2a

October 17, 2023

1 Shark Tank

Shark Tank is a reality TV show. Contestants present their idea for a company to a panel of investors (a.k.a. "sharks"), who then decide whether or not to invest in that company. The investors give a certain amount of money in exchange for a percentage stake in the company ("equity"). If you are not familiar with the show, you may want to watch part of an episode here to get a sense of how it works. You can also search for a clip on YouTube.

The data that you will examine in this lab contains data about all contestants from the first 6 seasons of the show, including: - the name and industry of the proposed company - whether or not it was funded (i.e., the "Deal" column) - which sharks chose to invest in the venture (N.B. There are 7 regular sharks, not including "Guest". Each shark has a column in the data set, labeled by their last name.) - if funded, the amount of money the sharks put in and the percentage equity they got in return

To earn full credit on this lab, you should: - use built-in `pandas` methods (like `.sum()` and `.max()`) instead of writing a for loop over a `DataFrame` or `Series` - use the split-apply-combine pattern wherever possible

Of course, if you can't think of a vectorized solution, a `for` loop is still better than no solution at all!

1.1 GROUP DETAILS

1. MEMBER-1: MANAN KUMAR (SID: 862393075)
2. MEMBER-2: NITYASH GAUTAM (SID: 862395403)

[1]:
```
import pandas as pd
```

1.2 Question 0. Getting and Cleaning the Data

The data is stored in the CSV file `sharktank.csv`. Read in the data into a Pandas `DataFrame`.

[2]:
```
sharktank_df = pd.read_csv('sharktank.csv')

sharktank_df
```

[2]:

	Season	No. in series	Company	Deal	\
0	1.0	1.0	Ava the Elephant	Yes	
1	1.0	1.0	Mr. Tod's Pie Factory	Yes	

```
2       1.0            1.0                       Wispots   No
3       1.0            1.0  College Foxes Packing Boxes   No
4       1.0            1.0                   Ionic Ear   No
..      …              …                           …  …
490     6.0           28.0                You Kick Ass  Yes
491     6.0           29.0                 Shark Wheel  Yes
492     6.0           29.0                   Gato Cafe   No
493     6.0           29.0             Sway Motorsports  Yes
494     6.0           29.0                   Spikeball  Yes

                Industry Entrepreneur Gender    Amount Equity  Corcoran  \
0             Healthcare               Female   $50,000    55%       1.0
1      Food and Beverage                 Male  $460,000    50%       1.0
2      Business Services                 Male       NaN    NaN       NaN
3       Lifestyle / Home                 Male       NaN    NaN       NaN
4      Uncertain / Other                 Male       NaN    NaN       NaN
..                   …                  …       …    …       …
490  Children / Education               Female  $100,000    10%       NaN
491     Fitness / Sports                 Male  $225,000     8%       NaN
492    Uncertain / Other               Female       NaN    NaN       NaN
493       Green/CleanTech                Male  $300,000    20%       NaN
494     Fitness / Sports                 Male  $500,000    20%       NaN

     Cuban  Greiner  Herjavec  John  O'Leary  Harrington  Guest  \
0      NaN      NaN       NaN   NaN      NaN         NaN    NaN
1      NaN      NaN       NaN   1.0      NaN         NaN    NaN
2      NaN      NaN       NaN   NaN      NaN         NaN    NaN
3      NaN      NaN       NaN   NaN      NaN         NaN    NaN
4      NaN      NaN       NaN   NaN      NaN         NaN    NaN
..     …      …       …   …      …          …    …
490    1.0      NaN       NaN   NaN      NaN         NaN    NaN
491    1.0      NaN       1.0   NaN      NaN         NaN    1.0
492    NaN      NaN       NaN   NaN      NaN         NaN    NaN
493    1.0      NaN       NaN   NaN      NaN         NaN    NaN
494    NaN      NaN       NaN   1.0      NaN         NaN    NaN

                                        Details / Notes
0                                                  NaN
1                                                  NaN
2                                                  NaN
3                                                  NaN
4                                                  NaN
..                                                 …
490                                                NaN
491  10% royalty until $500K; then converts to 5% e…
492                                                NaN
493                                                NaN
```

```
494                                                 NaN

[495 rows x 17 columns]
```

There is one column for each of the sharks. A 1 indicates that they chose to invest in that company, while a missing value indicates that they did not choose to invest in that company. Notice that these missing values show up as NaNs when we read in the data. Fill in these missing values with zeros. Other columns may also contain NaNs; be careful not to fill those columns with zeros, or you may end up with strange results down the line.

[3]:
```
# Replacing the Null Values with 0

shark_columns = ["Corcoran", "Cuban", "Greiner", "Herjavec", "John", "O'Leary",␣
 ↪"Harrington", "Guest"]

sharktank_df[shark_columns] = sharktank_df[shark_columns].fillna(0)

sharktank_df
```

[3]:
```
     Season  No. in series                      Company Deal  \
0       1.0            1.0               Ava the Elephant  Yes
1       1.0            1.0          Mr. Tod's Pie Factory  Yes
2       1.0            1.0                        Wispots   No
3       1.0            1.0  College Foxes Packing Boxes   No
4       1.0            1.0                     Ionic Ear   No
..      …              …                          …  …
490     6.0           28.0                  You Kick Ass  Yes
491     6.0           29.0                   Shark Wheel  Yes
492     6.0           29.0                     Gato Cafe   No
493     6.0           29.0              Sway Motorsports  Yes
494     6.0           29.0                     Spikeball  Yes

                 Industry Entrepreneur Gender    Amount Equity  Corcoran  \
0              Healthcare               Female   $50,000    55%       1.0
1       Food and Beverage                 Male  $460,000    50%       1.0
2       Business Services                 Male       NaN    NaN       0.0
3        Lifestyle / Home                 Male       NaN    NaN       0.0
4       Uncertain / Other                 Male       NaN    NaN       0.0
..                    …                  …       …    …       …
490  Children / Education               Female  $100,000    10%       0.0
491      Fitness / Sports                 Male  $225,000     8%       0.0
492     Uncertain / Other               Female       NaN    NaN       0.0
493       Green/CleanTech                 Male  $300,000    20%       0.0
494      Fitness / Sports                 Male  $500,000    20%       0.0

     Cuban  Greiner  Herjavec  John  O'Leary  Harrington  Guest  \
0      0.0      0.0       0.0   0.0      0.0         0.0    0.0
```

```
1      0.0      0.0       0.0   1.0      0.0         0.0    0.0
2      0.0      0.0       0.0   0.0      0.0         0.0    0.0
3      0.0      0.0       0.0   0.0      0.0         0.0    0.0
4      0.0      0.0       0.0   0.0      0.0         0.0    0.0
..     …        …         …     …        …           …      …
490    1.0      0.0       0.0   0.0      0.0         0.0    0.0
491    1.0      0.0       1.0   0.0      0.0         0.0    1.0
492    0.0      0.0       0.0   0.0      0.0         0.0    0.0
493    1.0      0.0       0.0   0.0      0.0         0.0    0.0
494    0.0      0.0       0.0   1.0      0.0         0.0    0.0

                                          Details / Notes
0                                                    NaN
1                                                    NaN
2                                                    NaN
3                                                    NaN
4                                                    NaN
..                                                   …
490                                                  NaN
491  10% royalty until $500K; then converts to 5% e…
492                                                  NaN
493                                                  NaN
494                                                  NaN

[495 rows x 17 columns]
```

Notice that Amount and Equity are currently being treated as categorical variables (`dtype: object`). Can you figure out why this is? Clean up these columns and cast them to numeric types (i.e., a `dtype` of `int` or `float`) because we'll need to perform mathematical operations on these columns.

[4]:
```
# Cleaning the "Amount" and "Equity" columns and changing them to float data␣
↪type
sharktank_df['Amount'] = sharktank_df['Amount'].str.replace('$','')
sharktank_df['Amount'] = sharktank_df['Amount'].str.replace(',','')
sharktank_df['Amount'] = sharktank_df['Amount'].astype(float)

sharktank_df['Equity'] = sharktank_df['Equity'].str.replace('%','')
sharktank_df['Equity'] = sharktank_df['Equity'].astype(float)

sharktank_df
```

```
C:\Users\nitya\AppData\Local\Temp\ipykernel_16732\945289602.py:2: FutureWarning:
The default value of regex will change from True to False in a future version.
In addition, single character regular expressions will *not* be treated as
literal strings when regex=True.
  sharktank_df['Amount'] = sharktank_df['Amount'].str.replace('$','')
```

[4]:

	Season	No. in series	Company	Deal
0	1.0	1.0	Ava the Elephant	Yes
1	1.0	1.0	Mr. Tod's Pie Factory	Yes
2	1.0	1.0	Wispots	No
3	1.0	1.0	College Foxes Packing Boxes	No
4	1.0	1.0	Ionic Ear	No
..	…	…	…	…
490	6.0	28.0	You Kick Ass	Yes
491	6.0	29.0	Shark Wheel	Yes
492	6.0	29.0	Gato Cafe	No
493	6.0	29.0	Sway Motorsports	Yes
494	6.0	29.0	Spikeball	Yes

	Industry	Entrepreneur Gender	Amount	Equity	Corcoran
0	Healthcare	Female	50000.0	55.0	1.0
1	Food and Beverage	Male	460000.0	50.0	1.0
2	Business Services	Male	NaN	NaN	0.0
3	Lifestyle / Home	Male	NaN	NaN	0.0
4	Uncertain / Other	Male	NaN	NaN	0.0
..	…	…	…	…	…
490	Children / Education	Female	100000.0	10.0	0.0
491	Fitness / Sports	Male	225000.0	8.0	0.0
492	Uncertain / Other	Female	NaN	NaN	0.0
493	Green/CleanTech	Male	300000.0	20.0	0.0
494	Fitness / Sports	Male	500000.0	20.0	0.0

	Cuban	Greiner	Herjavec	John	O'Leary	Harrington	Guest
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	1.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
..	…	…	…	…	…	…	…
490	1.0	0.0	0.0	0.0	0.0	0.0	0.0
491	1.0	0.0	1.0	0.0	0.0	0.0	1.0
492	0.0	0.0	0.0	0.0	0.0	0.0	0.0
493	1.0	0.0	0.0	0.0	0.0	0.0	0.0
494	0.0	0.0	0.0	1.0	0.0	0.0	0.0

	Details / Notes
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN
..	…
490	NaN

```
491  10% royalty until $500K; then converts to 5% e…
492                                                NaN
493                                                NaN
494                                                NaN

[495 rows x 17 columns]
```

1.3 Question 1. Which Company was Worth the Most?

The valuation of a company is how much it is worth. If someone invests \$10,000 for a 40% equity stake in the company, then this means the company must be valued at $25,000, since 40% of \$25,000 is \$10,000.

Calculate the valuation of each company that was funded. Which company was most valuable? Is it the same as the company that received the largest total investment from the sharks?

[5]:
```
# Selecting the funded companies from the data
funded_companies = sharktank_df[sharktank_df['Deal'] == 'Yes']

# Adding a column that shows valuation for each funded company from the data
funded_companies['Valuation'] = funded_companies['Amount'] /␣
 ↪(funded_companies['Equity'] / 100)

# The company with highest valuation
most_valuable_company = funded_companies.loc[funded_companies['Valuation'].
 ↪idxmax(), 'Company']

# The company that received the largest investment
highest_investment_company = funded_companies.loc[funded_companies['Amount'].
 ↪idxmax(), 'Company']

print(f"Company with the highest Valuation is: {most_valuable_company}")
print()
print(f"Comapny that received the largest investment is:␣
 ↪{highest_investment_company}")
print()

# Implementing a Check if they are the same companies or not
if most_valuable_company == highest_investment_company:
    print("Yes, the company with the highest valuation is the same as the␣
 ↪company that received the largest investment.")
else:
    print("No, the company with the highest valuation is the not same as the␣
 ↪company that received the largest investment.")

funded_companies
```

```
Company with the highest Valuation is: The Wall DoctoRX
```

```
Comapny that received the largest investment is: AirCar

No, the company with the highest valuation is the not same as the company that
received the largest investment.

C:\Users\nitya\AppData\Local\Temp\ipykernel_16732\4149249056.py:5:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  funded_companies['Valuation'] = funded_companies['Amount'] /
(funded_companies['Equity'] / 100)
```

[5]:

	Season	No. in series	Company	Deal	Industry	\
0	1.0	1.0	Ava the Elephant	Yes	Healthcare	
1	1.0	1.0	Mr. Tod's Pie Factory	Yes	Food and Beverage	
5	1.0	2.0	A Perfect Pear	Yes	Food and Beverage	
6	1.0	2.0	Classroom Jams	Yes	Children / Education	
10	1.0	3.0	Turbobaster	Yes	Food and Beverage	
..	…	…	…	…	…	
489	6.0	28.0	SynDaver Labs	Yes	Healthcare	
490	6.0	28.0	You Kick Ass	Yes	Children / Education	
491	6.0	29.0	Shark Wheel	Yes	Fitness / Sports	
493	6.0	29.0	Sway Motorsports	Yes	Green/CleanTech	
494	6.0	29.0	Spikeball	Yes	Fitness / Sports	

	Entrepreneur	Gender	Amount	Equity	Corcoran	Cuban	Greiner	\
0		Female	50000.0	55.0	1.0	0.0	0.0	
1		Male	460000.0	50.0	1.0	0.0	0.0	
5		Female	500000.0	50.0	0.0	0.0	0.0	
6		Male	250000.0	10.0	1.0	1.0	0.0	
10		Female	35000.0	100.0	0.0	0.0	0.0	
..		…	…	…	…	…	…	
489		Male	3000000.0	25.0	0.0	0.0	0.0	
490		Female	100000.0	10.0	0.0	1.0	0.0	
491		Male	225000.0	8.0	0.0	1.0	0.0	
493		Male	300000.0	20.0	0.0	1.0	0.0	
494		Male	500000.0	20.0	0.0	0.0	0.0	

	Herjavec	John	O'Leary	Harrington	Guest	\
0	0.0	0.0	0.0	0.0	0.0	
1	0.0	1.0	0.0	0.0	0.0	
5	1.0	0.0	1.0	0.0	0.0	
6	1.0	1.0	1.0	0.0	0.0	
10	0.0	0.0	0.0	1.0	0.0	

```
..        …   …      …          …    …
489       1.0   0.0      0.0          0.0    0.0
490       0.0   0.0      0.0          0.0    0.0
491       1.0   0.0      0.0          0.0    1.0
493       0.0   0.0      0.0          0.0    0.0
494       0.0   1.0      0.0          0.0    0.0

                                        Details / Notes     Valuation
0                                                   NaN  9.090909e+04
1                                                   NaN  9.200000e+05
5                                                   NaN  1.000000e+06
6                                                   NaN  2.500000e+06
10                                           2% royalty  3.500000e+04
..                                                  …           …
489                                                 NaN  1.200000e+07
490                                                 NaN  1.000000e+06
491  10% royalty until $500K; then converts to 5% e…  2.812500e+06
493                                                 NaN  1.500000e+06
494                                                 NaN  2.500000e+06

[249 rows x 18 columns]
```

YOUR EXPLANATION HERE

Company can receive a large investment but give away a big equity portion, resulting in a lower valuation.

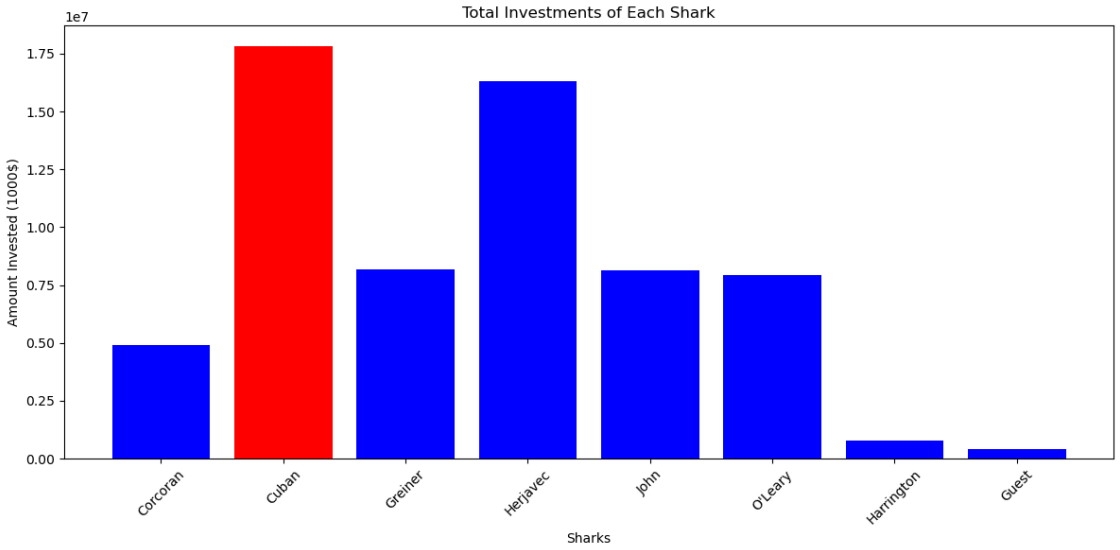
1.4 Question 2. Which Shark Invested the Most?

Calculate the total amount of money that each shark invested over the 6 seasons. Which shark invested the most total money over the 6 seasons?

Hint: If n sharks funded a given venture, then the amount that each shark invested is the total amount divided by n.

[6]:
```
import matplotlib.pyplot as plt

# Adding a column to show how many sharks that invested in each venture
sharktank_df['num_sharks'] = sharktank_df[shark_columns].sum(axis=1)

# Adding a column to show the amount each shark invested for each venture
sharktank_df['each_shark_investment'] = sharktank_df['Amount'] /␣
 ↪sharktank_df['num_sharks']

# Calculating the total investment made by each shark
shark_investments = {shark: (sharktank_df[shark] *␣
 ↪sharktank_df['each_shark_investment']).sum() for shark in shark_columns}

# Finding the shark who made the max investment
```

```
max_shark = max(shark_investments, key=shark_investments.get)

###### VISUALIZATION ######

sharks = list(shark_investments.keys())
investments = list(shark_investments.values())

plt.figure(figsize=(12, 6))
plt.bar(sharks, investments, color='blue')
plt.title('Total Investments of Each Shark')
plt.ylabel('Amount Invested (1000$)')
plt.xlabel('Sharks')

# Rotating the X-Label ticks for better layout
plt.xticks(rotation=45)
plt.tight_layout()

# Highlighting the shark with the most investment
plt.bar(max_shark, shark_investments[max_shark], color='red')
plt.show()
```



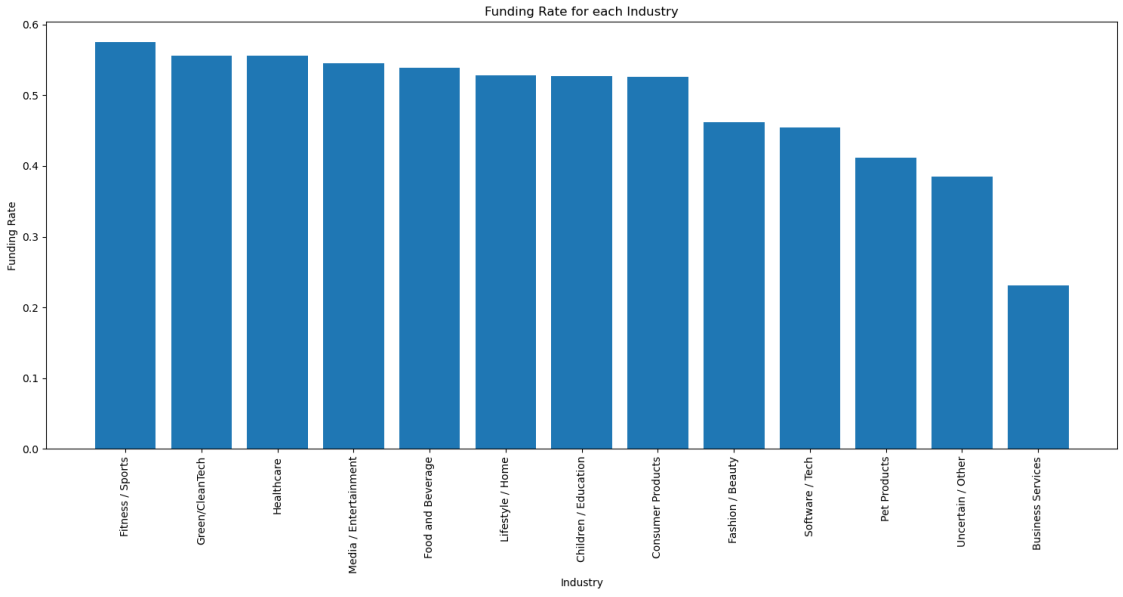
YOUR EXPLANATION HERE

Based on the following graph cuban invested the most.

1.5 Question 3. Do the Sharks Prefer Certain Industries?

Calculate the funding rate (the proportion of companies that were funded) for each industry. Make a visualization showing this information.

[7]:
```
# Counting the number of companies present under each industry
total_companies = sharktank_df['Industry'].value_counts()

# Counting the the number companies funded per industry
funded_counts = funded_companies['Industry'].value_counts()

# Calculating the funding rate for each industry
funding_rate = (funded_counts / total_companies).fillna(0)

import matplotlib.pyplot as plt

# Sort industries by funding rate for clearer visualization
sorted_indices = funding_rate.sort_values(ascending=False).index
sorted_values = funding_rate.sort_values(ascending=False).values

###### VISUALIZATION ######

plt.figure(figsize=(15, 8))
plt.bar(sorted_indices, sorted_values)
plt.title('Funding Rate for each Industry')
plt.ylabel('Funding Rate')
plt.xlabel('Industry')

# Rotating the X-Label ticks for better layout
plt.xticks(rotation=90)
plt.tight_layout()
plt.show()
```



YOUR EXPLANATION HERE

By calculating the financing rate for each industry to find the preferences in that sector. Then we represent the data using a bar chart with financing rates on the y-axis and industries on the x-axis. This displays the industries that the sharks like.

1.6 Submission Instructions

Once you are finished, follow these steps:

1. Restart the kernel and re-run this notebook from beginning to end by going to `Kernel > Restart Kernel and Run All Cells`.
2. If this process stops halfway through, that means there was an error. Correct the error and repeat Step 1 until the notebook runs from beginning to end.
3. Double check that there is a number next to each code cell and that these numbers are in order.

Then, submit your lab as follows:

1. Go to `File > Export Notebook As > PDF`.
2. Double check that the entire notebook, from beginning to end, is in this PDF file. (If the notebook is cut off, try first exporting the notebook to HTML and printing to PDF.)
3. Upload the Notebook (ipynb) to canvas (one submission per group).
4. Demo your lab by next Tuesday for full credit.

2b

October 17, 2023

1 Evidence of Discrimination?

The Department of Developmental Services (DDS) in California is responsible for allocating funds to support over 250,000 developmentally-disabled residents. The data set `ca_dds_expenditures.csv` contains data about 1,000 of these residents. The data comes from a discrimination lawsuit which alleged that California's Department of Developmental Services (DDS) privileged white (non-Hispanic) residents over Hispanic residents in allocating funds. We will focus on comparing the allocation of funds (i.e., expenditures) for these two ethnicities only, although there are other ethnicities in this data set.

There are 6 variables in this data set:

- Id: 5-digit, unique identification code for each consumer (similar to a social security number and used for identification purposes)

- Age Cohort: Binned age variable represented as six age cohorts (0-5, 6-12, 13-17, 18-21, 22-50, and 51+)
- Age: Unbinned age variable
- Gender: Male or Female
- Expenditures: Dollar amount of annual expenditures spent on each consumer
- Ethnicity: Eight ethnic groups (American Indian, Asian, Black, Hispanic, Multi-race, Native Hawaiian, Other, and White non-Hispanic)

1.1 GROUP DETAILS

1. MEMBER-1: MANAN KUMAR (SID: 862393075)
2. MEMBER-2: NITYASH GAUTAM (SID: 862395403)

2 Question 1

Read in the data set. Make a graphic that compares the *average* expenditures by the DDS on Hispanic residents and white (non-Hispanic) residents. Comment on what you see.

[1]:
```
import pandas as pd

# Reading the Dataset
df = pd.read_csv('ca_dds_expenditures.csv')
df
```

[1]:

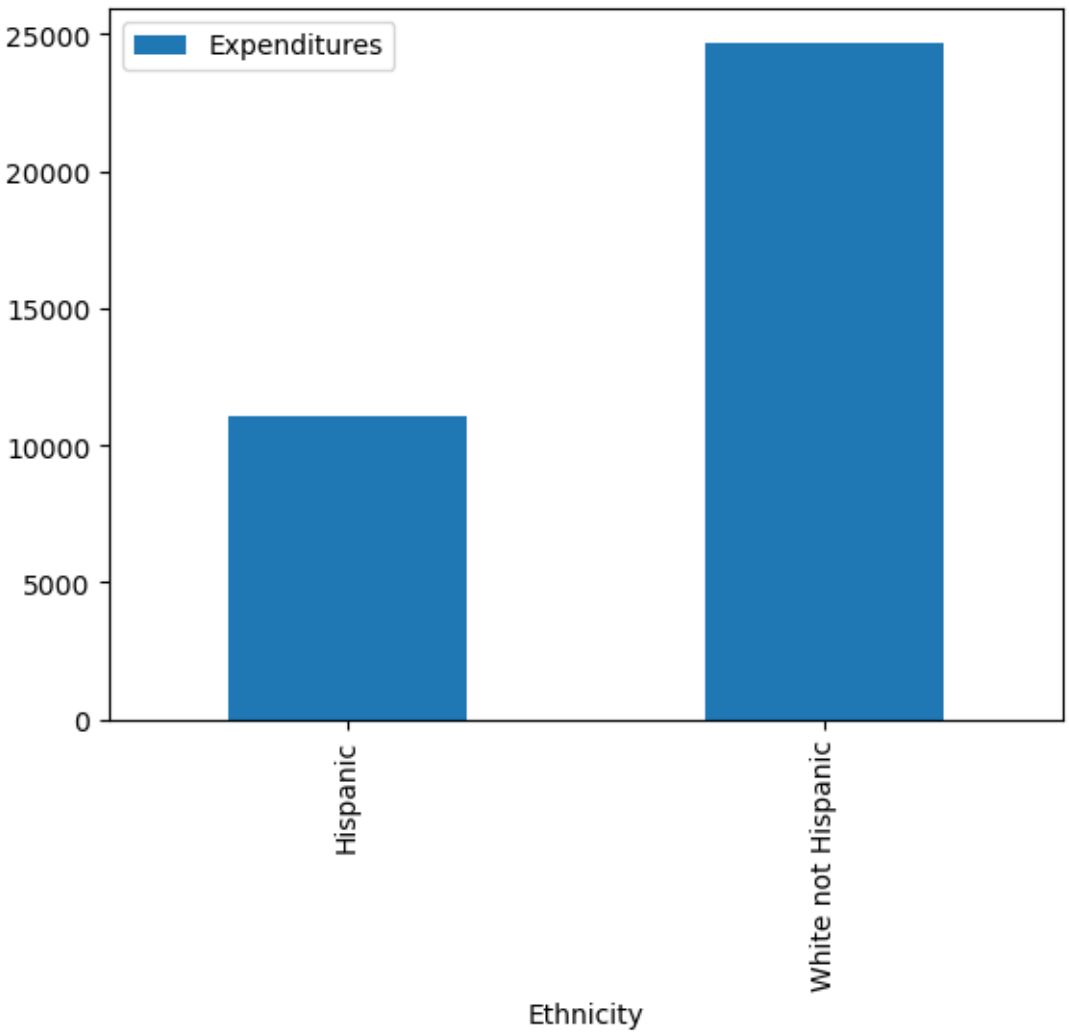
	Id	Age Cohort	Age	Gender	Expenditures	Ethnicity
0	10210	13 to 17	17	Female	2113	White not Hispanic
1	10409	22 to 50	37	Male	41924	White not Hispanic
2	10486	0 to 5	3	Male	1454	Hispanic
3	10538	18 to 21	19	Female	6400	Hispanic
4	10568	13 to 17	13	Male	4412	White not Hispanic
..	…	…	…	…	…	…
995	99622	51+	86	Female	57055	White not Hispanic
996	99715	18 to 21	20	Male	7494	Hispanic
997	99718	13 to 17	17	Female	3673	Multi Race
998	99791	6 to 12	10	Male	3638	Hispanic
999	99898	22 to 50	23	Male	26702	White not Hispanic

[1000 rows x 6 columns]

[2]:
```
import numpy as np

table=pd.
  ↪pivot_table(data=df,values='Expenditures',index='Ethnicity',aggfunc='mean')
print(table)
table.loc[['Hispanic','White not Hispanic']].plot.bar()
```

```
                  Expenditures
Ethnicity
American Indian    36438.250000
Asian              18392.372093
Black              20884.593220
Hispanic           11065.569149
Multi Race          4456.730769
Native Hawaiian    42782.333333
Other               3316.500000
White not Hispanic 24697.548628
```

[2]: <AxesSubplot: xlabel='Ethnicity'>



YOUR EXPLANATION HERE

The above graph shows that the average expenditure of Hispanics is less than the average expenditure of White non-hispanics

3 Question 2

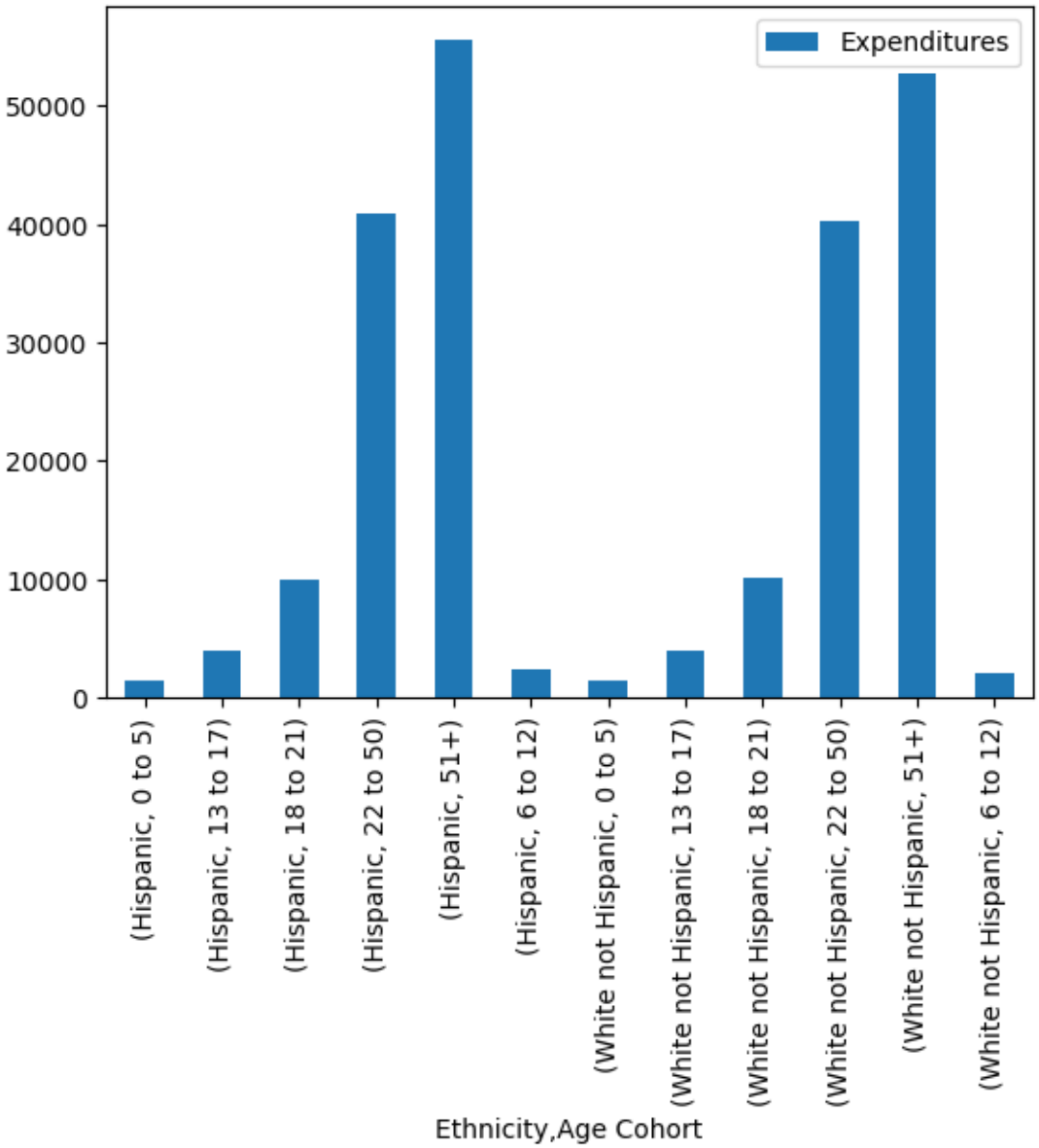
Now, calculate the average expenditures by ethnicity and age cohort. Make a graphic that compares the average expenditure on Hispanic residents and white (non-Hispanic) residents, *within each age cohort*.

Comment on what you see. How do these results appear to contradict the results you obtained in Question 1?

[3]:
```
table2=pd.pivot_table(data=df, values='Expenditures',index=['Ethnicity','Age␣
↪Cohort'],aggfunc='mean')
```

```
table2.loc[['Hispanic','White not Hispanic']].plot.bar()
```

[3]: <AxesSubplot: xlabel='Ethnicity,Age Cohort'>



YOUR EXPLANATION HERE

Inference from the graph is that Hispanics in each age cohort have generally a higher expenditure than White Not Hispanics

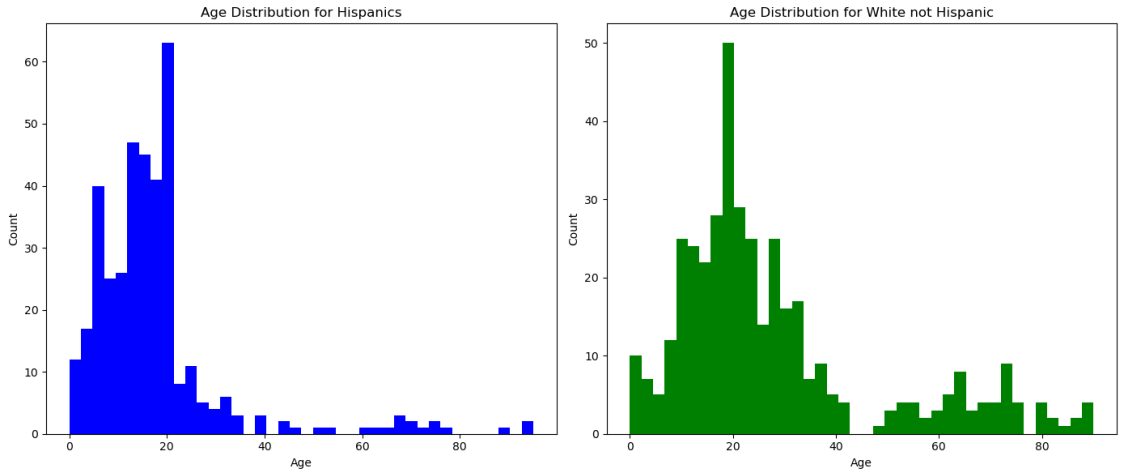
4 Question 3

Can you explain the discrepancy between the two analyses you conducted above (i.e., Questions 1 and 2)? Try to tell a complete story that interweaves tables, graphics, and explanation.

Hint: You might want to consider looking at:

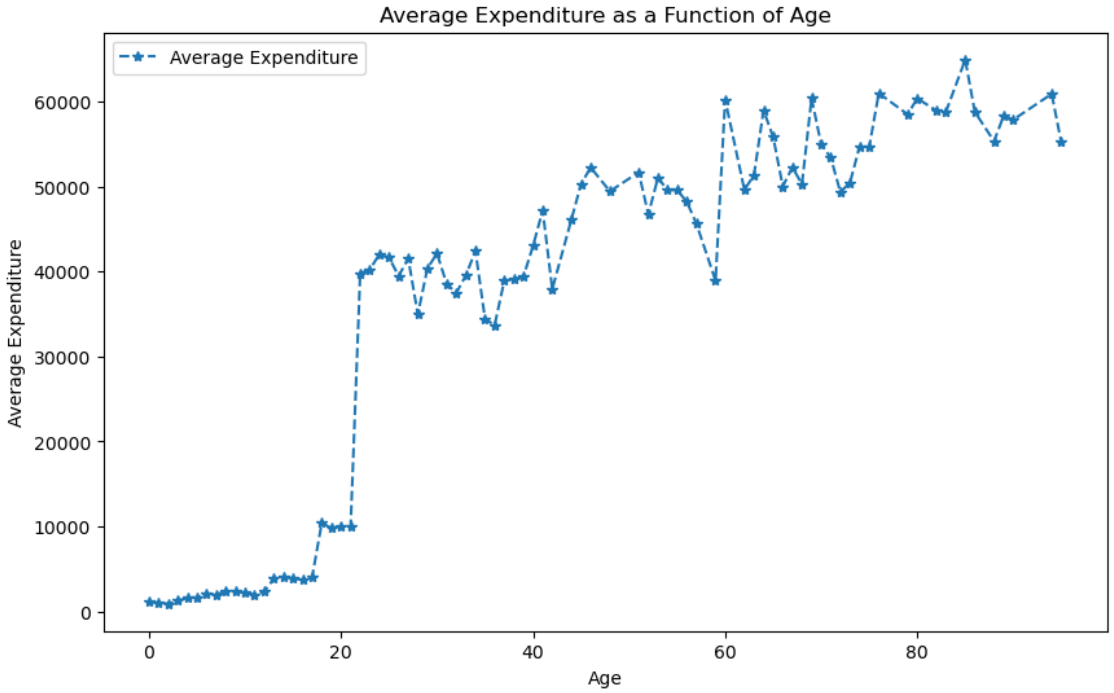
- the distributions of ages of Hispanics and whites
- the average expenditure as a function of age

[4]:
```
import matplotlib.pyplot as plt
# Initializing the Subplot details
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(14, 6))

# Histogram plotting for Hispanics
ax1.hist(df[df['Ethnicity'] == 'Hispanic']['Age'], bins=40, color='blue')
ax1.set_title('Age Distribution for Hispanics')
ax1.set_ylabel('Count')
ax1.set_xlabel('Age')

# Histogram plotting for White (not Hispanic)
ax2.hist(df[df['Ethnicity'] == 'White not Hispanic']['Age'], bins=40,␣
 ↪color='green')
ax2.set_title('Age Distribution for White not Hispanic')
ax2.set_ylabel('Count')
ax2.set_xlabel('Age')

plt.tight_layout()
plt.show()
```



[7]:
```
# Group by Age and calculate the mean expenditure for each age
```

```
ethinicity = ['Hispanic', 'White not Hispanic']
new_data = df[df['Ethnicity'].isin(ethinicity)]

t3 = pd.pivot_table(new_data, values = 'Expenditures', index = 'Age',␣
 ↪aggfunc='mean')

####### VISUALIZATIONS #######

plt.figure(figsize=(10,6))
plt.plot(t3['Expenditures'], '--*', label='Average Expenditure')
plt.xlabel('Age')
plt.ylabel('Average Expenditure')
plt.title('Average Expenditure as a Function of Age')
plt.legend()
plt.show()
```



YOUR EXPLANATION HERE

The above visualization shows that as the age inceares the Avergae Expenditure increases as well. Now, Refering back to the previous Histograms we can clearly see that the White Not Hispanics have a higher number of people present in the higher age groups as compared to the Hispanics. This explains the discrepancy, why the White Not Hispanics had a higher Average Expenditures while per Hispanics had higher for each Age Cohorts.

4.1 Submission Instructions

Once you are finished, follow these steps:

1. Restart the kernel and re-run this notebook from beginning to end by going to `Kernel > Restart Kernel and Run All Cells`.
2. If this process stops halfway through, that means there was an error. Correct the error and repeat Step 1 until the notebook runs from beginning to end.
3. Double check that there is a number next to each code cell and that these numbers are in order.

Then, submit your lab as follows:

1. Go to `File > Export Notebook As > PDF`.
2. Double check that the entire notebook, from beginning to end, is in this PDF file. (If the notebook is cut off, try first exporting the notebook to HTML and printing to PDF.)
3. Upload your Notebook (ipynb) to canvas (one submission per group).
4. Demo your lab.