Titanic: Machine Learning from Disaster - *Predict Survival on the Titanic*

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In [7]:
```
from IPython.display import Image
Image(url= 'images/timg.jpg')
```

Out[7]:

1. Data explore

In [57]:
```
import pandas as pd
```

In [58]:
```
train = pd.read_csv('input/train.csv')
test = pd.read_csv('input/test.csv')
```

Variable	Meaning	Note
Survived	0 = No, 1 = Yes	
Pclass	Ticket class: 1 = 1st, 2 = 2nd, 3 = 3rd	1st = Upper 2nd = Middle 3rd = Lower
Sex	Sex	
Age	-	Age is fractional if less than 1. If the age is estimated, is it in the form of xx.5
SibSp	siblings / spouses aboard the Titanic	Sibling = brother, sister, stepbrother, stepsister, Spouse = husband, wife (mistresses and fiancés were ignored)
parch	parents / children aboard the Titanic	Parent = mother, father, Child = daughter, son, stepdaughter, stepson, Some children travelled only with a nanny, therefore parch=0 for them
Ticket	Ticket number	
Fare	Passenger fare	
Cabin	Cabin number	
embarked	Port of Embarkation	C = Cherbourg, Q = Queenstown, S = Southampton

In [59]:
```
train.head()
```

Out[59]:

	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	Cumings, 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

```
In [60]: train.describe()
```

Out[60]:

	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

```
In [61]: train.shape

Out[61]: (891, 12)
```

```
In [62]: train.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
PassengerId    891 non-null int64
Survived       891 non-null int64
Pclass         891 non-null int64
Name           891 non-null object
Sex            891 non-null object
Age            714 non-null float64
SibSp          891 non-null int64
Parch          891 non-null int64
Ticket         891 non-null object
Fare           891 non-null float64
Cabin          204 non-null object
Embarked       889 non-null object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.6+ KB
```

```
In [63]: test.describe()
```

Out[63]:

	PassengerId	Pclass	Age	SibSp	Parch	Fare
count	418.000000	418.000000	332.000000	418.000000	418.000000	417.000000
mean	1100.500000	2.265550	30.272590	0.447368	0.392344	35.627188
std	120.810458	0.841838	14.181209	0.896760	0.981429	55.907576
min	892.000000	1.000000	0.170000	0.000000	0.000000	0.000000
25%	996.250000	1.000000	21.000000	0.000000	0.000000	7.895800
50%	1100.500000	3.000000	27.000000	0.000000	0.000000	14.454200
75%	1204.750000	3.000000	39.000000	1.000000	0.000000	31.500000
max	1309.000000	3.000000	76.000000	8.000000	9.000000	512.329200

```
In [64]: test.shape

Out[64]: (418, 11)
```

```
In [65]: test.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
PassengerId    418 non-null int64
Pclass         418 non-null int64
Name           418 non-null object
Sex            418 non-null object
Age            332 non-null float64
SibSp          418 non-null int64
Parch          418 non-null int64
Ticket         418 non-null object
Fare           417 non-null float64
Cabin          91 non-null object
Embarked       418 non-null object
dtypes: float64(2), int64(4), object(5)
memory usage: 36.0+ KB
```

```
In [66]: train.isnull().sum()
```

```
Out[66]: PassengerId      0
         Survived         0
         Pclass           0
         Name             0
         Sex              0
         Age            177
         SibSp            0
         Parch            0
         Ticket           0
         Fare             0
         Cabin          687
         Embarked         2
         dtype: int64
```

```
In [67]: test.isnull().sum()
```

```
Out[67]: PassengerId      0
         Pclass           0
         Name             0
         Sex              0
         Age             86
         SibSp            0
         Parch            0
         Ticket           0
         Fare             1
         Cabin          327
         Embarked         0
         dtype: int64
```

import python lib for visualization

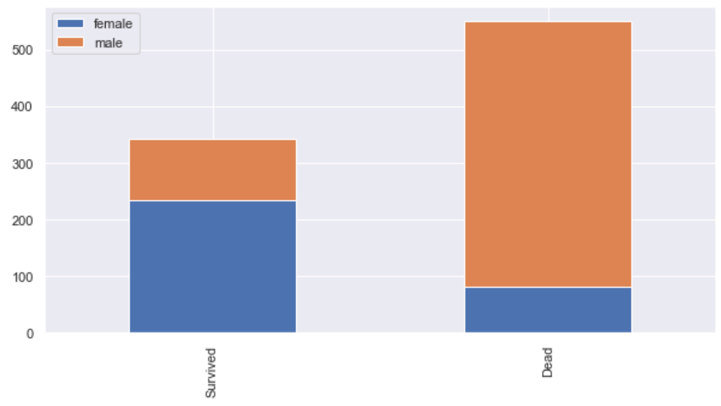
```
In [69]: import matplotlib.pyplot as plt
         %matplotlib inline
         import seaborn as sns
         sns.set() # setting seaborn default for plots
```

Bar Chart for Categorical Features

- Pclass
- Sex
- SibSp (# of siblings and spouse)
- Parch (# of parents and children)
- Embarked
- Cabin

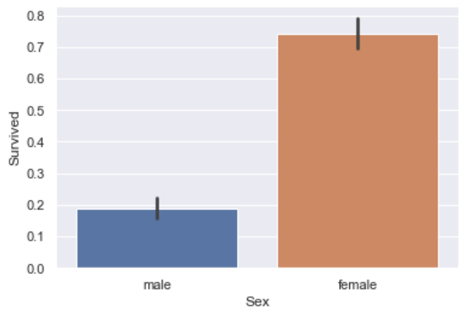
```
In [70]: def bar_chart(feature):
             survived = train[train['Survived']==1][feature].value_counts()
             dead = train[train['Survived']==0][feature].value_counts()
             df = pd.DataFrame([survived,dead])
             df.index = ['Survived','Dead']
             df.plot(kind='bar',stacked=True, figsize=(10,5))
```

```
In [71]: bar_chart('Sex')
```

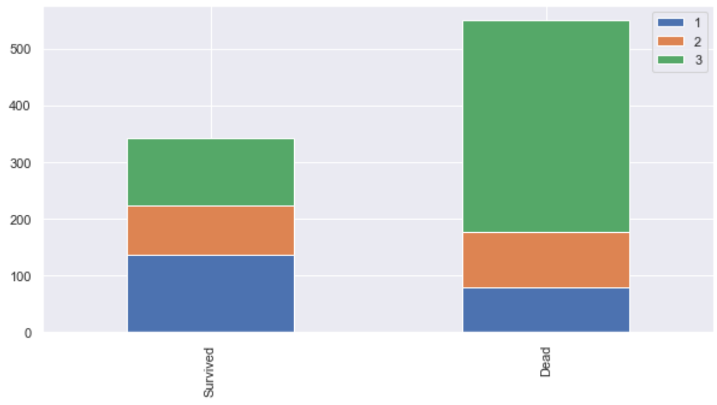


In [72]:
```
sns.barplot(x="Sex", y="Survived", data=train)
print("Percentage of females who survived:%.2f" % (train["Survived"][train["Sex"] == 'female'].value_counts(normalize = True)[1]*10
0))
print("Percentage of males who survived:%.2f" % (train["Survived"][train["Sex"] == 'male'].value_counts(normalize = True)[1]*100))
```

```
Percentage of females who survived:74.20
Percentage of males who survived:18.89
```

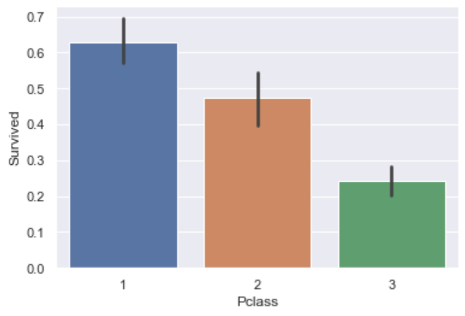


In [40]:
```
bar_chart('Pclass')
```

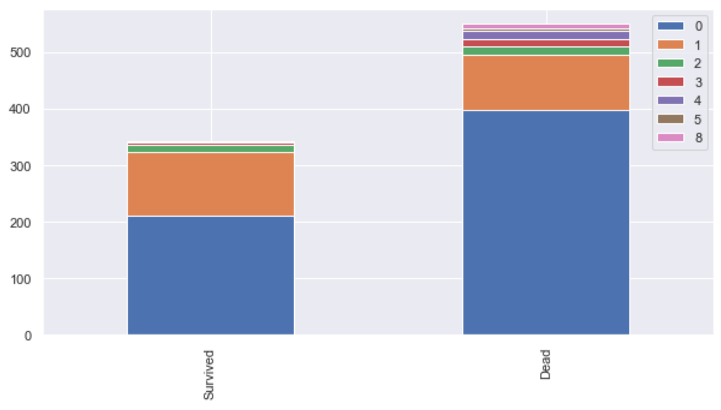


In [52]:
```
sns.barplot(x="Pclass", y="Survived", data=train)
print("Percentage of Pclass = 1 who survived:%.2f" % (train["Survived"][train["Pclass"] == 1].value_counts(normalize = True)[1]*100
))
print("Percentage of Pclass = 2 who survived:%.2f" % (train["Survived"][train["Pclass"] == 2].value_counts(normalize = True)[1]*100
))
print("Percentage of Pclass = 3 who survived:%.2f" % (train["Survived"][train["Pclass"] == 3].value_counts(normalize = True)[1]*100
))
```

```
Percentage of Pclass = 1 who survived:62.96
Percentage of Pclass = 2 who survived:47.28
Percentage of Pclass = 3 who survived:24.24
```

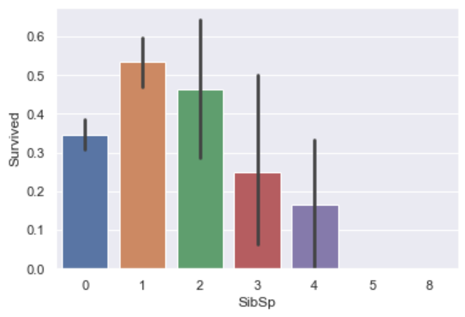


In [41]:
```
bar_chart('SibSp')
```

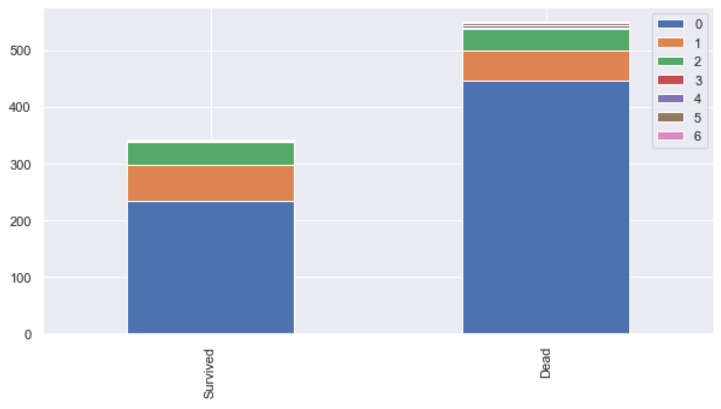


In [75]:
```
sns.barplot(x="SibSp", y="Survived", data=train)
print("Percentage of SibSp Number who survived")
```

```
Percentage of SibSp Number who survived
```

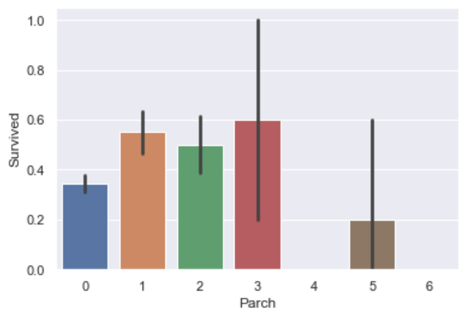


In [76]:
```
bar_chart('Parch')
```

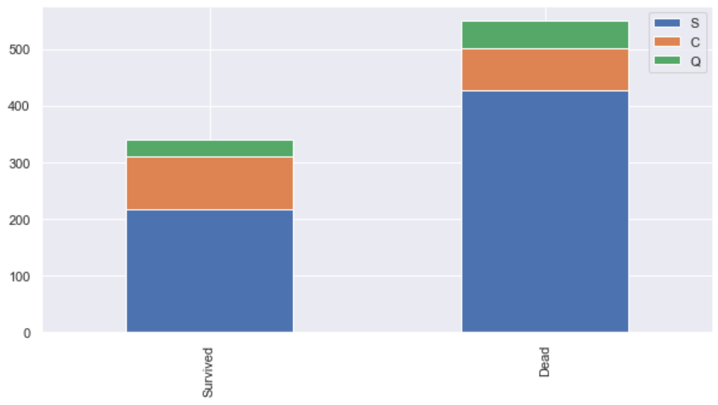


In [77]:
```
sns.barplot(x="Parch", y="Survived", data=train)
print("Percentage of Parch Number who survived")
```

```
Percentage of Parch Number who survived
```

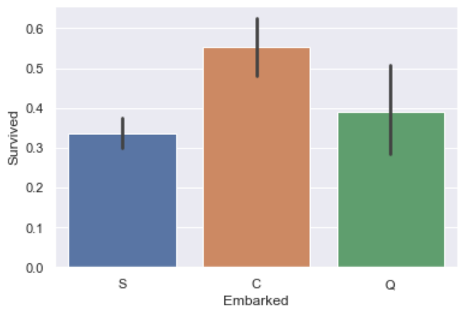


```
In [112]: bar_chart('Embarked')
```



```
In [113]: sns.barplot(x="Embarked", y="Survived", data=train)
          print("Percentage of Different Embarked who survived")
```

```
Percentage of Different Embarked who survived
```



2. Data process

```
In [114]: train.head(10)
Out[114]:
```

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

In order to handle the same thing only once, we will set a dataset combine train_data and test_data

```
In [115]: train_test_data = [train, test]
```

2.1 Name

```
In [116]: for dataset in train_test_data:
              dataset['Title'] = dataset['Name'].str.extract(' ([A-Za-z]+)\.', expand=False)
```

```
In [117]: train['Title'].value_counts()
```

```
Out[117]: Mr          517
          Miss        182
          Mrs         125
          Master       40
          Dr            7
          Rev           6
          Col           2
          Major         2
          Mlle          2
          Countess      1
          Ms            1
          Lady          1
          Jonkheer      1
          Don           1
          Mme           1
          Capt          1
          Sir           1
          Name: Title, dtype: int64
```

```
In [118]: test['Title'].value_counts()
```

```
Out[118]: Mr        240
          Miss       78
          Mrs        72
          Master     21
          Col         2
          Rev         2
          Dona        1
          Ms          1
          Dr          1
          Name: Title, dtype: int64
```

Variable	Chinese Meaning(help us understand)

Mr.= mister | 先生 Mrs.= mistress | 太太/夫人 Miss | 复数为misses，对未婚妇女用, Ms. or Mz | 美国近来用来称呼婚姻状态不明的妇女 Madame or Mme. | 复数是mesdames(简写是Mme) Mlle|小姐 Lady|女士，指成年女子，有些人尤其是长者认为这样说比较礼貌 Dona|是西班牙语对女子的称谓，相当于英语的 Lady Don，n.| <西>（置于男士名字前的尊称）先生，堂 Master|佣人对未成年男少主人的称呼,相当于汉语的"少爷"。 jonkheer|贵族 St.= saint|圣人 Rev.= reverend|用于基督教的牧师，如the Rev. Mr.Smith Dr.= doctor|医生/博士 Colonel|上校 major|意思有少校人意思 countless|女伯爵

Title map

First we will divide it into 3 part, man, woman and kids, people with high society position Consider the priority: Women and kids are always considered to be first priority, then is men.

"Mr": 0

"Mme","Mlle","Ms","Lady","Mrs","Miss","Master","Dona": 1

"Don","Sir","Capt","Countess","Major","Col","Rev","Dr","Jonkheer": 2

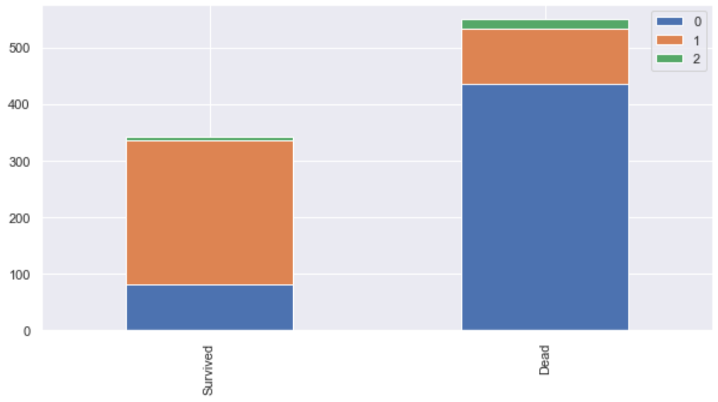
```
In [119]: title_mapping = {"Mr": 0, "Miss": 1, "Mrs": 1,"Mlle": 1, "Master": 1, "Ms": 1,"Lady": 1,
                            "Mme": 1, "Dona": 1, "Dr": 2, "Rev": 2, "Col": 2, "Major": 2,"Countess": 2,
                            "Jonkheer": 2, "Don": 2, "Capt": 2, "Sir": 2 }
          for dataset in train_test_data:
              dataset['Title'] = dataset['Title'].map(title_mapping)
```

```
In [120]: train.head()
```

Out[120]:

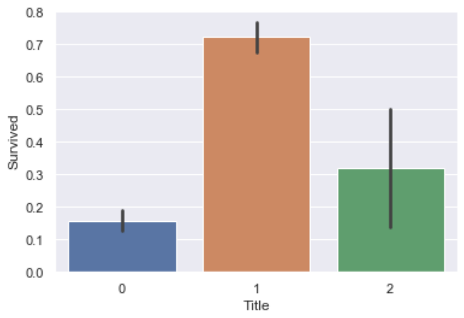
	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C	1
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S	1
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S	0

In [121]:
```
bar_chart('Title')
```



In [122]:
```
sns.barplot(x="Title", y="Survived", data=train)
print("Percentage of Title = 0 who survived:%.2f" % (train["Survived"][train["Title"] == 0].value_counts(normalize = True)[1]*100))
print("Percentage of Title = 1 who survived:%.2f" % (train["Survived"][train["Title"] == 1].value_counts(normalize = True)[1]*100))
print("Percentage of Title = 2 who survived:%.2f" % (train["Survived"][train["Title"] == 2].value_counts(normalize = True)[1]*100))
```

```
Percentage of Title = 0 who survived:15.67
Percentage of Title = 1 who survived:72.16
Percentage of Title = 2 who survived:31.82
```


Survived
Title