

```
In [1]: import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

```
In [2]: from sklearn.linear_model import LogisticRegression
```

```
In [3]: df_train=pd.read_csv("C2_train.gender_submission.csv")
df_test=pd.read_csv("C2_test.gender_submission.csv")
df_train
```

	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	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...)	female	38.0	1	0	PC 17599	71.2833	C85	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	
...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	
889	890	1	1	Behr, Mr. Karl	male	26.0	0	0	111369	30.0000	C148	

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
				Howell								
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	C

891 rows × 12 columns

In [4]:

df_test

Out[4]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	C
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	C
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	C
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	C
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	C
...
413	1305	3	Spector, Mr. Woolf	male	NaN	0	0	A.5.3236	8.0500	NaN	C
414	1306	1	Oliva y Ocana, Dona. Fermina	female	39.0	0	0	PC 17758	108.9000	C105	C
415	1307	3	Saether, Mr. Simon Sivertsen	male	38.5	0	0	SOTON/O.Q. 3101262	7.2500	NaN	C
416	1308	3	Ware, Mr. Frederick	male	NaN	0	0	359309	8.0500	NaN	C
417	1309	3	Peter, Master. Michael J	male	NaN	1	1	2668	22.3583	NaN	C

418 rows × 11 columns

```
In [5]: df1=df_train.dropna()
```

```
In [6]: df2=df_test.dropna()
```

```
In [7]: feature_matrix=df1[['PassengerId', 'Pclass','Age', 'SibSp',
                           'Parch','Fare']]
target_vector=df1[['Embarked']]
```

```
In [8]: feature_matrix.shape
```

```
Out[8]: (183, 6)
```

```
In [9]: target_vector.shape
```

```
Out[9]: (183, 1)
```

```
In [10]: from sklearn.preprocessing import StandardScaler
```

```
In [11]: fs=StandardScaler().fit_transform(feature_matrix)
```

```
In [12]: logr=LogisticRegression()
logr.fit(fs,target_vector)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:63: DataConversionWarning: A column-vector y was passed when a 1d array was expected. Please change the shape of y to (n_samples, ), for example using ravel().
    return f(*args, **kwargs)
```

```
Out[12]: LogisticRegression()
```

```
In [13]: df2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 87 entries, 12 to 414
Data columns (total 11 columns):
 #   Column      Non-Null Count  Dtype  
--- 
 0   PassengerId 87 non-null     int64  
 1   Pclass       87 non-null     int64  
 2   Name         87 non-null     object  
 3   Sex          87 non-null     object  
 4   Age          87 non-null     float64 
 5   SibSp        87 non-null     int64  
 6   Parch        87 non-null     int64  
 7   Ticket       87 non-null     object  
 8   Fare          87 non-null     float64 
 9   Cabin        87 non-null     object  
 10  Embarked     87 non-null     object 
```

```
dtypes: float64(2), int64(4), object(5)
memory usage: 8.2+ KB
```

In [14]: df2.columns

```
Out[14]: Index(['PassengerId', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp', 'Parch',
   'Ticket', 'Fare', 'Cabin', 'Embarked'],
   dtype='object')
```

In [15]: observation=df2[['PassengerId', 'Pclass', 'Age', 'SibSp', 'Parch',
 'Fare']]

In [16]: prediction=logr.predict(observation)
print(prediction)

```
['S' 'S' 'C' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'C' 'S' 'C' 'C' 'S' 'C' 'S' 'S'
 'S' 'S' 'C' 'S' 'S' 'S' 'S' 'C' 'S' 'S' 'S' 'S' 'S' 'C' 'S' 'S' 'S' 'S'
 'S' 'S' 'S' 'S' 'C' 'S' 'S'
 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S'
 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S' 'S']
```

In [17]: logr.classes_

```
Out[17]: array(['C', 'Q', 'S'], dtype=object)
```

In [18]: logr.predict_proba(observation)

```
Out[18]: array([[6.08971905e-040, 1.00337329e-144, 1.00000000e+000],
   [1.23227402e-046, 1.21293028e-146, 1.00000000e+000],
   [1.00000000e+000, 2.64311964e-144, 2.62330648e-020],
   [8.74684689e-048, 9.59255505e-151, 1.00000000e+000],
   [7.79904257e-058, 1.27363136e-153, 1.00000000e+000],
   [1.47737287e-049, 3.16517530e-151, 1.00000000e+000],
   [9.87655203e-052, 6.61406838e-153, 1.00000000e+000],
   [2.41467012e-059, 1.34463863e-156, 1.00000000e+000],
   [9.48918099e-044, 2.05555026e-150, 1.00000000e+000],
   [4.27537892e-050, 6.30946278e-154, 1.00000000e+000],
   [1.00000000e+000, 3.64533680e-146, 5.79600005e-018],
   [2.12722398e-068, 1.45384757e-162, 1.00000000e+000],
   [1.00000000e+000, 1.95684213e-147, 3.44533462e-018],
   [1.00000000e+000, 4.39546971e-148, 8.71913651e-017],
   [1.32481073e-061, 4.20734452e-161, 1.00000000e+000],
   [1.00000000e+000, 7.58602331e-149, 2.93658715e-017],
   [2.74061829e-062, 3.64139105e-162, 1.00000000e+000],
   [2.25687919e-001, 4.58245775e-139, 7.74312081e-001],
   [1.80986273e-001, 2.53591052e-139, 8.19013727e-001],
   [5.45095546e-063, 5.94350402e-161, 1.00000000e+000],
   [9.98575373e-001, 8.70056035e-140, 1.42462732e-003],
   [3.85799338e-056, 4.60564832e-163, 1.00000000e+000],
   [3.10314517e-046, 4.83527839e-157, 1.00000000e+000],
   [6.48473904e-055, 3.89846152e-162, 1.00000000e+000],
   [2.81368515e-070, 8.67176835e-171, 1.00000000e+000],
   [1.08280308e-063, 5.96125394e-168, 1.00000000e+000],
   [6.92497504e-001, 3.12646809e-143, 3.07502496e-001],
   [1.51715598e-070, 9.07550280e-173, 1.00000000e+000],
   [1.11930587e-049, 1.69989736e-163, 1.00000000e+000],
   [6.53910240e-056, 6.17042047e-166, 1.00000000e+000],
   [8.07049911e-066, 8.14357943e-171, 1.00000000e+000],
```

```
[1.00000000e+000, 2.39992618e-155, 6.61726374e-012],
[7.98318000e-050, 4.41670143e-169, 1.00000000e+000],
[5.67530213e-004, 7.59115023e-152, 9.99432470e-001],
[1.18824306e-068, 3.91524494e-176, 1.00000000e+000],
[3.52097421e-061, 3.24873391e-174, 1.00000000e+000],
[2.38027644e-060, 1.03615038e-174, 1.00000000e+000],
[6.24227366e-067, 3.71362583e-180, 1.00000000e+000],
[2.30654066e-051, 9.67574039e-173, 1.00000000e+000],
[5.96967620e-052, 3.09530437e-173, 1.00000000e+000],
[3.60562527e-062, 1.84107354e-177, 1.00000000e+000],
[9.98753360e-001, 1.91239301e-156, 1.24664028e-003],
[1.15583025e-036, 9.14931704e-172, 1.00000000e+000],
[3.23983533e-005, 1.20566080e-157, 9.99967602e-001],
[4.27283617e-072, 7.12984244e-185, 1.00000000e+000],
[1.55106048e-067, 8.39451329e-184, 1.00000000e+000],
[7.81404051e-012, 8.27024590e-163, 1.00000000e+000],
[2.54585276e-079, 4.02254454e-190, 1.00000000e+000],
[1.49481230e-059, 4.60453558e-183, 1.00000000e+000],
[6.51411592e-058, 8.68155622e-182, 1.00000000e+000],
[4.33826449e-048, 4.28426682e-179, 1.00000000e+000],
[3.10340679e-039, 8.85281708e-177, 1.00000000e+000],
[9.16967301e-067, 2.79103457e-187, 1.00000000e+000],
[2.30031083e-039, 2.00341270e-178, 1.00000000e+000],
[1.25754688e-060, 7.63824033e-189, 1.00000000e+000],
[7.54340191e-041, 7.29736878e-182, 1.00000000e+000],
[4.50487411e-060, 2.39522055e-191, 1.00000000e+000],
[2.74644477e-060, 1.08586460e-191, 1.00000000e+000],
[2.59943554e-079, 3.48017728e-200, 1.00000000e+000],
[9.84602149e-039, 9.76481273e-187, 1.00000000e+000],
[1.73773295e-057, 1.10233307e-192, 1.00000000e+000],
[1.20940443e-043, 2.54641319e-188, 1.00000000e+000],
[2.93938669e-040, 1.01111168e-186, 1.00000000e+000],
[6.99002669e-088, 2.03960384e-207, 1.00000000e+000],
[9.62309262e-086, 1.34121069e-206, 1.00000000e+000],
[4.30328484e-078, 3.04175748e-204, 1.00000000e+000],
[2.44186417e-080, 3.13990447e-205, 1.00000000e+000],
[4.98766646e-082, 8.94005298e-207, 1.00000000e+000],
[1.00000000e+000, 3.64074212e-226, 1.52370836e-080],
[1.23456527e-070, 1.58625020e-204, 1.00000000e+000],
[4.05689755e-083, 2.82183444e-209, 1.00000000e+000],
[8.36304637e-075, 7.01537655e-205, 1.00000000e+000],
[1.34903426e-074, 9.70432827e-208, 1.00000000e+000],
[1.20000763e-048, 3.30387186e-199, 1.00000000e+000],
[5.21188318e-093, 1.79611310e-215, 1.00000000e+000],
[3.33084545e-066, 2.16245191e-205, 1.00000000e+000],
[9.55155476e-077, 6.11194150e-210, 1.00000000e+000],
[8.56917344e-064, 6.11231434e-208, 1.00000000e+000],
[1.78129683e-081, 3.16634703e-214, 1.00000000e+000],
[1.73596071e-075, 9.69307656e-213, 1.00000000e+000],
[6.95928293e-069, 6.76039538e-210, 1.00000000e+000],
[1.02608940e-040, 2.33597670e-200, 1.00000000e+000],
[2.18536793e-086, 3.31125898e-217, 1.00000000e+000],
[1.18912368e-091, 7.63907138e-221, 1.00000000e+000],
[1.10798951e-025, 6.99386766e-195, 1.00000000e+000],
[2.38853088e-066, 7.74530338e-211, 1.00000000e+000],
[3.84344053e-060, 2.30602005e-209, 1.00000000e+000]])
```

In [19]: `logr.predict_proba(observation)[0][0]`

Out[19]: `6.0897190477931514e-40`

In [20]: `df2['Embarked'].value_counts()`

```
Out[20]: C      47
          S      39
          Q      1
Name: Embarked, dtype: int64
```

```
In [21]: x=df2[['PassengerId', 'Pclass', 'Age', 'SibSp', 'Parch',
           'Fare']]
y=df2['Embarked']
```

```
In [22]: g1={"Embarked":{"C":1,"S":2,"Q":3}}
df2=df2.replace(g1)
df2
```

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
12	904	1	Snyder, Mrs. John Pillsbury (Nelle Stevenson)	female	23.0	1	0	21228	82.2667	B45	2
14	906	1	Chaffee, Mrs. Herbert Fuller (Carrie Constance...)	female	47.0	1	0	W.E.P. 5734	61.1750	E31	2
24	916	1	Ryerson, Mrs. Arthur Larned (Emily Maria Borie)	female	48.0	1	3	PC 17608	262.3750	B57 B59 B63 B66	1
26	918	1	Ostby, Miss. Helene Ragnhild	female	22.0	0	1	113509	61.9792	B36	1
28	920	1	Brady, Mr. John Bertram	male	41.0	0	0	113054	30.5000	A21	2
...
404	1296	1	Frauenthal, Mr. Isaac Gerald	male	43.0	1	0	17765	27.7208	D40	1
405	1297	2	Nourney, Mr. Alfred (Baron von Drachstedt)"	male	20.0	0	0	SC/PARIS 2166	13.8625	D38	1
407	1299	1	Widener, Mr. George Dunton	male	50.0	1	1	113503	211.5000	C80	1
411	1303	1	Minahan, Mrs. William Edward (Lillian E Thorpe)	female	37.0	1	0	19928	90.0000	C78	3

PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
414	1306	Oliva y Ocana, Dona. Fermina	female	39.0	0	0	PC 17758	108.9000	C105	1

87 rows × 11 columns

In [23]: `from sklearn.model_selection import train_test_split`

In [24]: `x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.70)`

In [25]: `from sklearn.ensemble import RandomForestClassifier`

In [26]: `rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)`

Out[26]: `RandomForestClassifier()`

In [27]: `parameters={'max_depth':[1,2,3,4,5],
'min_samples_leaf':[5,10,15,20,25],
'n_estimators':[10,20,30,40,50]}
}`

In [28]: `from sklearn.model_selection import GridSearchCV
grid_search =GridSearchCV(estimator=rfc,param_grid=parameters,cv=2,scoring="accuracy")
grid_search.fit(x_train,y_train)`

Out[28]: `GridSearchCV(cv=2, estimator=RandomForestClassifier(),
param_grid={'max_depth': [1, 2, 3, 4, 5],
'min_samples_leaf': [5, 10, 15, 20, 25],
'n_estimators': [10, 20, 30, 40, 50]},
scoring='accuracy')`

In [29]: `grid_search.best_score_`

Out[29]: `0.5833333333333333`

In [30]: `rfc_best=grid_search.best_estimator_`

In [31]: `from sklearn.tree import plot_tree`

```
plt.figure(figsize=(80,40))
plot_tree(rfc_best.estimators_[5],feature_names=x.columns,class_names=[ 'Yes' , 'No' ],fill
```

Out[31]: `[Text(2232.0, 1630.800000000002, 'PassengerId <= 950.5\nngini = 0.499\nsamples = 43\nvalue = [31, 29]\nclass = Yes'),`

```
Text(1116.0, 543.5999999999999, 'gini = 0.298\nsamples = 7\nvalue = [2, 9]\nclass = N
o'),
Text(3348.0, 543.5999999999999, 'gini = 0.483\nsamples = 36\nvalue = [29, 20]\nclass =
Yes')]
```

PassengerId <= 950.5
gini = 0.499
samples = 43
value = [31, 29]
class = Yes

gini = 0.298
samples = 7
value = [2, 9]
class = No

gini = 0.483
samples = 36
value = [29, 20]
class = Yes