DSC55_Paulovici_Exercise_7_2

April 26, 2020

# Week 7: File: DSC550_Paulovici_Exercise_7_2.py (.ipynb) Name: Kevin Paulovici Date: 4/26/2020 Course: DSC 550 Data Mining (2205-1) Assignment: 7.2 Exercise: Titanic Case Study Part 2

# Part 1

## Assignment Tasks Complete the Titanic Case Study Part 1 tutorial. This will be a complete Analysis Case study but Part 1 is the Graph Analysis. I have provided sample code for you to use as you go through the tutorial. I recommend that you comment out the steps and run them separately so you can fully understand what you are doing for each step of the analysis. As you go through each step, take screenshots to âĂIJproveâĂİ to me that you successfully completed each step. Paste your screenshots into a Word document and submit that Word document to the Assignment submission link. Code provided by Prof. Becky Deitenbeck

```
In [1]: #Titanic Tutorial Part 1
        #Graphics Analysis

        import pandas as pd
        import yellowbrick
```

```
In [2]: #Step 1:  Load data into a dataframe
        addr1 = "train.csv"
        data = pd.read_csv(addr1)
```

```
In [3]: # Step 2:  check the dimension of the table
        print("The dimension of the table is: ", data.shape)
```

```
The dimension of the table is:  (891, 12)
```

```
In [4]: #Step 3:  Look at the data
        print(data.head(5))
```

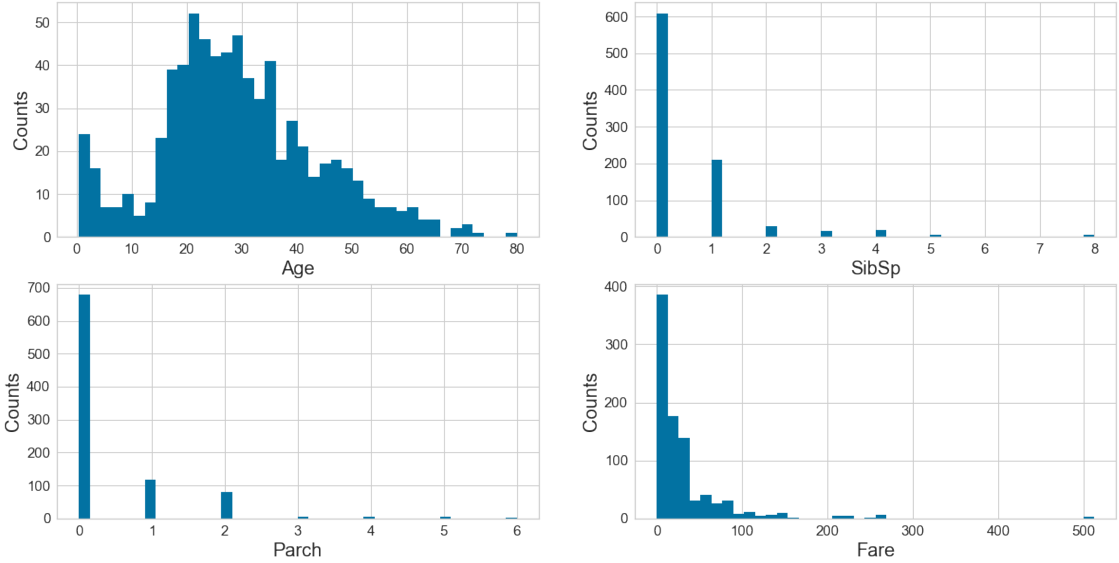
```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         0       3
```

```
                                                Name     Sex   Age  SibSp  \
0                            Braund, Mr. Owen Harris    male  22.0      1
1  Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0      1
2                             Heikkinen, Miss. Laina  female  26.0      0
3       Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1
4                           Allen, Mr. William Henry    male  35.0      0

   Parch            Ticket     Fare Cabin Embarked
0      0         A/5 21171   7.2500   NaN        S
1      0          PC 17599  71.2833   C85        C
2      0  STON/O2. 3101282   7.9250   NaN        S
3      0            113803  53.1000  C123        S
4      0            373450   8.0500   NaN        S
```

```
In [5]: #Step 5:  what type of variables are in the table
        print("Describe Data")
        print(data.describe())
        print("Summarized Data")
        print(data.describe(include=['O']))
```

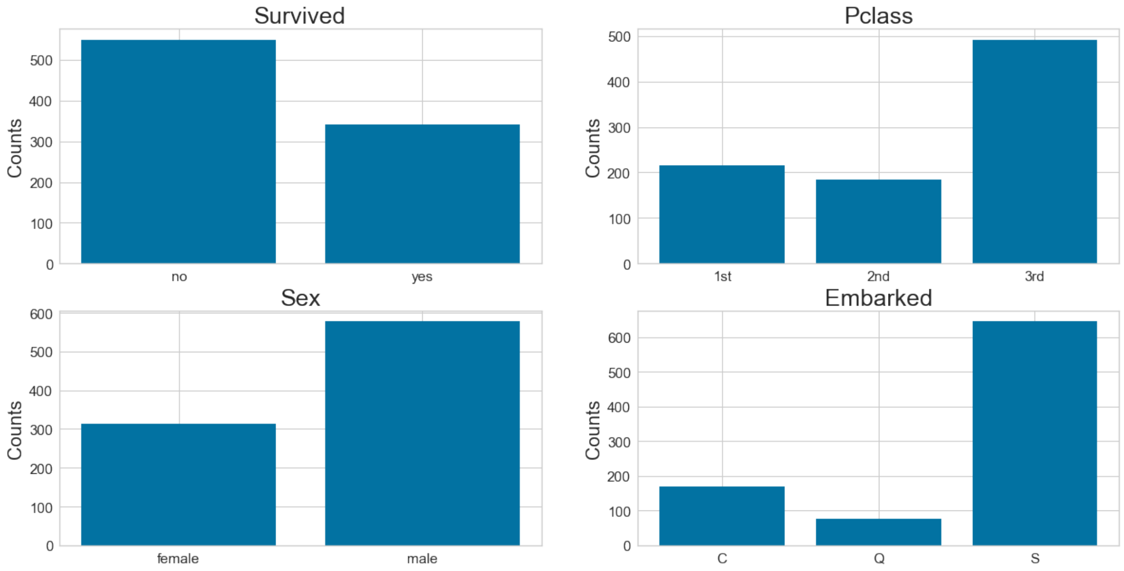
```
Describe Data
       PassengerId    Survived      Pclass         Age       SibSp  \
count   891.000000  891.000000  891.000000  714.000000  891.000000
mean    446.000000    0.383838    2.308642   29.699118    0.523008
std     257.353842    0.486592    0.836071   14.526497    1.102743
min       1.000000    0.000000    1.000000    0.420000    0.000000
25%     223.500000    0.000000    2.000000   20.125000    0.000000
50%     446.000000    0.000000    3.000000   28.000000    0.000000
75%     668.500000    1.000000    3.000000   38.000000    1.000000
max     891.000000    1.000000    3.000000   80.000000    8.000000

            Parch        Fare
count  891.000000  891.000000
mean     0.381594   32.204208
std      0.806057   49.693429
min      0.000000    0.000000
25%      0.000000    7.910400
50%      0.000000   14.454200
75%      0.000000   31.000000
max      6.000000  512.329200
Summarized Data
                         Name   Sex  Ticket Cabin Embarked
count                     891   891     891   204      889
unique                    891     2     681   147        3
top     Stewart, Mr. Albert A  male  347082    G6        S
freq                        1   577       7     4      644
```

```
In [6]: #Step 6: import visulization packages
        import matplotlib.pyplot as plt

        # set up the figure size
        plt.rcParams['figure.figsize'] = (20, 10)

        # make subplots
        fig, axes = plt.subplots(nrows = 2, ncols = 2)

        # Specify the features of interest
        num_features = ['Age', 'SibSp', 'Parch', 'Fare']
        xaxes = num_features
        yaxes = ['Counts', 'Counts', 'Counts', 'Counts']

        # draw histograms
        axes = axes.ravel()
        for idx, ax in enumerate(axes):
            ax.hist(data[num_features[idx]].dropna(), bins=40)
            ax.set_xlabel(xaxes[idx], fontsize=20)
            ax.set_ylabel(yaxes[idx], fontsize=20)
            ax.tick_params(axis='both', labelsize=15)
        plt.show()
```

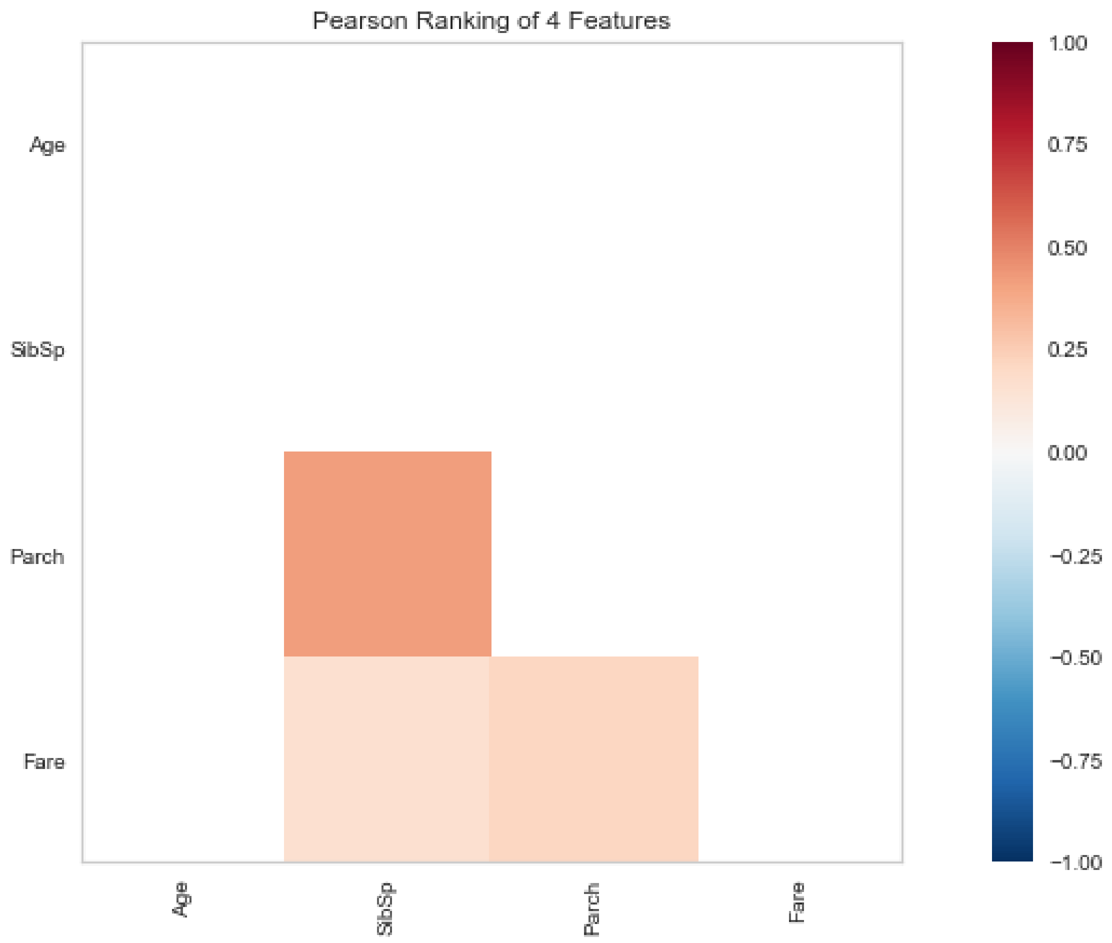


```
In [7]: #7:  Barcharts: set up the figure size
        #%matplotlib inline
        plt.rcParams['figure.figsize'] = (20, 10)

        # make subplots
```

```
fig, axes = plt.subplots(nrows = 2, ncols = 2)

# make the data read to feed into the visulizer
X_Survived = data.replace({'Survived': {1: 'yes', 0: 'no'}}).groupby('Survived').size()
Y_Survived = data.replace({'Survived': {1: 'yes', 0: 'no'}}).groupby('Survived').size()
# make the bar plot
axes[0, 0].bar(X_Survived, Y_Survived)
axes[0, 0].set_title('Survived', fontsize=25)
axes[0, 0].set_ylabel('Counts', fontsize=20)
axes[0, 0].tick_params(axis='both', labelsize=15)

# make the data read to feed into the visulizer
X_Pclass = data.replace({'Pclass': {1: '1st', 2: '2nd', 3: '3rd'}}).groupby('Pclass').s
Y_Pclass = data.replace({'Pclass': {1: '1st', 2: '2nd', 3: '3rd'}}).groupby('Pclass').s
# make the bar plot
axes[0, 1].bar(X_Pclass, Y_Pclass)
axes[0, 1].set_title('Pclass', fontsize=25)
axes[0, 1].set_ylabel('Counts', fontsize=20)
axes[0, 1].tick_params(axis='both', labelsize=15)

# make the data read to feed into the visulizer
X_Sex = data.groupby('Sex').size().reset_index(name='Counts')['Sex']
Y_Sex = data.groupby('Sex').size().reset_index(name='Counts')['Counts']
# make the bar plot
axes[1, 0].bar(X_Sex, Y_Sex)
axes[1, 0].set_title('Sex', fontsize=25)
axes[1, 0].set_ylabel('Counts', fontsize=20)
axes[1, 0].tick_params(axis='both', labelsize=15)

# make the data read to feed into the visulizer
X_Embarked = data.groupby('Embarked').size().reset_index(name='Counts')['Embarked']
Y_Embarked = data.groupby('Embarked').size().reset_index(name='Counts')['Counts']
# make the bar plot
axes[1, 1].bar(X_Embarked, Y_Embarked)
axes[1, 1].set_title('Embarked', fontsize=25)
axes[1, 1].set_ylabel('Counts', fontsize=20)
axes[1, 1].tick_params(axis='both', labelsize=15)
plt.show()
```

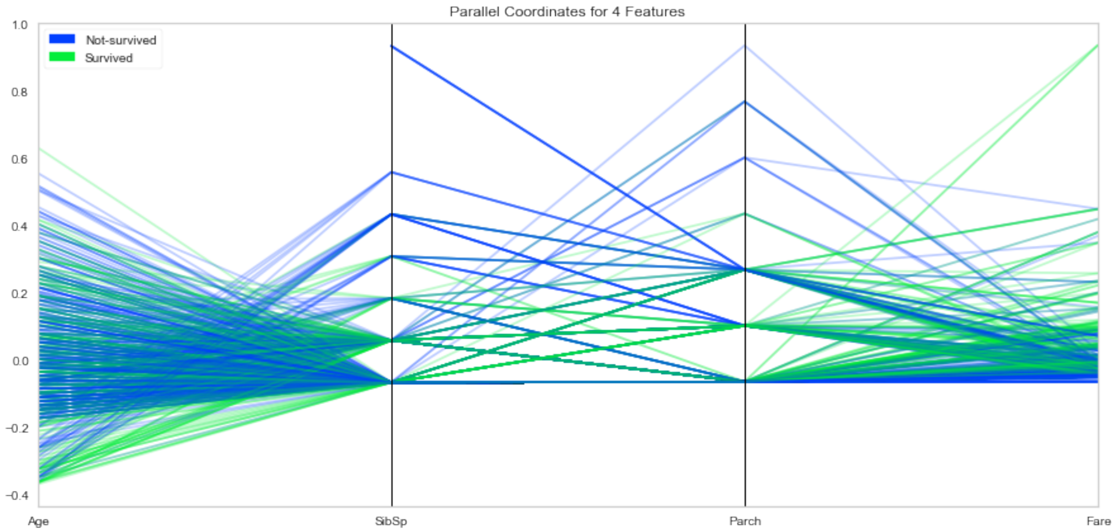


```
In [8]: #Step 8: Pearson Ranking
        #set up the figure size
        #%matplotlib inline
        plt.rcParams['figure.figsize'] = (15, 7)

        # import the package for visulization of the correlation
        from yellowbrick.features import Rank2D

        # extract the numpy arrays from the data frame
        X = data[num_features].values

        # instantiate the visualizer with the Covariance ranking algorithm
        visualizer = Rank2D(features=num_features, algorithm='pearson')
        visualizer.fit(X)                 # Fit the data to the visualizer
        visualizer.transform(X)             # Transform the data
        visualizer.poof(outpath="pcoords1.png") # Draw/show/poof the data
        plt.show()
```

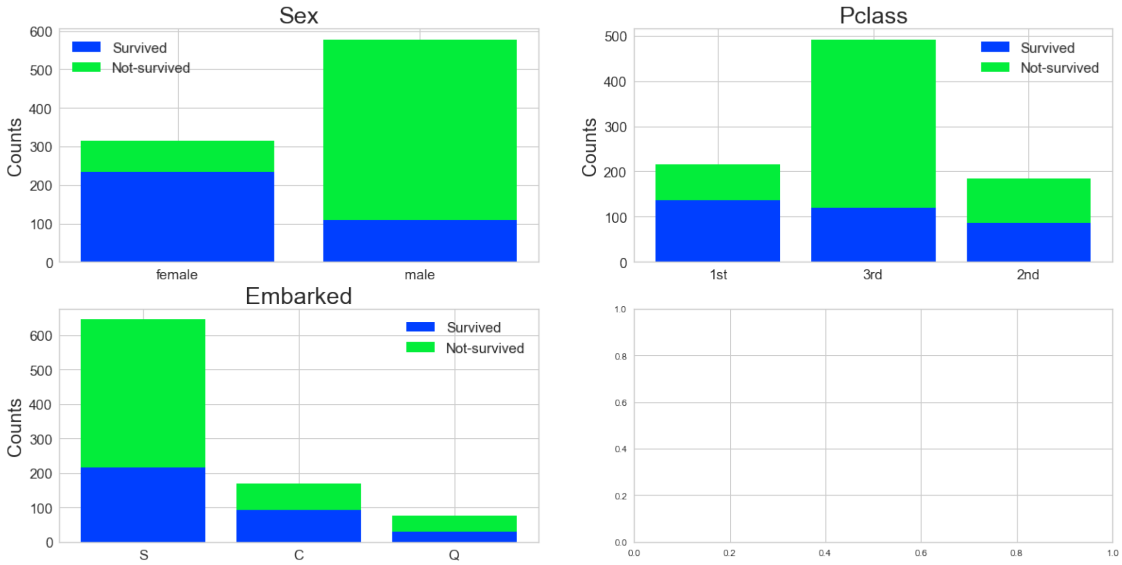


```
In [9]: # Step 9:  Compare variables against Survived and Not Survived
        #set up the figure size
        #%matplotlib inline
        plt.rcParams['figure.figsize'] = (15, 7)
        plt.rcParams['font.size'] = 50

        # setup the color for yellowbrick visulizer
        from yellowbrick.style import set_palette
        set_palette('sns_bright')

        # import packages
        from yellowbrick.features import ParallelCoordinates
        # Specify the features of interest and the classes of the target
        classes = ['Not-survived', 'Survived']
        num_features = ['Age', 'SibSp', 'Parch', 'Fare']

        # copy data to a new dataframe
        data_norm = data.copy()
```

```
# normalize data to 0-1 range
for feature in num_features:
    data_norm[feature] = (data[feature] - data[feature].mean(skipna=True)) / (data[fea

# Extract the numpy arrays from the data frame
X = data_norm[num_features].values
y = data.Survived.values

# Instantiate the visualizer
# Instantiate the visualizer
visualizer = ParallelCoordinates(classes=classes, features=num_features)


visualizer.fit(X, y)      # Fit the data to the visualizer
visualizer.transform(X)   # Transform the data
visualizer.poof(outpath="pcoords2.png") # Draw/show/poof the data
plt.show()
```



```
In [10]: # Step 10 - stacked bar charts to compare survived/not survived
         #set up the figure size
         #%matplotlib inline
         plt.rcParams['figure.figsize'] = (20, 10)

         # make subplots
         fig, axes = plt.subplots(nrows = 2, ncols = 2)

         # make the data read to feed into the visulizer
         Sex_survived = data.replace({'Survived': {1: 'Survived', 0: 'Not-survived'}})[data['Su
         Sex_not_survived = data.replace({'Survived': {1: 'Survived', 0: 'Not-survived'}})[data
         Sex_not_survived = Sex_not_survived.reindex(index = Sex_survived.index)
         # make the bar plot
         p1 = axes[0, 0].bar(Sex_survived.index, Sex_survived.values)
         p2 = axes[0, 0].bar(Sex_not_survived.index, Sex_not_survived.values, bottom=Sex_survi
         axes[0, 0].set_title('Sex', fontsize=25)
         axes[0, 0].set_ylabel('Counts', fontsize=20)
         axes[0, 0].tick_params(axis='both', labelsize=15)
         axes[0, 0].legend((p1[0], p2[0]), ('Survived', 'Not-survived'), fontsize = 15)

         # make the data read to feed into the visualizer
         Pclass_survived = data.replace({'Survived': {1: 'Survived', 0: 'Not-survived'}}).repla
         Pclass_not_survived = data.replace({'Survived': {1: 'Survived', 0: 'Not-survived'}}).r
         Pclass_not_survived = Pclass_not_survived.reindex(index = Pclass_survived.index)
         # make the bar plot
         p3 = axes[0, 1].bar(Pclass_survived.index, Pclass_survived.values)
         p4 = axes[0, 1].bar(Pclass_not_survived.index, Pclass_not_survived.values, bottom=Pcla
         axes[0, 1].set_title('Pclass', fontsize=25)
         axes[0, 1].set_ylabel('Counts', fontsize=20)
         axes[0, 1].tick_params(axis='both', labelsize=15)
         axes[0, 1].legend((p3[0], p4[0]), ('Survived', 'Not-survived'), fontsize = 15)

         # make the data read to feed into the visualizer
         Embarked_survived = data.replace({'Survived': {1: 'Survived', 0: 'Not-survived'}})[da
         Embarked_not_survived = data.replace({'Survived': {1: 'Survived', 0: 'Not-survived'}})
         Embarked_not_survived = Embarked_not_survived.reindex(index = Embarked_survived.index)
         # make the bar plot
         p5 = axes[1, 0].bar(Embarked_survived.index, Embarked_survived.values)
         p6 = axes[1, 0].bar(Embarked_not_survived.index, Embarked_not_survived.values, bottom=
         axes[1, 0].set_title('Embarked', fontsize=25)
         axes[1, 0].set_ylabel('Counts', fontsize=20)
         axes[1, 0].tick_params(axis='both', labelsize=15)
         axes[1, 0].legend((p5[0], p6[0]), ('Survived', 'Not-survived'), fontsize = 15)
         plt.show()
```



# Part 2
## Assignment Task Complete the Titanic Case Study Part 2 tutorial. This will be a complete Analysis Case study but Part 2 is the Feature and Dimensionality Reduction part. I have provided sample code for you to use as you go through the tutorial. I recommend that you comment out the steps and run them separately so you can fully understand what you are doing for each step of the analysis. As you go through each step, take screenshots to "prove" to me that you successfully completed each step. Paste your screenshots into a Word document and submit that Word document to the Assignment submission link.

```
In [11]: #Titanic Tutorial Part 2
         #Graphics Analysis
         #Feature Reduction (Extraction/Selection)
         #Filling in Missing Values

         #For Part 2 of the Titanic Tutorial, complete Steps 11-13.

         import pandas as pd
         import yellowbrick
```

```
In [12]: # Step 11 - fill in missing values and eliminate features
         #fill the missing age data with median value
         def fill_na_median(data, inplace=True):
             return data.fillna(data.median(), inplace=inplace)

         fill_na_median(data['Age'])
```

```
In [13]: # check the result
         print(data['Age'].describe())
```

```
count    891.000000
mean      29.361582
```

```
std        13.019697
min         0.420000
25%        22.000000
50%        28.000000
75%        35.000000
max        80.000000
Name: Age, dtype: float64
```

```
In [14]: # fill with the most represented value
         def fill_na_most(data, inplace=True):
             return data.fillna('S', inplace=inplace)

         fill_na_most(data['Embarked'])

In [15]: # check the result
         print(data['Embarked'].describe())
```

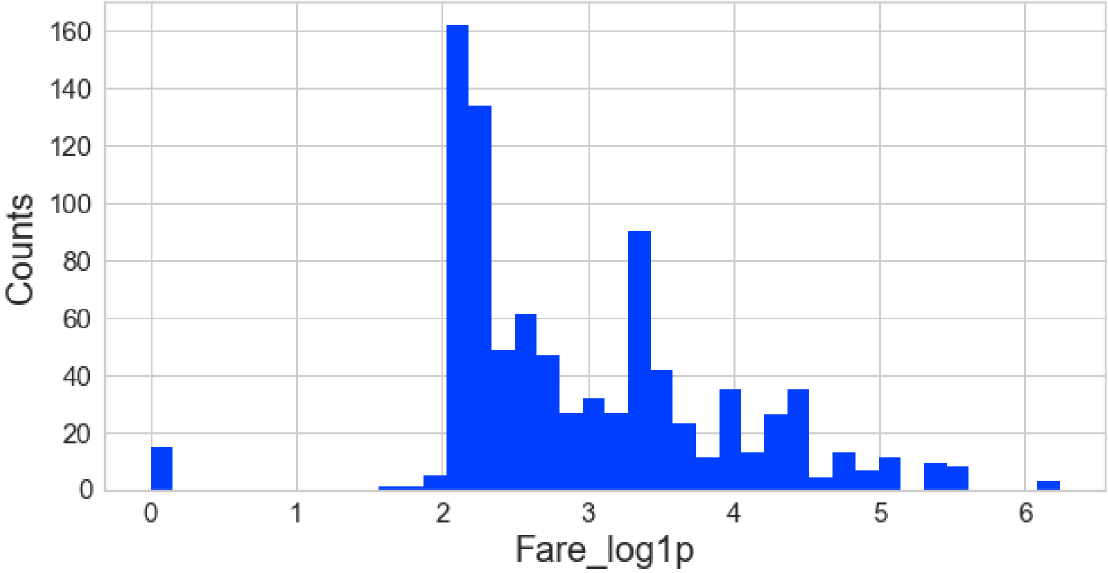
```
count      891
unique       3
top          S
freq       646
Name: Embarked, dtype: object
```

```
In [16]: # import package
         import numpy as np

         # log-transformation
         def log_transformation(data):
             return data.apply(np.log1p)

         data['Fare_log1p'] = log_transformation(data['Fare'])

In [17]: # check the data
         print(data.describe())
```

```
       PassengerId    Survived      Pclass         Age       SibSp  \
count   891.000000  891.000000  891.000000  891.000000  891.000000
mean    446.000000    0.383838    2.308642   29.361582    0.523008
std     257.353842    0.486592    0.836071   13.019697    1.102743
min       1.000000    0.000000    1.000000    0.420000    0.000000
25%     223.500000    0.000000    2.000000   22.000000    0.000000
50%     446.000000    0.000000    3.000000   28.000000    0.000000
75%     668.500000    1.000000    3.000000   35.000000    1.000000
max     891.000000    1.000000    3.000000   80.000000    8.000000

            Parch        Fare  Fare_log1p
count  891.000000  891.000000  891.000000
```

```
mean      0.381594   32.204208    2.962246
std       0.806057   49.693429    0.969048
min       0.000000    0.000000    0.000000
25%       0.000000    7.910400    2.187218
50%       0.000000   14.454200    2.737881
75%       0.000000   31.000000    3.465736
max       6.000000  512.329200    6.240917
```

```
In [18]: # Step 12 - adjust skewed data (fare)
         # check the distribution using histogram
         # set up the figure size
         #%matplotlib inline
         plt.rcParams['figure.figsize'] = (10, 5)

         plt.hist(data['Fare_log1p'], bins=40)
         plt.xlabel('Fare_log1p', fontsize=20)
         plt.ylabel('Counts', fontsize=20)
         plt.tick_params(axis='both', labelsize=15)
         plt.show()
```



```
In [19]: # Step 13 - convert categorical data to numbers
         # get the categorical data
         cat_features = ['Pclass', 'Sex', "Embarked"]
         data_cat = data[cat_features]
         data_cat = data_cat.replace({'Pclass': {1: '1st', 2: '2nd', 3: '3rd'}})
         # One Hot Encoding
         data_cat_dummies = pd.get_dummies(data_cat)
```

```
# check the data
print(data_cat_dummies.head(8))
```

```
   Pclass_1st  Pclass_2nd  Pclass_3rd  Sex_female  Sex_male  Embarked_C  \
0           0           0           1           0         1           0
1           1           0           0           1         0           1
2           0           0           1           1         0           0
3           1           0           0           1         0           0
4           0           0           1           0         1           0
5           0           0           1           0         1           0
6           1           0           0           0         1           0
7           0           0           1           0         1           0

   Embarked_Q  Embarked_S
0           0           1
1           0           0
2           0           1
3           0           1
4           0           1
5           1           0
6           0           1
7           0           1
```