Analysis of E-Commerce Dataset

The dataset is downloaded from Kaggle and can be found here

Features Meaninngs provided for this dataset is as the following:

- 'Address' - customer's address.
- 'Browser Info' - info regarding the browser of the customer.
- 'Company' - the company in which the customer work.
- 'Credit Card' - number of the customer's credit card.
- 'CC Exp Date' - the expiray date of teh customer's credit card.
- 'CC Security Code' - the security code of the customer's credit card.
- 'CC Provider' - name of the caompany provided the credit card.
- 'Email' - customer's email.
- 'Job' - customer's job title.
- 'IP Address' - customers' IP Address.
- 'Language' - customer's language.
- 'Purchase Price' - price of the item purchased

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import warnings
warnings.simplefilter(action='ignore', category=FutureWarning)

import requests
import lxml
from bs4 import BeautifulSoup

import scipy.stats

pd.set_option('precision',2)
pd.options.display.max_colwidth = 100
```

In [2]:

```
import plotly
import cufflinks as cf

from plotly.offline import download_plotlyjs, init_notebook_mode,plot,iplot

init_notebook_mode(connected=True)

cf.go_offline()

import plotly.graph_objs as go

import chart_studio.plotly as py
```

In [3]:
```
data = pd.read_csv('../data/Ecommerce Purchases.csv')
data.head()
```

Out[3]:

	Address	Lot	AM or PM	Browser Info	Company	Credit Card	CC Exp Date	CC Security Code	CC Provider	Email	Job	
0	16629 Pace Camp Apt. 448\nAlexisborough, NE 77130-7478	46 in	PM	Opera/9.56.(X11; Linux x86_64; sl-SI) Presto/2.9.183 Version/12.00	Martinez-Herman	6011929061123406	02/20	900	JCB 16 digit	pdunlap@yahoo.com	Scientist, product/process development	149.
1	9374 Jasmine Spurs Suite 508\nSouth John, TN 84355-4179	28 rn	PM	Opera/8.93.(Windows 98; Win 9x 4.90; en-US) Presto/2.9.176 Version/11.00	Fletcher, Richards and Whitaker	3337758169645356	11/18	561	Mastercard	anthony41@reed.com	Drilling engineer	1
2	Unit 0065 Box 5052\nDPO AP 27450	94 vE	PM	Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.2; Trident/5.1)	Simpson, Williams and Pham	675957666125	08/19	699	JCB 16 digit	amymiller@morales-harrison.com	Customer service manager	132
3	7780 Julia Fords\nNew Stacy, WA 45798	36 vm	PM	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_0 rv:3.0; en-US) AppleWebKit/531.27.1 (KHTML, like G...	Williams, Marshall and Buchanan	6011578504430710	02/24	384	Discover	brent16@olson-robinson.info	Drilling engineer	3
4	23012 Munoz Drive Suite 337\nNew Cynthia, TX 57826	20 IE	AM	Opera/9.58.(X11; Linux x86_64; it-IT) Presto/2.9.182 Version/11.00	Brown, Watson and Andrews	6011456623207998	10/25	678	Diners Club / Carte Blanche	christopherwright@gmail.com	Fine artist	2

In [4]:
```
data.duplicated().sum()
```

Out[4]:
```
0
```

In [5]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   Address           10000 non-null  object 
 1   Lot               10000 non-null  object 
 2   AM or PM          10000 non-null  object 
 3   Browser Info      10000 non-null  object 
 4   Company           10000 non-null  object 
 5   Credit Card       10000 non-null  int64  
 6   CC Exp Date       10000 non-null  object 
 7   CC Security Code  10000 non-null  int64  
 8   CC Provider       10000 non-null  object 
 9   Email             10000 non-null  object 
 10  Job               10000 non-null  object 
 11  IP Address        10000 non-null  object 
 12  Language          10000 non-null  object 
 13  Purchase Price    10000 non-null  float64
dtypes: float64(1), int64(2), object(11)
memory usage: 1.1+ MB
```

Data Cleaning

```
In [6]: data['Browser'] = data['Browser Info'].str.split('/').str.get(0)
```

Let's explore the 'Address' column

```
In [7]: data['Address']
```

```
Out[7]: 0        16629 Pace Camp Apt. 448\nAlexisborough, NE 77130-7478
        1       9374 Jasmine Spurs Suite 508\nSouth John, TN 84355-4179
        2                              Unit 0065 Box 5052\nDPO AP 27450
        3                         7780 Julia Fords\nNew Stacy, WA 45798
        4            23012 Munoz Drive Suite 337\nNew Cynthia, TX 57826
                                         ...                           
        9995              966 Castaneda Locks\nWest Juliafurt, CO 96415
        9996      832 Curtis Dam Suite 785\nNorth Edwardburgh, TX 55158
        9997                      Unit 4434 Box 6343\nDPO AE 28026-0283
        9998                       0096 English Rest\nRoystad, IA 12457
        9999             40674 Barrett Stravenue\nGrimesville, WI 79682
        Name: Address, Length: 10000, dtype: object
```

```
In [8]: data['Address'].str.split('\n').str.get(1)
```

```
Out[8]: 0       Alexisborough, NE 77130-7478
        1          South John, TN 84355-4179
        2                       DPO AP 27450
        3                New Stacy, WA 45798
        4              New Cynthia, TX 57826
                            ...             
        9995        West Juliafurt, CO 96415
        9996     North Edwardburgh, TX 55158
        9997               DPO AE 28026-0283
        9998               Roystad, IA 12457
        9999           Grimesville, WI 79682
        Name: Address, Length: 10000, dtype: object
```

It can be seen that some of the addresses has DPO abbreviation in them. Let's explore that.

```
In [9]: data['Address'].str.split('\n').str.get(1).str.contains('DPO')
```

```
Out[9]: 0       False
        1       False
        2        True
        3       False
        4       False
                ...  
        9995    False
        9996    False
        9997     True
        9998    False
        9999    False
        Name: Address, Length: 10000, dtype: bool
```

In [10]:

```
data['Address'][data['Address'].str.split('\n').str.get(1).str.contains('DPO')].\
        str.split('\n').\
        str.get(1).\
        str.split(' ').\
        str.get(1).\
        value_counts()
```

Out[10]:

```
AP    129
AA    127
AE    124
Name: Address, dtype: int64
```

I'll check if the number of rows contain AE, AA or AP is equal to those in the previous value_counts

In [11]:

```
print(sum(data['Address'].str.contains('AE')),
sum(data['Address'].str.contains('AA')),
sum(data['Address'].str.contains('AE')))
```

```
331 351 331
```

That means there are still some rows where there address contains AE, AP or AA

After conducting an online research, it turn out that DPO stands for Diplomatic Post Office, AA stands for Armed Forces America, AE stands for Armed Forces and AP stands for Armed Forces Pacific. Source

Furthermore, I found that FPO and APO are used for simlar cases.

In [12]:

```
# number of addresses that contain "AA"
data['Address'][data['Address'].str.contains('[DPO|APO|FPO]\sAA\s', regex=True)].\
        str.split('\n').\
        str.get(1).\
        str.split(' ').\
        str.get(0).\
        value_counts().sum()
```

Out[12]:

```
351
```

In [13]:

```
# number of addresses that contain "AE"
data['Address'][data['Address'].str.contains('[DPO|APO|FPO]\sAE\s', regex=True)].\
        str.split('\n').\
        str.get(1).\
        str.split(' ').\
        str.get(0).\
        value_counts().sum()
```

Out[13]:

```
331
```

In [14]:

```
# number of addresses that contain "AP"
data['Address'][data['Address'].str.contains('[DPO|APO|FPO]\sAP\s', regex=True)].\
        str.split('\n').\
        str.get(1).\
        str.split(' ').\
        str.get(0).\
        value_counts().sum()
```

Out[14]:

```
376
```

I'll check if the address contains 'FPO' or 'APO'

```
In [15]: sum(data['Address'].str.contains('FPO'))
```

```
Out[15]: 334
```

```
In [16]: sum(data['Address'].str.contains('APO'))
```

```
Out[16]: 344
```

So, in addition to DPO in the address text, there are also FPO and APO which can be used alternatively

```
In [17]: data['Address'][data['Address'].str.split('\n').str.get(1).str.contains('DPO')].\
                 str.split('\n').\
                 str.get(1).\
                 str.split(' ').\
                 str.get(1).\
                 value_counts()
```

```
Out[17]: AP    129
         AA    127
         AE    124
         Name: Address, dtype: int64
```

```
In [18]: data['Address'][data['Address'].str.split('\n').str.get(1).str.contains('FPO')].\
                 str.split('\n').\
                 str.get(1).\
                 str.split(' ').\
                 str.get(1).\
                 value_counts()
```

```
Out[18]: AP    122
         AA    114
         AE     98
         Name: Address, dtype: int64
```

```
In [19]: data['Address'][data['Address'].str.split('\n').str.get(1).str.contains('APO')].\
                 str.split('\n').\
                 str.get(1).\
                 str.split(' ').\
                 str.get(1).\
                 value_counts()
```

```
Out[19]: AP    125
         AA    110
         AE    109
         Name: Address, dtype: int64
```

I'll check if the total numbers of rows containing "AP", "AA" and "AE" in the previous 3 resutls are equal to those containing "AP", "AA" and "AE" in the dataset

```
In [20]: # number of addresses that contain "AA"
         data['Address'][data['Address'].str.contains('[DPO|APO|FPO]\sAP\s', regex=True)].\
                 str.split('\n').\
                 str.get(1).\
                 str.split(' ').\
                 str.get(0).\
                 value_counts().sum()

Out[20]: 376
```

```
In [21]: # number of addresses that contain "AE"
         data['Address'][data['Address'].str.contains('[DPO|APO|FPO]\sAA\s', regex=True)].\
                 str.split('\n').\
                 str.get(1).\
                 str.split(' ').\
                 str.get(0).\
                 value_counts().sum()

Out[21]: 351
```

```
In [22]: # number of addresses that contain "AP"
         data['Address'][data['Address'].str.contains('[DPO|APO|FPO]\sAE\s', regex=True)].\
                 str.split('\n').\
                 str.get(1).\
                 str.split(' ').\
                 str.get(0).\
                 value_counts().sum()

Out[22]: 331
```

There are equal. Mission Accomplished! Move on to the next step.

```
In [23]: # establish new address columns to work with it with ease
         data['Address List'] = data['Address'].str.replace('\n',', ').str.split(', ')
         data['Address List']

Out[23]: 0         [16629 Pace Camp Apt. 448, Alexisborough, NE 77130-7478]
         1        [9374 Jasmine Spurs Suite 508, South John, TN 84355-4179]
         2                               [Unit 0065 Box 5052, DPO AP 27450]
         3                          [7780 Julia Fords, New Stacy, WA 45798]
         4             [23012 Munoz Drive Suite 337, New Cynthia, TX 57826]
                                          ...
         9995                [966 Castaneda Locks, West Juliafurt, CO 96415]
         9996       [832 Curtis Dam Suite 785, North Edwardburgh, TX 55158]
         9997                          [Unit 4434 Box 6343, DPO AE 28026-0283]
         9998                         [0096 English Rest, Roystad, IA 12457]
         9999              [40674 Barrett Stravenue, Grimesville, WI 79682]
         Name: Address List, Length: 10000, dtype: object
```

```
In [24]: # get the number of elements in the each address list
         def get_address_length(x):
             return len(x)

         data['Address Length'] = data['Address List'].apply(get_address_length)

         data['Address Length'].value_counts()

Out[24]: 3    9286
         2     714
         Name: Address Length, dtype: int64
```

So, the Address list contains a maximum of 3 elements

```
In [25]: data.drop('Address Length', axis=1, inplace=True)
```

```
In [26]: def get_country(x):
             if len(x) > 2:
                 return 'United States of America'

         def get_state(x):
             if (len(x) > 2) and  (x[2].split(' ')[0]!= 'APO') and  (x[2].split(' ')[0]!='DPO') and  (x[2].split(' ')[0]!='FPO'):
                 return x[2].split(' ')[0]
```

```
In [27]: # assign the 'Country' values for rows with the addresses without 'DPO', 'APO' or 'FPO'
         data['Country'] = data['Address List'].apply(get_country)
         # assign the 'State' values for rows with the addresses without 'DPO', 'APO' or 'FPO'
         data['State Abbreviation'] = data['Address List'].apply(get_state)
```

```
In [28]: # assign the 'Country' values for rows with the addresses of include 'DPO', 'APO' or 'FPO'
         data.loc[data['Address'].str.contains('DPO'),'Country'] = 'Diplomatic Post Offic'
         data.loc[data['Address'].str.contains('FPO'),'Country'] = 'Fleet Post Office'
         data.loc[data['Address'].str.contains('APO'),'Country'] = 'Army Post Office'
```

```
In [29]: # assign the value 'AA' for the state where the address contains 'AA'
         data.loc[data['Address'].str.contains('[DPO|APO|FPO]\sAA\s', regex=True),'State Abbreviation']='AA'
         # assign the value 'AP' for the state where the address contains 'AP'
         data.loc[data['Address'].str.contains('[DPO|APO|FPO]\sAE\s', regex=True),'State Abbreviation']='AE'
         # assign the value 'AE' for the state where the address contains 'AE'
         data.loc[data['Address'].str.contains('[DPO|APO|FPO]\sAP\s', regex=True),'State Abbreviation']='AP'
```

```
In [30]: data.drop(['Address','Address List','CC Security Code'], axis=1, inplace=True)
```

To Change states abbreviation to states names, I'll web-scrap a table that contains the abbreviations and names of the states, then I'll join it with the data table.

```
In [31]: url = 'https://knowledgecenter.zuora.com/BB_Introducing_Z_Business/D_Country%2C_State%2C_and_Province_Codes/B_State_Names_and_2-

         page = requests.get(url)

         soup = BeautifulSoup(page.text,'lxml')
```

```
In [32]: table = soup.find('table',{'class':'zebra'})
```

```
In [33]: headers = []
         for i in table.find_all('th'):
             header = i.text
             headers.append(header)
```

```
In [34]: headers

Out[34]: ['State or Region Code', 'Name']
```

```
In [35]: states = pd.DataFrame(columns=headers)
```

```
In [36]: for row in table.find_all('tr')[1:]:
             table_data = row.find_all('td')
             row_data =[data_point.text.strip() for data_point in table_data]
             length = len(states)
             states.loc[length] = row_data
```

```
In [37]: states.rename(columns = {'State or Region Code':'State Abbreviation','Name':'State'}, inplace = True)
         states.head()
```

Out[37]:

	State Abbreviation	State
0	AA	Armed Forces America
1	AE	Armed Forces
2	AK	Alaska
3	AL	Alabama
4	AP	Armed Forces Pacific

In [38]:
```
data = data.merge(states, how = 'left', left_on ='State Abbreviation', right_on='State Abbreviation')
# data.drop(['States Abbreviation'], axis=1, inplace=True)
# data.rename(columns = {'AM or PM':'Period of Day'}, inplace=True)
data.head(2)
```

Out[38]:

	Lot	AM or PM	Browser Info	Company	Credit Card	CC Exp Date	CC Provider	Email	Job	IP Address	Language	Purchase Price	Browser
0	46 in	PM	Opera/9.56.(X11; Linux x86_64; sl-SI) Presto/2.9.183 Version/12.00	Martinez-Herman	6011929061123406	02/20	JCB 16 digit	pdunlap@yahoo.com	Scientist, product/process development	149.146.147.205	el	98.14	Opera
1	28 rn	PM	Opera/8.93.(Windows 98; Win 9x 4.90; en-US) Presto/2.9.176 Version/11.00	Fletcher, Richards and Whitaker	3337758169645356	11/18	Mastercard	anthony41@reed.com	Drilling engineer	15.160.41.51	fr	70.73	Opera

In [39]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10000 entries, 0 to 9999
Data columns (total 16 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   Lot                 10000 non-null  object 
 1   AM or PM            10000 non-null  object 
 2   Browser Info        10000 non-null  object 
 3   Company             10000 non-null  object 
 4   Credit Card         10000 non-null  int64  
 5   CC Exp Date         10000 non-null  object 
 6   CC Provider         10000 non-null  object 
 7   Email               10000 non-null  object 
 8   Job                 10000 non-null  object 
 9   IP Address          10000 non-null  object 
 10  Language            10000 non-null  object 
 11  Purchase Price      10000 non-null  float64
 12  Browser             10000 non-null  object 
 13  Country             10000 non-null  object 
 14  State Abbreviation  10000 non-null  object 
 15  State               9240 non-null   object 
dtypes: float64(1), int64(1), object(14)
memory usage: 1.3+ MB
```

There are still 760 missing values in the State Column

In [40]:
```
data[data['State'].isna()]['State Abbreviation'].value_counts()
```

Out[40]:
```
PW    170
MH    153
FM    149
MP    147
AS    141
Name: State Abbreviation, dtype: int64
```

In [41]:
```
# I did a  research online to discover the name of those abbreviations
data.loc[data['State Abbreviation']=='PW', 'State']='Palau'
data.loc[data['State Abbreviation']=='MH', 'State']='Marshall Islands'
data.loc[data['State Abbreviation']=='FM', 'State']='Federated States of Micronesia'
data.loc[data['State Abbreviation']=='MP', 'State']='Northern Mariana Islands'
data.loc[data['State Abbreviation']=='AS', 'State']='American Samoa'
```

In [42]:
```
data.rename(columns = {'AM or PM':'Period of Day'}, inplace=True)
```

In [43]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10000 entries, 0 to 9999
Data columns (total 16 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   Lot                 10000 non-null  object 
 1   Period of Day       10000 non-null  object 
 2   Browser Info        10000 non-null  object 
 3   Company             10000 non-null  object 
 4   Credit Card         10000 non-null  int64  
 5   CC Exp Date         10000 non-null  object 
 6   CC Provider         10000 non-null  object 
 7   Email               10000 non-null  object 
 8   Job                 10000 non-null  object 
 9   IP Address          10000 non-null  object 
 10  Language            10000 non-null  object 
 11  Purchase Price      10000 non-null  float64
 12  Browser             10000 non-null  object 
 13  Country             10000 non-null  object 
 14  State Abbreviation  10000 non-null  object 
 15  State               10000 non-null  object 
dtypes: float64(1), int64(1), object(14)
memory usage: 1.3+ MB
```

What period of the day is associated with large web traffic and what is its aevrage and total revenue?

In [44]:
```
display('Period of the Day by Web Traffic Percentage',
        data['Period of Day'].value_counts(normalize=True),
        'Period of the Day by Average  Revenue',
        data.groupby('Period of Day').mean()['Purchase Price'],
        'Period of the Day by Total Revenue',
        data.groupby('Period of Day').sum()['Purchase Price']
       )
```

```
'Period of the Day by Web Traffic Percentage'

PM    0.51
AM    0.49
Name: Period of Day, dtype: float64

'Period of the Day by Average  Revenue'

Period of Day
AM    50.19
PM    50.50
Name: Purchase Price, dtype: float64

'Period of the Day by Total Revenue'

Period of Day
AM    247519.87
PM    255953.15
Name: Purchase Price, dtype: float64
```

What is the most popular web browser by the customers?

In [45]:
```
data['Browser'].value_counts(normalize=True)
```

Out[45]:
```
Mozilla    0.79
Opera      0.21
Name: Browser, dtype: float64
```

Mozilla is the msot popular browser

Is there an association between the period of the day and the type of browser? ¶

In [46]:

```
cont_table  = pd.crosstab(data['Period of Day'], data['Browser'])
cont_table
```

Out[46]:

Browser	Mozilla	Opera
Period of Day		
AM	3878	1054
PM	4046	1022

In [47]:

```
_, p_value, __,___ = scipy.stats.chi2_contingency(cont_table, correction = True)
if p_value <= 0.05:
    print('There is a significant evidence that there is an association between period of the day and the type of browser')
else:
    print('There is no significant evidence that there is an association between period of the day and the type of browser')
```

```
There is no significant evidence that there is an association between period of the day and the type of browser
```

What are the top 10 companies by number of orders? and what are the top 10 companies by total revenue?...are the same?...and what are the emails associated with each group ?

In [48]:

```
top10_companies_by_orders = data['Company'].value_counts().head(10)
top10_companies_by_orders = top10_companies_by_orders.index.values
print('Top 10 Companies by Number of Orders:')
for company in top10_companies_by_orders:
    print(company)
```

```
Top 10 Companies by Number of Orders:
Brown Ltd
Smith Group
Smith PLC
Smith LLC
Williams LLC
Smith and Sons
Davis and Sons
Brown Group
Johnson LLC
Johnson Ltd
```

In [49]:

```
top10_companies_by_revenue = data.groupby('Company').sum()['Purchase Price'].sort_values(ascending=False).head(10)
top10_companies_by_revenue = top10_companies_by_revenue.index.values
print('Top 10 Countries by Revenue')
for company in top10_companies_by_revenue:
    print(company)
```

```
Top 10 Countries by Revenue
Brown Ltd
Williams LLC
Smith LLC
Smith PLC
Johnson Ltd
Smith Group
Johnson PLC
Davis and Sons
Brown Group
Brown Inc
```

In [50]:

```
print('Companies in the Top 10 by Revenue but not in the Top 10 by Number of Orders:')
for company in (set(top10_companies_by_revenue) - set(top10_companies_by_orders)):
    print(company)
```

```
Companies in the Top 10 by Revenue but not in the Top 10 by Number of Orders:
Johnson PLC
Brown Inc
```

In [51]:

```
print('Companies in the Top 10 by Number of Orders but not in Top by Revenue')
for company in (set(top10_companies_by_orders) - set(top10_companies_by_revenue)):
    print(company)
```

```
Companies in the Top 10 by Number of Orders but not in Top by Revenue
Johnson LLC
Smith and Sons
```

In [52]:

```
top10_companies_by_orders_emails = (data.loc[data['Company'].isin(top10_companies_by_orders),['Company','Email']].
                                    drop_duplicates())
print(top10_companies_by_orders_emails)

top10_companies_by_orders_emails.to_csv('../results/Emails of Top 10 Comapnies by Order.csv')
```

```
            Company                      Email
227     Smith Group        oramirez@sanchez.com
261     Brown Group   bakerjoshua@wade-butler.org
302    Williams LLC           alarson@yahoo.com
427     Smith Group    coxdiana@fuller-johnson.com
548  Smith and Sons           lmadden@gmail.com
...             ...                         ...
9660      Brown Ltd    matthewriley@sullivan.com
```

In [53]:

```
top10_companies_by_revenue_emails = (data.loc[data['Company'].isin(top10_companies_by_revenue),['Company','Email']].
                                     drop_duplicates())
print(top10_companies_by_revenue_emails)

top10_companies_by_revenue_emails.to_csv('../results/Emails of Top 10 Comapnies by Revenue.csv')
```

```
          Company                        Email
103     Brown Inc  wtownsend@jackson-johnson.biz
151     Brown Inc    walshnicole@smith-conner.org
227   Smith Group          oramirez@sanchez.com
261   Brown Group     bakerjoshua@wade-butler.org
302  Williams LLC             alarson@yahoo.com
...           ...                           ...
9707  Johnson Ltd         jonesdaniel@yahoo.com
9729  Johnson PLC             phill@hotmail.com
9741    Brown Ltd      barneschristina@yahoo.com
9774    Brown Ltd          marydavidson@gmail.com
9793    Brown Ltd              mary71@hotmail.com

[116 rows x 2 columns]
```

What are average and total revenue of the top 10 Credit Card Providers by total revenue?

In [54]:

```
top10_cc_providers_by_revenue = data.groupby('CC Provider').\
                                agg({'Purchase Price':['sum','mean']})['Purchase Price'].\
                                rename(columns = {'sum':'Total Revenue','mean':'Average Revenue'}).\
                                sort_values('Total Revenue', ascending=False).\
                                head(10)

top10_cc_providers_by_revenue
```

Out[54]:

	Total Revenue	Average Revenue
CC Provider		
VISA 16 digit	85528.86	49.87
JCB 16 digit	84597.33	49.30
JCB 15 digit	44376.60	51.13
Voyager	43085.77	51.97
American Express	42865.52	50.49
Maestro	42620.78	50.38
Discover	42208.13	51.66
Mastercard	40835.10	50.04
VISA 13 digit	39976.54	51.45
Diners Club / Carte Blanche	37378.39	48.73

What are total and average revenue of the top 4 job titled by total revenue? Is there a significant difference in the average revenue between them?

In [55]:

```
top4_jobs_by_revenue = data.groupby('Job').\
                                agg({'Purchase Price':['sum','mean']})['Purchase Price'].\
                                rename(columns = {'sum':'Total Revenue','mean':'Average Revenue'}).\
                                sort_values('Total Revenue', ascending=False).\
                                reset_index().\
                                head(4)
top4_jobs_by_revenue
```

Out[55]:

	Job	Total Revenue	Average Revenue
0	Dietitian	1605.30	61.74
1	Lawyer	1603.85	53.46
2	Purchasing manager	1577.97	58.44
3	Therapist, art	1526.31	61.05

In order to verify if there is a significant difference between the top 4 jobs, I'll conduct an ANOVA Hypothesis testing.

- $H_0 : \mu_1 = \mu_2 = \mu_3$ (the 4 population means are equal)
- H_1 : At least one of the means differ

In [56]:

```
# establish the 4 groups
Dietitians = data.loc[data['Job']=='Dietitian','Purchase Price']
Lawyers = data.loc[data['Job']=='Lawyer','Purchase Price']
Purcahsing_managers = data.loc[data['Job']=='Purchasing manager','Purchase Price']
Therapist_art = data.loc[data['Job']=='Therapist, art','Purchase Price']

# test if the 4 groups has equal variances
f_statistic, p_value = scipy.stats.f_oneway(Dietitians,Lawyers,Purcahsing_managers,Therapist_art)

if p_value <= 0.05:
    print('There is a sginificant evidence that at least one the means of the 4 groups is un equal to the others')

else:
   print('There is no siginificant evidence that the means of the 4 groups are different')
```

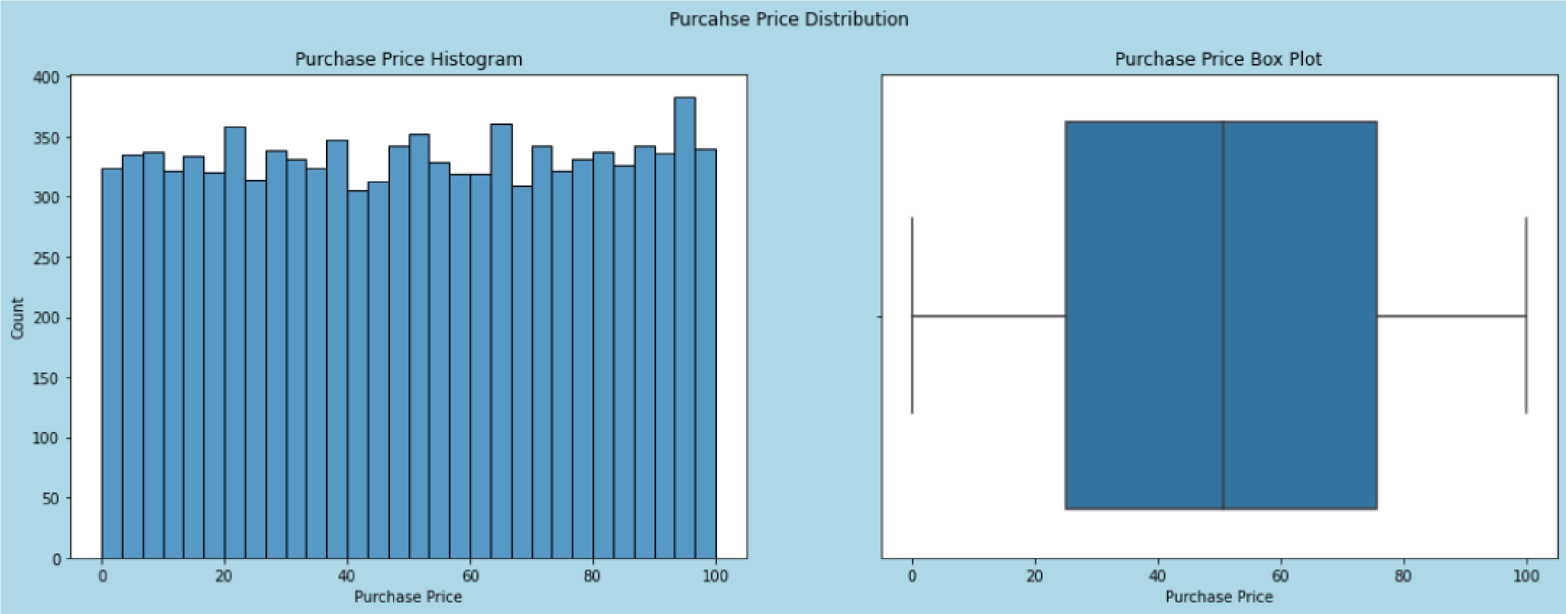
```
There is no siginificant evidence that the means of the 4 groups are different
```

What is the type of distribution exibited in the Revenue? and what is maximum, minimum and mean revenue?

```
In [57]: print(data['Purchase Price'].describe())

         plt.figure(figsize = (18,6), facecolor = 'lightblue')
         plt.suptitle('Purcahse Price Distribution')
         plt.subplot(1,2,1)
         sns.histplot(x = data['Purchase Price'], bins = 30)
         plt.title('Purchase Price Histogram')
         plt.subplot(1,2,2)
         sns.boxplot(x = data['Purchase Price'])
         plt.title('Purchase Price Box Plot')
         plt.show()
```

```
count    10000.00
mean        50.35
std         29.02
min          0.00
25%         25.15
50%         50.50
75%         75.77
max         99.99
Name: Purchase Price, dtype: float64
```



Purcahse Price Distribution

Purchase Price Histogram

Purchase Price Box Plot

- Distribution: uniform.
- Mean: 50.35.
- Maximum: 99.99.
- Minimum: 0.00

What are the emails of the customer(s) with minimum revenue ? ¶

In [58]:
```
emails = data.loc[data['Purchase Price'] == data['Purchase Price'].min(), 'Email']
print('Emails of cusomters with minimum revenue are:')
for email in emails:
    print(email)
```

```
Emails of cusomters with minimum revenue are:
jennifer11@baker.com
mjohnson@austin.org
```

How many poeple have English as their language and Social rResearcher as their job ?

In [59]:
```
q = ((data['Language']=='en') & (data['Job'] == 'Social researcher')).sum()
print(f'There are {q} Social reseahers with English as their language')
```

```
There are 3 Social reseahers with English as their language
```

What is the most popular email provider for the customer?

In [60]:
```
most_email_provider = data['Email'].str.split('@').str.get(1).str.split('.').str.get(0).value_counts().index[0]
print(f'Most email provider is {most_email_provider}')
```

```
Most email provider is hotmail
```

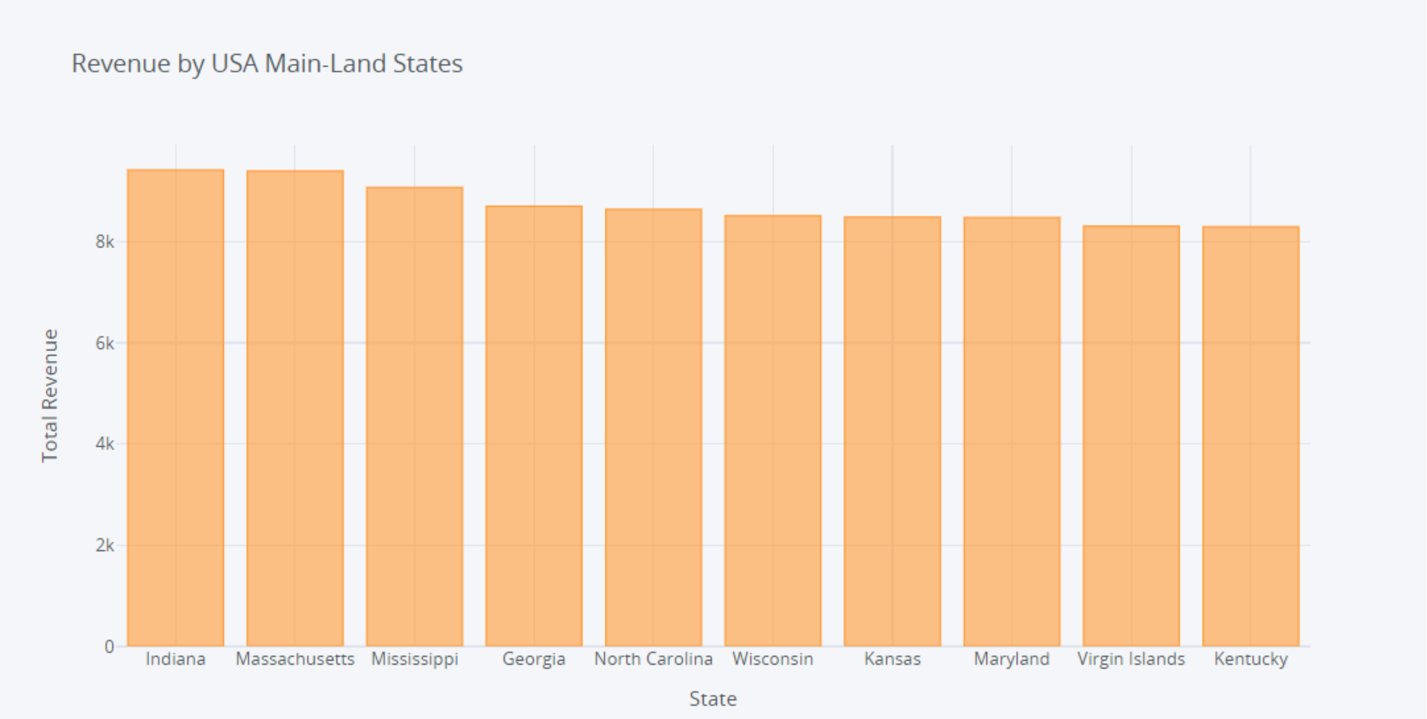
Within the traditional USA main land, show the distribution of the total revenue for the top 10 states by revenue?...this can be helpful in logistics planning

In [61]:
```
states_revenue = data[data['Country']=='United States of America'].\
                    groupby(['State','State Abbreviation']).agg({'Purchase Price':'sum'}).\
                    reset_index().\
                    rename(columns={'Purchase Price':'Total Revenue'}).\
                    sort_values('Total Revenue', ascending=False).\
                    head(10)
states_revenue
```

Out[61]:

	State	State Abbreviation	Total Revenue
16	Indiana	IN	9415.40
24	Massachusetts	MA	9394.40
27	Mississippi	MS	9070.84
11	Georgia	GA	8699.23
36	North Carolina	NC	8637.02
57	Wisconsin	WI	8509.18
18	Kansas	KS	8483.45
23	Maryland	MD	8475.41
52	Virgin Islands	VI	8304.62
19	Kentucky	KY	8292.13

```
In [62]: states_revenue.iplot(kind='bar', x = 'State',y='Total Revenue',title='Revenue by USA Main-Land States',
                              xTitle='State',yTitle='Total Revenue')
```


Revenue by USA Main-Land States

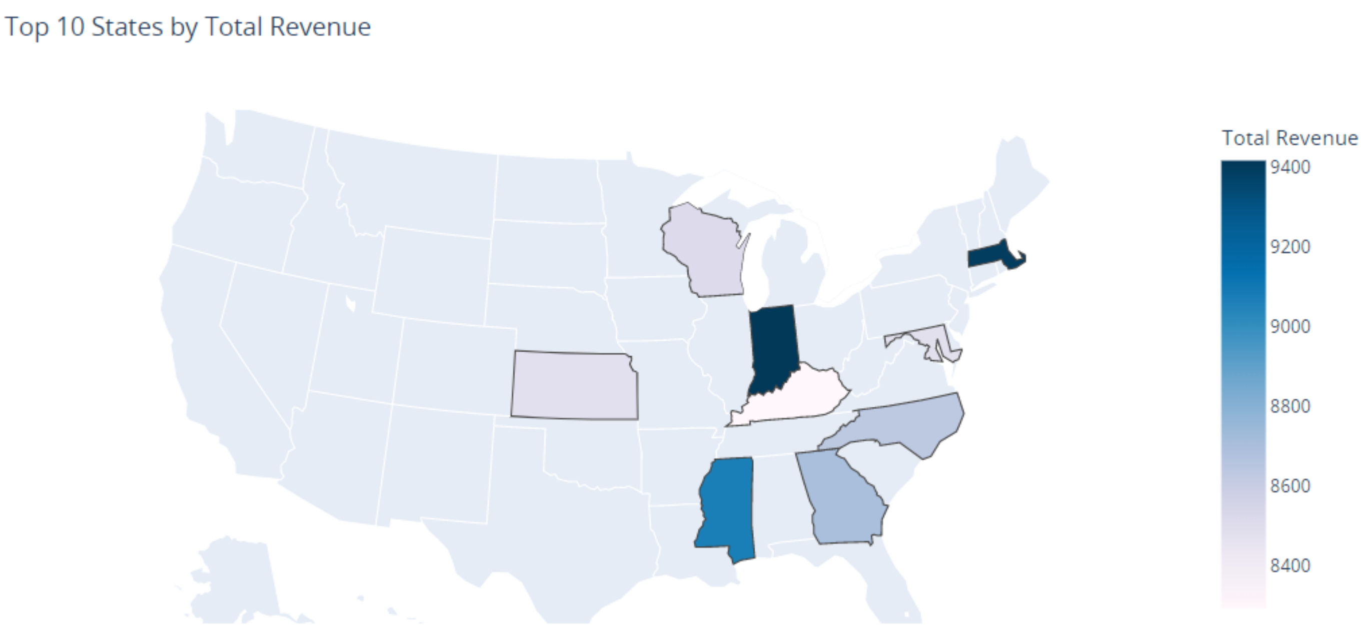
```
In [64]: location_list = states_revenue['State Abbreviation'].values
```

```
In [65]: figure_data = dict(type='choropleth',
                     locations=location_list,
                     locationmode='USA-states',
                     colorscale='pubu',
                     text = states_revenue['State'],
                     colorbar={'title':'Total Revenue'},
                     z = states_revenue['Total Revenue'].values
                    )
```

```
In [66]: layout = dict(title = 'Top 10 States by Total Revenue',geo={'scope':'usa'})
```

```
In [67]: choromap = go.Figure(data=[figure_data],layout=layout)
```

```
In [68]: iplot(choromap)
```


Top 10 States by Total Revenue

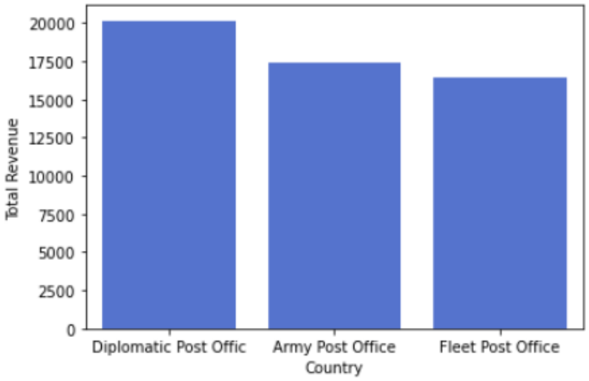
Show the revenue by regions in the 'Country' column not in the traditional USA main land?

In [69]:

```
rev_by_non_usa_country = data[data['Country']!='United States of America'].\
                            groupby('Country').\
                            agg({'Purchase Price':'sum'}).\
                            rename(columns = {'Purchase Price':'Total Revenue'}).\
                            sort_values('Total Revenue',ascending=False).\
                            reset_index()
print(rev_by_non_usa_country)

sns.barplot(x='Country',y='Total Revenue',data=rev_by_non_usa_country, color = '#4169E1')
plt.show()
```

```
                Country  Total Revenue
0  Diplomatic Post Offic       20170.40
1       Army Post Office       17451.89
2      Fleet Post Office       16425.77
```


Total Revenue
Diplomatic Post Offic
Army Post Office
Fleet Post Office
Country