xo8kodezx

April 10, 2024

```python
[10]: import os
      import pandas as pnd
      import numpy as nupy
      import seaborn as sns
      import matplotlib.pyplot as plot
```

```python
[11]: url1 = 'https://raw.githubusercontent.com/Shourya0712/titanicDT/main/
       ↪titanic_train.csv'
      url2 = 'https://raw.githubusercontent.com/Shourya0712/titanicDT/main/test.csv'
      train_set = pnd.read_csv(url1)
      test_set = pnd.read_csv(url2)
```

```python
[12]: train_set.head()
```

```
[12]:    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
```

```python
[14]: train_set.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
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

[15]: `train_set.isnull().sum()`

[15]:
```
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
```

[16]: `train_set['Age'] = train_set['Age'].fillna(train_set['Age'].mean())`

[18]: `train_set.isnull().sum()`

[18]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age              0
SibSp            0
Parch            0
```

```
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

[19]:
```python
train_set['Embarked'] = train_set['Embarked'].fillna(train_set['Embarked'].
 ↪mode()[0])
```

[20]:
```python
train_set.isnull().sum()
```

[20]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age              0
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         0
dtype: int64
```

[21]:
```python
embarked_mode = train_set['Embarked'].mode()[0]
print(embarked_mode)
```

```
S
```

[22]:
```python
train_set['Embarked'] = train_set['Embarked'].fillna(embarked_mode)
```

[23]:
```python
train_set.isnull().sum()
```

[23]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age              0
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         0
dtype: int64
```

```python
[24]: train_set['Cabin_Letter'] = train_set['Cabin'].apply(lambda x: str(x)[0])
```

```python
[25]: train_set['Cabin_Letter'].value_counts()
```

```
[25]: Cabin_Letter
      n    687
      C     59
      B     47
      D     33
      E     32
      A     15
      F     13
      G      4
      T      1
      Name: count, dtype: int64
```

```python
[26]: X = train_set[['Pclass', 'Sex', 'Age', 'SibSp', 'Parch', 'Fare',
       ↪'Cabin_Letter', 'Embarked']]
      y = train_set['Survived']
```

```python
[27]: from sklearn.preprocessing import LabelEncoder
      from sklearn.model_selection import train_test_split
      from sklearn.tree import DecisionTreeClassifier
      from sklearn import tree
```

```python
[28]: le = LabelEncoder()
      train_set['Sex'] = le.fit_transform(train_set['Sex'])
```

```python
[29]: X = train_set[['Pclass', 'Sex', 'Age', 'SibSp', 'Parch', 'Fare',
       ↪'Cabin_Letter', 'Embarked']]
      y = train_set['Survived']
```

```python
[30]: x_train, x_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
       ↪random_state=75)
```

```python
[31]: train_set['Embarked'] = le.fit_transform(train_set['Embarked'])
```

```python
[32]: train_set['Cabin_Letter'] = le.fit_transform(train_set['Cabin_Letter'])
```

```python
[33]: train_set.head(25)
```

```
[33]:    PassengerId  Survived  Pclass  \
      0            1         0       3
      1            2         1       1
      2            3         1       3
      3            4         1       1
      4            5         0       3
```

5	6	0	3
6	7	0	1
7	8	0	3
8	9	1	3
9	10	1	2
10	11	1	3
11	12	1	1
12	13	0	3
13	14	0	3
14	15	0	3
15	16	1	2
16	17	0	3
17	18	1	2
18	19	0	3
19	20	1	3
20	21	0	2
21	22	1	2
22	23	1	3
23	24	1	1
24	25	0	3

	Name	Sex	Age	SibSp \
0	Braund, Mr. Owen Harris	1	22.000000	1
1	Cumings, Mrs. John Bradley (Florence Briggs Th…	0	38.000000	1
2	Heikkinen, Miss. Laina	0	26.000000	0
3	Futrelle, Mrs. Jacques Heath (Lily May Peel)	0	35.000000	1
4	Allen, Mr. William Henry	1	35.000000	0
5	Moran, Mr. James	1	29.699118	0
6	McCarthy, Mr. Timothy J	1	54.000000	0
7	Palsson, Master. Gosta Leonard	1	2.000000	3
8	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	0	27.000000	0
9	Nasser, Mrs. Nicholas (Adele Achem)	0	14.000000	1
10	Sandstrom, Miss. Marguerite Rut	0	4.000000	1
11	Bonnell, Miss. Elizabeth	0	58.000000	0
12	Saundercock, Mr. William Henry	1	20.000000	0
13	Andersson, Mr. Anders Johan	1	39.000000	1
14	Vestrom, Miss. Hulda Amanda Adolfina	0	14.000000	0
15	Hewlett, Mrs. (Mary D Kingcome)	0	55.000000	0
16	Rice, Master. Eugene	1	2.000000	4
17	Williams, Mr. Charles Eugene	1	29.699118	0
18	Vander Planke, Mrs. Julius (Emelia Maria Vande…	0	31.000000	1
19	Masselmani, Mrs. Fatima	0	29.699118	0
20	Fynney, Mr. Joseph J	1	35.000000	0
21	Beesley, Mr. Lawrence	1	34.000000	0
22	McGowan, Miss. Anna "Annie"	0	15.000000	0
23	Sloper, Mr. William Thompson	1	28.000000	0
24	Palsson, Miss. Torborg Danira	0	8.000000	3

```
       Parch          Ticket     Fare Cabin  Embarked  Cabin_Letter
0          0        A/5 21171   7.2500   NaN         2             8
1          0        PC 17599  71.2833   C85         0             2
2          0  STON/O2. 3101282   7.9250   NaN         2             8
3          0           113803  53.1000  C123         2             2
4          0           373450   8.0500   NaN         2             8
5          0           330877   8.4583   NaN         1             8
6          0            17463  51.8625   E46         2             4
7          1           349909  21.0750   NaN         2             8
8          2           347742  11.1333   NaN         2             8
9          0           237736  30.0708   NaN         0             8
10         1          PP 9549  16.7000    G6         2             6
11         0           113783  26.5500  C103         2             2
12         0        A/5. 2151   8.0500   NaN         2             8
13         5           347082  31.2750   NaN         2             8
14         0           350406   7.8542   NaN         2             8
15         0           248706  16.0000   NaN         2             8
16         1           382652  29.1250   NaN         1             8
17         0           244373  13.0000   NaN         2             8
18         0           345763  18.0000   NaN         2             8
19         0             2649   7.2250   NaN         0             8
20         0           239865  26.0000   NaN         2             8
21         0           248698  13.0000   D56         2             3
22         0           330923   8.0292   NaN         1             8
23         0           113788  35.5000    A6         2             0
24         1           349909  21.0750   NaN         2             8
```

[34]: `train_set.corr(numeric_only=1)`

[34]:
```
              PassengerId  Survived    Pclass       Sex       Age     SibSp  \
PassengerId      1.000000 -0.005007 -0.035144  0.042939  0.033207 -0.057527
Survived        -0.005007  1.000000 -0.338481 -0.543351 -0.069809 -0.035322
Pclass          -0.035144 -0.338481  1.000000  0.131900 -0.331339  0.083081
Sex              0.042939 -0.543351  0.131900  1.000000  0.084153 -0.114631
Age              0.033207 -0.069809 -0.331339  0.084153  1.000000 -0.232625
SibSp           -0.057527 -0.035322  0.083081 -0.114631 -0.232625  1.000000
Parch           -0.001652  0.081629  0.018443 -0.245489 -0.179191  0.414838
Fare             0.012658  0.257307 -0.549500 -0.182333  0.091566  0.159651
Embarked         0.013128 -0.167675  0.162098  0.108262 -0.026749  0.068230
Cabin_Letter    -0.030939 -0.301116  0.746616  0.123076 -0.249134  0.041540

                 Parch      Fare  Embarked  Cabin_Letter
PassengerId  -0.001652  0.012658  0.013128     -0.030939
Survived      0.081629  0.257307 -0.167675     -0.301116
Pclass        0.018443 -0.549500  0.162098      0.746616
Sex          -0.245489 -0.182333  0.108262      0.123076
```
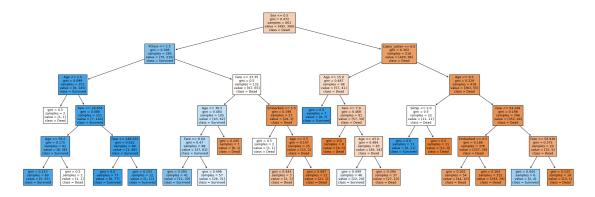
```
Age         -0.179191  0.091566 -0.026749     -0.249134
SibSp        0.414838  0.159651  0.068230      0.041540
Parch        1.000000  0.216225  0.039798     -0.032548
Fare         0.216225  1.000000 -0.224719     -0.523013
Embarked     0.039798 -0.224719  1.000000      0.194255
Cabin_Letter -0.032548 -0.523013  0.194255      1.000000
```

[35]:
```python
X = train_set[['Pclass', 'Sex', 'Age', 'SibSp', 'Parch', 'Fare',
 'Cabin_Letter', 'Embarked']]
# X = train_set[['Pclass', 'Sex', 'Age',  'SibSp', 'Parch', 'Fare', 'Embarked']]
y = train_set['Survived']
```

[36]:
```python
x_train, x_test, y_train, y_test = train_test_split(X, y, test_size=0.1,
 random_state=65)
```

[37]:
```python
from sklearn.metrics import accuracy_score
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import GridSearchCV
param_grid = {
    'max_depth': [3, 5, 7, None],
    'min_samples_split': [2, 5, 10],
    'min_samples_leaf': [1, 2, 4]
}
dt = DecisionTreeClassifier()
gs = GridSearchCV(estimator=dt, param_grid=param_grid, scoring='accuracy', cv=8)
gs.fit(x_train, y_train)

best_clf = gs.best_estimator_
y_pred = best_clf.predict(x_test)
yt_pred = best_clf.predict(x_train)
test_accuracy = accuracy_score(y_test, y_pred)
train_accuracy = accuracy_score(y_train, yt_pred)

# Print the best parameters found
print("Best Parameters:", gs.best_params_)
print("Test Accuracy:", test_accuracy)
print("Train Accuracy:", train_accuracy)

#plot tree
plot.figure(figsize=(30, 10))
tree.plot_tree(best_clf, feature_names=list(X.columns), class_names=['Dead',
 'Survived'], filled=True)
plot.show()
```

```
Best Parameters: {'max_depth': 5, 'min_samples_leaf': 2, 'min_samples_split':
10}
Test Accuracy: 0.8222222222222222
```

Train Accuracy: 0.846441947565543


```
[38]: from sklearn.model_selection import GridSearchCV
      from sklearn.ensemble import RandomForestClassifier
      rf = RandomForestClassifier(max_features='sqrt', oob_score=True,
       ↪random_state=65, n_jobs=-1)
      param_grid = { "criterion" : ["gini", "entropy"], "min_samples_leaf" : [1, 5,
       ↪10], "min_samples_split" : [2, 4, 10, 12, 16], "n_estimators": [50, 100,
       ↪400, 700, 1000]}
      gs = GridSearchCV(estimator=rf, param_grid=param_grid, scoring='accuracy',
       ↪cv=3, n_jobs=-1)
      gs = gs.fit(x_train, y_train)
      print(gs.best_score_)
      print(gs.best_params_)
      print(gs.cv_results_)
```

```
0.83270911360799
{'criterion': 'entropy', 'min_samples_leaf': 1, 'min_samples_split': 10,
'n_estimators': 100}
{'mean_fit_time': array([0.34907699, 0.47951063, 2.31736398, 3.98057111,
6.09895651,
        0.36027638, 0.52474229, 2.27914437, 4.25119646, 4.66219838,
        0.21627617, 0.74940578, 2.28568403, 3.95806193, 5.10880907,
        0.34962797, 0.6259199 , 2.32556979, 3.81450311, 5.21995211,
        0.24948502, 0.472001  , 2.41081119, 3.69699502, 5.40499751,
        0.27779945, 0.54392282, 2.37712789, 4.43397546, 5.43011244,
        0.29737163, 0.6869212 , 2.19706726, 4.30621847, 5.26877371,
        0.31758889, 0.69795338, 2.27575501, 4.13023901, 5.31245263,
        0.31889478, 0.57440702, 2.45663484, 4.21012338, 5.39353808,
        0.2785267 , 0.48835429, 2.52662849, 4.1319441 , 5.78748178,
        0.41892974, 0.61710167, 2.29580863, 4.37137198, 5.01174005,
        0.27848403, 0.57237601, 1.91613801, 3.80944037, 5.09366051,
        0.27876981, 0.51791573, 2.13594246, 3.92401052, 5.43244489,
        0.29948306, 0.56669935, 2.12246052, 3.53022687, 4.82387249,
```

```
          0.21106871, 0.49973361, 2.12068876, 3.9803412 , 4.99692233,
          0.20691291, 0.4576896 , 2.16682291, 4.28788638, 5.75789404,
          0.23433709, 0.54917614, 2.75081452, 5.85532451, 8.07800992,
          0.37149151, 1.08914002, 3.49035962, 5.00185378, 5.90075755,
          0.30375075, 1.19137732, 2.47537692, 4.99299844, 6.15784907,
          0.54188983, 0.80590494, 3.35590744, 5.73874728, 7.42789753,
          1.16030089, 1.14225062, 3.25916338, 4.57489808, 5.17702039,
          0.32697988, 0.62200348, 2.40692266, 4.46010733, 5.71907465,
          0.28451816, 0.64166792, 2.53603514, 4.04102238, 5.74017016,
          0.35059841, 0.57539344, 2.56810355, 4.61839366, 5.50336703,
          0.27912792, 0.53297599, 2.88186971, 4.55324674, 4.98643994,
          0.2385366 , 0.54889448, 2.82010976, 3.67296338, 6.03951351,
          0.28554749, 0.55582635, 2.49368016, 4.24646179, 5.99370782,
          0.42883348, 0.52140601, 2.39965375, 4.64167245, 5.42444428,
          0.33552932, 0.69128927, 2.22550305, 4.40603908, 5.02422643,
          0.230136  , 0.48122263, 2.72996728, 3.47905207, 4.39550789]),
 'std_fit_time': array([1.12464268e-01, 5.57594174e-02, 1.20206967e-01,
1.68776778e-01,
          1.61000071e-01, 1.53760859e-01, 3.89951740e-02, 1.69150551e-01,
          5.29695813e-01, 8.73800242e-02, 2.38324974e-03, 5.91352206e-02,
          8.16989046e-02, 2.75212310e-01, 1.11918563e-01, 3.01406800e-02,
          9.84429180e-02, 1.84025516e-01, 4.55329912e-01, 1.61673722e-01,
          1.76552052e-02, 3.47172241e-02, 4.70250318e-02, 3.50975611e-01,
          7.22511842e-02, 1.49320038e-02, 4.00566317e-03, 8.11429450e-02,
          1.36483417e-01, 2.55617171e-01, 4.17998863e-02, 6.58981518e-02,
          2.23041070e-02, 2.90343761e-01, 7.64214381e-02, 3.08187327e-02,
          4.54385258e-02, 1.81882714e-01, 2.53567868e-01, 3.56658238e-02,
          1.41179536e-02, 6.87518107e-02, 1.36370270e-01, 3.51896326e-01,
          4.60227047e-02, 2.35189784e-02, 3.41532555e-02, 1.60184603e-01,
          4.91200332e-01, 2.19703036e-01, 8.92604672e-02, 4.32002054e-02,
          7.28289104e-02, 2.21642966e-01, 1.05660330e-01, 2.06188822e-02,
          4.67626801e-02, 8.59685624e-02, 3.30203013e-01, 2.10595123e-02,
          6.55774442e-02, 1.88987697e-04, 1.57890856e-01, 3.96620130e-01,
          3.34399912e-01, 2.46771061e-02, 7.20176572e-02, 1.55199267e-01,
          1.24976451e-01, 3.74775959e-02, 2.19984419e-02, 6.15921178e-02,
          4.94933579e-02, 2.07145510e-01, 9.25125556e-02, 1.25637769e-02,
          5.73974246e-03, 1.65024439e-01, 2.90836797e-01, 4.15379203e-02,
          2.86660186e-02, 8.54558385e-02, 1.93403722e-01, 2.18034673e-01,
          3.99167500e-01, 5.82273063e-02, 2.01000079e-01, 2.40141249e-01,
          4.66884526e-02, 6.43366914e-02, 1.94006160e-02, 1.41796343e-01,
          7.04611781e-02, 7.89087695e-02, 2.06671311e-01, 1.12931124e-01,
          1.30573756e-01, 2.88508474e-01, 1.50900073e-01, 6.34725883e-01,
          2.41328112e-02, 1.78824720e-01, 3.29695547e-01, 1.96986635e-01,
          3.05597187e-01, 4.61556821e-02, 5.66517471e-02, 7.18861920e-02,
          2.45235555e-01, 1.02329925e-01, 1.66576941e-02, 5.73928423e-02,
          1.51583493e-01, 2.31795028e-01, 2.92754105e-01, 6.68537362e-02,
          2.20297964e-02, 1.28707520e-01, 1.13555728e-01, 4.15893300e-02,
          3.38400664e-02, 8.12329833e-02, 2.98516949e-01, 1.02462208e-01,
```

```
        5.88649860e-02, 9.88760229e-03, 3.96751115e-02, 7.11480814e-02,
        2.54782797e-01, 1.42674259e-01, 1.53792155e-02, 6.85390376e-02,
        3.44972507e-01, 3.04562958e-01, 1.95407675e-01, 4.40913281e-02,
        1.52272865e-02, 1.22376578e-01, 2.67365086e-01, 1.60440915e-01,
        4.67156520e-02, 7.35830989e-02, 1.50267513e-01, 1.43029233e-01,
        5.49922954e-02, 2.17485606e-02, 6.12020502e-02, 1.49538646e-01,
        7.69389358e-02, 1.29425880e-01]), 'mean_score_time': array([0.07711196,
0.08096687, 0.32944274, 0.29442318, 0.43775996,
        0.08379698, 0.11320901, 0.2487576 , 0.27256298, 0.35280506,
        0.05271618, 0.17230829, 0.18314902, 0.3291719 , 0.39053027,
        0.12490447, 0.09097028, 0.16408269, 0.28727889, 0.399671  ,
        0.05670389, 0.05697219, 0.15479819, 0.29518096, 0.44616628,
        0.08205342, 0.09562834, 0.19699216, 0.35467148, 0.41472419,
        0.06919797, 0.11790951, 0.26417971, 0.34450841, 0.40684613,
        0.08987848, 0.20189246, 0.24750662, 0.32168913, 0.46569705,
        0.11429588, 0.13125475, 0.23503025, 0.31150985, 0.45176776,
        0.05597377, 0.08360664, 0.24218313, 0.35426116, 0.47621258,
        0.1165568 , 0.1625975 , 0.18177072, 0.26157125, 0.36082975,
        0.08935189, 0.08418417, 0.15565189, 0.31823826, 0.40727679,
        0.06103611, 0.07836707, 0.18871578, 0.30734682, 0.3452247 ,
        0.0604225 , 0.10544745, 0.14067586, 0.2788736 , 0.35378941,
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       0.01378946, 0.0140137 , 0.01235892, 0.0152902 , 0.01332969,
       0.01378946, 0.0140137 , 0.01235892, 0.0152902 , 0.01332969,
       0.01378946, 0.0140137 , 0.01235892, 0.0152902 , 0.01332969]),
'rank_test_score': array([135, 143, 123, 110, 135, 150, 123,  42,  75,  69,   3,
    3,  19,
```

```
       35,  35,  42,  35,  69,  19,  19,  84,  75,  35,  42,  42,  19,
       42,  42,  19,  75,  19,  42,  42,  19,  75,  19,  42,  42,  19,
       75,  84,  69,  14,  42,  42,  10,  11,  14,  69,  42,  94,  42,
      110, 110, 138,  94,  42, 110, 110, 138,  94,  42, 110, 110, 138,
       94,  42, 110, 110, 138,  94,  42, 110, 110, 138, 110,  84,  11,
       94,  75,  84,  35,   6,  11,  19,   2,   1,  14,  35,  42, 135,
       75,   3,  14,  35, 149, 110,  19,  42,  75,   6,  19,  84,  42,
       42,   6,  19,  84,  42,  42,   6,  19,  84,  42,  42,  84,  19,
       19,  14,  75,  84,  69,  84,  42,  69,  94, 123,  94, 123, 143,
       94, 123,  94, 123, 143,  94, 123,  94, 123, 143,  94, 123,  94,
      123, 143,  94, 123,  94, 123, 143])}
```

[39]:
```python
gs = gs.fit(x_test, y_test)
print(gs.best_score_)
```

```
0.8222222222222223
```

1 Predicting on test data

[52]:
```python
test_set['Age'] = test_set['Age'].fillna(test_set['Age'].mean())
test_set['Fare'] = test_set['Fare'].fillna(test_set['Fare'].mean())
test_set['Embarked'] = test_set['Embarked'].fillna(test_set['Embarked'].
  ↪mode()[0])
test_set['Embarked'] = le.fit_transform(test_set['Embarked'])
test_set['Cabin_Letter'] = test_set['Cabin'].apply(lambda x: str(x)[0])
test_set['Cabin_Letter'] = le.fit_transform(test_set['Cabin_Letter'])
test_set['Sex'] = le.fit_transform(test_set['Sex'])
```

[53]:
```python
test_set.head(25)
```

[53]:
```
    PassengerId  Pclass                                               Name  \
0           892       3                                     Kelly, Mr. James
1           893       3                     Wilkes, Mrs. James (Ellen Needs)
2           894       2                            Myles, Mr. Thomas Francis
3           895       3                                     Wirz, Mr. Albert
4           896       3           Hirvonen, Mrs. Alexander (Helga E Lindqvist)
5           897       3                          Svensson, Mr. Johan Cervin
6           898       3                                 Connolly, Miss. Kate
7           899       2                         Caldwell, Mr. Albert Francis
8           900       3           Abrahim, Mrs. Joseph (Sophie Halaut Easu)
9           901       3                           Davies, Mr. John Samuel
10          902       3                                   Ilieff, Mr. Ylio
11          903       1                          Jones, Mr. Charles Cresson
12          904       1       Snyder, Mrs. John Pillsbury (Nelle Stevenson)
13          905       2                               Howard, Mr. Benjamin
14          906       1   Chaffee, Mrs. Herbert Fuller (Carrie Constance…
15          907       2          del Carlo, Mrs. Sebastiano (Argenia Genovesi)
```

16	908	2	Keane, Mr. Daniel
17	909	3	Assaf, Mr. Gerios
18	910	3	Ilmakangas, Miss. Ida Livija
19	911	3	Assaf Khalil, Mrs. Mariana (Miriam")"
20	912	1	Rothschild, Mr. Martin
21	913	3	Olsen, Master. Artur Karl
22	914	1	Flegenheim, Mrs. Alfred (Antoinette)
23	915	1	Williams, Mr. Richard Norris II
24	916	1	Ryerson, Mrs. Arthur Larned (Emily Maria Borie)

	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	\
0	1	34.50000	0	0	330911	7.8292	NaN	
1	0	47.00000	1	0	363272	7.0000	NaN	
2	1	62.00000	0	0	240276	9.6875	NaN	
3	1	27.00000	0	0	315154	8.6625	NaN	
4	0	22.00000	1	1	3101298	12.2875	NaN	
5	1	14.00000	0	0	7538	9.2250	NaN	
6	0	30.00000	0	0	330972	7.6292	NaN	
7	1	26.00000	1	1	248738	29.0000	NaN	
8	0	18.00000	0	0	2657	7.2292	NaN	
9	1	21.00000	2	0	A/4 48871	24.1500	NaN	
10	1	30.27259	0	0	349220	7.8958	NaN	
11	1	46.00000	0	0	694	26.0000	NaN	
12	0	23.00000	1	0	21228	82.2667	B45	
13	1	63.00000	1	0	24065	26.0000	NaN	
14	0	47.00000	1	0	W.E.P. 5734	61.1750	E31	
15	0	24.00000	1	0	SC/PARIS 2167	27.7208	NaN	
16	1	35.00000	0	0	233734	12.3500	NaN	
17	1	21.00000	0	0	2692	7.2250	NaN	
18	0	27.00000	1	0	STON/O2. 3101270	7.9250	NaN	
19	0	45.00000	0	0	2696	7.2250	NaN	
20	1	55.00000	1	0	PC 17603	59.4000	NaN	
21	1	9.00000	0	1	C 17368	3.1708	NaN	
22	0	30.27259	0	0	PC 17598	31.6833	NaN	
23	1	21.00000	0	1	PC 17597	61.3792	NaN	
24	0	48.00000	1	3	PC 17608	262.3750	B57 B59 B63 B66	

	Embarked	Cabin_Letter
0	1	7
1	2	7
2	1	7
3	2	7
4	2	7
5	2	7
6	1	7
7	2	7
8	0	7

```
 9          2          7
10          2          7
11          2          7
12          2          1
13          2          7
14          2          4
15          0          7
16          1          7
17          0          7
18          2          7
19          0          7
20          0          7
21          2          7
22          2          7
23          0          7
24          0          1
```

[54]: `test_set.isnull().sum()`

```
[54]: PassengerId       0
      Pclass            0
      Name              0
      Sex               0
      Age               0
      SibSp             0
      Parch             0
      Ticket            0
      Fare              0
      Cabin           327
      Embarked          0
      Cabin_Letter      0
      dtype: int64
```

[58]:
```python
test_X = test_set[['Pclass', 'Sex', 'Age', 'SibSp', 'Parch',
  'Fare','Cabin_Letter', 'Embarked']]
# Make predictions on the test data using the trained Decision Tree classifier
test_predictions_dt = best_clf.predict(test_X)
# Make predictions on the test data using the trained Random Forest classifier
test_predictions_rf = gs.predict(test_X)
# Output predictions
output_dt = pnd.DataFrame({'PassengerId': test_set.PassengerId, 'Survived':
  test_predictions_dt})
output_rf = pnd.DataFrame({'PassengerId': test_set.PassengerId, 'Survived':
  test_predictions_rf})
# Save the predictions to a CSV file
output_dt.to_csv('predictions_decision_tree.csv', index=False)
output_rf.to_csv('predictions_random_forest.csv', index=False)
```

```
[60]: compareDtAndRf = accuracy_score(test_predictions_dt, test_predictions_rf)
      print("Comparing results predicted by Decision Tree and Random Forest",␣
       ↪compareDtAndRf)
```

Comparing results predicted by Decision Tree and Random Forest
0.8444976076555024

```
[ ]:
```