

Exercise 5.2: Titanic Case Study Part 1

DSC 550

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Case Study: Analyze data to predict who will Survive the Titanic

```
In [20]: import pandas as pd
import numpy as np
import string
import re
import matplotlib.pyplot as plt
from collections import Counter
import yellowbrick
```

1. Load the data from the “train.csv” file into a DataFrame.

```
In [2]: # Loading the data
data = pd.read_csv("train.csv")
```

2. Display the dimensions of the file (so you’ll have a good idea the amount of data you are working with.data

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

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

It has 891 records and 12 variables

3. Display the first 5 rows of data so you can see the column headings and the type of data for each column.

```
In [6]: # Display the data
data.head(10)
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cummings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S
5	6	0	3	Moran, Mr. James	male	NaN	0	0	330877	8.4583	NaN	Q
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.8625	E46	S
7	8	0	3	Palsson, Master. Gosta Leonard	male	2.0	3	1	349909	21.0750	NaN	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.1333	NaN	S
9	10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14.0	1	0	237736	30.0708	NaN	C

Survived variable is Boolean variable with 0 or 1, Missing values have NaN. Survived will be the target variable and all other columns will be features.

5. Look at summary information about your data (total, mean, min, max, freq, unique, etc.) Does this present any more questions for you? Does it lead you to a conclusion yet?

Describing the Statistics of all numerical data

```
In [7]: print("Describe Data")
data.describe()
```

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

Summary for categorical data

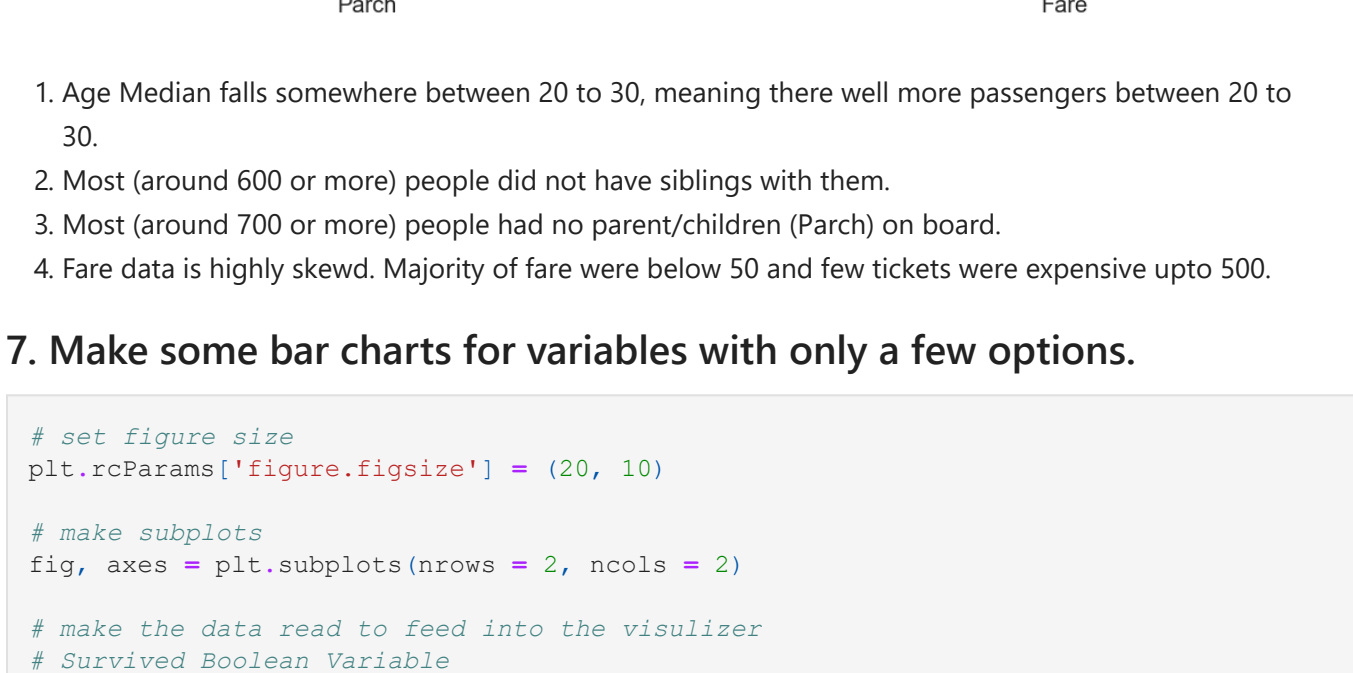
```
In [8]: print("Summarized Data")
data.describe(include=['O'])
```

	Name	Sex	Ticket	Cabin	Embarked
count	891	891	891	204	889
unique	891	2	681	147	3
top	Nosworthy, Mr. Richard Cater	male	CA. 2343	G6	S
freq	1	577	7	4	644

The minimum and maximum age is .42 and 80. That means it had passengers as young as infants and older people. So Age can be an important feature. Fare also had a big spread, with max value of 512.329. There were higher number of male passengers on the ship.

6. Make some histograms of your data

```
In [14]: # set figure size
plt.rcParams['figure.figsize'] = (20, 10)
```



1. Age Median falls somewhere between 20 to 30, meaning there well more passengers between 20 to 30.
2. Most (around 600 or more) people did not have siblings with them.
3. Most (around 700 or more) people had no parent/children (Parch) on board.
4. Fare data is highly skewed. Majority of fare were below 50 and few tickets were expensive upto 500.

7. Make some bar charts for variables with only a few options.

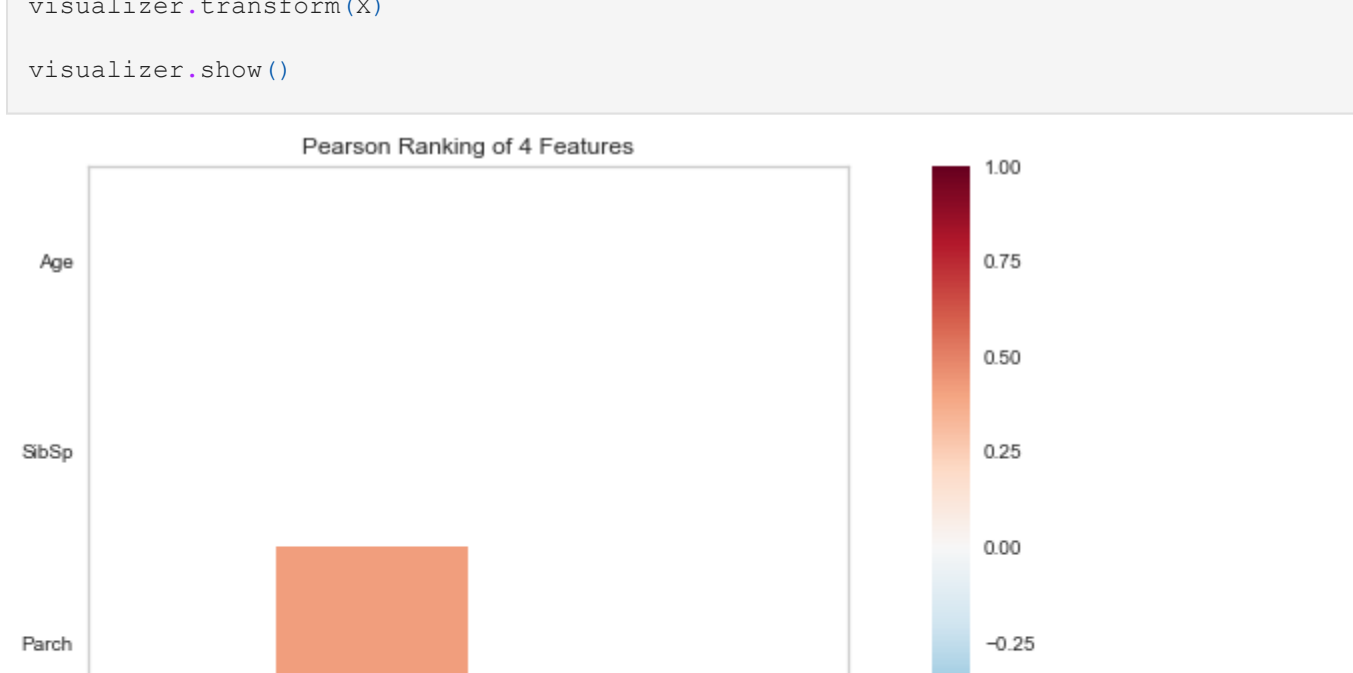
```
In [19]: # set figure size
plt.rcParams['figure.figsize'] = (20, 10)
```



1. There were more passenger in 3rd class compared to 1st and 2nd
2. There were more male passengers than female
3. There were more people mounted from Southampton (S). (Embark — Southampton, Cherbourg, and Queenstown)

8. To see if the data is correlated, make some Pearson Ranking charts

```
In [32]: #set up the figure size
plt.rcParams['figure.figsize'] = (15, 7)
```



```
Out[32]: <AxesSubplot:title={'center': 'Pearson Ranking of 4 Features'}>
```

9. Use Parallel Coordinates visualization to compare the distributions of numerical variables between passengers that survived and those that did not survive.

```
In [46]: # setup the color for yellowbrick vizualizer
from yellowbrick.style import set_palette
set_palette('sns_bright')
```

```
In [47]: # import packages
from yellowbrick.features import ParallelCoordinates
```

```
In [47]: # Specify the features of interest and the classes of the target
classes = ['Not-survived', 'Survived']
num_features = ['Age', 'SibSp', 'Parch', 'Fare']
```

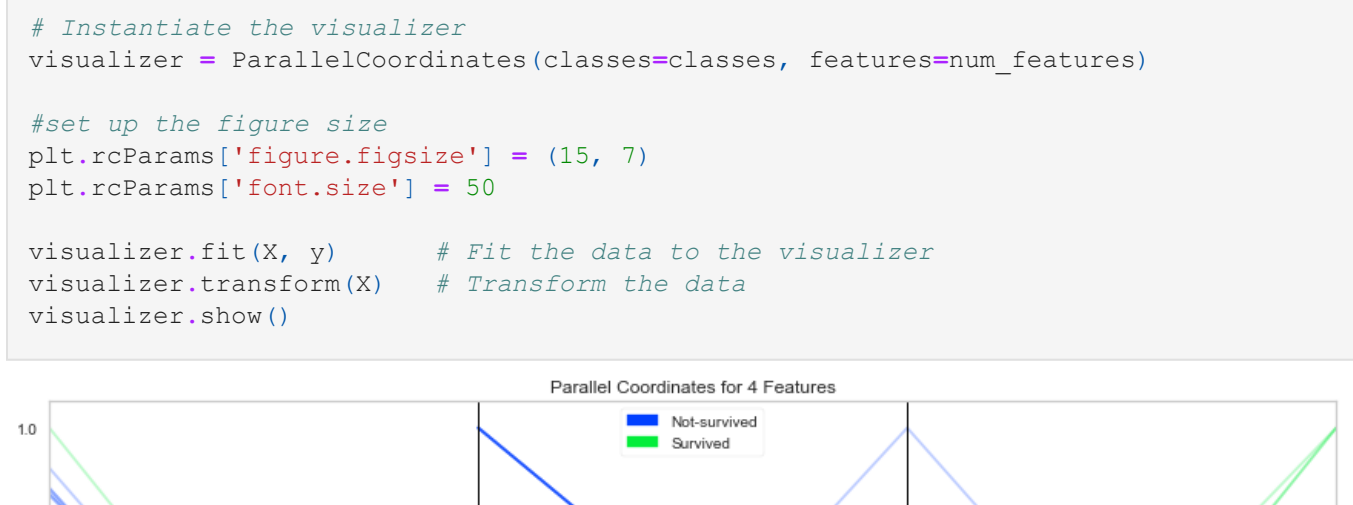
```
In [48]: # copy data to a new dataframe
data_norm = data.copy()
```

```
In [50]: # normalize data to 0-1 range
for feature in num_features:
    data_norm[feature] = (data[feature] - data[feature].min(skipna=True)) / (data[feature].max(skipna=True) - data[feature].min(skipna=True))
```

```
In [52]: data_norm.head(5)
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Emba
0	1	0	3	Braund, Mr. Owen Harris	male	0.271174	0.125	0.0	A/5 21171	0.014151	NaN	
1	2	1	1	Cummings, Mrs. John Bradley (Florence Briggs Th...	female	0.472229	0.125	0.0	PC 17599	0.139136	C85	
2	3	1	3	Heikkinen, Miss. Laina	female	0.321438	0.000	0.0	STON/O2. 3101282	0.015469	NaN	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	0.434531	0.125	0.0	113803	0.103644	C123	
4	5	0	3	Allen, Mr. William Henry	male	0.434531	0.000	0.0	373450	0.015713	NaN	

```
In [57]: # Extract the numpy arrays from the data frame
X = data_norm[num_features].values
y = data_norm.Survived.values
```



```
Out[57]: <AxesSubplot:title={'center': 'Parallel Coordinates for 4 Features'}>
```

Passengers traveling with siblings on the boat have a higher death rate (Blue) and passengers who paid a higher fare had a higher survival rate (Green).

10. Use Stack Bar Charts to compare passengers who survived to passengers who didn't survive based on the other variables.

Based on Categorical variables Sex, Embarked, Pclass

```
In [60]: #set up the figure size
plt.rcParams['figure.figsize'] = (20, 10)
```



Females had higher survival rate compared to Males, 1st class had higher survival rate and Embarked from Southampton has lower survival rate