# Summer 2022 Data Science Intern Challenge

***Sunay Bhat***

Please complete the following questions, and provide your thought process/work. You can attach your work in a text file, link, etc. on the application page. Please ensure answers are easily visible for reviewers!

**Question 1:** Given some sample data, write a program to answer the following: click here to access the required data set

> On Shopify, we have exactly 100 sneaker shops, and each of these shops sells only one model of shoe. We want to do some analysis of the average order value (AOV). When we look at orders data over a 30 day window, we naively calculate an AOV of $3145.13. Given that we know these shops are selling sneakers, a relatively affordable item, something seems wrong with our analysis.

a. Think about what could be going wrong with our calculation. Think about a better way to evaluate this data.

> *The naive Average Order Value calculation is done by taking the mean of all the order values. The issue with this dataset is **large outliers skewing the mean** - our data is not normally distributed.*

b. What metric would you report for this dataset?

> *The simplest option is to **take the median or mode**. More complicated options might include assuming a multi-modal distribution and using a cluster method to extract the AOV for each group. This notebook attached below shows both of those methods*

c. What is its value?

- **median** $284.00
- **mode**: $153.00
- **K-means** (3):
  - 1: $302.58 (Majority of orders: 98.75%)
  - 2: $49,213.04 (0.92% of orders)
  - 3: $704,000.00 (0.34% of orders)

**Question 2:** For this question you'll need to use SQL. Follow this link to access the data set required for the challenge. Please use queries to answer the following questions. Paste your queries along with your final numerical answers below.

a. How many orders were shipped by Speedy Express in total?
   **196**,
   Query:
   SELECT COUNT(*) FROM Orders
   WHERE ShipperID=3

b. What is the last name of the employee with the most orders?
   **Handel**
   Queries (I know this can be done more efficiently with JOINs, but I have not learned SQL).

   SELECT CustomerID, COUNT(*) FROM Orders
   GROUP BY CustomerID
   ORDER BY 2 DESC

   SELECT * From Customers
   WHERE CustomerID = 20

c. What product was ordered the most by customers in Germany?
   *I don't know SQL, but I can learn if its core to the job. This query gets you the product ID's. Need to sort by counts, take the top value, and query the products table for it.*

```
(SELECT ProductID
  FROM OrderDetails
 WHERE OrderID IN (SELECT OrderID FROM Orders
                                  WHERE CustomerID IN (SELECT CustomerID FROM Customers
                WHERE Country = 'Germany')))
```

# Shopify

January 18, 2022

## 0.1 Shopify: Summer 2022 Data Science Intern Challenge

### 0.1.1 By: Sunay Bhat

**a.** The naive Average Order Value calculation is done by taking the mean of all the order values. The issue with this dataset is **large outliers skewing the mean** - our data is not normally distirbuted.

**b.** The simplest option is to **take the median** or mode. More complicated options might include assuming a multi-modal distribution and using a cluter method to extract the AOV for each group. This notebook shows both of those methods

**c.** * **median** $284.00 * **mode:** $153.00 * **K-means** (3): * 1: $302.58 (Majority of orders: 98.75%) * 2: $49,213.04 (0.92% of orders) * 3: $704,000.00 (0.34% of orders)

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

[44]:
```
# Import and View data characteristics
df_sales = pd.read_csv('2019 Winter Data Science Intern Challenge Data Set -␣
 ↪Sheet1.csv')
print(df_sales.head())
df_sales.nunique()
```

```
   order_id  shop_id  user_id  order_amount  total_items payment_method  \
0         1       53      746           224            2           cash
1         2       92      925            90            1           cash
2         3       44      861           144            1           cash
3         4       18      935           156            1    credit_card
4         5       18      883           156            1    credit_card

            created_at
0  2017-03-13 12:36:56
1  2017-03-03 17:38:52
2   2017-03-14 4:23:56
3  2017-03-26 12:43:37
4   2017-03-01 4:35:11
```

[44]:
```
order_id          5000
shop_id            100
user_id            301
order_amount       258
total_items          8
payment_method       3
created_at        4991
dtype: int64
```

### 0.1.2 a. Naive Calc issue

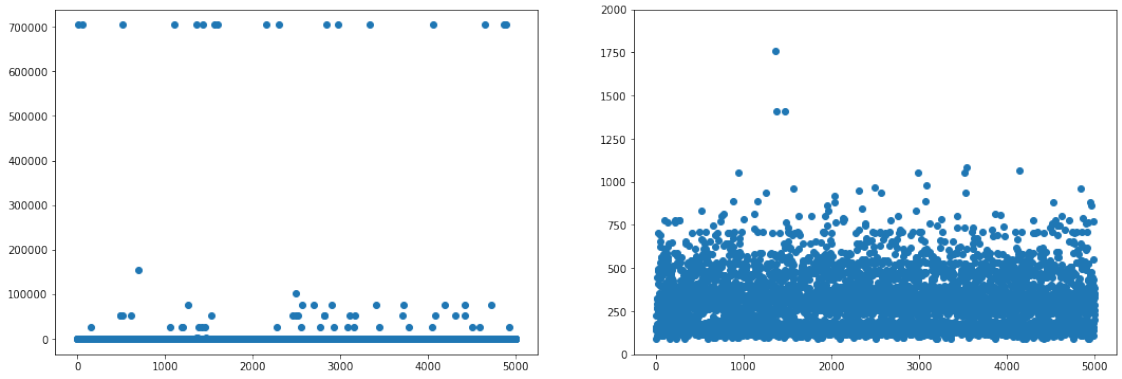
[45]:
```
print('Naive AOV: ${:.2f}'.format(df_sales['order_amount'].mean()))
```

```
Naive AOV: $3145.13
```

A quick visualization (below) shows that we have a couple modes of very large outliers that can vastly skew the mean. We would want to remove or spearate our data into these modes for better analysis. A quick glance suggests 3-4 clusters, although a long-tail distribution is the most realistic model to consider.

[71]:
```
# Naive Calculation is likely an average accross stores, averaged again
fig, (ax1,ax2) = plt.subplots(1,2,figsize=(18,6))
ax1.scatter(range(df_sales['order_amount'].shape[0]),df_sales['order_amount'])
ax2.scatter(range(df_sales['order_amount'].shape[0]),df_sales['order_amount'])
ax2.set_ylim([0,2000])
```

[71]:
```
(0.0, 2000.0)
```




### 0.1.3 b and c: Alternative Calcs

[85]:
```
print('Median AOV: ${:.2f}'.format(df_sales['order_amount'].median()))
print('Mode AOV: ${:.2f}'.format(df_sales['order_amount'].mode()[0]))
```

```
Median AOV: $284.00
Mode AOV: $153.00
```

[90]:
```
# K-means, 3 clusters
from sklearn.cluster import KMeans
km = KMeans(3, init='random',n_init=10, max_iter=300,tol=1e-04, random_state=0)
km.fit(df_sales['order_amount'].to_numpy().reshape(-1,1))
km.cluster_centers_
```

[90]:
```
array([[3.02580514e+02],
       [7.04000000e+05],
       [4.92130435e+04]])
```

[96]:
```
# Percent in each cluster
df_sales['kmean'] = km.labels_
df_sales['kmean'].value_counts()/50
```

[96]:
```
0    98.74
2     0.92
1     0.34
Name: kmean, dtype: float64
```