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September 2, 2017

```
In [48]: ## In the Below Data Challenge we will Check for the outlier treatment, Missing Value
         ## after removal of autocorelation and finally predict the output and the AUC score i
```

```
In [1]: #Importing the Data Set

        import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
        from sklearn import preprocessing
        from xgboost.sklearn import XGBClassifier
        from sklearn.model_selection import cross_val_score
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\cross_validation.py:44: DeprecationWarning:
  "This module will be removed in 0.20.", DeprecationWarning)
```

```
In [2]: #Importing the Data
        train =  pd.read_csv("D:\\Kaggle Projects\\Blue Owl\\train.csv")
        test =  pd.read_csv("D:\\Kaggle Projects\\Blue Owl\\test.csv")
```

```
In [3]: test_raw = test.copy()
```

```
In [4]: test_raw.head(5)
```

```
Out[4]:    age  cost_of_ad device_type gender  in_initial_launch_location  income  \
        0   34    0.005134     Android      F                           1   40376
        1   53    0.005223     desktop      F                           1   84511
        2   46    0.004939      laptop      F                           0   79322
        3   36    0.004924     Android      F                           0   63295
        4   28    0.005146       other      F                           1   36170

           n_drivers  n_vehicles  prior_ins_tenure
        0          1           3                 7
        1          1           1                11
        2          1           1                 4
        3          1           2                 0
        4          1           3                 3
```

```
In [5]: train.head(5)
```

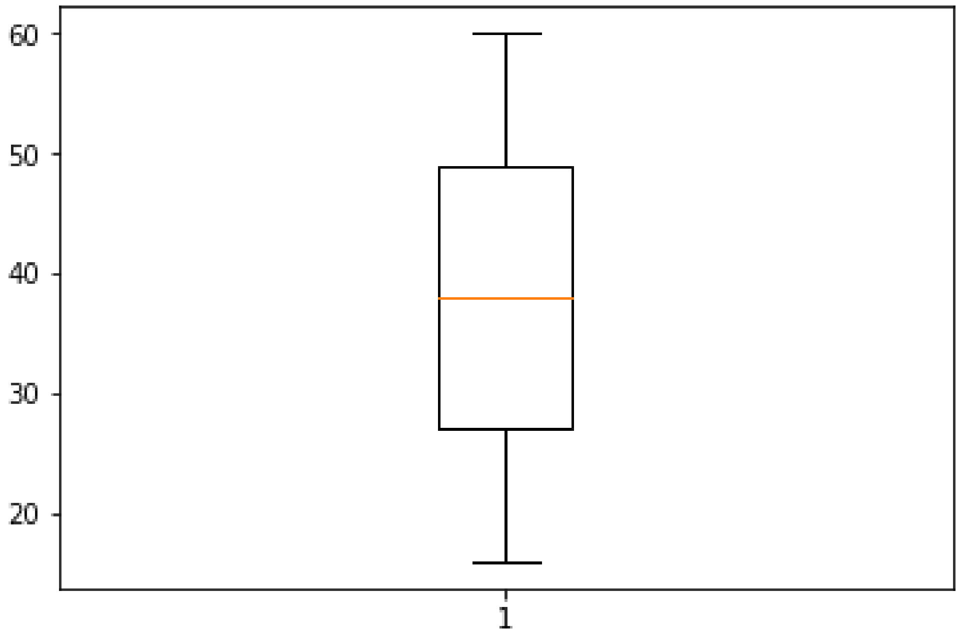
```
Out[5]:    age  cost_of_ad device_type gender  in_initial_launch_location  income  \
        0   56    0.005737      iPhone      M                           0   62717
        1   50    0.004733     desktop      F                           0   64328
        2   54    0.004129      laptop      M                           0   83439
        3   16    0.005117     Android      F                           0   30110
        4   37    0.003635     desktop      M                           0   76565

           n_drivers  n_vehicles  prior_ins_tenure  outcome
        0          2           1                 4        0
        1          2           3                 2        0
        2          1           3                 7        0
        3          2           3                 0        0
        4          2           1                 5        0
```

```
In [6]: train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 10 columns):
age                           10000 non-null int64
cost_of_ad                    10000 non-null float64
device_type                   10000 non-null object
gender                        9731 non-null object
in_initial_launch_location    10000 non-null int64
income                        10000 non-null int64
n_drivers                     10000 non-null int64
n_vehicles                    10000 non-null int64
prior_ins_tenure              10000 non-null int64
outcome                       10000 non-null int64
dtypes: float64(1), int64(7), object(2)
memory usage: 781.3+ KB
```

```
In [7]: x_age = train['age']
```

```
In [8]: plt.boxplot(x_age)
        plt.show()
```

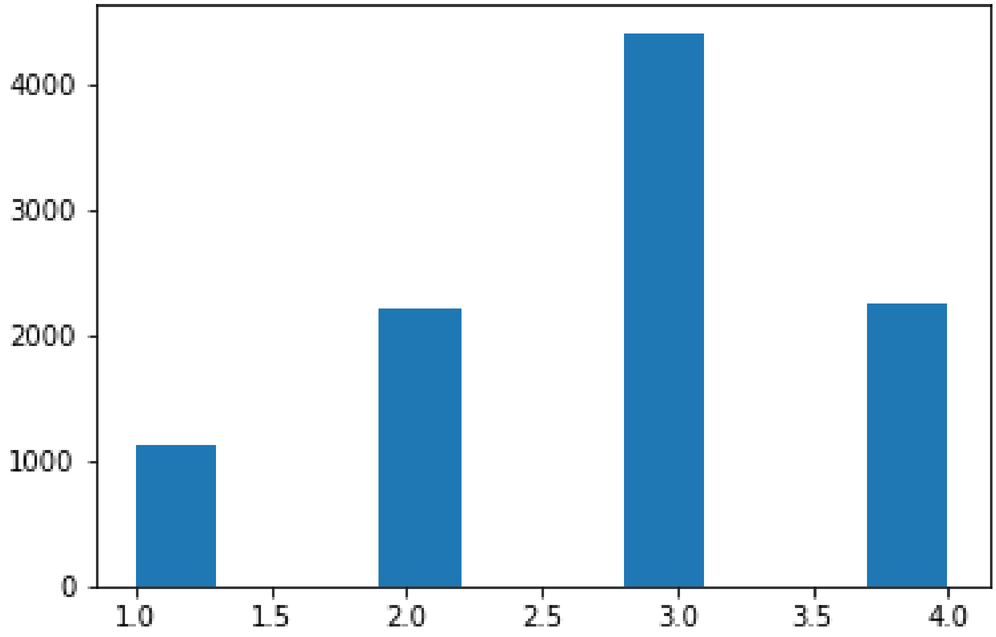


```
In [9]: def transform_diff_grp(dl):
            if dl > 55 : return 1
            elif 45 < dl <= 55 : return 2
            elif 25 < dl <= 45 : return 3
            elif 15 < dl <= 25 : return 4
            elif 0 < dl <= 15 : return 5
```

```
In [10]: train["age"] = train['age'].map(transform_diff_grp)
         test["age"] = test['age'].map(transform_diff_grp)
```

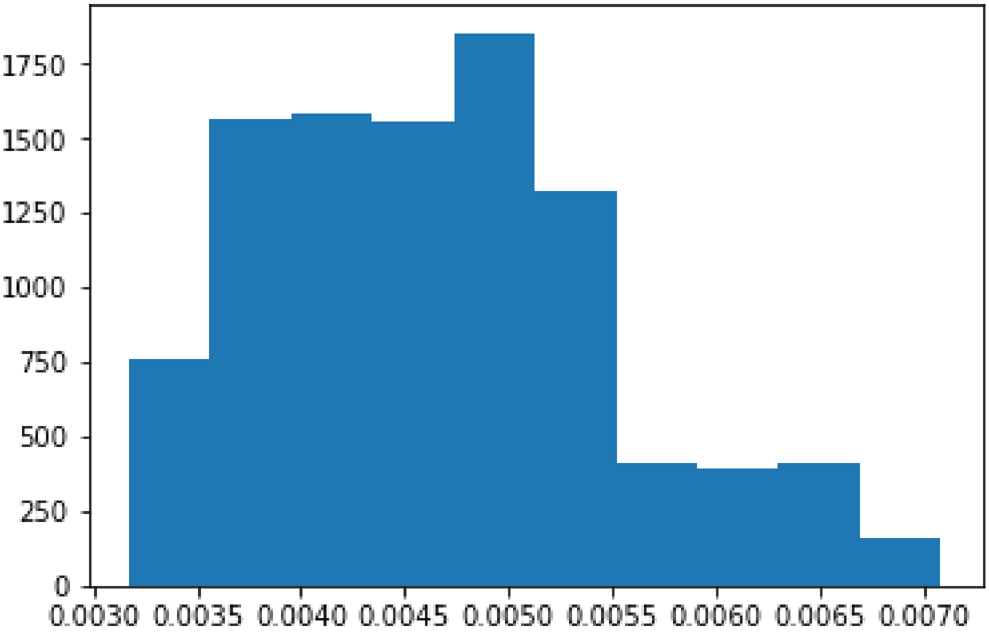
```
In [11]: age = train['age']
```

```
In [12]: plt.hist(age)
         plt.show()
```



```
In [13]: ad_cost = train['cost_of_ad']
```

```
In [14]: plt.hist(ad_cost)
         plt.show()
```



```
In [15]: train.head(5)
```

```
Out[15]:    age  cost_of_ad device_type gender  in_initial_launch_location  income  \
         0    1    0.005737      iPhone      M                           0   62717
         1    2    0.004733     desktop      F                           0   64328
         2    2    0.004129      laptop      M                           0   83439
         3    4    0.005117     Android      F                           0   30110
         4    3    0.003635     desktop      M                           0   76565

            n_drivers  n_vehicles  prior_ins_tenure  outcome
         0          2           1                 4        0
         1          2           3                 2        0
         2          1           3                 7        0
         3          2           3                 0        0
         4          2           1                 5        0
```

```
In [16]: train['device_type'].unique()
```

```
Out[16]: array(['iPhone', 'desktop', 'laptop', 'Android', 'other'], dtype=object)
```

```
In [17]: train.loc[(train.device_type== 'iPhone') ,'device_type' ] = 0
         train.loc[(train.device_type== 'desktop') ,'device_type' ] = 1
         train.loc[(train.device_type== 'laptop') ,'device_type' ] = 2
         train.loc[(train.device_type== 'Android') ,'device_type' ] = 3
         train.loc[(train.device_type== 'other') ,'device_type' ] = 4

         test.loc[(test.device_type== 'iPhone') ,'device_type' ] = 0
         test.loc[(test.device_type== 'desktop') ,'device_type' ] = 1
         test.loc[(test.device_type== 'laptop') ,'device_type' ] = 2
         test.loc[(test.device_type== 'Android') ,'device_type' ] = 3
         test.loc[(test.device_type== 'other') ,'device_type' ] = 4
```

```
In [18]: test['gender'].unique()
```

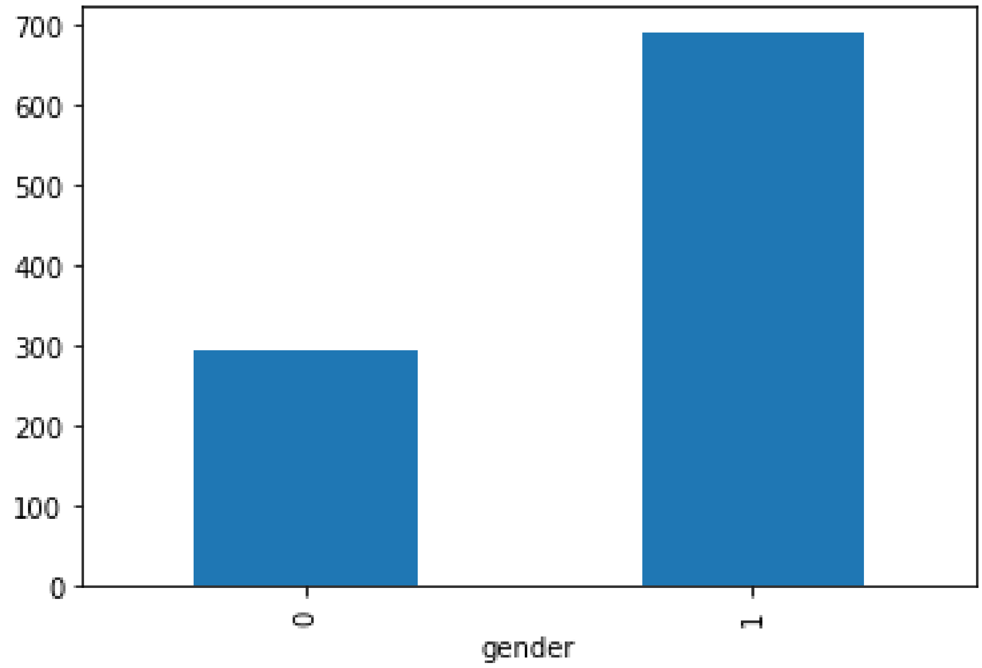
```
Out[18]: array(['F', 'M', nan], dtype=object)
```

```
In [19]: test['gender'].fillna(1, inplace=True)
         train['gender'].fillna(1, inplace=True)
```

```
In [20]: train.loc[(train.gender== 'M') ,'gender' ] = 1
         train.loc[(train.gender== 'F') ,'gender' ] = 0
```

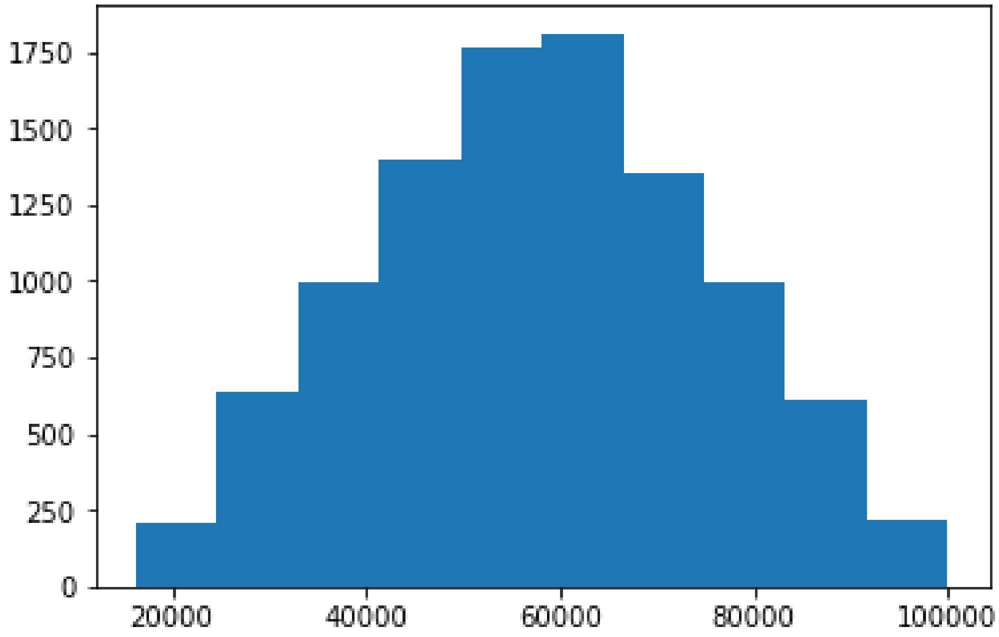
```
In [21]: test.loc[(test.gender== 'M') ,'gender' ] = 1
         test.loc[(test.gender== 'F') ,'gender' ] = 0
```

```
In [22]: train.groupby(['gender'])['outcome'].sum().plot(kind="bar")
         plt.show()
```



```
In [23]: inc = train['income']
```

```
In [24]: plt.hist(inc)
         plt.show()
```

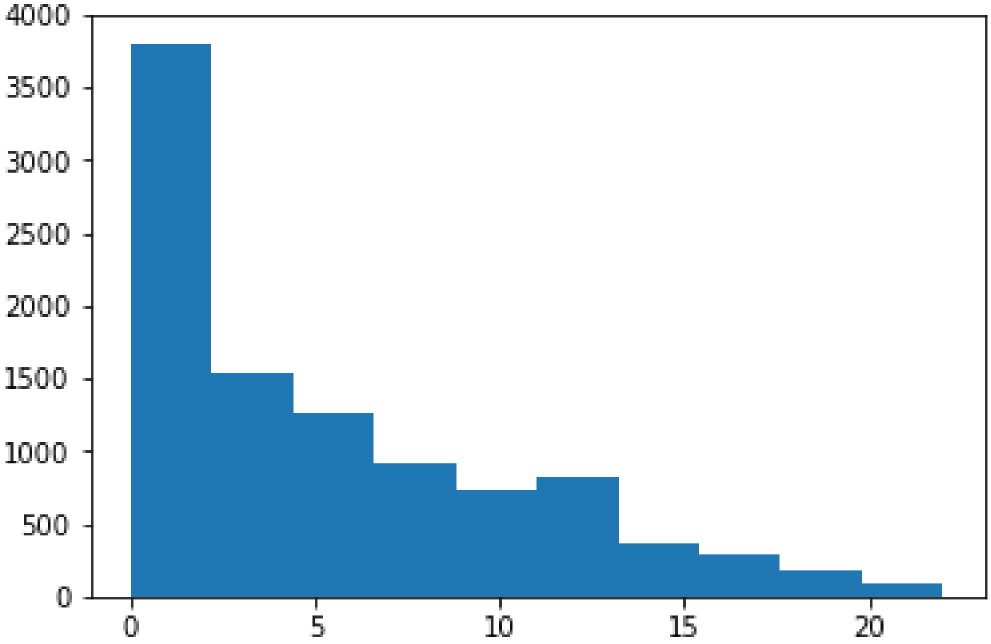


```
In [25]: train['prior_ins_tenure'].unique()
```

```
Out[25]: array([ 4,  2,  7,  0,  5,  1, 10,  8,  3,  6, 11, 18,  9, 17, 16, 19, 13,
                12, 15, 14, 22, 21, 20], dtype=int64)
```

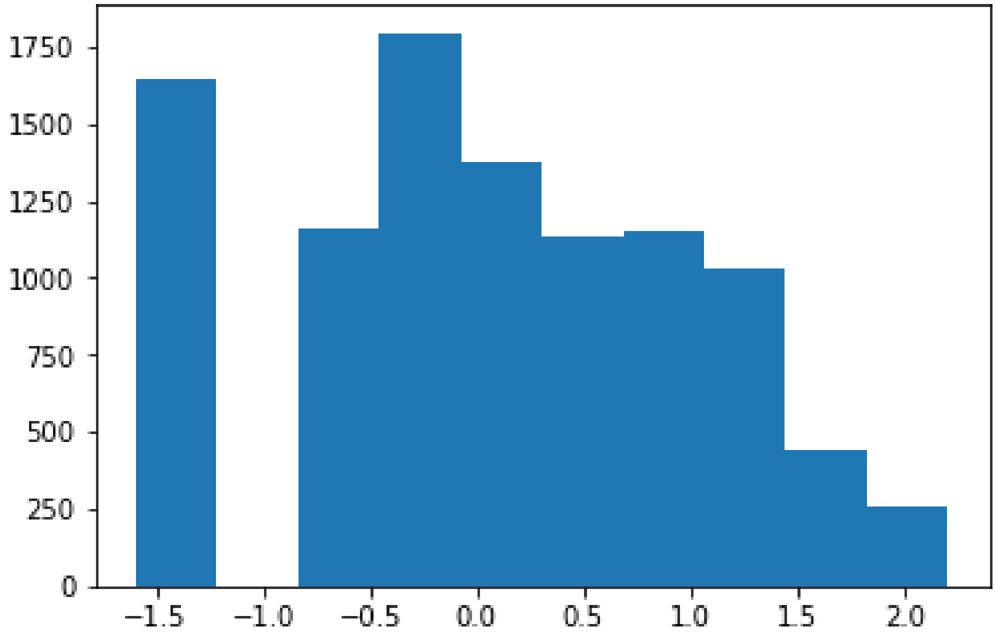
```
In [26]: ins_ten = train['prior_ins_tenure']
```

```
In [27]: plt.hist(ins_ten)
         plt.show()
```

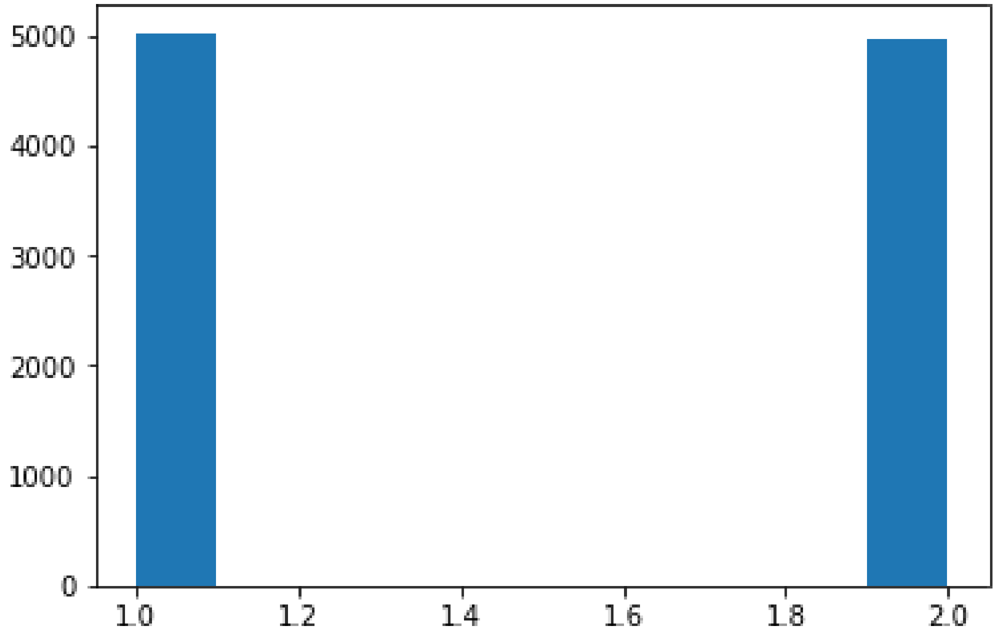


```
In [28]: ins_new = preprocessing.scale(np.sqrt(train['prior_ins_tenure']))
         test_ins_new = preprocessing.scale(np.sqrt(test['prior_ins_tenure']))
```

```
In [29]: plt.hist(ins_new)
         plt.show()
```



```
In [30]: train['prior_ins_tenure'] = ins_new
         test['prior_ins_tenure'] = test_ins_new

In [31]: ins_vec = train['n_drivers']

In [32]: plt.hist(ins_vec)
         plt.show()
```

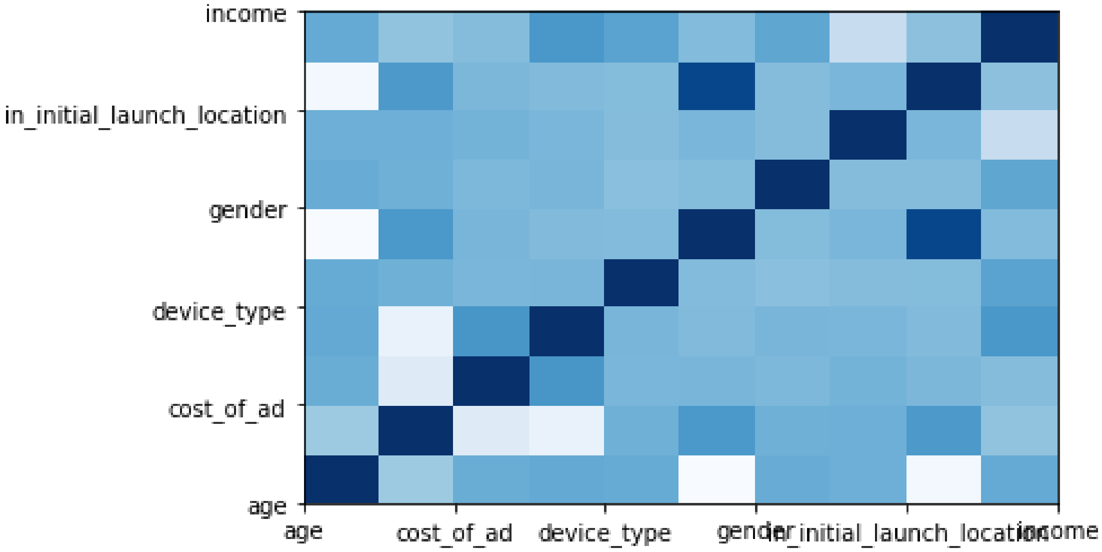


```
In [33]: train['device_type'] = train['device_type'].apply(int)
         train['gender'] = train['gender'].apply(int)
         test['device_type'] = test['device_type'].apply(int)
         test['gender'] = test['gender'].apply(int)
```

```
In [34]: train['n_drivers'].unique()
```

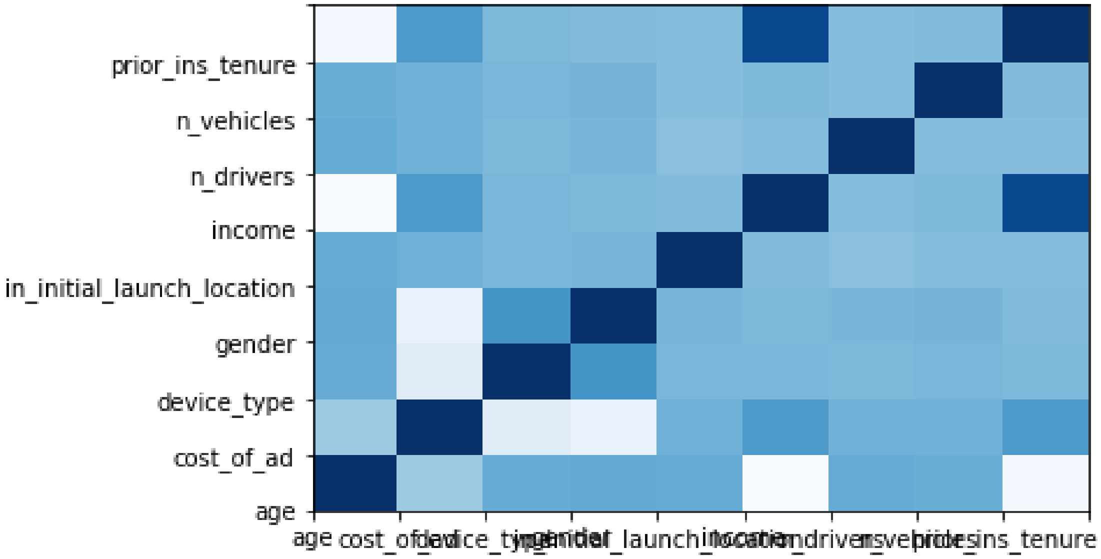
```
Out[34]: array([2, 1], dtype=int64)
```

```
In [35]: # Checking the Corrrelation Matrix
         Corr_Analysis_Train = train.corr()
         Corr_Analysis_Train.to_csv("D:\\Kaggle Projects\\Blue Owl\\Corr_Analysis_Train.csv",
         fig, ax = plt.subplots()
         ax.pcolor(Corr_Analysis_Train.corr(), cmap=plt.cm.Blues)
         ax.set_xticklabels(Corr_Analysis_Train.columns)
         ax.set_yticklabels(Corr_Analysis_Train.columns)
         plt.show()
```

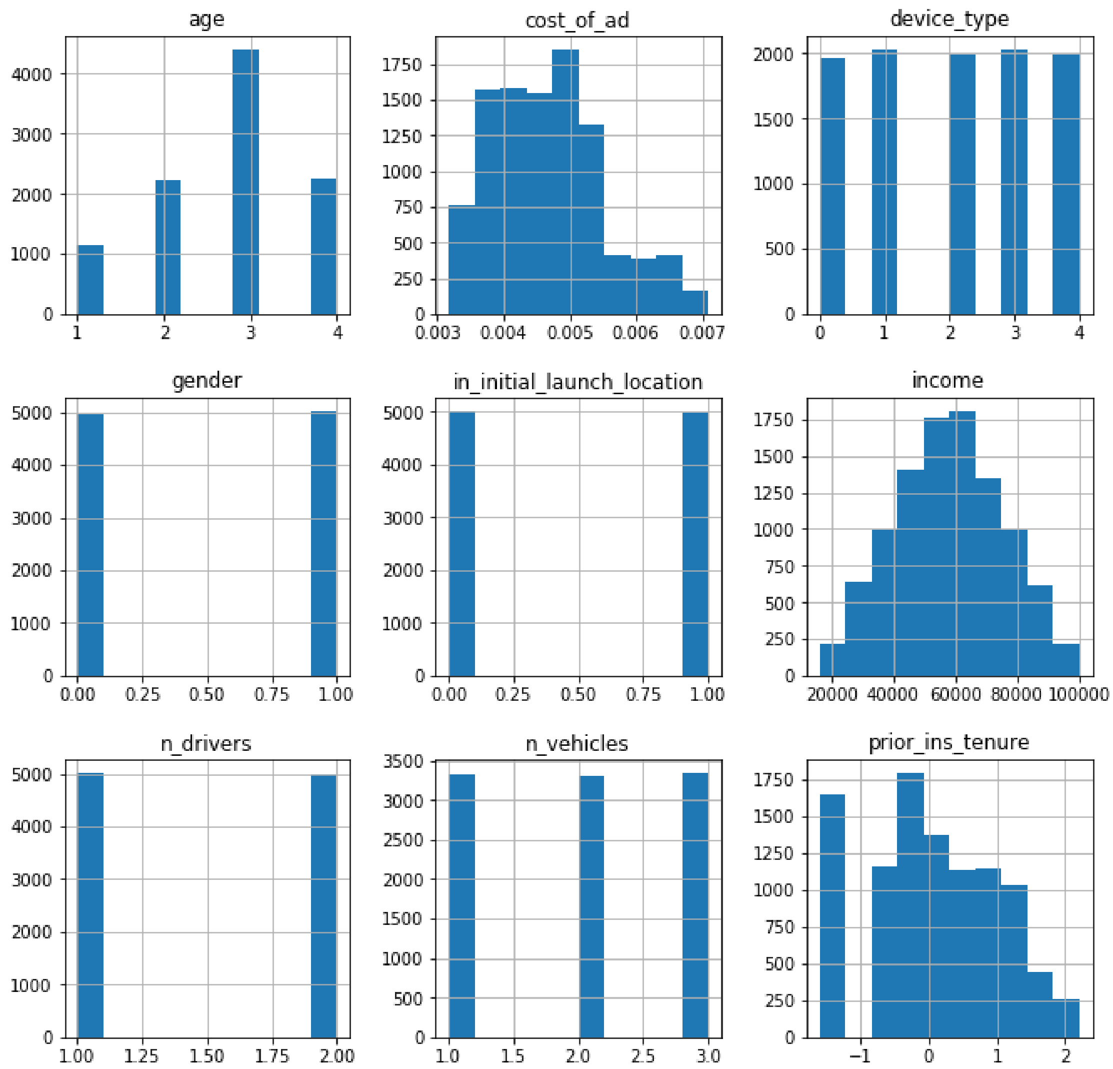


```
In [36]: y_train = train['outcome']
         train_new = train.drop('outcome', 1)
```

```
In [37]: # Checking the Corrrelation Matrix
         Corr_Analysis_Train = train_new.corr()
         #Corr_Analysis_Train.to_csv("D:\\Kaggle Projects\\Blue Owl\\Corr_Analysis_Train.csv",
         fig, ax = plt.subplots()
         ax.pcolor(Corr_Analysis_Train.corr(), cmap=plt.cm.Blues)
         ax.set_xticklabels(Corr_Analysis_Train.columns)
         ax.set_yticklabels(Corr_Analysis_Train.columns)
         plt.show()
```



```
In [38]: train_new[train_new.dtypes[(train_new.dtypes=="float64")|(train_new.dtypes=="int64")]
                                        .index.values].hist(figsize=[11,11])

Out[38]: array([[<matplotlib.axes._subplots.AxesSubplot object at 0x000002066C6AFCF8>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x000002066C9EEE48>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x000002066C6BDAC8>],
                [<matplotlib.axes._subplots.AxesSubplot object at 0x000002066CAB3A20>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x000002066CB12BA8>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x000002066CB12BE0>],
                [<matplotlib.axes._subplots.AxesSubplot object at 0x000002066C808E48>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x000002066C5E9080>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x000002066C7C7BE0>]], dtype=

In [39]: plt.show()
```



```
In [40]: model = XGBClassifier()
         model.fit(train_new, y_train)
```

```
Out[40]: XGBClassifier(base_score=0.5, colsample_bylevel=1, colsample_bytree=1,
                gamma=0, learning_rate=0.1, max_delta_step=0, max_depth=3,
                min_child_weight=1, missing=None, n_estimators=100, nthread=-1,
                objective='binary:logistic', reg_alpha=0, reg_lambda=1,
                scale_pos_weight=1, seed=0, silent=True, subsample=1)
```

```
In [41]: roc = cross_val_score(model, train_new, y_train, scoring='roc_auc' ,cv=5)
```

```
In [42]: np.mean(roc)
```

```
Out[42]: 0.84355108689757863
```

```
In [43]: y_pred = model.predict(test)
```

```
In [44]: test_raw.head(5)
```

```
Out[44]:    age  cost_of_ad device_type gender  in_initial_launch_location  income  \
         0   34    0.005134     Android      F                           1   40376
         1   53    0.005223     desktop      F                           1   84511
         2   46    0.004939      laptop      F                           0   79322
         3   36    0.004924     Android      F                           0   63295
         4   28    0.005146       other      F                           1   36170

            n_drivers  n_vehicles  prior_ins_tenure
         0          1           3                 7
         1          1           1                11
         2          1           1                 4
         3          1           2                 0
         4          1           3                 3
```

```
In [45]: test_raw['outcome'] = y_pred
```

```
In [46]: test_raw.head(15)
```

```
Out[46]:     age  cost_of_ad device_type gender  in_initial_launch_location  income  \
         0    34    0.005134     Android      F                           1   40376
         1    53    0.005223     desktop      F                           1   84511
         2    46    0.004939      laptop      F                           0   79322
         3    36    0.004924     Android      F                           0   63295
         4    28    0.005146       other      F                           1   36170
         5    51    0.006242      iPhone      F                           0   60520
         6    20    0.003534     desktop      M                           0   59324
         7    35    0.004568     Android      F                           0   37002
         8    32    0.004713     Android      F                           1   45207
         9    33    0.006178      iPhone      F                           0   72587
         10   27    0.003350      laptop      M                           0   52713
         11   51    0.005774      iPhone      M                           0   86333
         12   28    0.003912     desktop      M                           1   41397
         13   57    0.003603     desktop      M                           0   72786
         14   55    0.003648     Android      M                           1   90290

             n_drivers  n_vehicles  prior_ins_tenure  outcome
         0           1           3                 7        0
         1           1           1                11        0
         2           1           1                 4        0
         3           1           2                 0        0
         4           1           3                 3        0
         5           1           1                14        0
         6           1           1                 0        0
         7           2           3                 5        0
         8           1           2                 7        0
```

```
9           1           2                  6        0
10          2           3                  5        0
11          1           1                 16        0
12          1           2                  4        0
13          2           3                 10        0
14          1           1                 12        0
```

```
In [47]: test_raw.to_csv("D:\\Kaggle Projects\\Blue Owl\\FinalResult.csv", index=True , header=
```

```
In [ ]:
```