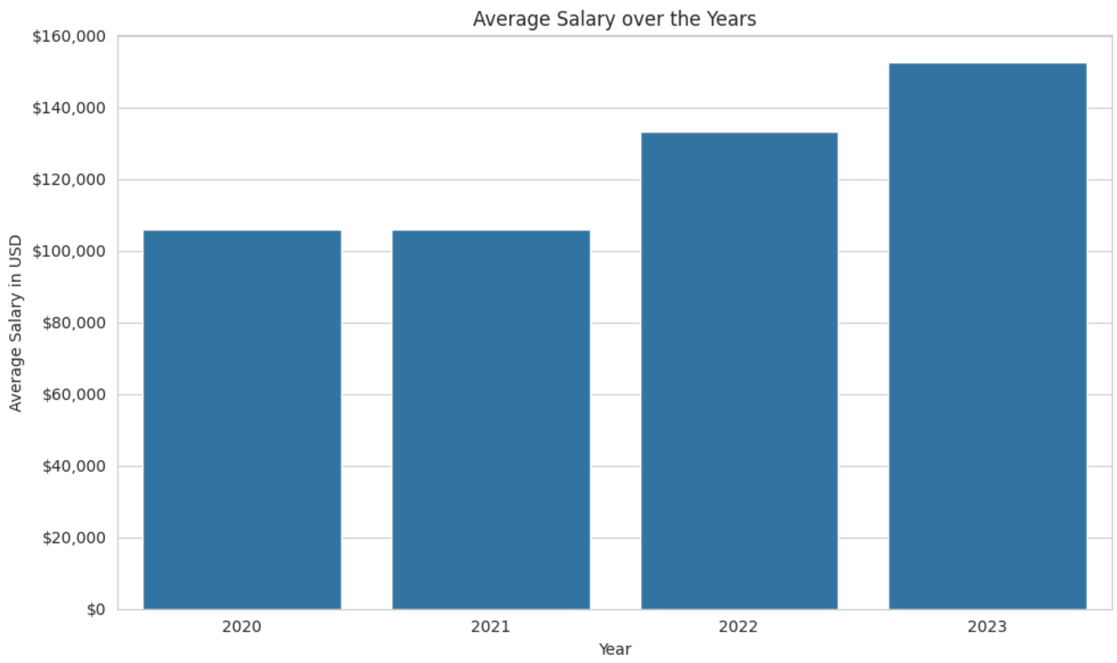
Looks like there is a lot of duplicates. I will remove them.

[5]:
```
jobs_df.drop_duplicates(keep='first', inplace=True)
jobs_df.duplicated().sum()
```

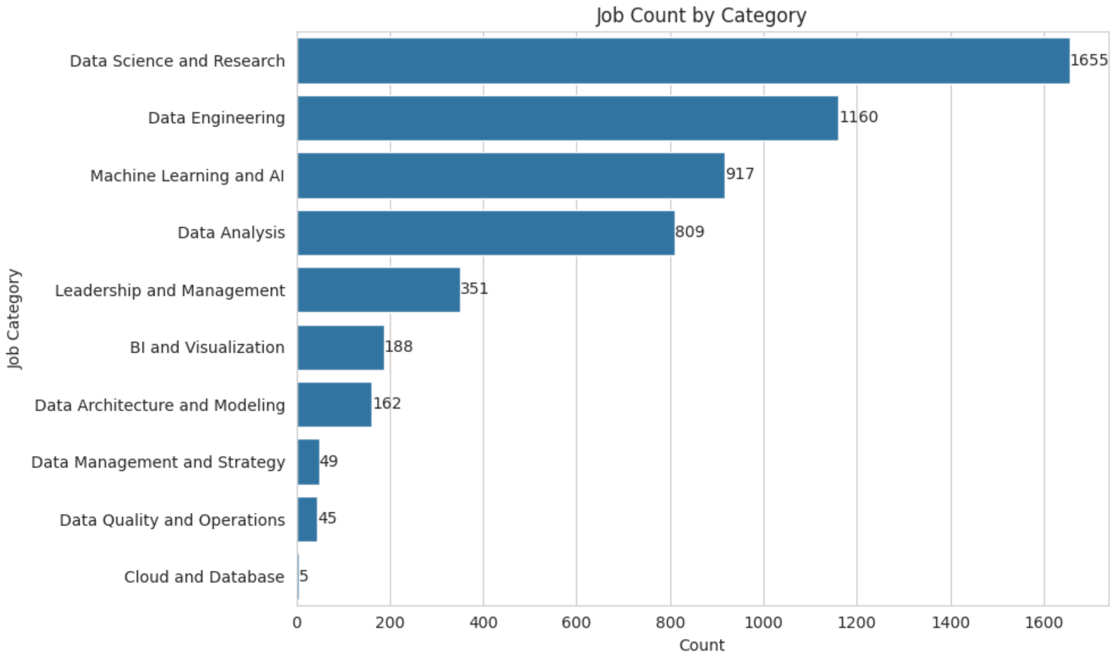
[5]:
```
0
```

0.0.3 Look for interesting items to plot

[6]:
```
salary_years = jobs_df.groupby('work_year').agg({'salary_in_usd': 'mean'}). \
                               sort_values('work_year')
fig, ax = plt.subplots(figsize=(10,6))
fmt = '${x:,.0f}'
tick = mtick.StrMethodFormatter(fmt)
ax.yaxis.set_major_formatter(tick)
ax.set(xlabel='Year',ylabel='Average Salary in USD',title='Average Salary over␣
 ↪the Years')
sns.barplot(data=salary_years, y='salary_in_usd', x='work_year')
fig.savefig('images/yearAveSalary.png', bbox_inches='tight', dpi=300)
```

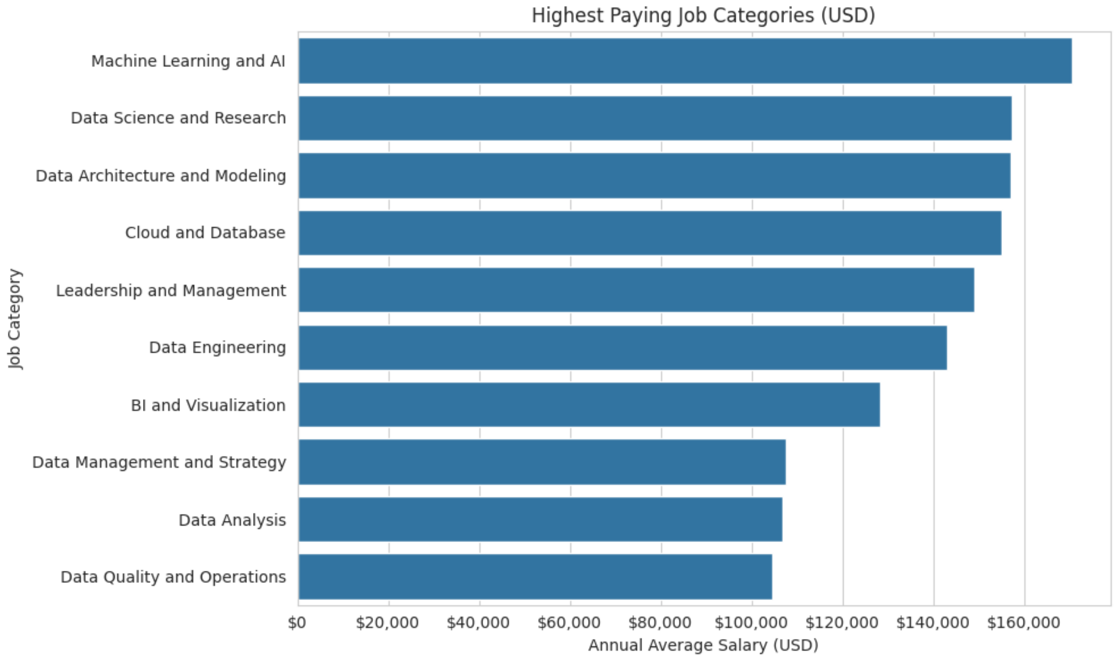


```
[7]: fig, ax = plt.subplots(figsize=(10,6))
     ax.set(ylabel='Job Category',title='Job Count by Category',xlabel='Count')
     sns.countplot(ax=ax, data=jobs_df, y='job_category',␣
      ↪order=jobs_df['job_category']. \
                   value_counts().index)
     ax.bar_label(ax.containers[0])
     fig.savefig('images/jobCatCount.png', bbox_inches='tight', dpi=300)
```



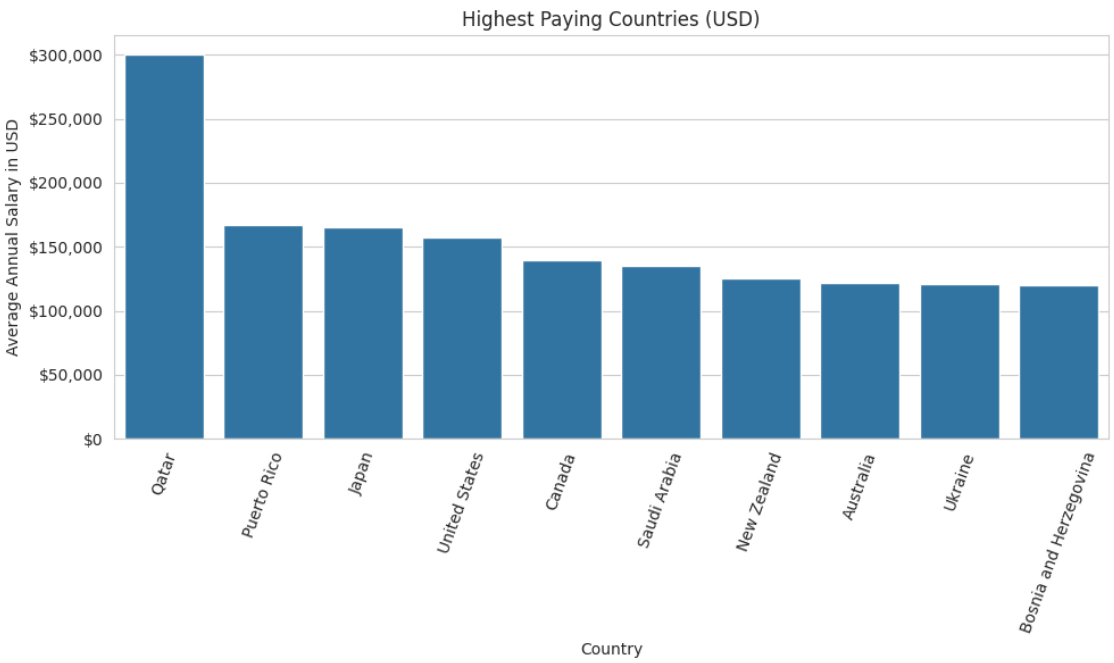
[8]:

```
# Highest paying categories in USD
salary = jobs_df.groupby('job_category').agg({'salary_in_usd': 'mean'}). \
                         sort_values('salary_in_usd', ascending=False)
fig, ax = plt.subplots(figsize=(10,6))
fmt = '${x:,.0f}'
tick = mtick.StrMethodFormatter(fmt)
ax.xaxis.set_major_formatter(tick)
ax.set(xlabel='Annual Average Salary (USD)',ylabel='Job Category', \
       title='Highest Paying Job Categories (USD)')
sns.barplot(data=salary, y='job_category', x='salary_in_usd')
fig.savefig('images/highJobCatUSD.png', bbox_inches='tight', dpi=300)
```

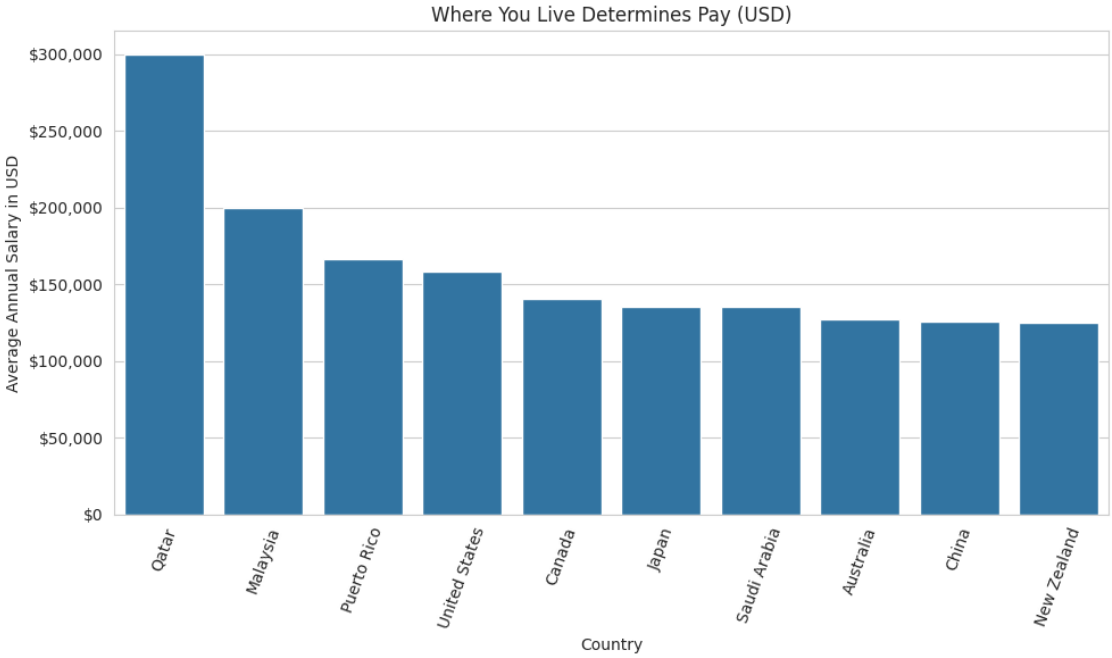


[9]:

```
# Highest pay by company_location in USD. Top 10
pay_country = jobs_df.groupby('company_location').agg({'salary_in_usd':␣
 ↪'mean'}). \
                               sort_values('salary_in_usd', ascending=False).
 ↪head(10)
fig, ax = plt.subplots(figsize=(10,6))
fmt = '${x:,.0f}'
tick = mtick.StrMethodFormatter(fmt)
ax.yaxis.set_major_formatter(tick)
ax.set(xlabel='Country',ylabel='Average Annual Salary in USD', \
       title='Highest Paying Countries (USD)')
sns.barplot(data=pay_country, x='company_location', y='salary_in_usd')
plt.xticks(rotation=70)
fig.savefig('images/highCountryUSD.png', bbox_inches='tight', dpi=300)
```

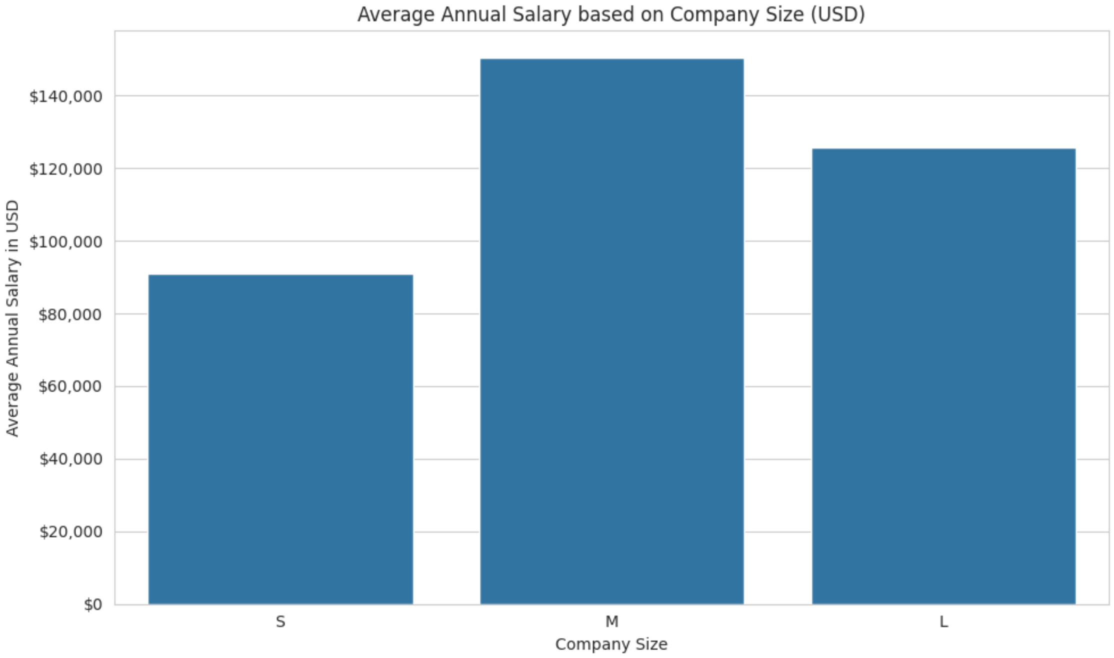


[10]:
```
# Highest pay by employee_residence in USD. Top 10
pay_residence = jobs_df.groupby('employee_residence').agg({'salary_in_usd':␣
 ↪'mean'}). \
                                   sort_values('salary_in_usd', ascending=False).
 ↪head(10)
fig, ax = plt.subplots(figsize=(10,6))
fmt = '${x:,.0f}'
tick = mtick.StrMethodFormatter(fmt)
ax.yaxis.set_major_formatter(tick)
ax.set(xlabel='Country',ylabel='Average Annual Salary in USD', \
       title='Where You Live Determines Pay (USD)')
sns.barplot(data=pay_residence, x='employee_residence', y='salary_in_usd')
plt.xticks(rotation=70)
fig.savefig('images/highResidenceUSD.png', bbox_inches='tight', dpi=300)
```



[11]:

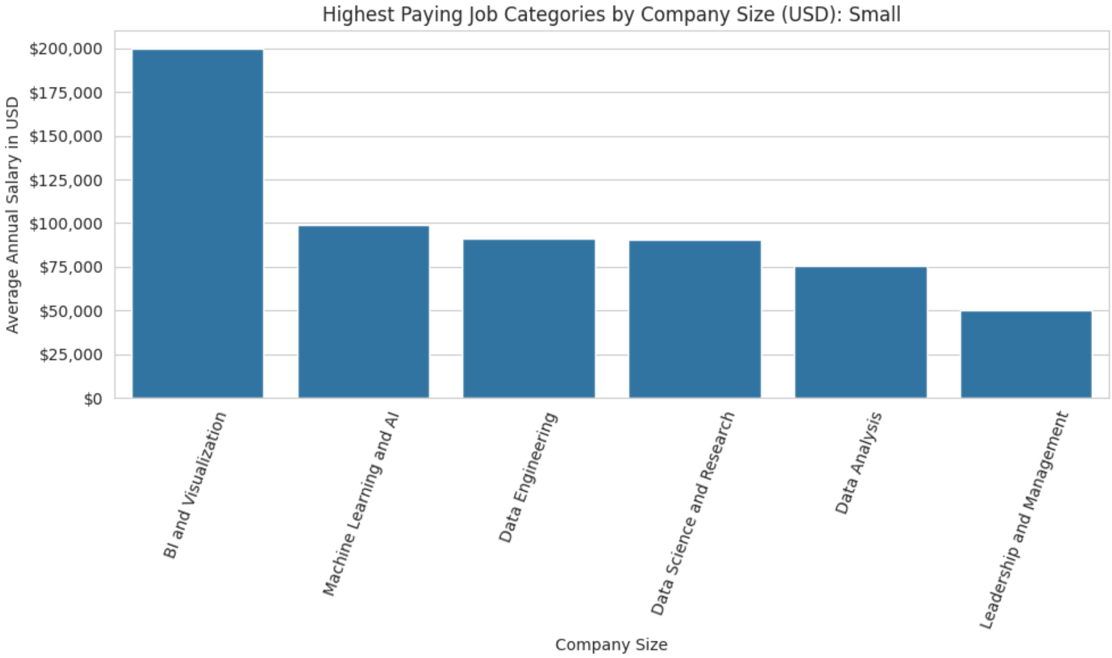
```
# Average Salary by company_size
size = jobs_df.groupby('company_size').agg({'salary_in_usd': 'mean'}). \
                        sort_values('company_size', ascending=False)
fig, ax = plt.subplots(figsize=(10,6))
fmt = '${x:,.0f}'
tick = mtick.StrMethodFormatter(fmt)
ax.yaxis.set_major_formatter(tick)
ax.set(xlabel='Company Size', ylabel='Average Annual Salary in USD', \
       title='Average Annual Salary based on Company Size (USD)')
sns.barplot(data=size, x='company_size', y='salary_in_usd')
fig.savefig('images/aveCompanySize.png', bbox_inches='tight', dpi=300)
```

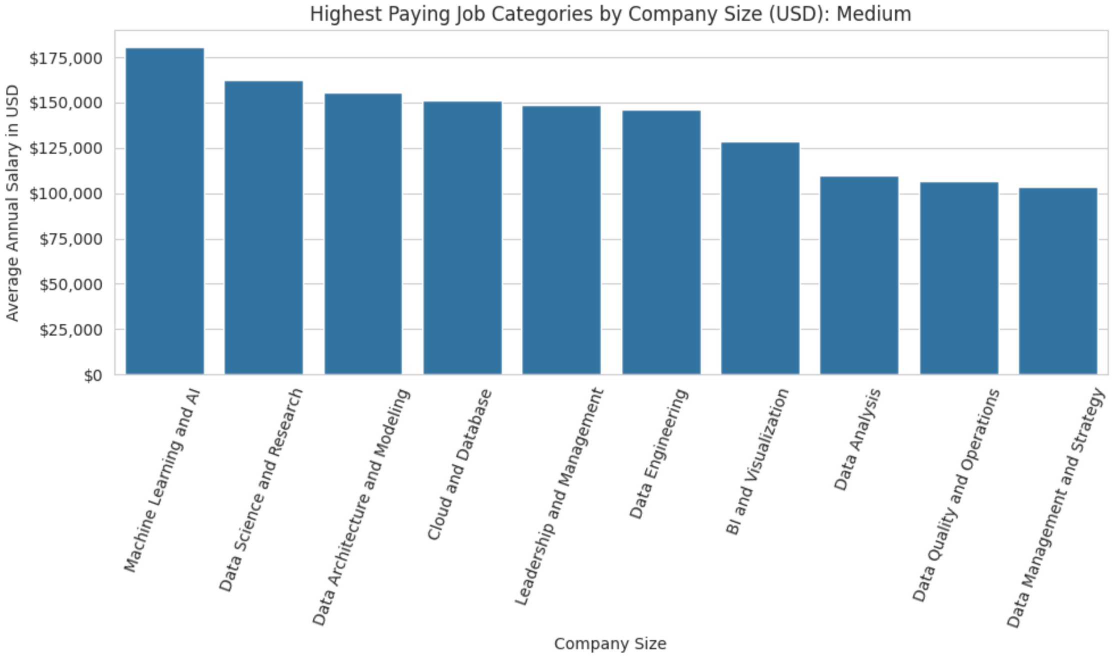


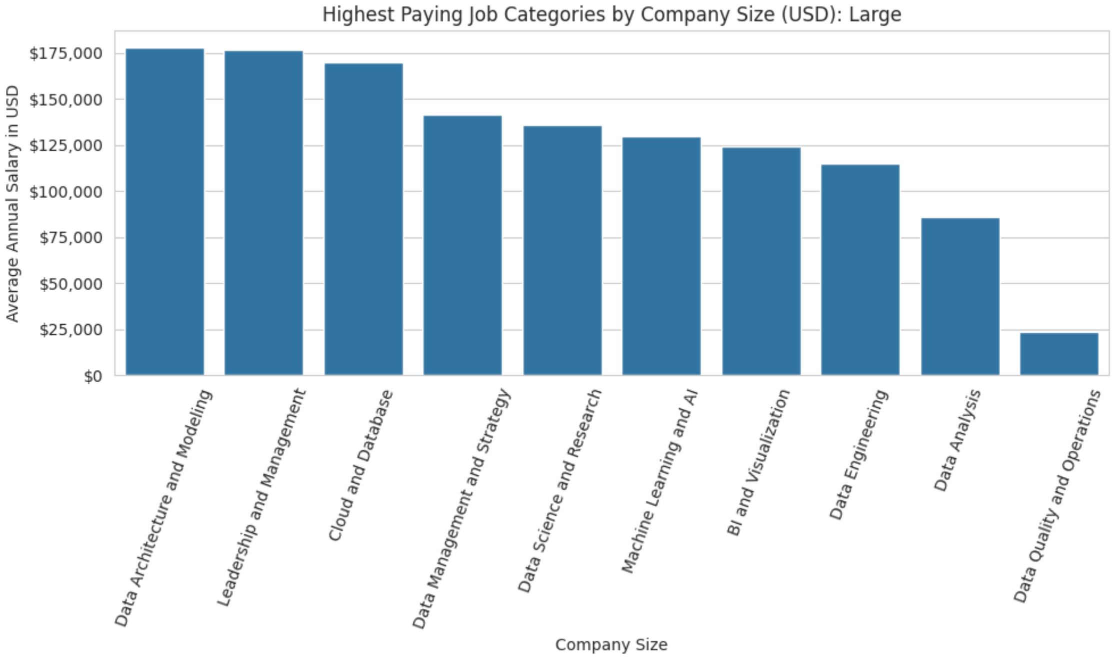
[12]:

```
sizes = {'S':'Small','M':'Medium','L':'Large'}

for key in sizes:
    size = jobs_df[jobs_df['company_size'] == key]
    comp_size = size.groupby('job_category').agg({'salary_in_usd': 'mean'}). \
                                sort_values('salary_in_usd', ascending=False)
    fig, ax = plt.subplots(figsize=(10,6))
    ax.yaxis.set_major_formatter(mtick.StrMethodFormatter('${x:,.0f}'))
    ax.set(xlabel='Company Size', ylabel='Average Annual Salary in USD', \
           title=f'Highest Paying Job Categories by Company Size (USD):␣
 ↪{sizes[key]}')
    plt.xticks(rotation=70)
    sns.barplot(data=comp_size,x='job_category', y='salary_in_usd')
    fig.savefig('images/'+sizes[key]+'Cat.png', bbox_inches='tight', dpi=300)
```

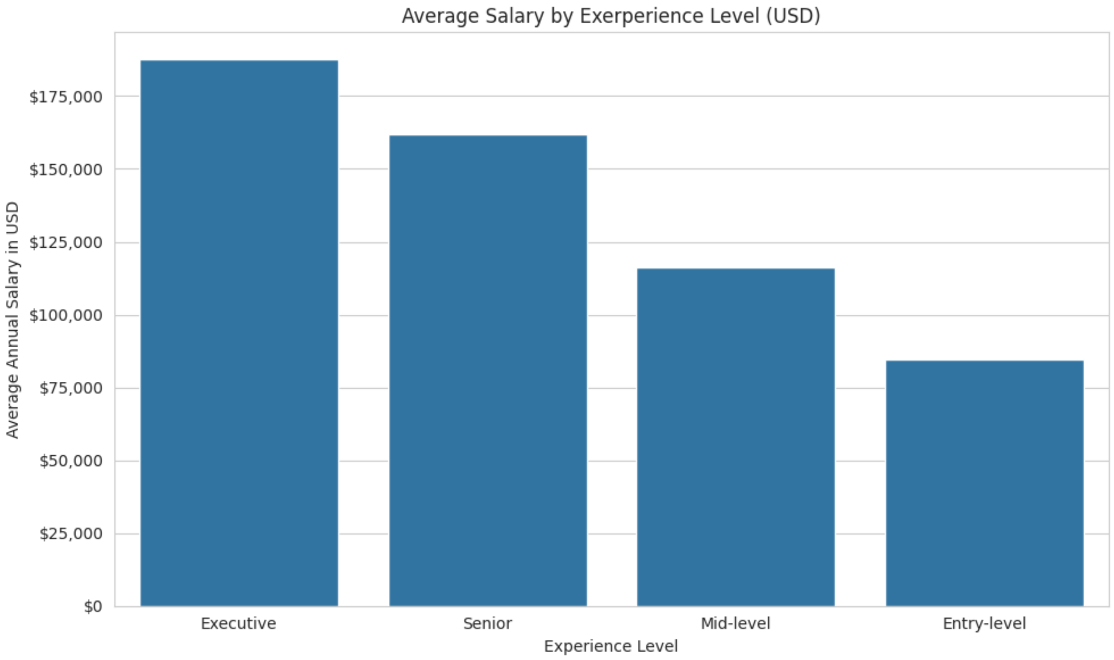

Highest Paying Job Categories by Company Size (USD): Small
Average Annual Salary in USD
$200,000
$175,000
$150,000
$125,000
$100,000
$75,000
$50,000
$25,000
$0
BI and Visualization
Machine Learning and AI
Data Engineering
Data Science and Research
Data Analysis
Leadership and Management
Company Size


Highest Paying Job Categories by Company Size (USD): Medium
Average Annual Salary in USD
$175,000
$150,000
$125,000
$100,000
$75,000
$50,000
$25,000
$0
Machine Learning and AI
Data Science and Research
Data Architecture and Modeling
Cloud and Database
Leadership and Management
Data Engineering
BI and Visualization
Data Analysis
Data Quality and Operations
Data Management and Strategy
Company Size



[13]:

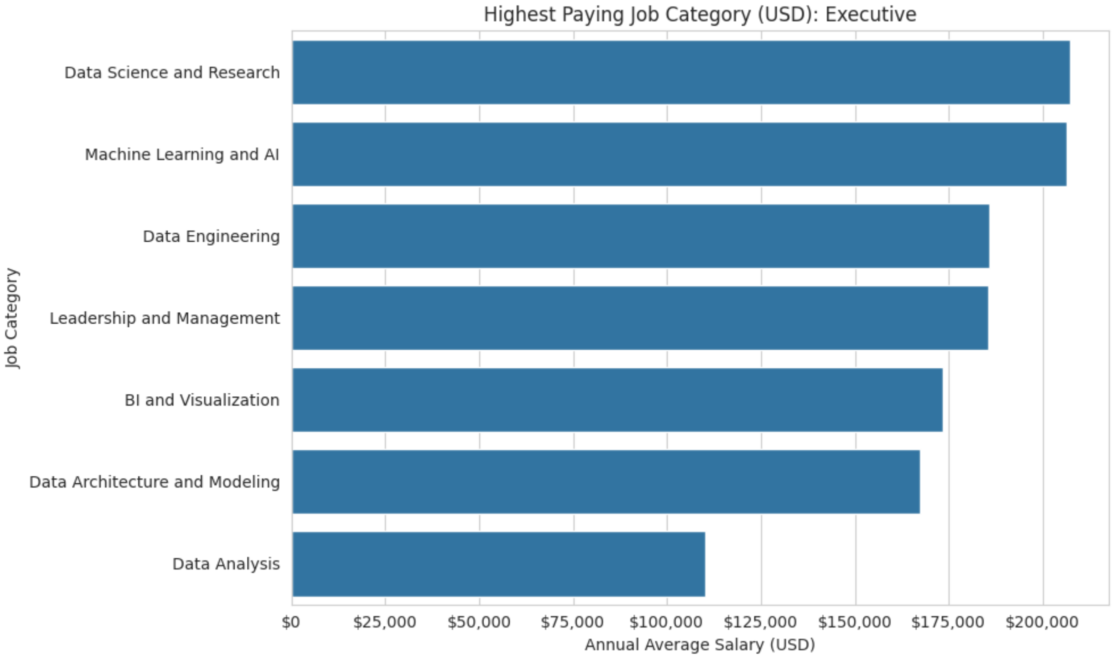
```
# Salary based on experience level
experience = jobs_df.groupby('experience_level').agg({'salary_in_usd': 'mean'}).
 ↪ \
                             sort_values('salary_in_usd', ascending=False)
fig, ax = plt.subplots(figsize=(10,6))
fmt = '${x:,.0f}'
tick = mtick.StrMethodFormatter(fmt)
ax.yaxis.set_major_formatter(tick)
ax.set(xlabel='Experience Level', ylabel='Average Annual Salary in USD', \
       title='Average Salary by Exerperience Level (USD)')
sns.barplot(data=experience, x='experience_level', y='salary_in_usd')
fig.savefig('images/salaryByexperience.png', bbox_inches='tight', dpi=300)
```

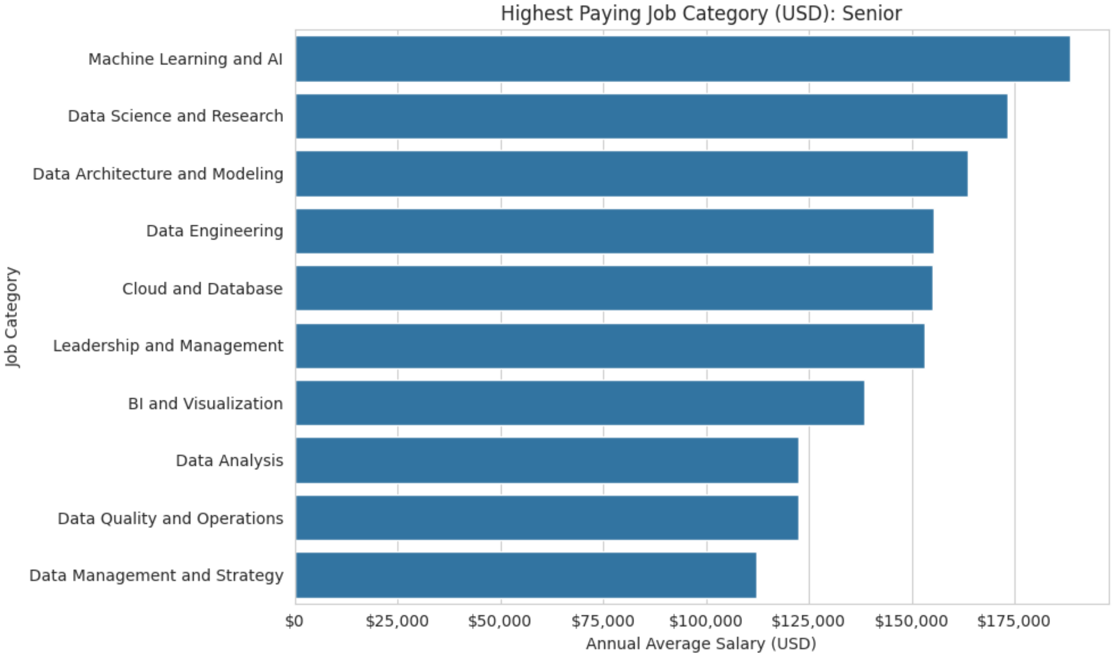


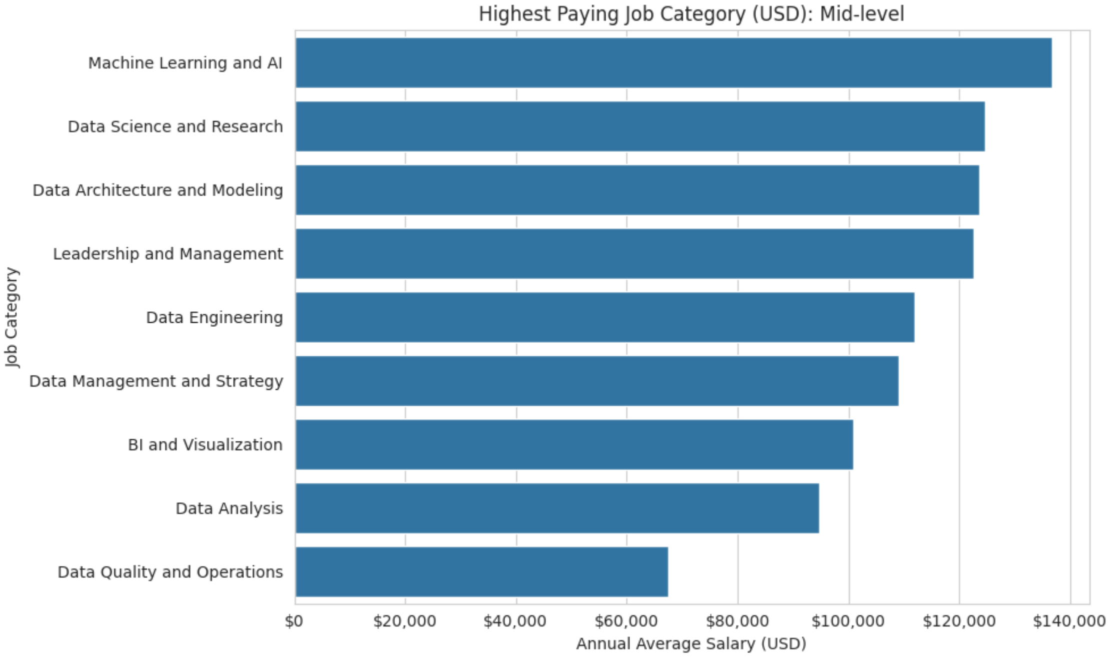
Explore each experience level to see what job categories pay the most in USD

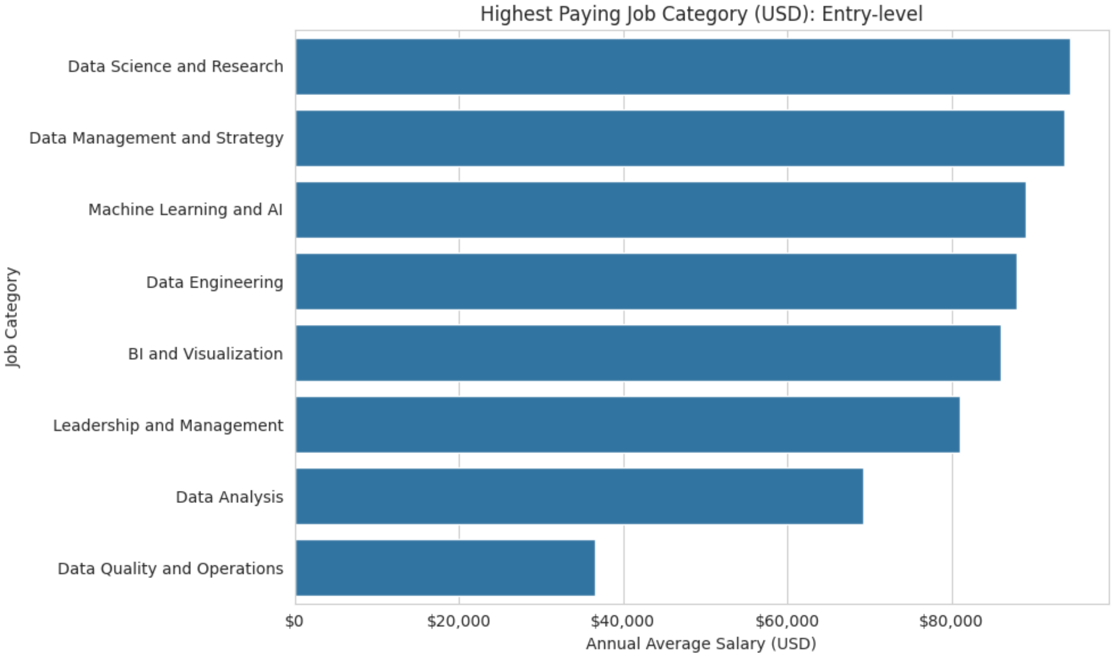
[14]:

```python
# Look at salary based on experience level for all levels
experiences = ['Executive','Senior','Mid-level','Entry-level']
for i in range(len(experiences)):
    exp = jobs_df[jobs_df['experience_level'] == experiences[i]]
    salary = exp.groupby('job_category').agg({'salary_in_usd': 'mean'}). \
                         sort_values('salary_in_usd', ascending=False)
    fig, ax = plt.subplots(figsize=(10,6))
    ax.xaxis.set_major_formatter(mtick.StrMethodFormatter('${x:,.0f}'))
    ax.set(xlabel='Annual Average Salary (USD)', ylabel='Job Category', \
           title=f'Highest Paying Job Category (USD): {experiences[i]}')
    sns.barplot(data=salary, y='job_category', x='salary_in_usd')
    fig.savefig('images/'+experiences[i]+'.png', bbox_inches='tight', dpi=300)
```


Highest Paying Job Category (USD): Executive
Job Category
Data Science and Research
Machine Learning and AI
Data Engineering
Leadership and Management
BI and Visualization
Data Architecture and Modeling
Data Analysis
$0
$25,000
$50,000
$75,000
$100,000
$125,000
$150,000
$175,000
$200,000
Annual Average Salary (USD)


Highest Paying Job Category (USD): Senior
Job Category
Machine Learning and AI
Data Science and Research
Data Architecture and Modeling
Data Engineering
Cloud and Database
Leadership and Management
BI and Visualization
Data Analysis
Data Quality and Operations
Data Management and Strategy
$0
$25,000
$50,000
$75,000
$100,000
$125,000
$150,000
$175,000
Annual Average Salary (USD)


Highest Paying Job Category (USD): Mid-level
Job Category
Machine Learning and AI
Data Science and Research
Data Architecture and Modeling
Leadership and Management
Data Engineering
Data Management and Strategy
BI and Visualization
Data Analysis
Data Quality and Operations
$0
$20,000
$40,000
$60,000
$80,000
$100,000
$120,000
$140,000
Annual Average Salary (USD)


Highest Paying Job Category (USD): Entry-level
Job Category
Data Science and Research
Data Management and Strategy
Machine Learning and AI
Data Engineering
BI and Visualization
Leadership and Management
Data Analysis
Data Quality and Operations
$0
$20,000
$40,000
$60,000
$80,000
Annual Average Salary (USD)

[ ]: