Web_Scraping_Pandas_Seaborn

February 11, 2025

Exploring the Largest Companies in the United States by Revenue: A Web Scraping and Data Analysis Project

This project leverages Python for web scraping, data wrangling, and visualization to analyze the largest US companies by revenue. The dataset was scraped, cleaned, and analyzed to uncover trends and insights about industry performance and company success. Key skills demonstrated include web scraping, data cleaning, and data visualization with pandas, matplotlib, and seaborn. Future work could explore predictive modeling, sentiment analysis, and automated reporting.

[3]:
```
# Import necessary libraries for web scraping
from bs4 import BeautifulSoup
import requests
```

[4]:
```
# Select target URL and retrieve the webpage content
url = 'https://en.wikipedia.org/wiki/
 ↪List_of_largest_companies_in_the_United_States_by_revenue'
page = requests.get(url)
soup = BeautifulSoup(page.text, 'html')
```

[ ]:
```
# Explore the contents of the webpage to locate correct table
soup.find('table')
```

[ ]:
```
soup.find_all('table')[1]
```

[7]:
```
#  Select table containing the list of the largest companies by revenue
table = soup.find_all('table')[0]
```

[8]:
```
# Extract table headers
table_titles = table.find_all('th')
```

[9]:
```
# Clean and store the table headers
clean_table_titles = [title.text.strip() for title in table_titles]
print(clean_table_titles)
```

```
['Rank', 'Name', 'Industry', 'Revenue (USD millions)', 'Revenue growth',
'Employees', 'Headquarters']
```

[10]:
```
# Import pandas for data manipulation
import pandas as pd
```

[11]:
```
# Create empty DataFrame with column titles
df = pd.DataFrame(columns=clean_table_titles)
```

[12]:
```
# Extract all table rows for data extraction
column_data = table.find_all('tr')
```

[13]:
```
# Populate DataFrame by iterating through each row
for row in column_data[1:]: # Skip header row
    row_data = row.find_all('td') # Extract individual data cells
    individual_row_data = [data.text.strip() for data in row_data] # Cleaning␣
 ↪data

    length = len(df) # Determine the length of DataFrame (number of rows)
    df.loc[length] = individual_row_data # Using dataframe length to index and␣
 ↪populate table
```

[14]:
```
# Inspect first five rows of Dataframe
print(df.head())
```

```
  Rank                Name                    Industry Revenue (USD millions)  \
0    1             Walmart                      Retail                 648,125
1    2              Amazon  Retail and cloud computing                 574,785
2    3               Apple       Electronics industry                 383,482
3    4  UnitedHealth Group                  Healthcare                 371,622
4    5  Berkshire Hathaway               Conglomerate                 364,482

  Revenue growth  Employees          Headquarters
0           6.0%  2,100,000  Bentonville, Arkansas
1          11.9%  1,525,000    Seattle, Washington
2          -2.8%    161,000  Cupertino, California
3          14.6%    440,000  Minnetonka, Minnesota
4          20.7%    396,500        Omaha, Nebraska
```

[15]:
```
# Save DataFrame as CSV file (excluding the index)
df.to_csv(r'C:\Users\Liina\Desktop\MINU FAILID\PYTHON\Companies.csv', index␣
 ↪=False)
```

[16]:
```
# Import seaborn and matplotlib for data visualization
import seaborn as sns
import matplotlib.pyplot as plt
```

[17]:
```
# Display dataset information to check column types and missing values
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 100 entries, 0 to 99
Data columns (total 7 columns):
 #   Column                  Non-Null Count  Dtype
```

```
---  ------                  --------------  -----
 0   Rank                    100 non-null    object
 1   Name                    100 non-null    object
 2   Industry                100 non-null    object
 3   Revenue (USD millions)  100 non-null    object
 4   Revenue growth          100 non-null    object
 5   Employees               100 non-null    object
 6   Headquarters            100 non-null    object
dtypes: object(7)
memory usage: 6.2+ KB
None
```

[18]:
```
# Convert numerical columns to appropriate data types
num_cols = ['Rank',  'Revenue (USD millions)', 'Revenue growth', 'Employees']

# Remove thousand separators and percentage signs before conversion
df[num_cols] = df[num_cols].replace([",", "%"], "", regex=True).astype(float)
# Fill possible missing values with the median
df[num_cols] = df[num_cols].fillna(df[num_cols].median())
```

[19]:
```
# Recheck dataset information to confirm successful type conversion
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 100 entries, 0 to 99
Data columns (total 7 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   Rank                    100 non-null    float64
 1   Name                    100 non-null    object
 2   Industry                100 non-null    object
 3   Revenue (USD millions)  100 non-null    float64
 4   Revenue growth          100 non-null    float64
 5   Employees               100 non-null    float64
 6   Headquarters            100 non-null    object
dtypes: float64(4), object(3)
memory usage: 6.2+ KB
None
```

[20]:
```
# Display the first five rows after cleaning
print(df.head())
```

```
   Rank                Name                     Industry  \
0   1.0             Walmart                       Retail
1   2.0              Amazon  Retail and cloud computing
2   3.0               Apple       Electronics industry
3   4.0  UnitedHealth Group                   Healthcare
4   5.0  Berkshire Hathaway               Conglomerate
```

```
   Revenue (USD millions)  Revenue growth  Employees           Headquarters
0                648125.0             6.0  2100000.0  Bentonville, Arkansas
1                574785.0            11.9  1525000.0    Seattle, Washington
2                383482.0            -2.8   161000.0  Cupertino, California
3                371622.0            14.6   440000.0  Minnetonka, Minnesota
4                364482.0            20.7   396500.0        Omaha, Nebraska
```

[21]:
```
# Count missing values per column
print(df.isnull().sum())
```

```
Rank                     0
Name                     0
Industry                 0
Revenue (USD millions)   0
Revenue growth           0
Employees                0
Headquarters             0
dtype: int64
```

[22]:
```
# Display summary statistics for numerical columns
print(df.describe())
```

```
              Rank  Revenue (USD millions)  Revenue growth     Employees
count   100.000000              100.000000      100.000000  1.000000e+02
mean     50.500000           122346.090000        6.078000  1.626779e+05
std      29.011492           107882.041929       21.022996  2.669024e+05
min       1.000000            43452.000000      -41.700000  4.137000e+03
25%      25.750000            54608.500000       -6.175000  4.500000e+04
50%      50.500000            80296.000000        5.950000  8.650000e+04
75%      75.250000           149927.250000       13.025000  1.891625e+05
max     100.000000           648125.000000      125.900000  2.100000e+06
```

[23]:
```
# Count duplicate rows in the dataset
print(df.duplicated().sum())
```

```
0
```

[24]:
```
# Count unique occurrences of company names
print(df["Name"].value_counts())
```

```
Name
Walmart                    1
John Deere                 1
Cisco                      1
Allstate                   1
Publix                     1
                          ..
Verizon Communications     1
Meta Platforms             1
Valero Energy              1
```

```
Walgreens Boots Alliance    1
Best Buy                    1
Name: count, Length: 100, dtype: int64
```

[25]:
```
# Aggregate revenue data by industry and rank industries by total revenue
grouped_by_industry_sum = df.groupby('Industry')['Revenue (USD millions)'].
  ↪agg(['min','max','mean','sum']).sort_values(by='sum', ascending=False)
print(grouped_by_industry_sum )
```

```
                                        min       max           mean  \
Industry
Retail                                43452.0  648125.0  161548.400000
Healthcare                            64968.0  371622.0  220786.166667
Financials                            45735.0  171912.0   98394.769231
Petroleum industry                    48712.0  344582.0  135590.666667
Technology and cloud computing        61860.0  307394.0  193723.000000
Retail and cloud computing           574785.0  574785.0  574785.000000
Conglomerate                          67954.0  364482.0  167118.666667
Pharmaceutical industry               45006.0  139081.0   75368.333333
Technology                            49954.0  134902.0   73691.500000
Electronics industry                 383482.0  383482.0  383482.000000
Automotive industry                  171842.0  176191.0  174016.500000
Telecommunications                    54607.0  133974.0  103384.333333
Health insurance                     106374.0  195265.0  150819.500000
Health                               276711.0  276711.0  276711.000000
Insurance                             46802.0   62109.0   54586.800000
Pharmacy wholesale                   262173.0  262173.0  262173.000000
Financial services                   239425.0  239425.0  239425.000000
Transportation                        90155.0   90958.0   90556.500000
Airline                               52788.0   58048.0   54851.000000
Aerospace and defense                 67571.0   77794.0   72682.500000
Beverage                              45754.0   91471.0   68612.500000
Conglomerate and telecommunications  122428.0  122428.0  122428.000000
Financial                             54609.0   67364.0   60986.500000
Food processing                       52788.0   53355.0   53071.500000
Automotive and energy                 96773.0   96773.0   96773.000000
Food industry                         93935.0   93935.0   93935.000000
Media                                 88898.0   88898.0   88898.000000
Consumer products manufacturing       82006.0   82006.0   82006.000000
Food service                          76325.0   76325.0   76325.000000
Machinery                             67060.0   67060.0   67060.000000
Agriculture manufacturing             61251.0   61251.0   61251.000000
Infotech                              57555.0   57555.0   57555.000000
Telecom hardware manufacturing        56998.0   56998.0   56998.000000
Apparel                               51217.0   51217.0   51217.000000
Energy trading                        47711.0   47711.0   47711.000000
Agriculture cooperative               45590.0   45590.0   45590.000000
Chemical industry                     44622.0   44622.0   44622.000000
```

Industry	sum
Retail	1615484.0
Healthcare	1324717.0
Financials	1279132.0
Petroleum industry	1220316.0
Technology and cloud computing	581169.0
Retail and cloud computing	574785.0
Conglomerate	501356.0
Pharmaceutical industry	452210.0
Technology	442149.0
Electronics industry	383482.0
Automotive industry	348033.0
Telecommunications	310153.0
Health insurance	301639.0
Health	276711.0
Insurance	272934.0
Pharmacy wholesale	262173.0
Financial services	239425.0
Transportation	181113.0
Airline	164553.0
Aerospace and defense	145365.0
Beverage	137225.0
Conglomerate and telecommunications	122428.0
Financial	121973.0
Food processing	106143.0
Automotive and energy	96773.0
Food industry	93935.0
Media	88898.0
Consumer products manufacturing	82006.0
Food service	76325.0
Machinery	67060.0
Agriculture manufacturing	61251.0
Infotech	57555.0
Telecom hardware manufacturing	56998.0
Apparel	51217.0
Energy trading	47711.0
Agriculture cooperative	45590.0
Chemical industry	44622.0

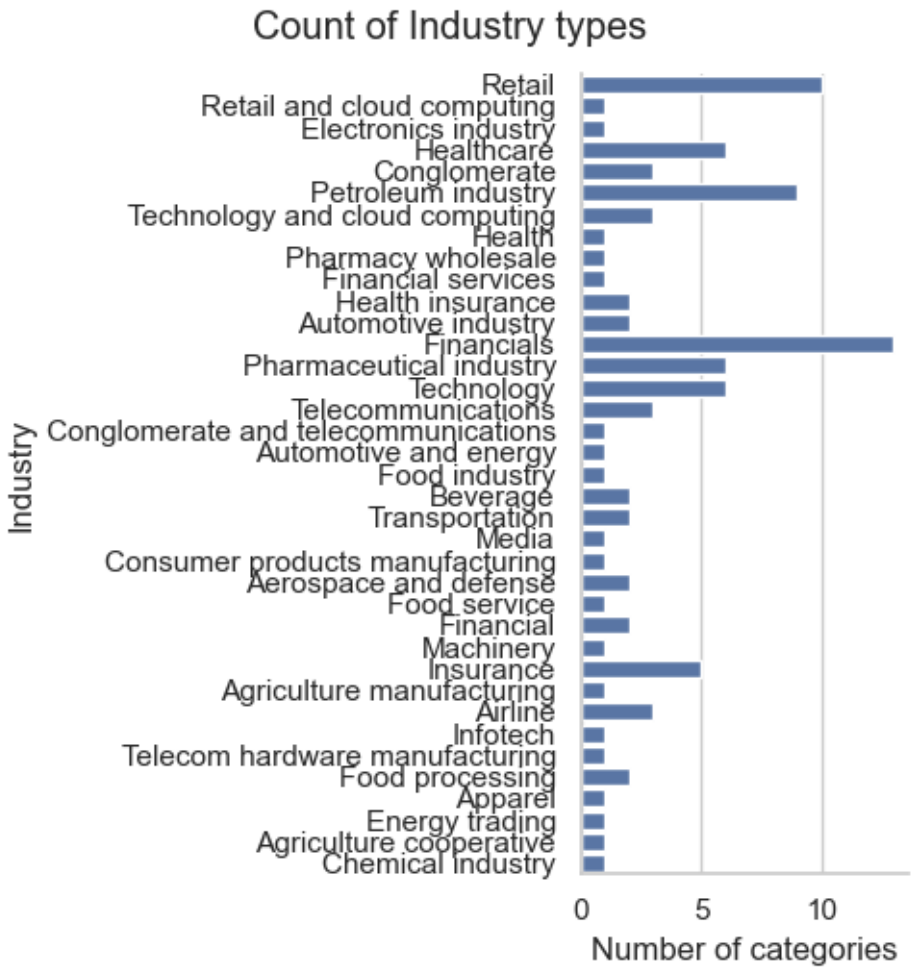
[26]:
```
# The three industries with the highest total revenue are:
# 1. Retail
# 2. Healthcare
# 3. Financials
# However, industries with the highest *average* revenue are:
# 1. Retail and cloud computing
```

```python
# 2. Electronics industry
# 3. Health
grouped_by_industry_average = df.groupby('Industry')['Revenue (USD millions)'].
  ↪agg(['min','max','mean','sum']).sort_values(by='mean', ascending=False)
print(grouped_by_industry_average)
```

```
                                     min       max           mean  \
Industry
Retail and cloud computing          574785.0  574785.0  574785.000000
Electronics industry                383482.0  383482.0  383482.000000
Health                              276711.0  276711.0  276711.000000
Pharmacy wholesale                  262173.0  262173.0  262173.000000
Financial services                  239425.0  239425.0  239425.000000
Healthcare                           64968.0  371622.0  220786.166667
Technology and cloud computing       61860.0  307394.0  193723.000000
Automotive industry                 171842.0  176191.0  174016.500000
Conglomerate                         67954.0  364482.0  167118.666667
Retail                               43452.0  648125.0  161548.400000
Health insurance                    106374.0  195265.0  150819.500000
Petroleum industry                   48712.0  344582.0  135590.666667
Conglomerate and telecommunications 122428.0  122428.0  122428.000000
Telecommunications                   54607.0  133974.0  103384.333333
Financials                           45735.0  171912.0   98394.769231
Automotive and energy                96773.0   96773.0   96773.000000
Food industry                        93935.0   93935.0   93935.000000
Transportation                       90155.0   90958.0   90556.500000
Media                                88898.0   88898.0   88898.000000
Consumer products manufacturing      82006.0   82006.0   82006.000000
Food service                         76325.0   76325.0   76325.000000
Pharmaceutical industry              45006.0  139081.0   75368.333333
Technology                           49954.0  134902.0   73691.500000
Aerospace and defense                67571.0   77794.0   72682.500000
Beverage                             45754.0   91471.0   68612.500000
Machinery                            67060.0   67060.0   67060.000000
Agriculture manufacturing            61251.0   61251.0   61251.000000
Financial                            54609.0   67364.0   60986.500000
Infotech                             57555.0   57555.0   57555.000000
Telecom hardware manufacturing       56998.0   56998.0   56998.000000
Airline                              52788.0   58048.0   54851.000000
Insurance                            46802.0   62109.0   54586.800000
Food processing                      52788.0   53355.0   53071.500000
Apparel                              51217.0   51217.0   51217.000000
Energy trading                       47711.0   47711.0   47711.000000
Agriculture cooperative              45590.0   45590.0   45590.000000
Chemical industry                    44622.0   44622.0   44622.000000

                                        sum
Industry
```

```
Retail and cloud computing            574785.0
Electronics industry                  383482.0
Health                                276711.0
Pharmacy wholesale                    262173.0
Financial services                    239425.0
Healthcare                           1324717.0
Technology and cloud computing        581169.0
Automotive industry                   348033.0
Conglomerate                          501356.0
Retail                               1615484.0
Health insurance                      301639.0
Petroleum industry                   1220316.0
Conglomerate and telecommunications   122428.0
Telecommunications                    310153.0
Financials                           1279132.0
Automotive and energy                  96773.0
Food industry                          93935.0
Transportation                        181113.0
Media                                  88898.0
Consumer products manufacturing        82006.0
Food service                           76325.0
Pharmaceutical industry               452210.0
Technology                            442149.0
Aerospace and defense                 145365.0
Beverage                              137225.0
Machinery                              67060.0
Agriculture manufacturing              61251.0
Financial                             121973.0
Infotech                               57555.0
Telecom hardware manufacturing         56998.0
Airline                               164553.0
Insurance                             272934.0
Food processing                       106143.0
Apparel                                51217.0
Energy trading                         47711.0
Agriculture cooperative                45590.0
Chemical industry                      44622.0
```

[27]:
```
# Visualize the distribution of companies across different industries
sns.set(style="whitegrid")
g = sns.catplot(y= 'Industry',data=df, kind = 'count')
g.fig.suptitle('Count of Industry types', y = 1.03)
g.set(ylabel = "Industry", xlabel= "Number of categories")
plt.show()
```



[28]:
```
# The three most represented industries in the dataset are:
# 1. Financials
# 2. Retail
# 3. Petroleum industry
```

[29]:
```
# Identify the top 10 companies by revenue growth
top_ten = df.head(10)
print(top_ten)

# Sort the top 10 companies by revenue growth in descending order
top_ten.sort_values(by='Revenue growth', ascending=False)
```

```
   Rank                 Name                         Industry  \
0   1.0              Walmart                           Retail
1   2.0               Amazon        Retail and cloud computing
2   3.0                Apple              Electronics industry
3   4.0    UnitedHealth Group                       Healthcare
```

```
4   5.0    Berkshire Hathaway                   Conglomerate
5   6.0           CVS Health                     Healthcare
6   7.0           ExxonMobil              Petroleum industry
7   8.0             Alphabet  Technology and cloud computing
8   9.0  McKesson Corporation                         Health
9  10.0              Cencora              Pharmacy wholesale

   Revenue (USD millions)  Revenue growth  Employees  \
0                648125.0             6.0  2100000.0
1                574785.0            11.9  1525000.0
2                383482.0            -2.8   161000.0
3                371622.0            14.6   440000.0
4                364482.0            20.7   396500.0
5                357776.0            10.9   259500.0
6                344582.0           -16.7    61500.0
7                307394.0             8.7   182502.0
8                276711.0             4.8    48000.0
9                262173.0             9.9    44000.0

                Headquarters
0       Bentonville, Arkansas
1         Seattle, Washington
2       Cupertino, California
3       Minnetonka, Minnesota
4             Omaha, Nebraska
5    Woonsocket, Rhode Island
6               Spring, Texas
7   Mountain View, California
8               Irving, Texas
9  Conshohocken, Pennsylvania
```

[29]:

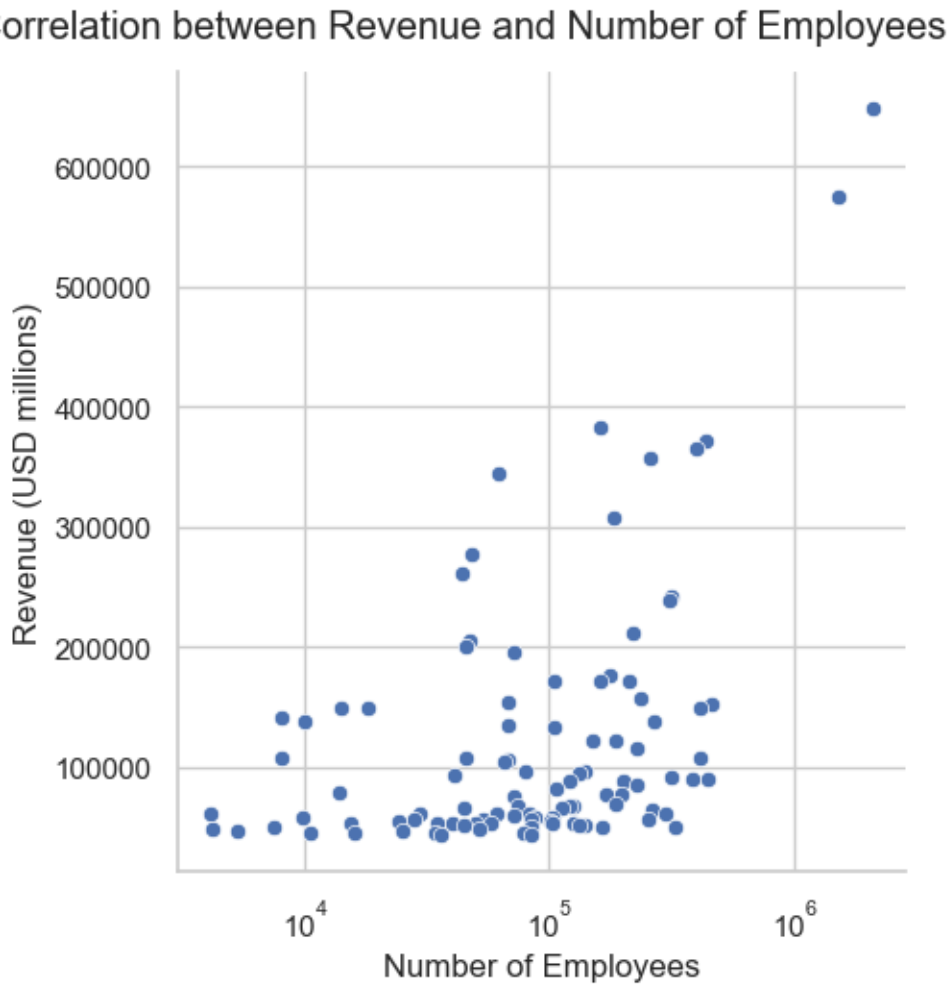
```
   Rank                  Name                         Industry  \
4   5.0    Berkshire Hathaway                   Conglomerate
3   4.0    UnitedHealth Group                     Healthcare
1   2.0                Amazon      Retail and cloud computing
5   6.0           CVS Health                     Healthcare
9  10.0              Cencora              Pharmacy wholesale
7   8.0             Alphabet  Technology and cloud computing
0   1.0              Walmart                          Retail
8   9.0  McKesson Corporation                         Health
2   3.0                Apple            Electronics industry
6   7.0           ExxonMobil              Petroleum industry

   Revenue (USD millions)  Revenue growth  Employees  \
4                364482.0            20.7   396500.0
3                371622.0            14.6   440000.0
1                574785.0            11.9  1525000.0
```

```
5                357776.0            10.9   259500.0
9                262173.0             9.9    44000.0
7                307394.0             8.7   182502.0
0                648125.0             6.0  2100000.0
8                276711.0             4.8    48000.0
2                383482.0            -2.8   161000.0
6                344582.0           -16.7    61500.0

                Headquarters
4             Omaha, Nebraska
3       Minnetonka, Minnesota
1         Seattle, Washington
5    Woonsocket, Rhode Island
9  Conshohocken, Pennsylvania
7   Mountain View, California
0       Bentonville, Arkansas
8               Irving, Texas
2       Cupertino, California
6               Spring, Texas
```

[30]:
```
# Check if there is a correlation between 'Revenue (USD millions)' and␣
↪'Employees'
df[['Revenue (USD millions)', 'Employees']].corr()
```

[30]:
```
                        Revenue (USD millions)  Employees
Revenue (USD millions)                1.000000   0.699229
Employees                             0.699229   1.000000
```

[31]:
```
# Visualize the correlation with a scatter plot
g = sns.relplot(x='Employees', y='Revenue (USD millions)', data = df, kind =␣
↪'scatter')
g.fig.suptitle('Correlation between Revenue and Number of Employees', y = 1.03)
g.set(xlabel="Number of Employees", ylabel="Revenue (USD millions)")

# Set log scale for the x-axis (data spans large ranges)
g.set(xscale='log')
plt.show()
```



[32]:
```
# The correlation coefficient between "Revenue (USD millions)" and "Employees"
# is 0.699, indicating a strong positive correlation.
# This trend is also visible in the scatter plot.
```

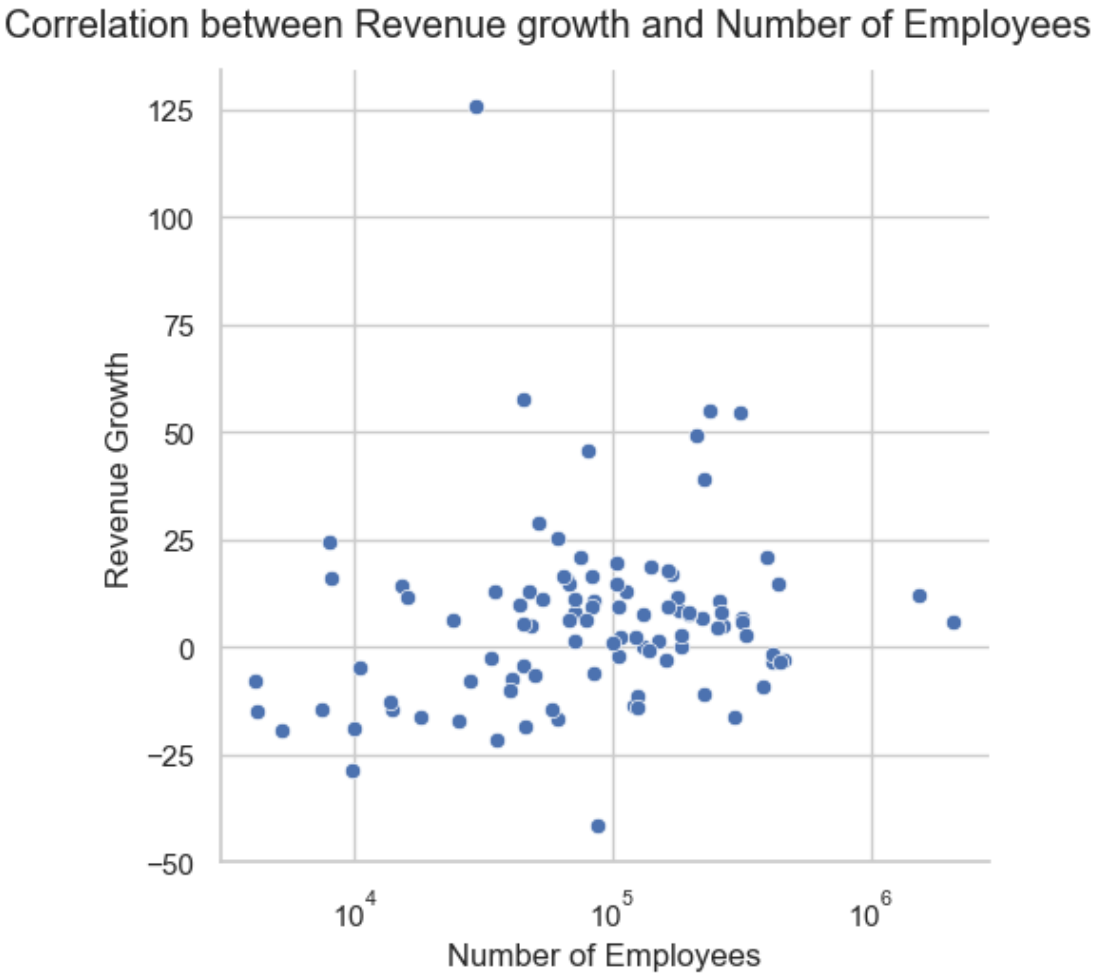
[33]:
```
# Check if there is a correlation between 'Revenue growth' and 'Employees'
df[['Revenue growth', 'Employees']].corr()
```

[33]:

	Revenue growth	Employees
Revenue growth	1.000000	0.052155
Employees	0.052155	1.000000

[34]:
```
# There is no strong correlation between "Revenue growth" and "Employees"
# because the correlation coefficient is 0.052.
# This is also reflected in the scatter plot.

g = sns.relplot(x='Employees', y='Revenue growth', data = df, kind = 'scatter')
```

```
g.fig.suptitle('Correlation between Revenue growth and Number of Employees', y
 ↪= 1.03)
g.set(xlabel="Number of Employees", ylabel="Revenue Growth")
# Set log scale for the x-axis (data spans large ranges)
g.set(xscale='log')
plt.show()
```



[ ]: