```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.svm import SVC , LinearSVC
from sklearn.ensemble import RandomForestClassifier
```

```
data_train = pd.read_csv("train.csv")
data_test = pd.read_csv("test.csv")
data_train.head()
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
```

```
data_train.describe()
```

	PassengerId	Survived	Pclass	Age	SibSp	
count	891.000000	891.000000	891.000000	714.000000	891.000000	891
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0
std	257.353842	0.486592	0.836071	14.526497	1.102743	0
min	1.000000	0.000000	1.000000	0.420000	0.000000	0
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0
max	891.000000	1.000000	3.000000	80.000000	8.000000	6

look at what data is actually missing

```
total = data_train.isnull().sum().sort_values(ascending=False)
percent_1 = data_train.isnull().sum()/data_train.isnull().count()*100
percent_2 = (round(percent_1, 1)).sort_values(ascending=False)
missing_data = pd.concat([total, percent_2], axis=1, keys=['Total', '%'])
missing_data.head(5)
```

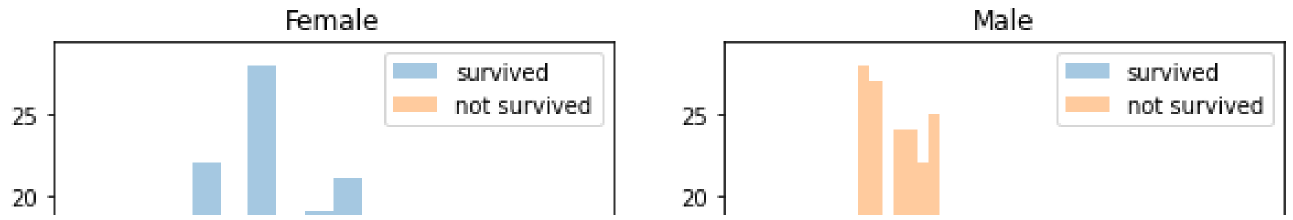
	Total	%
Cabin	687	77.1
Age	177	19.9

```
data_train.columns.values
```

```
array(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'Sib
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked'], dtype=object)
```

What features could contribute to a high survival rate ?

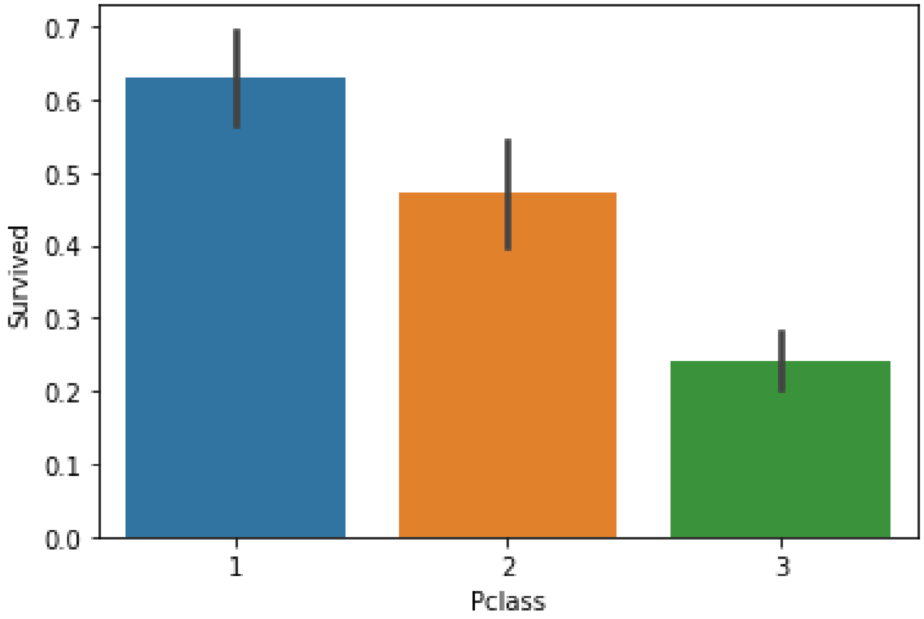
```
survived = 'survived'
not_survived = 'not survived'

fig, axes = plt.subplots(nrows=1, ncols=2,figsize=(10, 4))
women = data_train[data_train['Sex']=='female']
men = data_train[data_train['Sex']=='male']

ax = sns.distplot(women[women['Survived']==1].Age.dropna(), bins=18, label
ax = sns.distplot(women[women['Survived']==0].Age.dropna(), bins=40, label
ax.legend()
ax.set_title('Female')

ax = sns.distplot(men[men['Survived']==1].Age.dropna(), bins=18, label = su
ax = sns.distplot(men[men['Survived']==0].Age.dropna(), bins=40, label = no
ax.legend()
_ = ax.set_title('Male')
```



Pclass

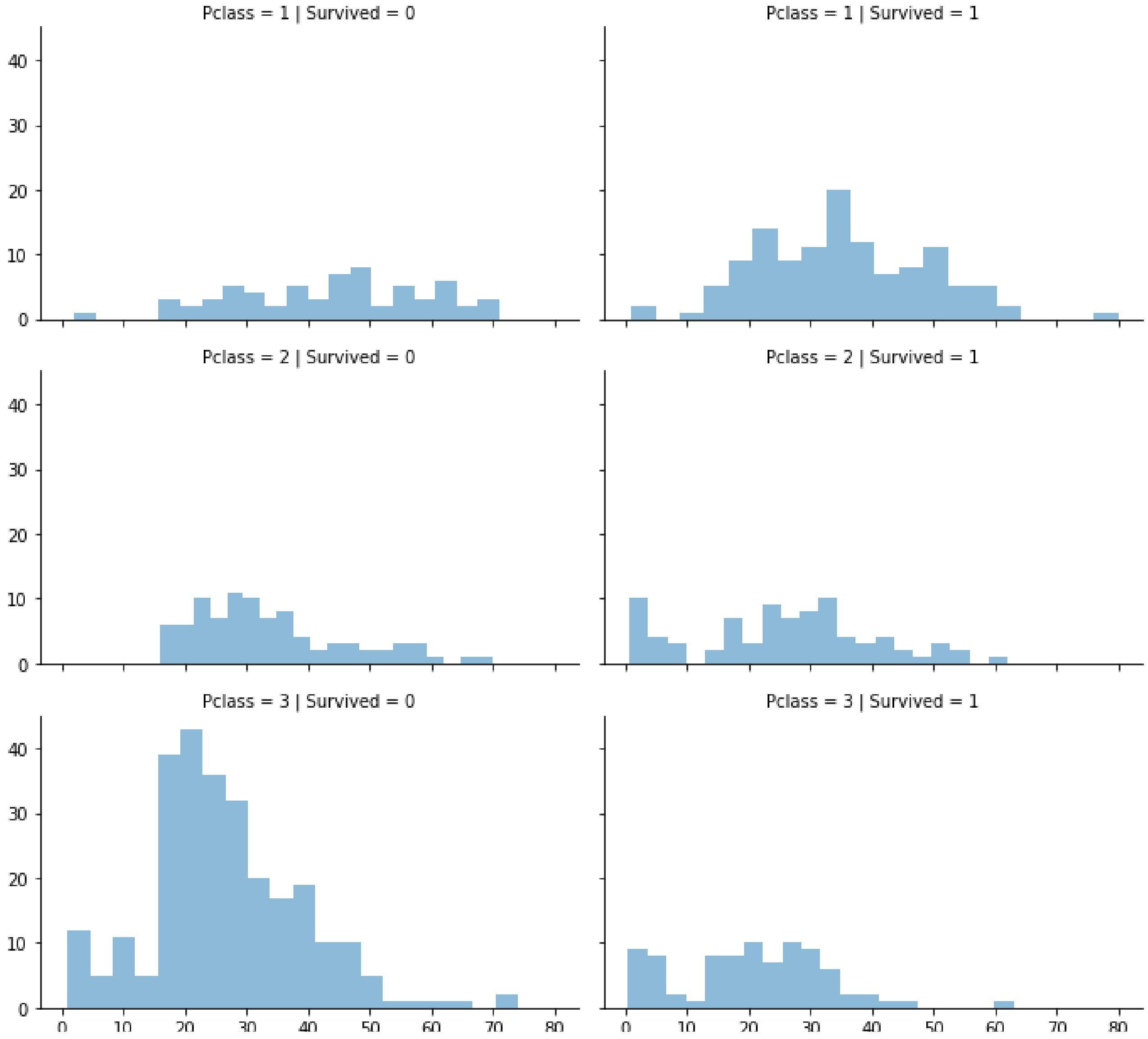
```
sns.barplot(x='Pclass' , y='Survived',data=data_train)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc6618c2d30>
```



```
grd = sns.FacetGrid(data_train,row='Pclass', col='Survived',size=3,aspect=1
grd.map(plt.hist,'Age',alpha =.5,bins=20)
grd.add_legend()
```

```
/usr/local/lib/python3.6/dist-packages/seaborn/axisgrid.py:243: UserWa
  warnings.warn(msg, UserWarning)
<seaborn.axisgrid.FacetGrid at 0x7fc65cf2fe10>
```



Data Preprocessing

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
```

In Cabin No of Values Missing

```
dtypes: float64(2), int64(5), object(5)
```

```
del data_train['Cabin']
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(4)
memory usage: 76.7+ KB
```

```
data_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    object 
 4   Age          332 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         417 non-null    float64
 9   Cabin        91 non-null     object 
 10  Embarked     418 non-null    object 
dtypes: float64(2), int64(4), object(5)
```

```
del data_test['Cabin']
```

```
data_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 10 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    object 
 4   Age          332 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         417 non-null    float64
 9   Embarked     418 non-null    object 
dtypes: float64(2), int64(4), object(4)
memory usage: 32.8+ KB
```

Age

Calculate mean and fill missing Values

```
data_train['Age'] = data_train['Age'].fillna(data_train['Age'].mean())
```

```
data_train= data_train.dropna()
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 889 entries, 0 to 890
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  889 non-null    int64  
 1   Survived     889 non-null    int64  
 2   Pclass       889 non-null    int64  
 3   Name         889 non-null    object 
 4   Sex          889 non-null    object 
 5   Age          889 non-null    float64
 6   SibSp        889 non-null    int64  
 7   Parch        889 non-null    int64  
 8   Ticket       889 non-null    object 
 9   Fare         889 non-null    float64
 10  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(4)
memory usage: 83.3+ KB
```

```
del data_train['Name']
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 889 entries, 0 to 890
Data columns (total 10 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
```

```
lb_make = LabelEncoder()
data_train["Sex"] = lb_make.fit_transform(data_train["Sex"])
data_train[["Sex"]].head(5)
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:2: Settir
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas
```

	Sex
0	1
1	0
2	0
3	0
4	1

```
data_train
```

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	T
0	1	0	3	1	22.000000	1	0	A/5
1	2	1	1	0	38.000000	1	0	PC
2	3	1	3	0	26.000000	0	0	STO 31

```
dummies = pd.get_dummies(data_train["Embarked"])
dummies.head()
```

	C	Q	S
0	0	0	1
1	1	0	0
2	0	0	1
3	0	0	1
4	0	0	1

890	891	0	3	1	32.000000	0	0	3

```
data_train = pd.concat([data_train , dummies],axis=1)
data_train
```

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	T
0	1	0	3	1	22.000000	1	0	A/5
1	2	1	1	0	38.000000	1	0	PC
2	3	1	3	0	26.000000	0	0	STO
3	4	1	1	0	35.000000	1	0	1

```
del data_train['Embarked']
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 889 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  889 non-null    int64  
 1   Survived     889 non-null    int64  
 2   Pclass       889 non-null    int64  
 3   Sex          889 non-null    int64  
 4   Age          889 non-null    float64
 5   SibSp        889 non-null    int64  
 6   Parch        889 non-null    int64  
 7   Ticket       889 non-null    object 
 8   Fare         889 non-null    float64
 9   C            889 non-null    uint8  
 10  Q            889 non-null    uint8  
 11  S            889 non-null    uint8  
dtypes: float64(2), int64(6), object(1), uint8(3)
memory usage: 72.1+ KB
```

```
del data_train['Ticket']
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 889 entries, 0 to 890
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  889 non-null    int64  
 1   Survived     889 non-null    int64  
 2   Pclass       889 non-null    int64  
 3   Sex          889 non-null    int64  
 4   Age          889 non-null    float64
 5   SibSp        889 non-null    int64  
```

```
ID = data_train["PassengerId"]
```

```
 7   Fare         889 non-null    float64
 8   C            889 non-null    uint8  
```

```
del data_train["PassengerId"]
```

```
 10  S            889 non-null    uint8  
dtypes: float64(2), int64(6), uint8(3)
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 889 entries, 0 to 890
Data columns (total 10 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Survived  889 non-null    int64  
 1   Pclass    889 non-null    int64  
 2   Sex       889 non-null    int64  
 3   Age       889 non-null    float64
 4   SibSp     889 non-null    int64  
 5   Parch     889 non-null    int64  
 6   Fare      889 non-null    float64
 7   C         889 non-null    uint8  
 8   Q         889 non-null    uint8  
 9   S         889 non-null    uint8  
dtypes: float64(2), int64(5), uint8(3)
memory usage: 58.2 KB
```

```
data_train.isnull().sum()
```

```
Survived    0
Pclass      0
Sex         0
Age         0
SibSp       0
```

Testing Dataset

```
data_test['Age'] = data_test['Age'].fillna(data_test['Age'].mean())
```

```
data_test= data_test.dropna()
```

```
data_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 417 entries, 0 to 417
Data columns (total 10 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  417 non-null    int64  
 1   Pclass       417 non-null    int64  
 2   Name         417 non-null    object 
 3   Sex          417 non-null    object 
 4   Age          417 non-null    float64
 5   SibSp        417 non-null    int64  
 6   Parch        417 non-null    int64  
 7   Ticket       417 non-null    object 
 8   Fare         417 non-null    float64
 9   Embarked     417 non-null    object 
dtypes: float64(2), int64(4), object(4)
memory usage: 35.8+ KB
```

```
del data_test['Name']
```

```
lb_make_test = LabelEncoder()
data_test["Sex"] = lb_make_test.fit_transform(data_test["Sex"])
data_test[["Sex"]].head(5)
```

	Sex
0	1
1	0
2	1
3	1

```
dummies_test = pd.get_dummies(data_test["Embarked"])
dummies_test.head()
```

	C	Q	S
0	0	1	0
1	0	0	1
2	0	1	0
3	0	0	1
4	0	0	1

```
data_test = pd.concat([data_test , dummies_test],axis=1)
data_test
```

	PassengerId	Pclass	Sex	Age	SibSp	Parch	Ticket
0	892	3	1	34.50000	0	0	330911
1	893	3	0	47.00000	1	0	363272

```
del data_test['Embarked']
del data_test['Ticket']
```

```
data_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 417 entries, 0 to 417
Data columns (total 10 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  417 non-null    int64  
 1   Pclass       417 non-null    int64  
 2   Sex          417 non-null    int64  
 3   Age          417 non-null    float64
 4   SibSp        417 non-null    int64  
 5   Parch        417 non-null    int64  
 6   Fare         417 non-null    float64
 7   C            417 non-null    uint8  
 8   Q            417 non-null    uint8  
 9   S            417 non-null    uint8  
dtypes: float64(2), int64(5), uint8(3)
memory usage: 27.3 KB
```

```
del data_test['PassengerId']
```

```
data_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 417 entries, 0 to 417
Data columns (total 9 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Pclass  417 non-null    int64
```

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 889 entries, 0 to 890
Data columns (total 10 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Survived  889 non-null    int64
 1   Pclass    889 non-null    int64
 2   Sex       889 non-null    int64
 3   Age       889 non-null    float64
 4   SibSp     889 non-null    int64
 5   Parch     889 non-null    int64
 6   Fare      889 non-null    float64
 7   C         889 non-null    uint8
 8   Q         889 non-null    uint8
 9   S         889 non-null    uint8
dtypes: float64(2), int64(5), uint8(3)
memory usage: 58.2 KB
```

Bulding Model

```
surv =  data_train["Survived"]
```

```
X = data_train.drop("Survived",1)
```

```
X.head()
```

	Pclass	Sex	Age	SibSp	Parch	Fare	C	Q	S
0	3	1	22.0	1	0	7.2500	0	0	1
1	1	0	38.0	1	0	71.2833	1	0	0
2	3	0	26.0	0	0	7.9250	0	0	1

```
Y = data_train["Survived"]
Y.head()
```

```
0    0
1    1
2    1
3    1
4    0
Name: Survived, dtype: int64
```

Logistics Regression

```
logreg = LogisticRegression()
logreg.fit(X, Y)
```

```
/usr/local/lib/python3.6/dist-packages/sklearn/linear_model/_logistic
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as show
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options
    https://scikit-learn.org/stable/modules/linear_model.html#logisti
  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG)
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept
                   intercept_scaling=1, l1_ratio=None, max_iter=100,
                   multi_class='auto', n_jobs=None, penalty='l2',
                   random_state=None, solver='lbfgs', tol=0.0001, verb
                   warm_start=False)
```

```
Y_pred = logreg.predict(data_test)
Y_pred
```

```
array([0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0,
       1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0,
       1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1,
       1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1,
       1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0,
       0, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1,
       0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1,
       1, 1, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0,
       0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1,
       0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1,
       0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0,
       0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0,
       1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0,
       0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0,
       1, 1, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1,
```

```
acc_log = round(logreg.score(X, Y) * 100, 2)
print("Accuracy Of Logistics Regression is :",acc_log)
```

```
Accuracy Of Logistics Regression is : 80.09
```

KNN

```
# KNN
knn = KNeighborsClassifier(n_neighbors = 3)
knn.fit(X, Y)
Y_pred = knn.predict(data_test)
acc_knn = round(knn.score(X, Y) * 100, 2)
print("Accuracy Of KNN is :",acc_knn)
```

```
Accuracy Of KNN is : 83.58
```

Linear Support Vector Machine

```
linear_svc = LinearSVC()
linear_svc.fit(X, Y)
```

```
Y_pred_SVC = linear_svc.predict(data_test)

acc_linear_svc = round(linear_svc.score(X, Y) * 100, 2)
print("Accuracy Of Linear Support Vector Machine is :",acc_linear_svc)
```

```
Accuracy Of Linear Support Vector Machine is : 78.52
/usr/local/lib/python3.6/dist-packages/sklearn/svm/_base.py:947: Conve
  "the number of iterations.", ConvergenceWarning)
```

Decision tree Classifier

```
decision_tree = DecisionTreeClassifier()
decision_tree.fit(X, Y)

Y_pred_dec = decision_tree.predict(data_test)
acc_decision_tree = round(decision_tree.score(X, Y) * 100, 2)
print("Accuracy Of Decision tree Classifier is :",acc_decision_tree)
```

```
Accuracy Of Decision tree Classifier is : 98.2
```

Random Forest

```
random_forest = RandomForestClassifier(n_estimators=100)
random_forest.fit(X, Y)

Y_pred_RF = random_forest.predict(data_test)

random_forest.score(X, Y)
acc_random_forest = round(random_forest.score(X, Y) * 100, 2)
print("Accuracy Of Random Forest is :",acc_random_forest)
```

```
Accuracy Of Random Forest is : 98.2
```

Which is the best Model ?

```
Model_chk = pd.DataFrame({'Models': ['Logistic Regression','KNN',
                                    'Support Vector Machines','Decision Tre
                                    'Random Forest'],
    'Score': [acc_log, acc_knn, acc_linear_svc,
              acc_decision_tree,acc_random_forest]})
Model_chk_df = Model_chk.sort_values(by='Score', ascending=False)
Model_chk_df = Model_chk_df.set_index('Score')
Model_chk_df.head(9)
```

```
                        Models
Score
98.20            Decision Tree
98.20            Random Forest
83.58                      KNN
80.09      Logistic Regression
78.52  Support Vector Machines
```

Feature Importance

Decision Tree

```
importances = pd.DataFrame({'feature':X.columns,'importance':np.round(decis
importances = importances.sort_values('importance',ascending=False).set_ind
importances.head(15)
```

feature	importance
Sex	0.307
Age	0.249
Fare	0.232
Pclass	0.109
SibSp	0.051
Parch	0.029

Random forest

```
importances = pd.DataFrame({'feature':X.columns,'importance':np.round(rando
importances = importances.sort_values('importance',ascending=False).set_ind
importances.head(15)
```

feature	importance
Sex	0.268
Age	0.266
Fare	0.262
Pclass	0.081
SibSp	0.049
Parch	0.038
C	0.014
S	0.014
Q	0.008

Create CSV File

*Training Dataset *

```
df = pd.DataFrame({}).to_csv("Titanic_pred_Output.csv")
```

Using Decision Tree Algo

```
decision_tree = DecisionTreeClassifier()
decision_tree.fit(X, Y)

Y_pred_dec_x = decision_tree.predict(X)
Y_pred_dec_x
```

```
array([0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0,
       1, 1, 0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0,
       1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1,
       0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0,
       1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0,
       0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 0, 0,
       0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0,
       0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0,
```

```
from sklearn.metrics import confusion_matrix
cm1 = confusion_matrix(Y , Y_pred_dec_x)
print(cm1)
```

```
[[547   2]
 [ 14 326]]
       0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 0,
```

```
df = pd.read_csv("Titanic_pred_Output.csv")
df["PassengerId"] = ""
df.to_csv("Titanic_pred_Output.csv", index=False)
       0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1,
```

```
df
```

```
  Unnamed: 0  PassengerId
       0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1,
```

```
df = pd.read_csv("Titanic_pred_Output.csv")
df["PassengerId"] = ID
df.to_csv("Titanic_pred_Output.csv", index=False)
       0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0,
```

```
df
```

	Unnamed: 0	PassengerId
0	NaN	1
1	NaN	2
2	NaN	3
3	NaN	4
4	NaN	5
...	...	...
886	NaN	887
887	NaN	888
889	NaN	890

```
df["Survived"] = Y
df.to_csv("Titanic_pred_Output.csv", index=False)
```

```
df
```

	PassengerId	Loan_Status	Survived
0	1		0
1	2		1
2	3		1
3	4		1
4	5		0
...	...	...	...
886	887		0
887	888		1
888	889		0
889	890		1
890	891		0

889 rows × 3 columns

```
df["Survived_Prediction"] = Y_pred_dec_x
df.to_csv("Titanic_pred_Output.csv", index=False)
```

```
df
```

```
     PassengerId  Survived  Survived_Prediction
  0            1         0                    0
  1            2         1                    1
  2            3         1                    1
  3            4         1                    1
  4            5         0                    0
...          ...       ...                  ...
886          887         0                    0
887          888         1                    1
888          889         0                    0
889          890         1                    1
890          891         0                    0

889 rows × 3 columns
```

```
df["Survived"].replace(0,'No',inplace = True)
df["Survived"].replace(1,'Yes',inplace = True)
df["Survived_Prediction"].replace(0,'No',inplace = True)
df["Survived_Prediction"].replace(1,'Yes',inplace = True)
df.to_csv("Titanic_pred_Output.csv", index=False)
```

```
df
```

	PassengerId	Survived	Survived_Prediction
0	1	No	No
1	2	Yes	Yes
2	3	Yes	Yes
3	4	Yes	Yes
4	5	No	No
...	...	...	...
886	887	No	No
887	888	Yes	Yes
888	889	No	No

889 rows × 3 columns

Testing on New Data

create csv file

```
df1 = pd.DataFrame({}).to_csv("Titanic_prediction_test_data.csv")
```

```
Y_pred_dec_test = decision_tree.predict(data_test)
Y_pred_dec_test
```

```
array([0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 1, 0, 1, 1, 0, 1,
       1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0,
       1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0,
```

```
data_test_copy = data_test.copy()
```

```
data_test_copy
```

	Pclass	Sex	Age	SibSp	Parch	Fare	C	Q	S
0	3	1	34.50000	0	0	7.8292	0	1	0
1	3	0	47.00000	1	0	7.0000	0	0	1
2	2	1	62.00000	0	0	9.6875	0	1	0
3	3	1	27.00000	0	0	8.6625	0	0	1
4	3	0	22.00000	1	1	12.2875	0	0	1
...	...	...	...	...	...	...	...	...	...
413	3	1	30.27259	0	0	8.0500	0	0	1
414	1	0	39.00000	0	0	108.9000	1	0	0
415	3	1	38.50000	0	0	7.2500	0	0	1
416	3	1	30.27259	0	0	8.0500	0	0	1
417	3	1	30.27259	1	1	22.3583	1	0	0

417 rows × 9 columns

```
data_test_copy["Survived_Prediction"] = Y_pred_dec_test
data_test_copy.to_csv("data_test_copy.csv", index=False)
```

```
data_test_copy
```

	Pclass	Sex	Age	SibSp	Parch	Fare	C	Q	S	Survived
0	3	1	34.50000	0	0	7.8292	0	1	0	
1	3	0	47.00000	1	0	7.0000	0	0	1	
2	2	1	62.00000	0	0	9.6875	0	1	0	
3	3	1	27.00000	0	0	8.6625	0	0	1	
4	3	0	22.00000	1	1	12.2875	0	0	1	
...	...	...	...	...	...	...	...	...	...	
413	3	1	30.27259	0	0	8.0500	0	0	1	
414	1	0	39.00000	0	0	108.9000	1	0	0	

```
data_test_copy["Survived_Prediction"].replace(0,'No',inplace = True)
data_test_copy["Survived_Prediction"].replace(1,'Yes',inplace = True)
data_test_copy.to_csv("data_test_copy.csv", index=False)
```

```
data_test_copy
```

```
     Pclass  Sex        Age  SibSp  Parch      Fare  C  Q  S  Survived

1         3    0  47.00000      1      0    7.0000  0  0  1
```

Thanks