

Exemplar_Discover what is in your dataset

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1 Exemplar: Discover what is in your dataset

1.1 Introduction

In this activity, you will discover characteristics of a dataset and use visualizations to analyze the data. This will develop and strengthen your skills in **exploratory data analysis (EDA)** and your knowledge of functions that allow you to explore and visualize data.

EDA is an essential process in a data science workflow. As a data professional, you will need to conduct this process to better understand the data at hand and determine how it can be used to solve the problem you want to address. This activity will give you an opportunity to practice that process and prepare you for EDA in future projects.

In this activity, you are a member of an analytics team that provides insights to an investing firm. To help them decide which companies to invest in next, the firm wants insights into **unicorn companies**—companies that are valued at over one billion dollars. The data you will use for this task provides information on over 1,000 unicorn companies, including their industry, country, year founded, and select investors. You will use this information to gain insights into how and when companies reach this prestigious milestone and to make recommendations for next steps to the investing firm.

1.2 Step 1: Imports

1.2.1 Import libraries and packages

First, import the relevant Python libraries and modules. Use the **pandas** library and the **matplotlib.pyplot** module.

```
[1]: # Import libraries and packages

### YOUR CODE HERE ###

import pandas as pd
import matplotlib.pyplot as plt
import datetime as dt
```

1.2.2 Load the dataset into a DataFrame

The dataset provided is in the form of a csv file named `Unicorn_Companies.csv` and contains a subset of data on unicorn companies. Load the data from the csv file into a DataFrame and save it in a variable.

```
[2]: # Load data from the csv file into a DataFrame and save in a variable

### YOUR CODE HERE ###

companies = pd.read_csv("Unicorn_Companies.csv")
```

Hint 1

Refer to what you learned about [loading data](#) in Python.

Hint 2

Use the function in the `pandas` library that allows you to read data from a csv file and load the data into a DataFrame.

Hint 3

Use the `read_csv()` function from the `pandas` library.

1.3 Step 2: Data exploration

1.3.1 Display the first 10 rows of the data

Next, explore the dataset and answer questions to guide your exploration and analysis of the data. To begin, display the first 10 rows of the data to get an understanding of how the dataset is structured.

```
[3]: # Display the first 10 rows of the data

### YOUR CODE HERE ###

companies.head(10)
```

```
[3]:
```

	Company	Valuation	Date Joined	Industry \
0	Bytedance	\$180B	4/7/17	Artificial intelligence
1	SpaceX	\$100B	12/1/12	Other
2	SHEIN	\$100B	7/3/18	E-commerce & direct-to-consumer
3	Stripe	\$95B	1/23/14	Fintech
4	Klarna	\$46B	12/12/11	Fintech
5	Canva	\$40B	1/8/18	Internet software & services
6	Checkout.com	\$40B	5/2/19	Fintech
7	Instacart	\$39B	12/30/14	Supply chain, logistics, & delivery
8	JUUL Labs	\$38B	12/20/17	Consumer & retail
9	Databricks	\$38B	2/5/19	Data management & analytics

	City	Country/Region	Continent	Year Founded	Funding	\
0	Beijing	China	Asia	2012	\$8B	
1	Hawthorne	United States	North America	2002	\$7B	
2	Shenzhen	China	Asia	2008	\$2B	
3	San Francisco	United States	North America	2010	\$2B	
4	Stockholm	Sweden	Europe	2005	\$4B	
5	Surry Hills	Australia	Oceania	2012	\$572M	
6	London	United Kingdom	Europe	2012	\$2B	
7	San Francisco	United States	North America	2012	\$3B	
8	San Francisco	United States	North America	2015	\$14B	
9	San Francisco	United States	North America	2013	\$3B	

Select Investors

0	Sequoia Capital China, SIG Asia Investments, S...
1	Founders Fund, Draper Fisher Jurvetson, Rothen...
2	Tiger Global Management, Sequoia Capital China...
3	Khosla Ventures, LowercaseCapital, capitalG
4	Institutional Venture Partners, Sequoia Capita...
5	Sequoia Capital China, Blackbird Ventures, Mat...
6	Tiger Global Management, Insight Partners, DST...
7	Khosla Ventures, Kleiner Perkins Caufield & By...
8	Tiger Global Management
9	Andreessen Horowitz, New Enterprise Associates...

Hint 1

Refer to [the content about exploratory data analysis in Python](#).

Hint 2

Use the function in the `pandas` library that allows you to get a specific number of rows from the top of a `DataFrame`.

Hint 3

Use the `head()` function from the `pandas` library.

Question: What do you think the “Date Joined” column represents?

- The “Date Joined” column represents when the company became a “unicorn,” reaching one billion dollars in valuation.

Question: What do you think the “Select Investors” column represents?

- The “Select Investors” column represents the top investors in the company.

1.3.2 Assess the size of the dataset

Get a sense of how large the dataset is. The `size` property that `DataFrames` have can help.

```
[4]: # How large the dataset is

    ### YOUR CODE HERE ###

    companies.size
```

```
[4]: 10740
```

Question: What do you notice about the size of the dataset?

- The size of the dataset is 10740. This means that there are 10740 values in total across the whole dataset.

1.3.3 Determine the shape of the dataset

Identify the number of rows and columns in the dataset. The `shape` property that DataFrames have can help.

```
[5]: # Shape of the dataset

    ### YOUR CODE HERE ###

    companies.shape
```

```
[5]: (1074, 10)
```

Question: What do you notice about the shape of the dataset?

- The shape of the dataset is (1074, 10). The first number, 1074, represents the number of rows (also known as entries). The second number, 10, represents the number of columns. According to this dataset, there are 1074 unicorn companies as of March 2022, and this dataset also shows 10 aspects of each company.

1.3.4 Get basic information about the dataset

To further understand what the dataset entails, get basic information about the dataset, including the data type of values in each column. There is more than one way to approach this task. In this instance, use the `info()` function from `pandas`.

```
[6]: # Get information

    ### YOUR CODE HERE ###

    companies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1074 entries, 0 to 1073
Data columns (total 10 columns):
```

#	Column	Non-Null Count	Dtype
0	Company	1074 non-null	object
1	Valuation	1074 non-null	object
2	Date Joined	1074 non-null	object
3	Industry	1074 non-null	object
4	City	1058 non-null	object
5	Country/Region	1074 non-null	object
6	Continent	1074 non-null	object
7	Year Founded	1074 non-null	int64
8	Funding	1074 non-null	object
9	Select Investors	1073 non-null	object

dtypes: int64(1), object(9)
memory usage: 84.0+ KB

Question: What do you notice about the type of data in the `Year Founded` column? Refer to the output from using `info()` above. Knowing the data type of this variable is helpful because it indicates what types of analysis can be done with that variable, how it can be aggregated with other variables, and so on.

- `Dtype` is listed as `int64` in the `Year Founded` column. This means that the year a company was founded is represented as an integer.

Question: What do you notice about the type of data in the `Date Joined` column? Refer to the output from using `info()` above. Knowing the data type of this variable is helpful because it indicates what types of analysis can be done with that variable and how the variable can be transformed to suit specific tasks.

- `Dtype` is listed as `object` for the `Date Joined` column. This means that the date a company became a unicorn is represented as an object.

1.4 Step 3: Statistical tests

1.4.1 Find descriptive statistics

Find descriptive statistics and structure your dataset. The `describe()` function from the `pandas` library can help. This function generates statistics for the numeric columns in a dataset.

```
[7]: ### Get descriptive statistics

### YOUR CODE HERE ###

companies.describe()
```

```
[7]:      Year Founded
count    1074.000000
mean     2012.895717
std         5.698573
min      1919.000000
```

25%	2011.000000
50%	2014.000000
75%	2016.000000
max	2021.000000

Question: Based on the table of descriptive stats generated above, what do you notice about the minimum value in the **Year Founded** column? This is important to know because it helps you understand how early the entries in the data begin.

- The minimum value in the **Year Founded** column is 1919. This means that this dataset does not contain data on unicorn companies founded before 1919.

Question: What do you notice about the maximum value in the **Year Founded** column? This is important to know because it helps you understand the most recent year captured by the data.

- The maximum value in the **Year Founded** column is 2021. This means that this dataset does not include data on unicorn companies founded after 2021.

1.4.2 Convert the Date Joined column to datetime

- Use `pd.to_datetime()` to convert the “Date Joined” column to datetime.
- Update the column with the converted values.
- Use `.info()` to confirm that the update actually took place

You can use the `to_datetime()` function from the **pandas** library. This splits each value into year, month, and date components. This is an important step in data cleaning, as it makes the data in this column easier to use in tasks you may encounter. To name a few examples, you may need to compare “date joined” between companies or determine how long it took a company to become a unicorn. Having “date joined” in datetime form would help you complete such tasks.

```
[8]: # Step 1. Use pd.to_datetime() to convert Date Joined column to datetime
      # Step 2. Update the column with the converted values

      ### YOUR CODE HERE ###

      companies["Date Joined"] = pd.to_datetime(companies["Date Joined"])
```

```
[9]: # Use .info() to confirm that the update actually took place

      ### YOUR CODE HERE ###

      companies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1074 entries, 0 to 1073
Data columns (total 10 columns):
 #   Column                Non-Null Count  Dtype
---  -
 0   Company               1074 non-null   object
```

```

1  Valuation          1074 non-null  object
2  Date Joined        1074 non-null  datetime64[ns]
3  Industry           1074 non-null  object
4  City               1058 non-null  object
5  Country/Region     1074 non-null  object
6  Continent          1074 non-null  object
7  Year Founded       1074 non-null  int64
8  Funding            1074 non-null  object
9  Select Investors   1073 non-null  object
dtypes: datetime64[ns](1), int64(1), object(8)
memory usage: 84.0+ KB

```

1.4.3 Create a Year Joined column

It is common to encounter situations where you will need to compare the year joined with the year founded. The `Date Joined` column does not just have year—it has the year, month, and date. Extract the year component from the `Date Joined` column and add those year components into a new column to keep track of each company's year joined.

```

[10]: # Step 1: Use .dt.year to extract year component from Date Joined column
      # Step 2: Add the result as a new column named Year Joined to the DataFrame

      ### YOUR CODE HERE ###

      companies["Year Joined"] = companies["Date Joined"].dt.year

```

```

[11]: # Use .head() to confirm that the new column did get added

      ### YOUR CODE HERE ###

      companies.head()

```

```

[11]:
   Company Valuation Date Joined Industry \
0  Bytedance   $180B  2017-04-07  Artificial intelligence
1   SpaceX    $100B  2012-12-01                Other
2   SHEIN     $100B  2018-07-03  E-commerce & direct-to-consumer
3   Stripe     $95B  2014-01-23                Fintech
4   Klarna     $46B  2011-12-12                Fintech

   City Country/Region Continent Year Founded Funding \
0   Beijing         China        Asia        2012   $8B
1  Hawthorne  United States  North America        2002   $7B
2   Shenzhen         China        Asia        2008   $2B
3  San Francisco  United States  North America        2010   $2B
4   Stockholm         Sweden        Europe        2005   $4B

   Select Investors Year Joined

```

0	Sequoia Capital China, SIG Asia Investments, S...	2017
1	Founders Fund, Draper Fisher Jurvetson, Rothen...	2012
2	Tiger Global Management, Sequoia Capital China...	2018
3	Khosla Ventures, LowercaseCapital, capitalG	2014
4	Institutional Venture Partners, Sequoia Capita...	2011

1.5 Step 4: Results and evaluation

1.5.1 Take a sample of the data

It is not necessary to take a sample of the data in order to conduct the visualizations and EDA that follow. But you may encounter scenarios in the future where you will need to take a sample of the data due to time and resource limitations. For the purpose of developing your skills around sampling, take a sample of the data and work with that sample for the next steps of analysis you want to conduct. Use the `sample()` function for this task.

- Use `sample()` with the `n` parameter set to 50 to randomly sample 50 unicorn companies from the data. Be sure to specify the `random_state` parameter to ensure reproducibility of your work. Save the result to a variable called `companies_sampled`.

```
[12]: # Sample the data

### YOUR CODE HERE ###

companies_sample = companies.sample(n = 50, random_state = 42)
```

1.5.2 Visualize the time it took companies to reach unicorn status

Visualize the longest time it took companies to reach unicorn status for each industry represented in the sample. To create a bar plot to visualize this, use the `bar()` function from the `matplotlib.pyplot` module. You'll first need to prepare the data.

```
[13]: # Prepare data for plotting

### YOUR CODE HERE ###

# Create new `years_till_unicorn` column
companies_sample["years_till_unicorn"] = companies_sample["Year Joined"] -
↳ companies_sample["Year Founded"]

# Group the data by `Industry`. For each industry, get the max value in the
↳ `years_till_unicorn` column.
grouped = (companies_sample[["Industry", "years_till_unicorn"]]
            .groupby("Industry")
            .max()
            .sort_values(by="years_till_unicorn")
            )
```



```
grouped
```

```
[13]:                                     years_till_unicorn
Industry
Consumer & retail                        1
Auto & transportation                    2
Artificial intelligence                  5
Data management & analytics              8
Mobile & telecommunications            9
Supply chain, logistics, & delivery     12
Internet software & services            13
Other                                   15
E-commerce & direct-to-consumer        18
Cybersecurity                          19
Fintech                                21
Health                                 21
```

Now, create a bar plot.

```
[14]: # Create bar plot
# with Industry column as the categories of the bars
# and the difference in years between Year Joined column and Year Founded_
    ↳ column as the heights of the bars

### YOUR CODE HERE ###

plt.bar(grouped.index, grouped["years_till_unicorn"])

# Set title

### YOUR CODE HERE ###

plt.title("Bar plot of maximum years taken by company to become unicorn per_
    ↳ industry (from sample)")

# Set x-axis label

### YOUR CODE HERE ###

plt.xlabel("Industry")

# Set y-axis label

### YOUR CODE HERE ###

plt.ylabel("Maximum number of years")
```

```

# Rotate labels on the x-axis as a way to avoid overlap in the positions of the
↳ text

### YOUR CODE HERE ###

plt.xticks(rotation=45, horizontalalignment='right')

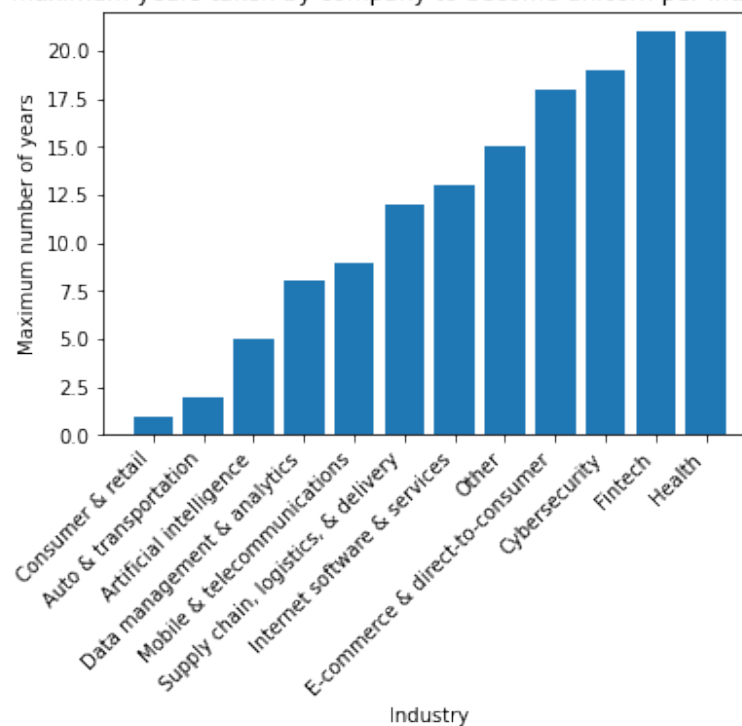
# Display the plot

### YOUR CODE HERE ###

plt.show()

```

Bar plot of maximum years taken by company to become unicorn per industry (from sample)



Hint 1

To prepare the data for modeling, begin by creating a column that represents the number of years it took each company to reach unicorn status.

Hint 2

To prepare the data for modeling, group the dataframe by industry and get the maximum value in the newly created column for each industry.

Hint 3

Use the `plt.bar()` to create the bar plot, passing in the categories and heights of the bars.

Use `plt.title()`, `plt.xlabel()`, and `plt.ylabel()` to set the title, x-axis label, and y-axis label, respectively.

Use `plt.xticks()` to rotate labels on the x-axis of a plot. The parameters `rotation=45`, `horizontalalignment='right'` can be passed in to rotate the labels by 45 degrees and align the labels to the right.

Use `plt.show()` to display a plot.

Question: What do you observe from this bar plot?

- This bar plot shows that for this sample of unicorn companies, the largest value for maximum time taken to become a unicorn occurred in the Heath and Fintech industries, while the smallest value occurred in the Consumer & Retail industry.

1.5.3 Visualize the maximum unicorn company valuation per industry

Visualize unicorn companies' maximum valuation for each industry represented in the sample. To create a bar plot to visualize this, use the `bar()` function from the `matplotlib.pyplot` module. Before plotting, create a new column that represents the companies' valuations as numbers (instead of strings, as they're currently represented). Then, use this new column to plot your data.

```
[15]: # Create a column representing company valuation as numeric data

# Create new column
companies_sample['valuation_billions'] = companies_sample['Valuation']
# Remove the '$' from each value
companies_sample['valuation_billions'] = companies_sample['valuation_billions'].
    ↪str.replace('$', '')
# Remove the 'B' from each value
companies_sample['valuation_billions'] = companies_sample['valuation_billions'].
    ↪str.replace('B', '')
# Convert column to type int
companies_sample['valuation_billions'] = companies_sample['valuation_billions'].
    ↪astype('int')
companies_sample.head()
```

```
[15]:
```

	Company	Valuation	Date Joined	Industry	\
542	Aiven	\$2B	2021-10-18	Internet software & services	
370	Jusfoun Big Data	\$2B	2018-07-09	Data management & analytics	
307	Innovaccer	\$3B	2021-02-19	Health	
493	Algolia	\$2B	2021-07-28	Internet software & services	
350	SouChe Holdings	\$3B	2017-11-01	E-commerce & direct-to-consumer	

	City	Country/Region	Continent	Year Founded	Funding	\
542	Helsinki	Finland	Europe	2016	\$210M	
370	Beijing	China	Asia	2010	\$137M	

307	San Francisco	United States	North America	2014	\$379M
493	San Francisco	United States	North America	2012	\$334M
350	Hangzhou	China	Asia	2012	\$1B

	Select Investors	Year Joined	\
542	Institutional Venture Partners, Atomico, Early...	2021	
370	Boxin Capital, DT Capital Partners, IDG Capital	2018	
307	M12, WestBridge Capital, Lightspeed Venture Pa...	2021	
493	Accel, Alven Capital, Storm Ventures	2021	
350	Morningside Ventures, Warburg Pincus, CreditEa...	2017	

	years_till_unicorn	valuation_billions
542	5	2
370	8	2
307	7	3
493	9	2
350	5	3

Now, prepare the data for modeling by performing the necessary calculations on it.

```
[16]: # Prepare data for modeling
grouped = (companies_sample[["Industry", "valuation_billions"]]
          .groupby("Industry")
          .max()
          .sort_values(by="valuation_billions")
          )
grouped
```

```
[16]:
```

	valuation_billions
Industry	
Auto & transportation	1
Consumer & retail	1
Other	2
Supply chain, logistics, & delivery	2
Cybersecurity	3
Health	3
Data management & analytics	4
E-commerce & direct-to-consumer	4
Internet software & services	5
Mobile & telecommunications	7
Fintech	10
Artificial intelligence	12

```
[17]: # Create bar plot
# with Industry column as the categories of the bars
# and new valuation column as the heights of the bars
```

```

#### YOUR CODE HERE ####

plt.bar(grouped.index, grouped["valuation_billions"])

# Set title

#### YOUR CODE HERE ####

plt.title("Bar plot of maximum unicorn company valuation per industry (from_
↳sample)")

# Set x-axis label

#### YOUR CODE HERE ####

plt.xlabel("Industry")

# Set y-axis label

#### YOUR CODE HERE ####

plt.ylabel("Maximum valuation in billions of dollars")

# Rotate labels on the x-axis as a way to avoid overlap in the positions of the_
↳text

#### YOUR CODE HERE ####

plt.xticks(rotation=45, horizontalalignment='right')

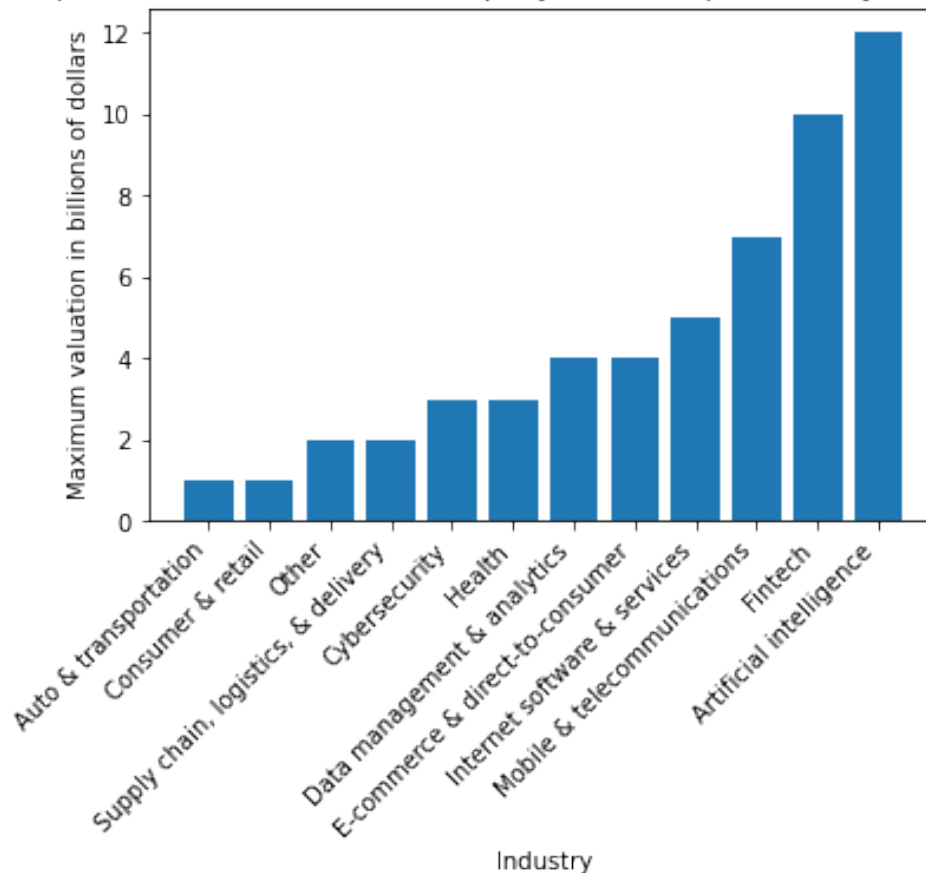
# Display the plot

#### YOUR CODE HERE ####

plt.show()

```

Bar plot of maximum unicorn company valuation per industry (from sample)



Hint 1

Repeat the process from the last task, only this time with different variables.

Hint 2

Use the function in the `matplotlib.pyplot` module that allows you to create a bar plot, specifying the category and height for each bar.

Use the functions in the `matplotlib.pyplot` module that allow you to set the title, x-axis label, and y-axis label of plots. In that module, there are also functions for rotating the labels on the x-axis and displaying the plot.

Hint 3

You can use the `plt.bar()` to create the bar plot, passing in the categories and heights of the bars.

You can use `plt.title()`, `plt.xlabel()`, and `plt.ylabel()` to set the title, x-axis label, and y-axis label, respectively.

You can use `plt.xticks()` to rotate labels on the x-axis of a plot. The parameters `rotation=45`, `horizontalalignment='right'` can be passed in to rotate the labels by 45 degrees and align the

labels to the right.

You can use `plt.show()` to display a plot.

Question: What do you observe from this bar plot?

- This bar plot shows that for this sample of unicorn companies, the highest maximum valuation occurred in the Artificial Intelligence industry, while the lowest maximum valuation occurred in the Auto & transportation, and Consumer & retail industries.

1.6 Considerations

What are some key takeaways that you learned from this lab?

- Functions in the `pandas` library can be used to gather characteristics about the data at hand.
 - The `info()` and `describe()` functions were especially useful for gathering basic information about a dataset and finding descriptive statistics, respectively.
- Functions in the `matplotlib.pyplot` module can be used to create visualizations to further understand specific aspects of the data.
 - The `bar()` function allowed you to create bar plots that helped visualize categorical information about the data. You were able to visualize the maximum years to become a unicorn and maximum valuation for each industry represented in the sample taken from the data.

What findings would you share with others?

- There are 1074 unicorn companies represented in this dataset.
- Some companies took longer to reach unicorn status but have accrued high valuation as of March 2022. Companies could take longer to achieve unicorn status for a number of reasons, including requiring more funding or taking longer to develop a business model.

What recommendations would you share with stakeholders based on these findings?

It may be helpful to focus more on industry specifics. Next steps to consider: - Identify the main industries that the investing firm is interested in investing in. - Select a subset of this data that includes only companies in those industries. - Analyze that subset more closely. Determine which companies have higher valuation but do not have as many investors currently. They may be good candidates to consider investing in.

References

Bhat, M.A. (2022, March). *Unicorn Companies*.

Congratulations! You've completed this lab. However, you may not notice a green check mark next to this item on Coursera's platform. Please continue your progress regardless of the check mark. Just click on the "save" icon at the top of this notebook to ensure your work has been logged.