In [120…

```
import pandas as pd
import numpy as np

import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline

from sklearn.preprocessing import OrdinalEncoder, OneHotEncoder

from sklearn.impute import SimpleImputer

from sklearn.compose import make_column_transformer, ColumnTransformer
from sklearn.pipeline import Pipeline, make_pipeline

from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from xgboost import XGBClassifier
from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier, GradientBoostingClassifier, ExtraTrees(


from sklearn.model_selection import cross_val_score, StratifiedKFold, train_test_split, GridSearchCV
```

In [122…

```
train_df = pd.read_csv('C:/Users/Sarvamm/Documents/Datasets/train (2).csv')
test_df = pd.read_csv('C:/Users/Sarvamm/Documents/Datasets/test.csv')
```

In [123…

```
train_df.head()
```

Out[123…

	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 [124…

```
train_df.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
```

In [125…

```
train_df.describe()
```

Out[125…

	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 [126…

```
train_df.groupby(['Pclass'], as_index=False)['Survived'].mean()
```

Out[126…

	Pclass	Survived
0	1	0.629630
1	2	0.472826
2	3	0.242363

In [127…

```
train_df.groupby(['Sex'], as_index=False)['Survived'].mean()
```

Out[127…

	Sex	Survived
0	female	0.742038
1	male	0.188908

In [128…

```
train_df.groupby(['SibSp'], as_index=False)['Survived'].mean()
```

Out[128…

	SibSp	Survived
0	0	0.345395
1	1	0.535885
2	2	0.464286
3	3	0.250000
4	4	0.166667
5	5	0.000000
6	8	0.000000

In [129…

```
train_df.groupby(['Parch'], as_index=False)['Survived'].mean()
```

Out[129…

	Parch	Survived
0	0	0.343658
1	1	0.550847
2	2	0.500000
3	3	0.600000
4	4	0.000000
5	5	0.200000
6	6	0.000000

In [130…

```
train_df['Family_Size'] = train_df['SibSp'] + train_df['Parch'] + 1
test_df['Family_Size'] = train_df['SibSp'] + train_df['Parch'] + 1
```

In [132…

```
train_df.groupby(['Family_Size'], as_index=False)['Survived'].mean()
```

Out[132…

	Family_Size	Survived
0	1	0.303538
1	2	0.552795
2	3	0.578431
3	4	0.724138
4	5	0.200000
5	6	0.136364
6	7	0.333333
7	8	0.000000
8	11	0.000000

In [133…
```
family_map = {1: 'Alone', 2:'Small', 3:'Small', 4:'Small', 5:'Medium', 6:'Medium', 7:'Large', 8:'Large',9:'Larg
train_df['Family_Size_Grouped'] = train_df['Family_Size'].map(family_map)
test_df['Family_Size_Grouped'] = train_df['Family_Size'].map(family_map)
```

In [134…
```
train_df.groupby(['Family_Size_Grouped'], as_index=False)['Survived'].mean()
```

Out[134…

	Family_Size_Grouped	Survived
0	Alone	0.303538
1	Large	0.222222
2	Medium	0.162162
3	Small	0.578767

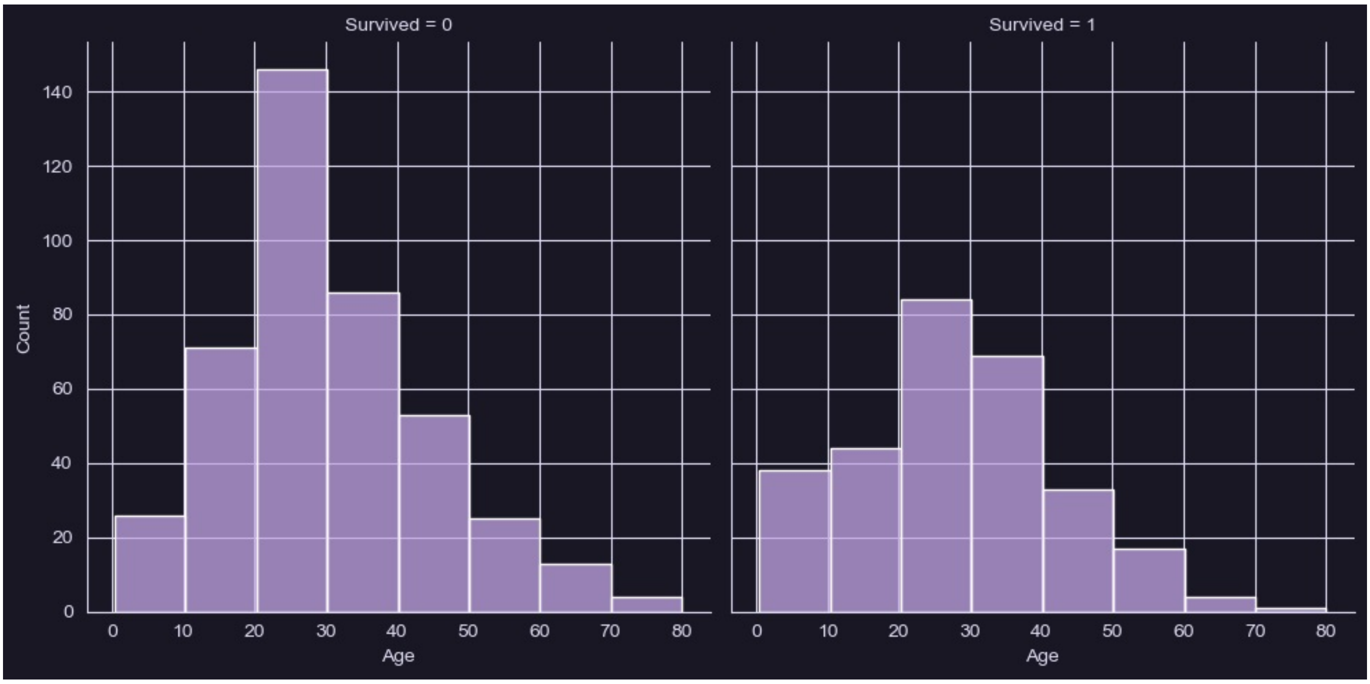
In [135…
```
train_df.groupby(['Embarked'], as_index=False)['Survived'].mean()
```

Out[135…

	Embarked	Survived
0	C	0.553571
1	Q	0.389610
2	S	0.336957

In [136…
```
sns.displot(train_df, x='Age', col='Survived', binwidth=10, height=5)
```

Out[136…
```
<seaborn.axisgrid.FacetGrid at 0x276552218b0>
```



In [137…
```
train_df['Age_Cut'] = pd.qcut(train_df['Age'], 8)
test_df['Age_Cut'] = pd.qcut(train_df['Age'], 8)
```

In [141…
```
train_df.groupby(['Age_Cut'], as_index=False)['Survived'].mean()
```

```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\1587675067.py:1: FutureWarning: The default of observed=Fals
e is deprecated and will be changed to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  train_df.groupby(['Age_Cut'], as_index=False)['Survived'].mean()
```

Out[141…

	Age_Cut	Survived
0	(0.419, 16.0]	0.550000
1	(16.0, 20.125]	0.341772
2	(20.125, 24.0]	0.367347
3	(24.0, 28.0]	0.352941
4	(28.0, 32.312]	0.416667
5	(32.312, 38.0]	0.450549
6	(38.0, 47.0]	0.329545
7	(47.0, 80.0]	0.415730

In [142…

```
train_df.loc[train_df['Age'] <= 19, 'Age'] = 0
train_df.loc[(train_df['Age'] > 19) & (train_df['Age'] <= 25), 'Age'] = 1
train_df.loc[(train_df['Age'] > 25) & (train_df['Age'] <= 31.8), 'Age'] = 2
train_df.loc[(train_df['Age'] > 31.8) & (train_df['Age'] <= 41), 'Age'] = 3
train_df.loc[(train_df['Age'] > 41) & (train_df['Age'] <= 80), 'Age'] = 4
train_df.loc[train_df['Age'] > 80, 'Age']

test_df.loc[test_df['Age'] <= 19, 'Age'] = 0
test_df.loc[(test_df['Age'] > 19) & (test_df['Age'] <= 25), 'Age'] = 1
test_df.loc[(test_df['Age'] > 25) & (test_df['Age'] <= 31.8), 'Age'] = 2
test_df.loc[(test_df['Age'] > 31.8) & (test_df['Age'] <= 41), 'Age'] = 3
test_df.loc[(test_df['Age'] > 41) & (test_df['Age'] <= 80), 'Age'] = 4
test_df.loc[test_df['Age'] > 80, 'Age']
```

Out[142…

```
Series([], Name: Age, dtype: float64)
```

In [143…

```
train_df['Age']
```

Out[143…

```
0      1.0
1      3.0
2      2.0
3      3.0
4      3.0
      ...
886    2.0
887    0.0
888    NaN
889    2.0
890    3.0
Name: Age, Length: 891, dtype: float64
```

In [145…

```
train_df.head()
```

Out[145…

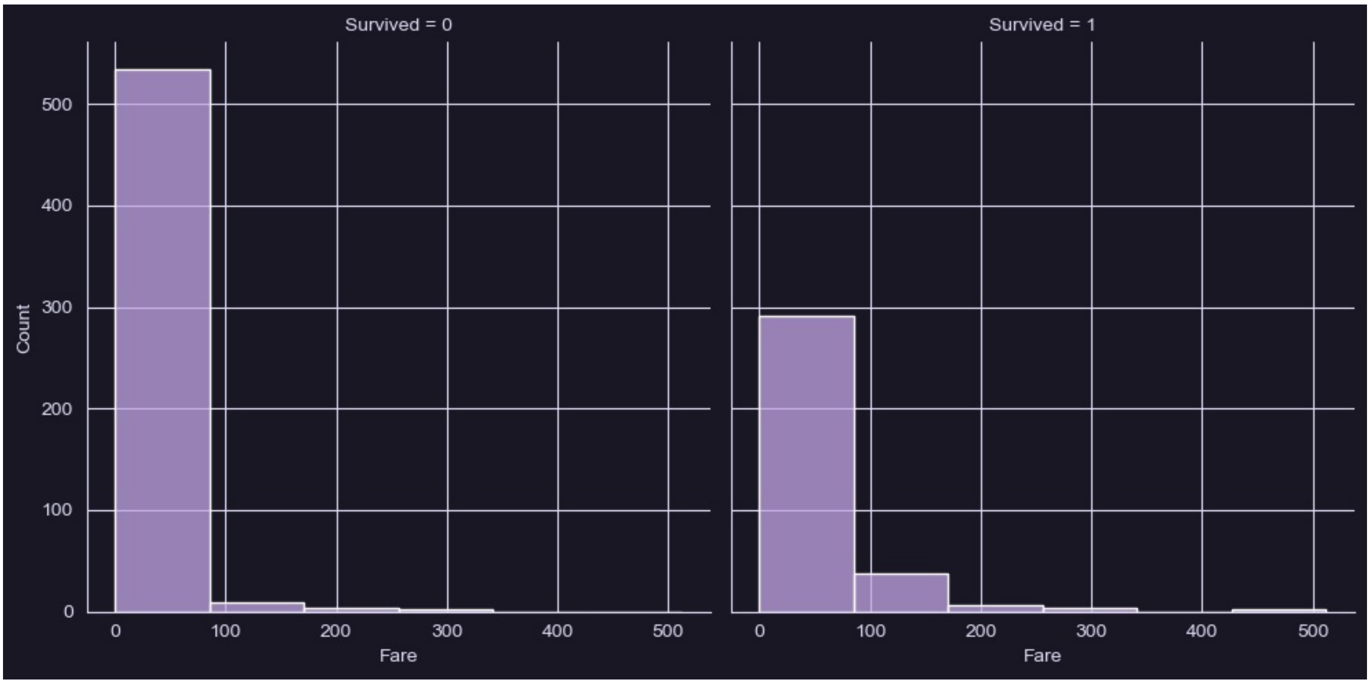
	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Family_Size	Fami
0	1	0	3	Braund, Mr. Owen Harris	male	1.0	1	0	A/5 21171	7.2500	NaN	S	2	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	3.0	1	0	PC 17599	71.2833	C85	C	2	
2	3	1	3	Heikkinen, Miss. Laina	female	2.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	3.0	1	0	113803	53.1000	C123	S	2	
4	5	0	3	Allen, Mr. William Henry	male	3.0	0	0	373450	8.0500	NaN	S	1	

In [147…

```
sns.displot(train_df, x='Fare', col='Survived', binwidth=80, height=5)
```

Out[147…

```
<seaborn.axisgrid.FacetGrid at 0x27652ebeba0>
```



```
In [148…  train_df['Fare_Cut'] = pd.qcut(train_df['Fare'], 5)
          test_df['Fare_Cut'] = pd.qcut(test_df['Fare'], 5)
```

```
In [152…  train_df.groupby(['Fare_Cut'], as_index=False)['Survived'].mean()
```

```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\1994933730.py:1: FutureWarning: The default of observed=Fals
e is deprecated and will be changed to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  train_df.groupby(['Fare_Cut'], as_index=False)['Survived'].mean()
```

Out[152…

	Fare_Cut	Survived
0	(-0.001, 7.854]	0.217877
1	(7.854, 10.5]	0.201087
2	(10.5, 21.679]	0.424419
3	(21.679, 39.688]	0.444444
4	(39.688, 512.329]	0.642045

```
In [153…  train_df.loc[train_df['Fare'] <= 7.854, 'Fare'] = 0
          train_df.loc[(train_df['Fare'] > 7.854) & (train_df['Fare'] <= 10.5), 'Fare'] = 1
          train_df.loc[(train_df['Fare'] > 10.5) & (train_df['Fare'] <= 21.679), 'Fare'] = 2
          train_df.loc[(train_df['Fare'] > 21.679) & (train_df['Fare'] <= 39.688), 'Fare'] = 3
          train_df.loc[(train_df['Fare'] > 39.688) & (train_df['Fare'] <= 512.329), 'Fare'] = 4
          train_df.loc[train_df['Fare'] > 512.329, 'Fare']

          test_df.loc[test_df['Fare'] <= 7.854, 'Fare'] = 0
          test_df.loc[(test_df['Fare'] > 7.854) & (test_df['Fare'] <= 10.5), 'Fare'] = 1
          test_df.loc[(test_df['Fare'] > 10.5) & (test_df['Fare'] <= 21.679), 'Fare'] = 2
          test_df.loc[(test_df['Fare'] > 21.679) & (test_df['Fare'] <= 39.688), 'Fare'] = 3
          test_df.loc[(test_df['Fare'] > 39.688) & (test_df['Fare'] <= 512.329), 'Fare'] = 4
          test_df.loc[test_df['Fare'] > 512.329, 'Fare']
```

```
Out[153…  343    512.3292
          Name: Fare, dtype: float64
```

```
In [157…  train_df['Name']
```

```
Out[157…  0                                Braund, Mr. Owen Harris
          1      Cumings, Mrs. John Bradley (Florence Briggs Th...
          2                                 Heikkinen, Miss. Laina
          3           Futrelle, Mrs. Jacques Heath (Lily May Peel)
          4                               Allen, Mr. William Henry
                                        ...
          886                                Montvila, Rev. Juozas
          887                         Graham, Miss. Margaret Edith
          888             Johnston, Miss. Catherine Helen "Carrie"
          889                                Behr, Mr. Karl Howell
          890                                  Dooley, Mr. Patrick
          Name: Name, Length: 891, dtype: object
```

In [158…

```
train_df['Title'] = train_df['Name'].str.split(pat= ",", expand=True)[1].str.split(pat= ".", expand=True)[0].app
test_df['Title'] = test_df['Name'].str.split(pat= ",", expand=True)[1].str.split(pat= ".", expand=True)[0].apply
```

In [160…

```
train_df.groupby(['Title'], as_index=False)['Survived'].mean()
```

Out[160…

	Title	Survived
0	Capt	0.000000
1	Col	0.500000
2	Don	0.000000
3	Dr	0.428571
4	Jonkheer	0.000000
5	Lady	1.000000
6	Major	0.500000
7	Master	0.575000
8	Miss	0.697802
9	Mlle	1.000000
10	Mme	1.000000
11	Mr	0.156673
12	Mrs	0.792000
13	Ms	1.000000
14	Rev	0.000000
15	Sir	1.000000
16	the Countess	1.000000

In [161…

```
train_df['Title'] = train_df['Title'].replace({
    'Capt': 'Military',
    'Col': 'Military',
    'Major': 'Military',
    'Jonkheer': 'Noble',
    'the Countess': 'Noble',
    'Don': 'Noble',
    'Lady': 'Noble',
    'Sir': 'Noble',
    'Mlle': 'Noble',
    'Ms': 'Noble',
    'Mme': 'Noble'
})

test_df['Title'] = test_df['Title'].replace({
    'Capt': 'Military',
    'Col': 'Military',
    'Major': 'Military',
    'Jonkheer': 'Noble',
    'the Countess': 'Noble',
    'Don': 'Noble',
    'Lady': 'Noble',
    'Sir': 'Noble',
    'Mlle': 'Noble',
    'Ms': 'Noble',
    'Mme': 'Noble'
})
```

In [162…

```
train_df.groupby(['Title'], as_index=False)['Survived'].agg(['count', 'mean'])
```

Out[162…

	Title	count	mean
0	Dr	7	0.428571
1	Master	40	0.575000
2	Military	5	0.400000
3	Miss	182	0.697802
4	Mr	517	0.156673
5	Mrs	125	0.792000
6	Noble	9	0.777778
7	Rev	6	0.000000

In [166…

```
train_df['Name_Length'] = train_df['Name'].apply(lambda x: len(x))
test_df['Name_Length'] = test_df['Name'].apply(lambda x: len(x))
```

In [171…

```
train_df['Name_LengthGB'] = pd.qcut(train_df['Name_Length'], 3)
test_df['Name_LengthGB'] = pd.qcut(test_df['Name_Length'], 3)
```

In [172…

```
train_df.groupby(['Name_LengthGB'], as_index=False)['Survived'].mean()
```

```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\554738133.py:1: FutureWarning: The default of observed=False
is deprecated and will be changed to True in a future version of pandas. Pass observed=False to retain current b
ehavior or observed=True to adopt the future default and silence this warning.
  train_df.groupby(['Name_LengthGB'], as_index=False)['Survived'].mean()
```

Out[172…

	Name_LengthGB	Survived
0	(11.999, 22.0]	0.252336
1	(22.0, 28.0]	0.322581
2	(28.0, 82.0]	0.587629

In [173…

```
train_df.loc[train_df['Name_Length'] <= 22, 'Name_Size'] = 0
train_df.loc[(train_df['Name_Length'] > 22) & (train_df['Name_Length'] <= 28), 'Name_Size'] = 1
train_df.loc[(train_df['Name_Length'] > 28) & (train_df['Name_Length'] <= 82), 'Name_Size'] = 2
train_df.loc[train_df['Name_Length'] > 82, 'Name_Size']

test_df.loc[test_df['Name_Length'] <= 22, 'Name_Size'] = 0
test_df.loc[(test_df['Name_Length'] > 22) & (test_df['Name_Length'] <= 28), 'Name_Size'] = 1
test_df.loc[(test_df['Name_Length'] > 28) & (test_df['Name_Length'] <= 82), 'Name_Size'] = 2
test_df.loc[test_df['Name_Length'] > 82, 'Name_Size']
```

Out[173…

```
Series([], Name: Name_Size, dtype: float64)
```

In [176…

```
train_df.head()
```

Out[176…

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Family_Size	Family_
0	1	0	3	Braund, Mr. Owen Harris	male	1.0	1	0	A/5 21171	0.0	NaN	S	2	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	3.0	1	0	PC 17599	4.0	C85	C	2	
2	3	1	3	Heikkinen, Miss. Laina	female	2.0	0	0	STON/O2. 3101282	1.0	NaN	S	1	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	3.0	1	0	113803	4.0	C123	S	2	
4	5	0	3	Allen, Mr. William Henry	male	3.0	0	0	373450	1.0	NaN	S	1	

In [185…

```
train_df['Ticket']
```

Out[185…

```
0             A/5 21171
1              PC 17599
2      STON/O2. 3101282
3                113803
4                373450
             ...
886              211536
887              112053
888          W./C. 6607
889              111369
890              370376
Name: Ticket, Length: 891, dtype: object
```

In [186…

```
train_df['TicketNumber'] = train_df['Ticket'].apply(lambda x: pd.Series({'Ticket': x.split()[-1]}))
test_df['TicketNumber'] = test_df['Ticket'].apply(lambda x: pd.Series({'Ticket': x.split()[-1]}))
```

In [187…

```
train_df.groupby(['TicketNumber'], as_index=False)['Survived'].agg(['count', 'mean']).sort_values('count', asce
```

Out[187…

	TicketNumber	count	mean
464	347082	7	0.000000
196	2343	7	0.000000
94	1601	7	0.714286
168	2144	6	0.000000
468	347088	6	0.000000
...	...	...	...
271	2662	1	0.000000
272	2663	1	1.000000
273	2664	1	0.000000
276	2667	1	1.000000
339	3101274	1	0.000000

679 rows × 3 columns

In [192…

```
train_df.groupby('TicketNumber')['TicketNumber'].transform('count')
```

Out[192…

```
0      1
1      1
2      1
3      2
4      1
      ..
886    1
887    1
888    2
889    1
890    1
Name: TicketNumber, Length: 891, dtype: int64
```

In [194…

```
train_df['TicketNumberCounts'] = train_df.groupby('TicketNumber')['TicketNumber'].transform('count')
test_df['TicketNumberCounts'] = test_df.groupby('TicketNumber')['TicketNumber'].transform('count')
```

In [196…

```
train_df.groupby(['TicketNumberCounts'], as_index=False)['Survived'].agg(['count', 'mean']).sort_values('count'
```

Out[196…

	TicketNumberCounts	count	mean
0	1	544	0.295956
1	2	188	0.569149
2	3	66	0.712121
3	4	44	0.500000
6	7	21	0.238095
5	6	18	0.000000
4	5	10	0.000000

In [197…

```
train_df['Ticket']
```

Out[197…

```
0             A/5 21171
1              PC 17599
2      STON/O2. 3101282
3                113803
4                373450
             ...
886              211536
887              112053
888          W./C. 6607
889              111369
890              370376
Name: Ticket, Length: 891, dtype: object
```

In [200…

```
train_df['Ticket'].str.split(pat=" ", expand=True)
```

Out[200…

	0	1	2
0	A/5	21171	None
1	PC	17599	None
2	STON/O2.	3101282	None
3	113803	None	None
4	373450	None	None
...	...	...	...
886	211536	None	None
887	112053	None	None
888	W./C.	6607	None
889	111369	None	None
890	370376	None	None

891 rows × 3 columns

In [205…

```
train_df['TicketLocation'] = np.where(train_df['Ticket'].str.split(pat=" ", expand=True)[1].notna(), train_df['
test_df['TicketLocation'] = np.where(test_df['Ticket'].str.split(pat=" ", expand=True)[1].notna(), test_df['Tic
```

In [208…

```
train_df['TicketLocation'].value_counts()
```

Out[208…

```
TicketLocation
Blank          665
PC              60
C.A.            27
STON/O          12
A/5             10
W./C.            9
CA.              8
SOTON/O.Q.       8
SOTON/OQ         7
A/5.             7
CA               6
STON/O2.         6
C                5
F.C.C.           5
S.O.C.           5
SC/PARIS         5
SC/Paris         4
S.O./P.P.        3
PP               3
A/4.             3
A/4              3
SC/AH            3
A./5.            2
SOTON/O2         2
A.5.             2
WE/P             2
S.C./PARIS       2
P/PP             2
F.C.             1
SC               1
S.W./PP          1
A/S              1
Fa               1
SCO/W            1
SW/PP            1
W/C              1
S.C./A.4.        1
S.O.P.           1
A4.              1
W.E.P.           1
SO/C             1
S.P.             1
C.A./SOTON       1
Name: count, dtype: int64
```

In [210…

```
train_df['TicketLocation'] = train_df['TicketLocation'].replace({
    'SOTON/O.Q.':'SOTON/OQ',
    'C.A.':'CA',
    'CA.':'CA',
    'SC/PARIS':'SC/Paris',
    'S.C./PARIS':'SC/Paris',
    'A/4.':'A/4',
    'A/5.':'A/5',
    'A.5.':'A/5',
    'A./5.':'A/5',
    'W./C.':'W/C',
})

test_df['TicketLocation'] = test_df['TicketLocation'].replace({
    'SOTON/O.Q.':'SOTON/OQ',
    'C.A.':'CA',
    'CA.':'CA',
    'SC/PARIS':'SC/Paris',
    'S.C./PARIS':'SC/Paris',
    'A/4.':'A/4',
    'A/5.':'A/5',
    'A.5.':'A/5',
    'A./5.':'A/5',
    'W./C.':'W/C',
})
```

In [212…

```
train_df.groupby(['TicketLocation'], as_index=False)['Survived'].agg(['count', 'mean'])
```

Out[212…

	TicketLocation	count	mean
0	A/4	6	0.000000
1	A/5	21	0.095238
2	A/S	1	0.000000
3	A4.	1	0.000000
4	Blank	665	0.383459
5	C	5	0.400000
6	C.A./SOTON	1	0.000000
7	CA	41	0.341463
8	F.C.	1	0.000000
9	F.C.C.	5	0.800000
10	Fa	1	0.000000
11	P/PP	2	0.500000
12	PC	60	0.650000
13	PP	3	0.666667
14	S.C./A.4.	1	0.000000
15	S.O./P.P.	3	0.000000
16	S.O.C.	5	0.000000
17	S.O.P.	1	0.000000
18	S.P.	1	0.000000
19	S.W./PP	1	1.000000
20	SC	1	1.000000
21	SC/AH	3	0.666667
22	SC/Paris	11	0.454545
23	SCO/W	1	0.000000
24	SO/C	1	1.000000
25	SOTON/O2	2	0.000000
26	SOTON/OQ	15	0.133333
27	STON/O	12	0.416667
28	STON/O2.	6	0.500000
29	SW/PP	1	1.000000
30	W.E.P.	1	0.000000
31	W/C	10	0.100000
32	WE/P	2	0.500000

In [214…

```
train_df['Cabin'] = train_df['Cabin'].fillna('U')
train_df['Cabin'] = pd.Series([i[0] if not pd.isnull(i) else 'x' for i in train_df['Cabin']])

test_df['Cabin'] = test_df['Cabin'].fillna('U')
test_df['Cabin'] = pd.Series([i[0] if not pd.isnull(i) else 'x' for i in test_df['Cabin']])
```

In [216…

```
train_df.groupby(['Cabin'], as_index=False)['Survived'].agg(['count', 'mean'])
```

Out[216…

	Cabin	count	mean
0	A	15	0.466667
1	B	47	0.744681
2	C	59	0.593220
3	D	33	0.757576
4	E	32	0.750000
5	F	13	0.615385
6	G	4	0.500000
7	T	1	0.000000
8	U	687	0.299854

In [218…

```
train_df['Cabin_Assigned'] = train_df['Cabin'].apply(lambda x: 0 if x in ['U'] else 1)
test_df['Cabin_Assigned'] = test_df['Cabin'].apply(lambda x: 0 if x in ['U'] else 1)
```

In [220…

```
train_df.groupby(['Cabin_Assigned'], as_index=False)['Survived'].agg(['count', 'mean'])
```

Out[220…

	Cabin_Assigned	count	mean
0	0	687	0.299854
1	1	204	0.666667

In [222…

```
train_df.head()
```

Out[222…

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	...	Age_Cut	Fare_Cut	Title	Name_Ler
0	1	0	3	Braund, Mr. Owen Harris	male	1.0	1	0	A/5 21171	0.0	...	(20.125, 24.0]	(-0.001, 7.854]	Mr	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	3.0	1	0	PC 17599	4.0	...	(32.312, 38.0]	(39.688, 512.329]	Mrs	
2	3	1	3	Heikkinen, Miss. Laina	female	2.0	0	0	STON/O2. 3101282	1.0	...	(24.0, 28.0]	(7.854, 10.5]	Miss	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	3.0	1	0	113803	4.0	...	(32.312, 38.0]	(39.688, 512.329]	Mrs	
4	5	0	3	Allen, Mr. William Henry	male	3.0	0	0	373450	1.0	...	(32.312, 38.0]	(7.854, 10.5]	Mr	

5 rows × 24 columns

In [224…

```
train_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 24 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                891 non-null    object  
 11  Embarked             889 non-null    object  
 12  Family_Size          891 non-null    int64   
 13  Family_Size_Grouped  884 non-null    object  
 14  Age_Cut              714 non-null    category
 15  Fare_Cut             891 non-null    category
 16  Title                891 non-null    object  
 17  Name_Length          891 non-null    int64   
 18  Name_LengthGB        891 non-null    category
 19  Name_Size            891 non-null    float64 
 20  TicketNumber         891 non-null    object  
 21  TicketNumberCounts   891 non-null    int64   
 22  TicketLocation       891 non-null    object  
 23  Cabin_Assigned       891 non-null    int64   
dtypes: category(3), float64(3), int64(9), object(9)
memory usage: 149.7+ KB
```

In [226…

```
train_df.columns
```

Out[226…

```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked', 'Family_Size',
       'Family_Size_Grouped', 'Age_Cut', 'Fare_Cut', 'Title', 'Name_Length',
       'Name_LengthGB', 'Name_Size', 'TicketNumber', 'TicketNumberCounts',
       'TicketLocation', 'Cabin_Assigned'],
      dtype='object')
```

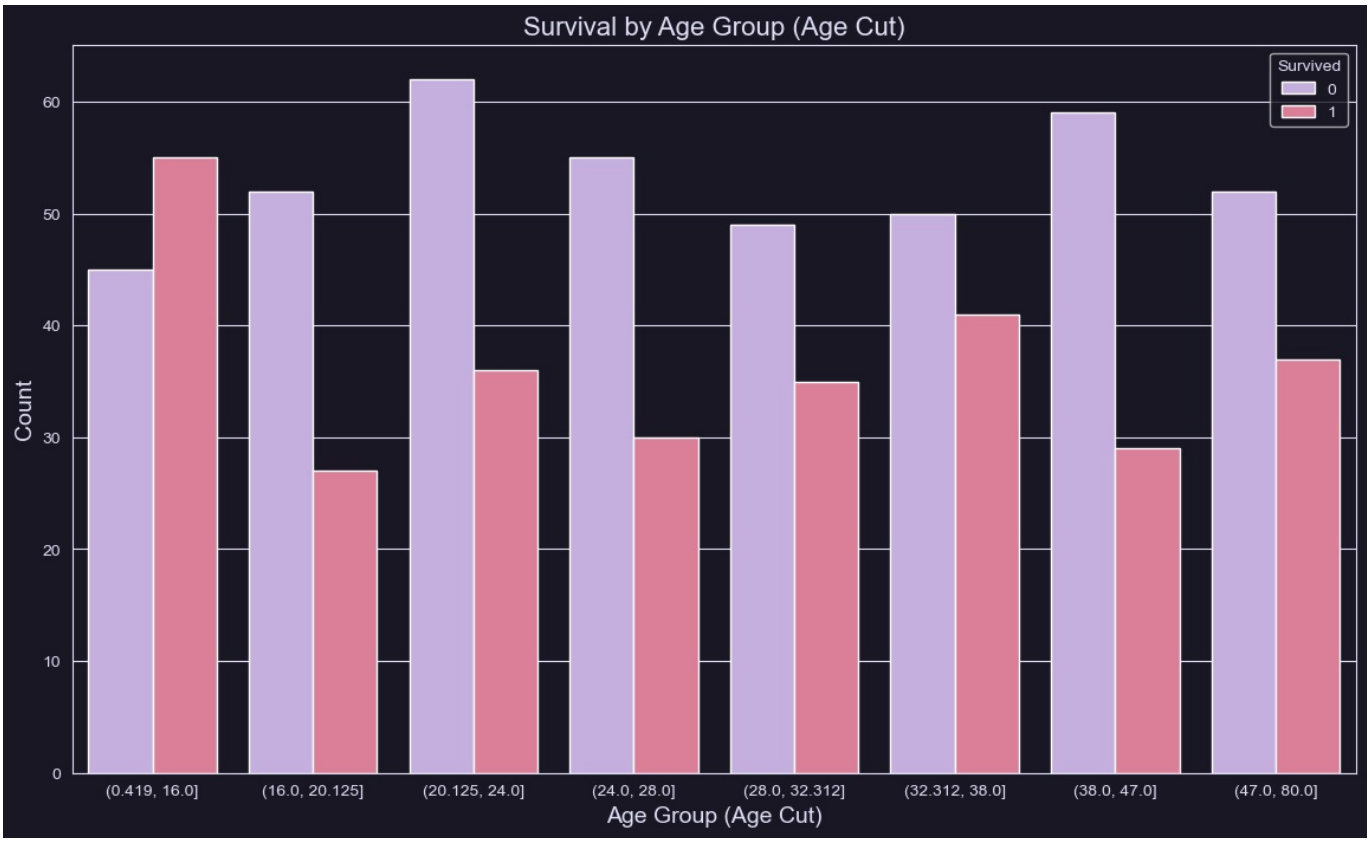
In [228…

```
rosepine_colors = {
    'background': '#191724',
    'foreground': '#e0def4',
    'highlight': '#c4a7e7',
    'muted': '#eb6f92',
    'accent': '#9ccfd8',
    'secondary': '#f6c177',
    'tertiary': '#56949f'
}

# Applying rosepine color to Seaborn
custom_palette = [rosepine_colors['highlight'], rosepine_colors['muted'], rosepine_colors['accent']]
sns.set_palette(custom_palette)
sns.set_style("darkgrid", {"axes.facecolor": rosepine_colors['background']})
plt.rcParams['axes.facecolor'] = rosepine_colors['background']
plt.rcParams['axes.edgecolor'] = rosepine_colors['foreground']
plt.rcParams['axes.labelcolor'] = rosepine_colors['foreground']
plt.rcParams['xtick.color'] = rosepine_colors['foreground']
plt.rcParams['ytick.color'] = rosepine_colors['foreground']
plt.rcParams['grid.color'] = rosepine_colors['foreground']
plt.rcParams['figure.facecolor'] = rosepine_colors['background']
plt.rcParams['text.color'] = rosepine_colors['foreground']
```

In [260…

```
# Survival by Age Cut
plt.figure(figsize=(14, 8))
sns.countplot(data=train_df, x='Age_Cut', hue='Survived', palette=custom_palette)
plt.title('Survival by Age Group (Age Cut)', fontsize=16, color=rosepine_colors['foreground'])
plt.xlabel('Age Group (Age Cut)', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```

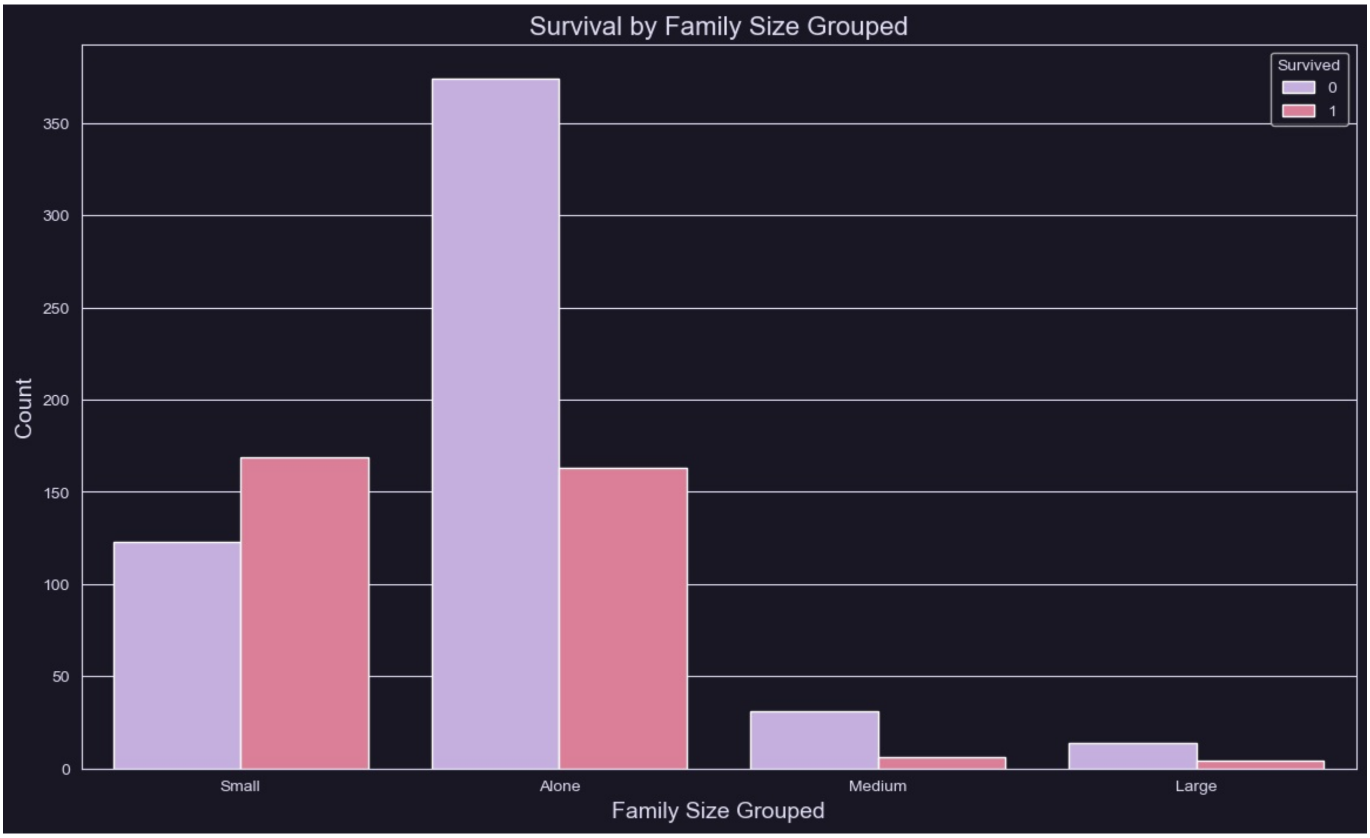
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\1412024652.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(data=train_df, x='Age_Cut', hue='Survived', palette=custom_palette)
```



In [262…

```
# Survival by Family Size Grouped
plt.figure(figsize=(14, 8))
sns.countplot(x='Family_Size_Grouped', hue='Survived', data=train_df, palette=custom_palette)
plt.title('Survival by Family Size Grouped', fontsize=16, color=rosepine_colors['foreground'])
plt.xlabel('Family Size Grouped', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```

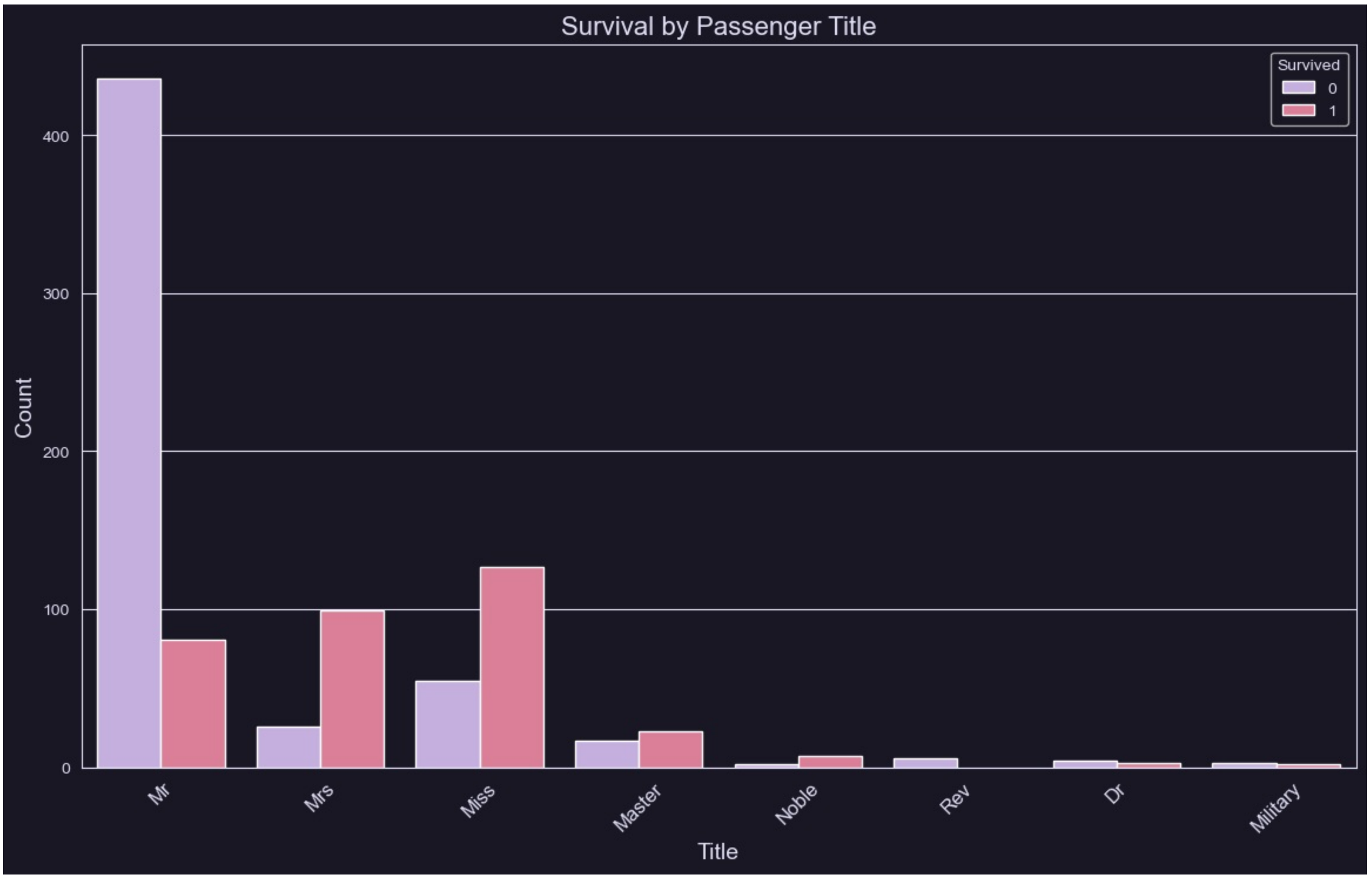
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3212574283.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(x='Family_Size_Grouped', hue='Survived', data=train_df, palette=custom_palette)
```



In [264…

```
# Survival by Title
plt.figure(figsize=(14, 8))
sns.countplot(data=train_df, x='Title', hue='Survived', palette=custom_palette)
plt.title('Survival by Passenger Title', fontsize=16, color=rosepine_colors['foreground'])
plt.xlabel('Title', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.xticks(rotation=45, fontsize=12)
plt.show()
```

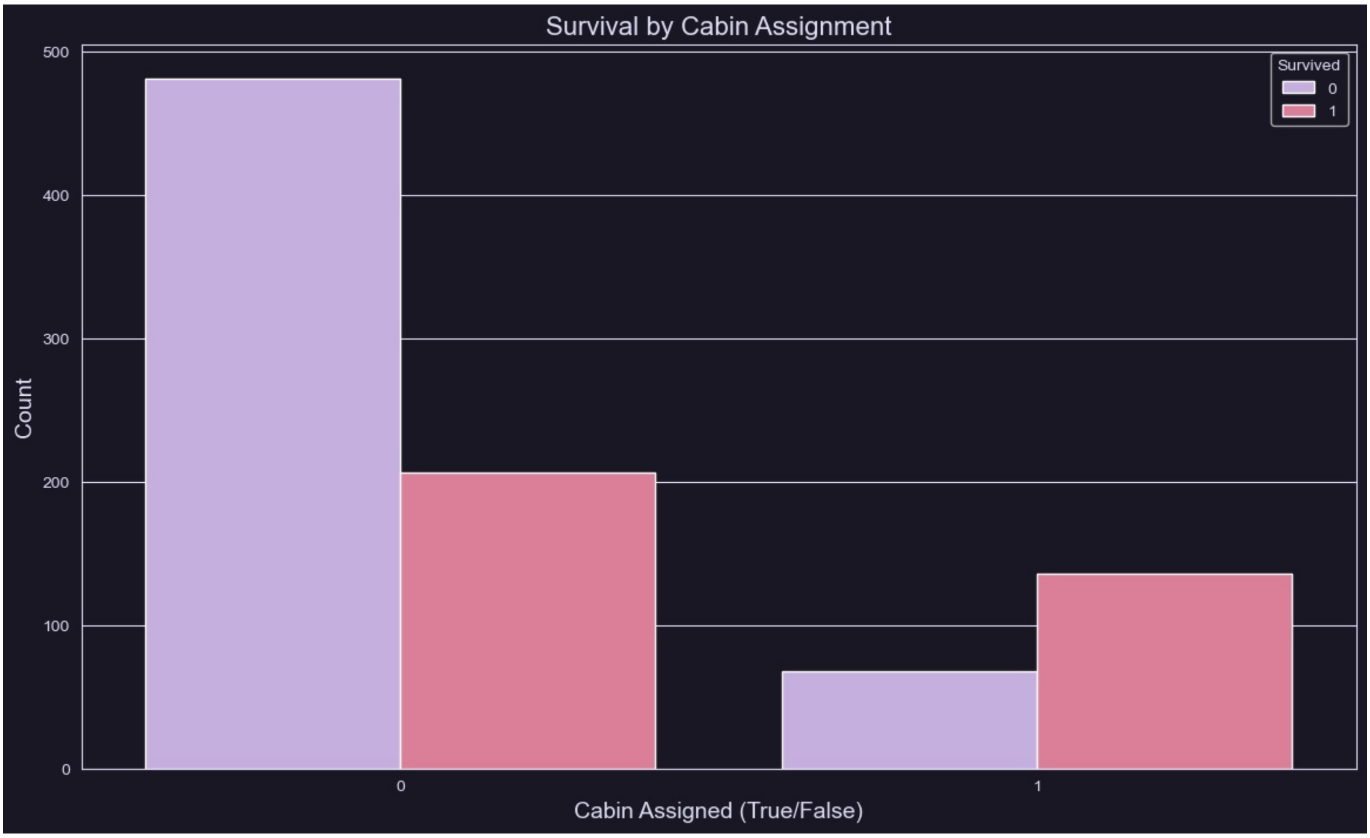
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\629769478.py:3: UserWarning: The palette list has more value
s (3) than needed (2), which may not be intended.
  sns.countplot(data=train_df, x='Title', hue='Survived', palette=custom_palette)
```



In [266…

```
# Survival by Cabin Assigned
plt.figure(figsize=(14, 8))
sns.countplot(data=train_df, x='Cabin_Assigned', hue='Survived', palette=custom_palette)
plt.title('Survival by Cabin Assignment', fontsize=16, color=rosepine_colors['foreground'])
plt.xlabel('Cabin Assigned (True/False)', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```

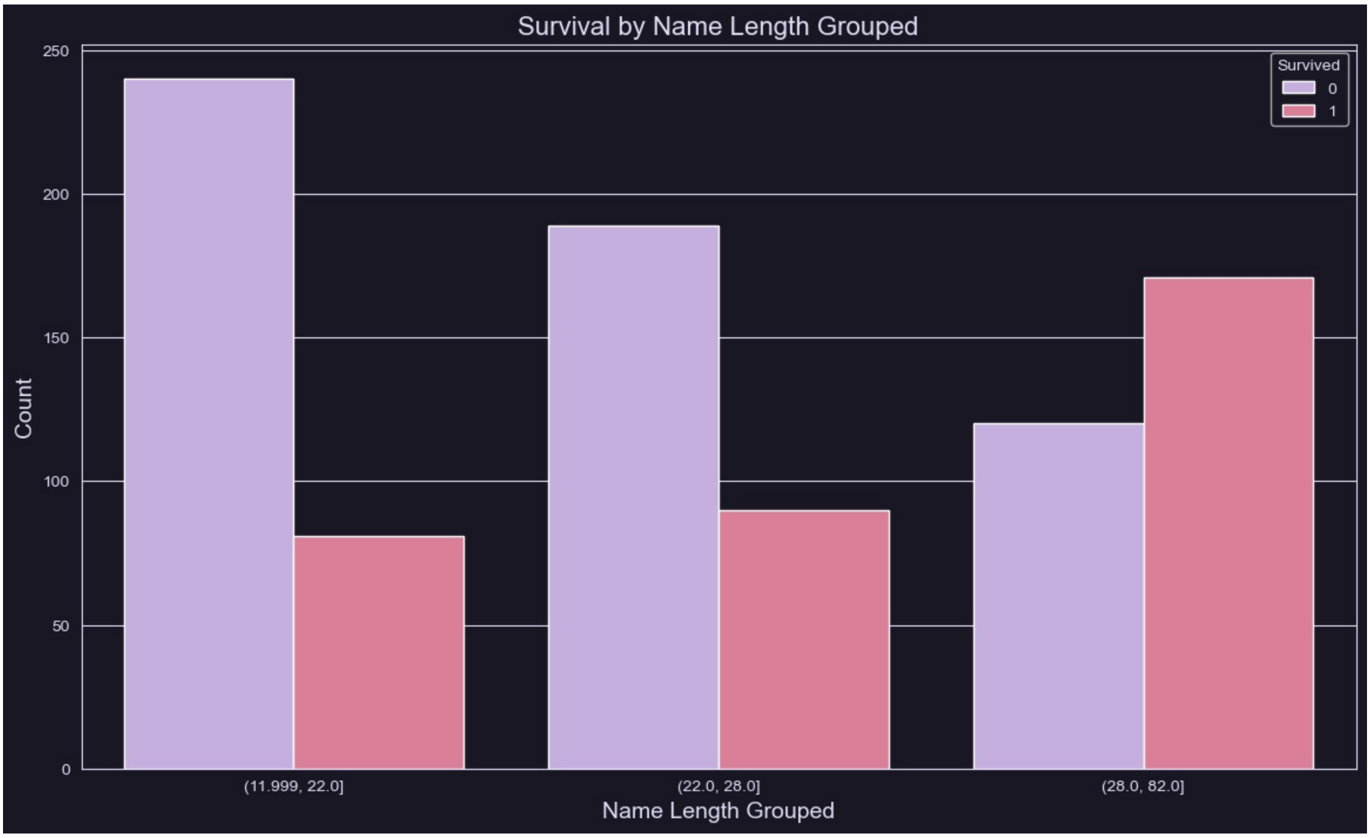
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3128971738.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(data=train_df, x='Cabin_Assigned', hue='Survived', palette=custom_palette)
```



In [268…

```
# Survival by Name Length Grouped
plt.figure(figsize=(14, 8))
sns.countplot(data=train_df, x='Name_LengthGB', hue='Survived', palette=custom_palette)
plt.title('Survival by Name Length Grouped', fontsize=16, color=rosepine_colors['foreground'])
plt.xlabel('Name Length Grouped', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```

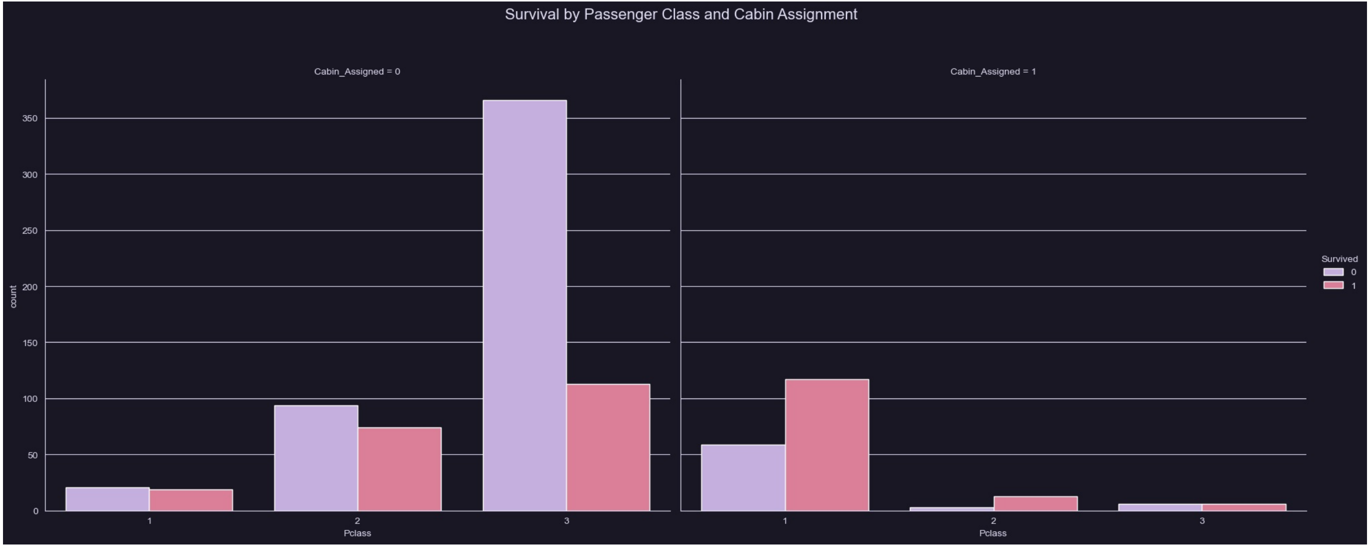
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\1042684205.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(data=train_df, x='Name_LengthGB', hue='Survived', palette=custom_palette)
```



In [270…

```
# Survival by Pclass and Cabin Assignment
plt.figure(figsize=(16, 8))
sns.catplot(data=train_df, x='Pclass', hue='Survived', col='Cabin_Assigned', kind='count', palette=custom_palet
plt.subplots_adjust(top=0.85)
plt.suptitle('Survival by Passenger Class and Cabin Assignment', fontsize=16, color=rosepine_colors['foreground
plt.show()
```

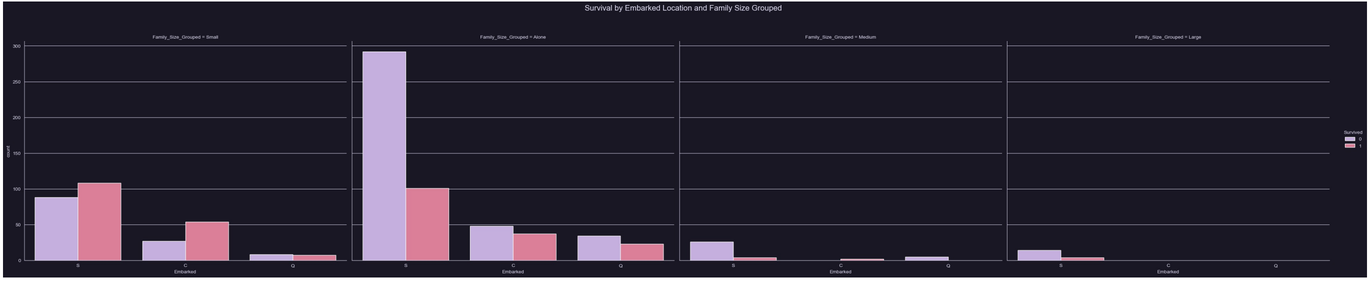
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3117503700.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.catplot(data=train_df, x='Pclass', hue='Survived', col='Cabin_Assigned', kind='count', palette=custom_pale
tte, height=8, aspect=1.2)
<Figure size 1600x800 with 0 Axes>
```



In [272…

```
# Survival by Embarked Location and Family Size Grouped
plt.figure(figsize=(16, 8))
sns.catplot(data=train_df, x='Embarked', hue='Survived', col='Family_Size_Grouped', kind='count', palette=custo
plt.subplots_adjust(top=0.85)
plt.suptitle('Survival by Embarked Location and Family Size Grouped', fontsize=16, color=rosepine_colors['foreg
plt.show()
```

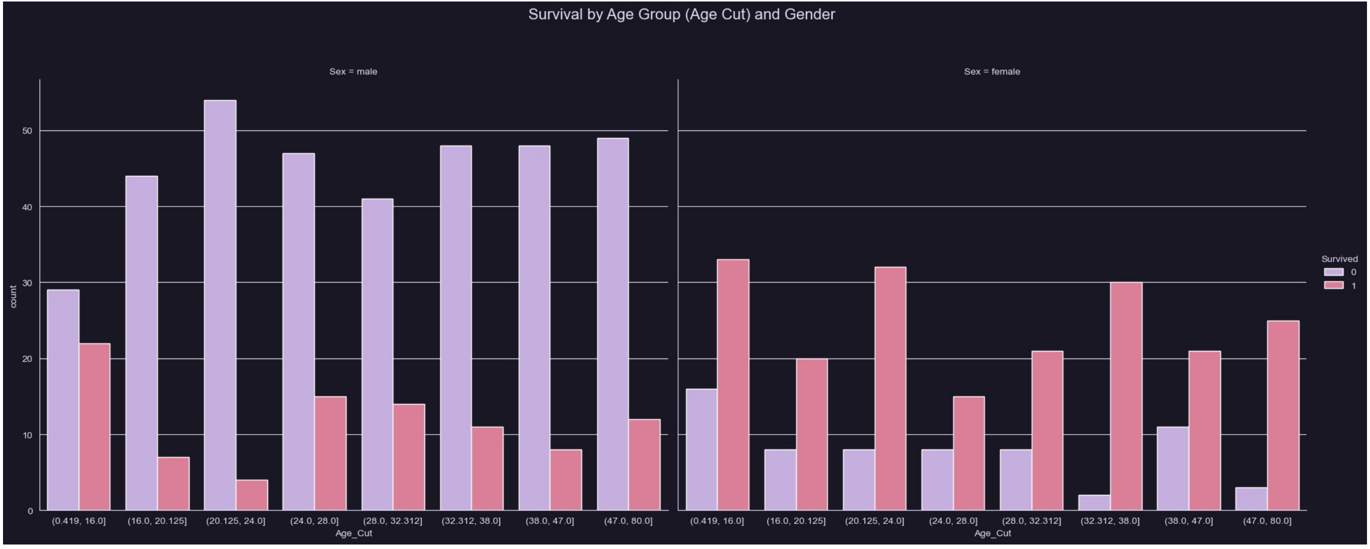
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\275370688.py:3: UserWarning: The palette list has more value
s (3) than needed (2), which may not be intended.
  sns.catplot(data=train_df, x='Embarked', hue='Survived', col='Family_Size_Grouped', kind='count', palette=cust
om_palette, height=8, aspect=1.2)
<Figure size 1600x800 with 0 Axes>
```



In [273…

```
# Survival by Age Cut and Gender
plt.figure(figsize=(16, 8))
sns.catplot(data=train_df, x='Age_Cut', hue='Survived', col='Sex', kind='count', palette=custom_palette, height
plt.subplots_adjust(top=0.85)
plt.suptitle('Survival by Age Group (Age Cut) and Gender', fontsize=16, color=rosepine_colors['foreground'])
plt.show()
```

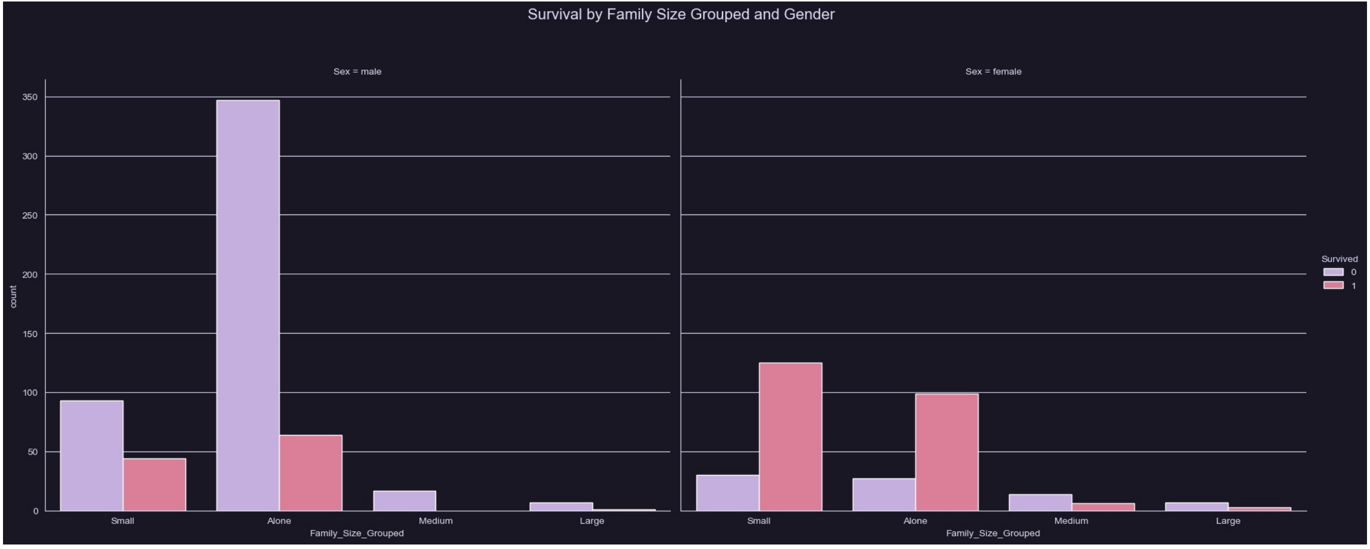
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\2537975102.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.catplot(data=train_df, x='Age_Cut', hue='Survived', col='Sex', kind='count', palette=custom_palette, heigh
t=8, aspect=1.2)
<Figure size 1600x800 with 0 Axes>
```



In [276…

```
# Survival by Family Size Grouped and Gender
plt.figure(figsize=(16, 8))
sns.catplot(data=train_df, x='Family_Size_Grouped', hue='Survived', col='Sex', kind='count', palette=custom_pale
plt.subplots_adjust(top=0.85)
plt.suptitle('Survival by Family Size Grouped and Gender', fontsize=16, color=rosepine_colors['foreground'])
plt.show()
```

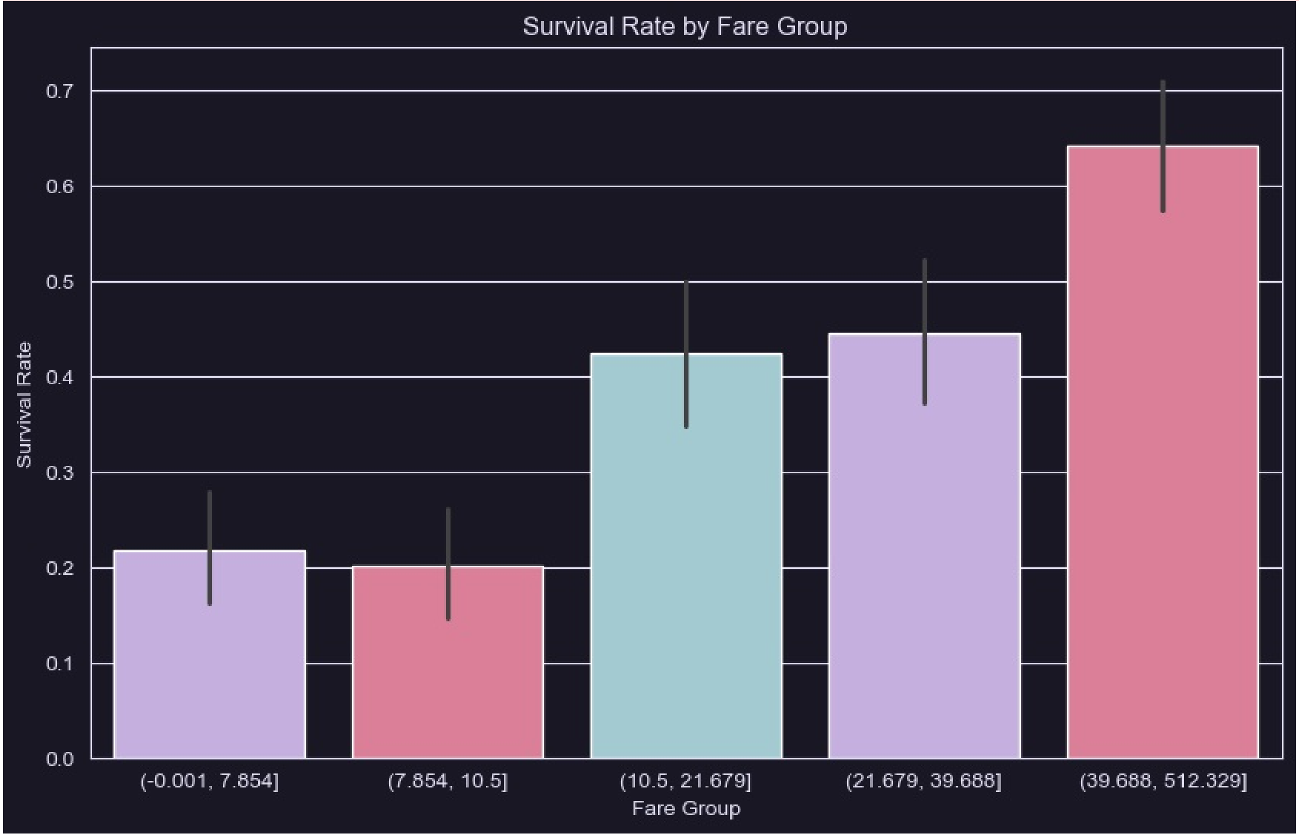
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\2831674548.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.catplot(data=train_df, x='Family_Size_Grouped', hue='Survived', col='Sex', kind='count', palette=custom_pa
lette, height=8, aspect=1.2)
<Figure size 1600x800 with 0 Axes>
```



In [282…

```
# Survival rate by Fare Group
plt.figure(figsize=(10, 6))
sns.barplot(x='Fare_Cut', y='Survived', data=train_df, palette=custom_palette)
plt.title('Survival Rate by Fare Group', color=rosepine_colors['foreground'])
plt.xlabel('Fare Group')
plt.ylabel('Survival Rate')
plt.show()
```

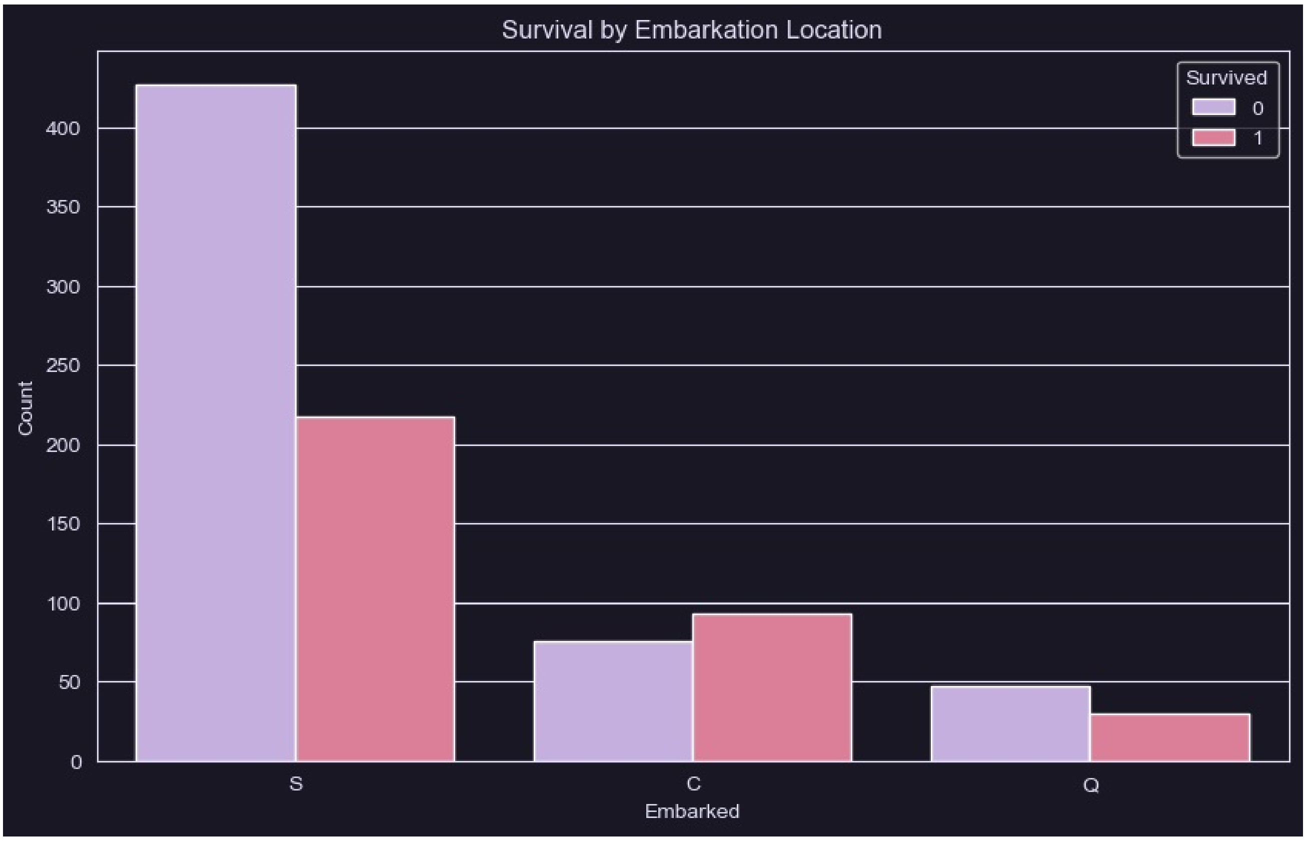
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3436550498.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable
to `hue` and set `legend=False` for the same effect.

  sns.barplot(x='Fare_Cut', y='Survived', data=train_df, palette=custom_palette)
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3436550498.py:3: UserWarning:
The palette list has fewer values (3) than needed (5) and will cycle, which may produce an uninterpretable plot.
  sns.barplot(x='Fare_Cut', y='Survived', data=train_df, palette=custom_palette)
```



In [284…

```
# Survival rate by Embarkation point
plt.figure(figsize=(10, 6))
sns.countplot(data=train_df, x='Embarked', hue='Survived', palette=custom_palette)
plt.title('Survival by Embarkation Location', color=rosepine_colors['foreground'])
plt.xlabel('Embarked')
plt.ylabel('Count')
plt.show()
```

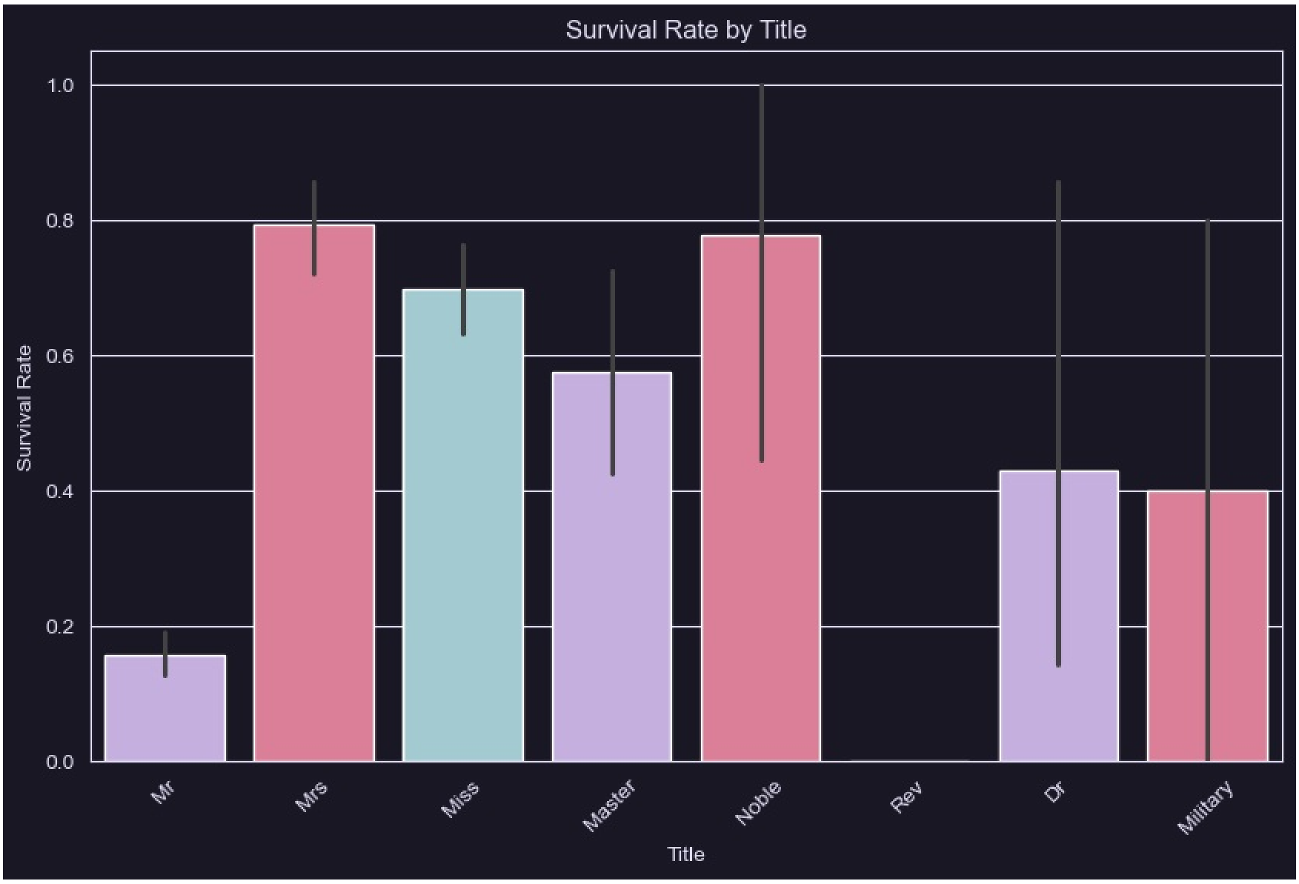
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3380855827.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(data=train_df, x='Embarked', hue='Survived', palette=custom_palette)
```



In [286…

```
# Survival rate by Title
plt.figure(figsize=(10, 6))
sns.barplot(x='Title', y='Survived', data=train_df, palette=custom_palette)
plt.title('Survival Rate by Title', color=rosepine_colors['foreground'])
plt.xlabel('Title')
plt.ylabel('Survival Rate')
plt.xticks(rotation=45)
plt.show()
```

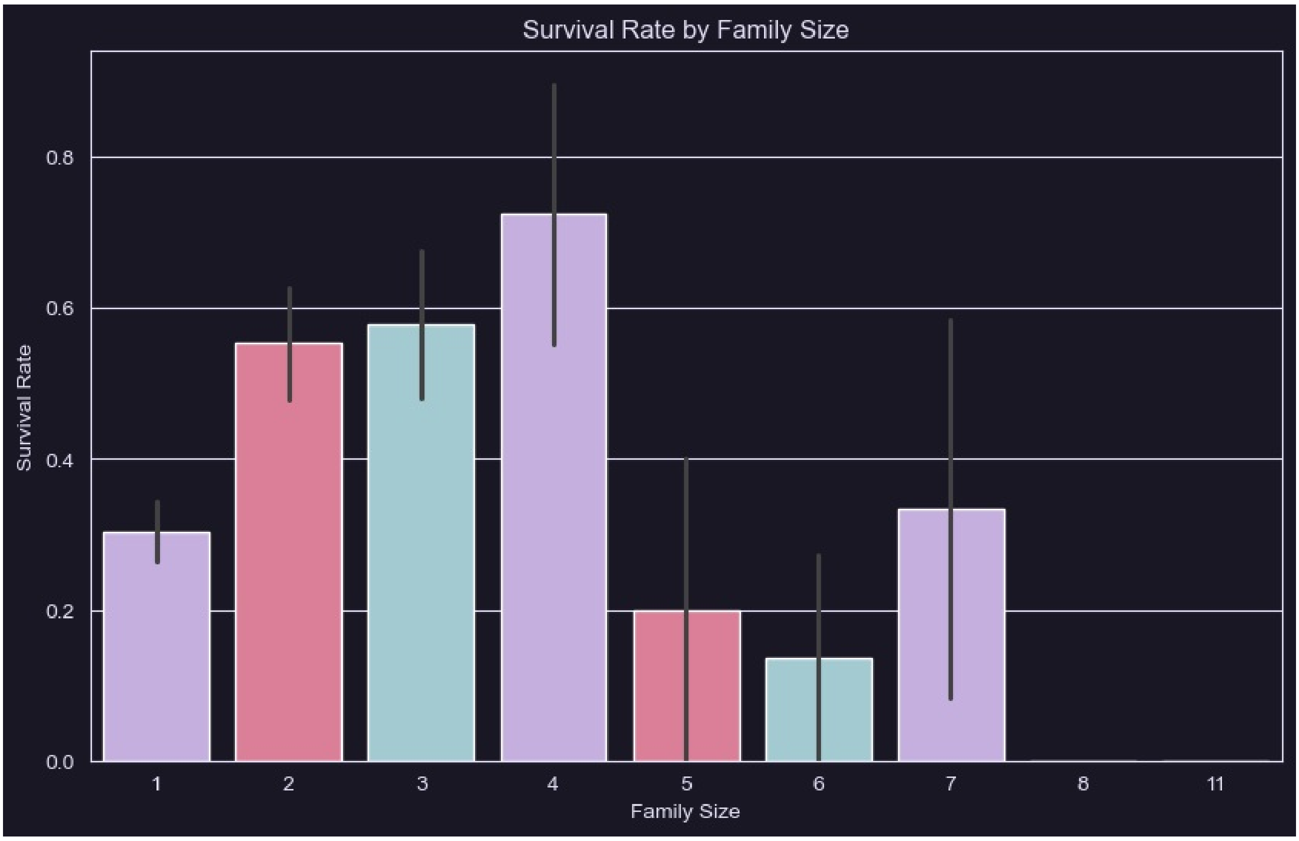
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3708922752.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable
to `hue` and set `legend=False` for the same effect.

  sns.barplot(x='Title', y='Survived', data=train_df, palette=custom_palette)
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3708922752.py:3: UserWarning:
The palette list has fewer values (3) than needed (8) and will cycle, which may produce an uninterpretable plot.
  sns.barplot(x='Title', y='Survived', data=train_df, palette=custom_palette)
```



In [288…

```
# Survival by Family Size
plt.figure(figsize=(10, 6))
sns.barplot(x='Family_Size', y='Survived', data=train_df, palette=custom_palette)
plt.title('Survival Rate by Family Size', color=rosepine_colors['foreground'])
plt.xlabel('Family Size')
plt.ylabel('Survival Rate')
plt.show()
```

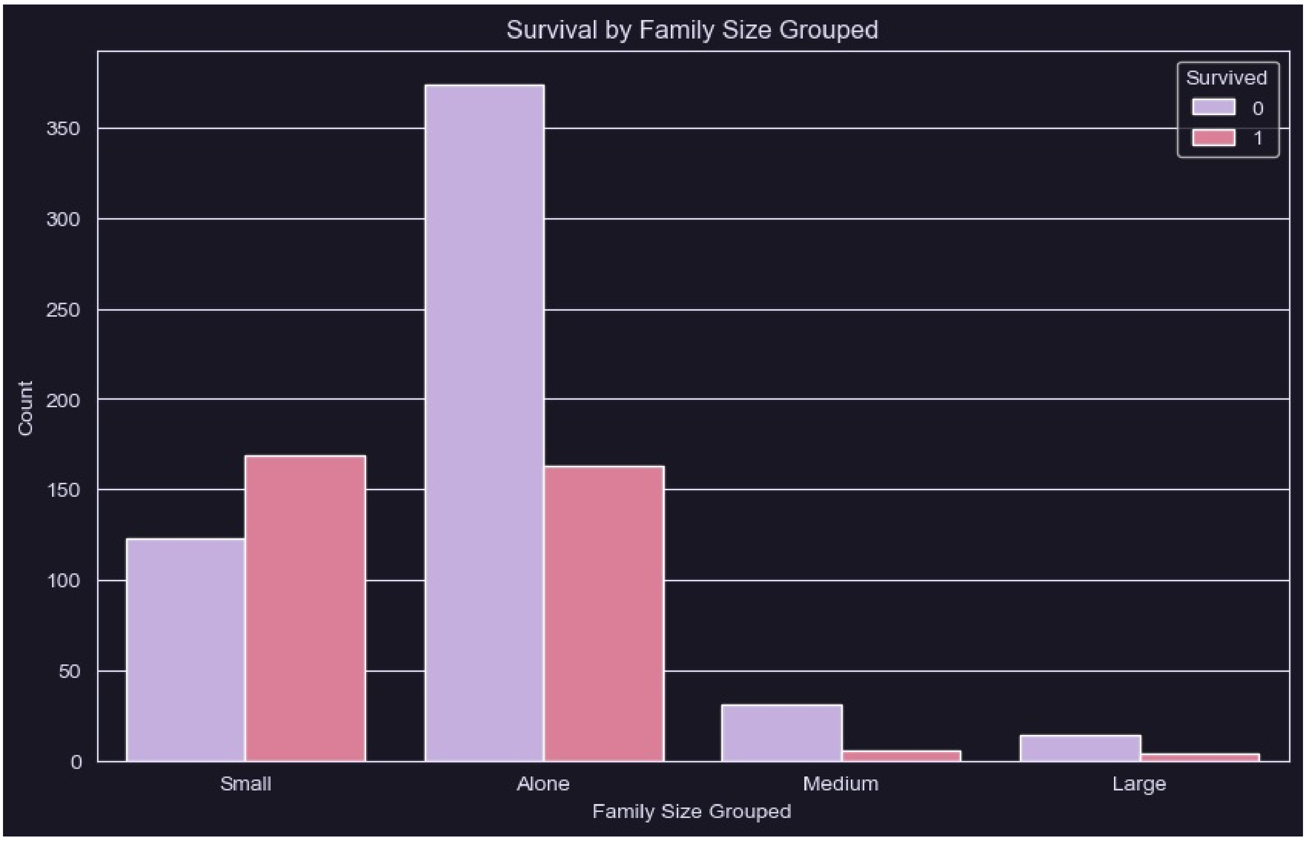
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3767261332.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable
to `hue` and set `legend=False` for the same effect.

  sns.barplot(x='Family_Size', y='Survived', data=train_df, palette=custom_palette)
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3767261332.py:3: UserWarning:
The palette list has fewer values (3) than needed (9) and will cycle, which may produce an uninterpretable plot.
  sns.barplot(x='Family_Size', y='Survived', data=train_df, palette=custom_palette)
```



In [290…

```
# Survival by Family Size Grouped
plt.figure(figsize=(10, 6))
sns.countplot(x='Family_Size_Grouped', hue='Survived', data=train_df, palette=custom_palette)
plt.title('Survival by Family Size Grouped', color=rosepine_colors['foreground'])
plt.xlabel('Family Size Grouped')
plt.ylabel('Count')
plt.show()
```

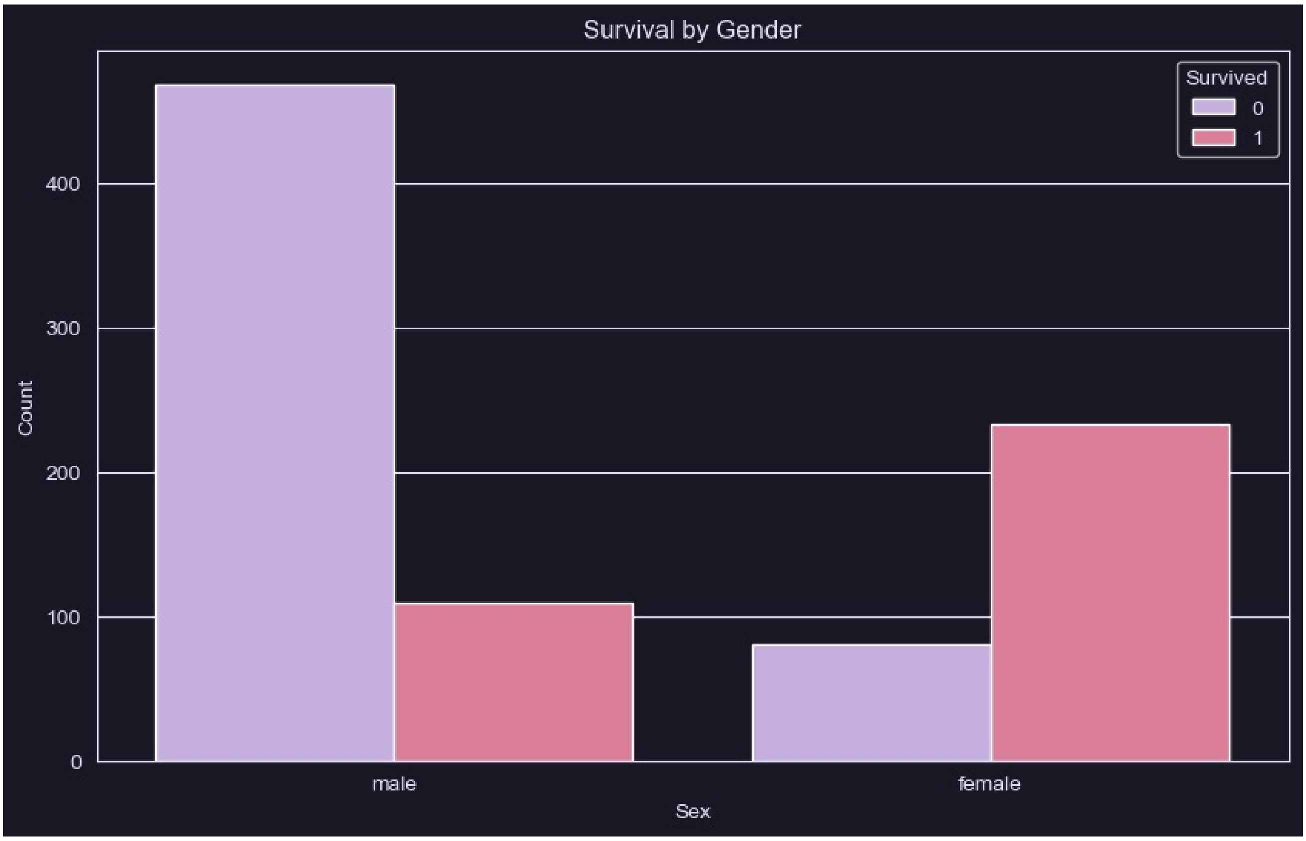
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3530841514.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(x='Family_Size_Grouped', hue='Survived', data=train_df, palette=custom_palette)
```



In [292…

```
# Survival by Gender
plt.figure(figsize=(10, 6))
sns.countplot(data=train_df, x='Sex', hue='Survived', palette=custom_palette)
plt.title('Survival by Gender', color=rosepine_colors['foreground'])
plt.xlabel('Sex')
plt.ylabel('Count')
plt.show()
```

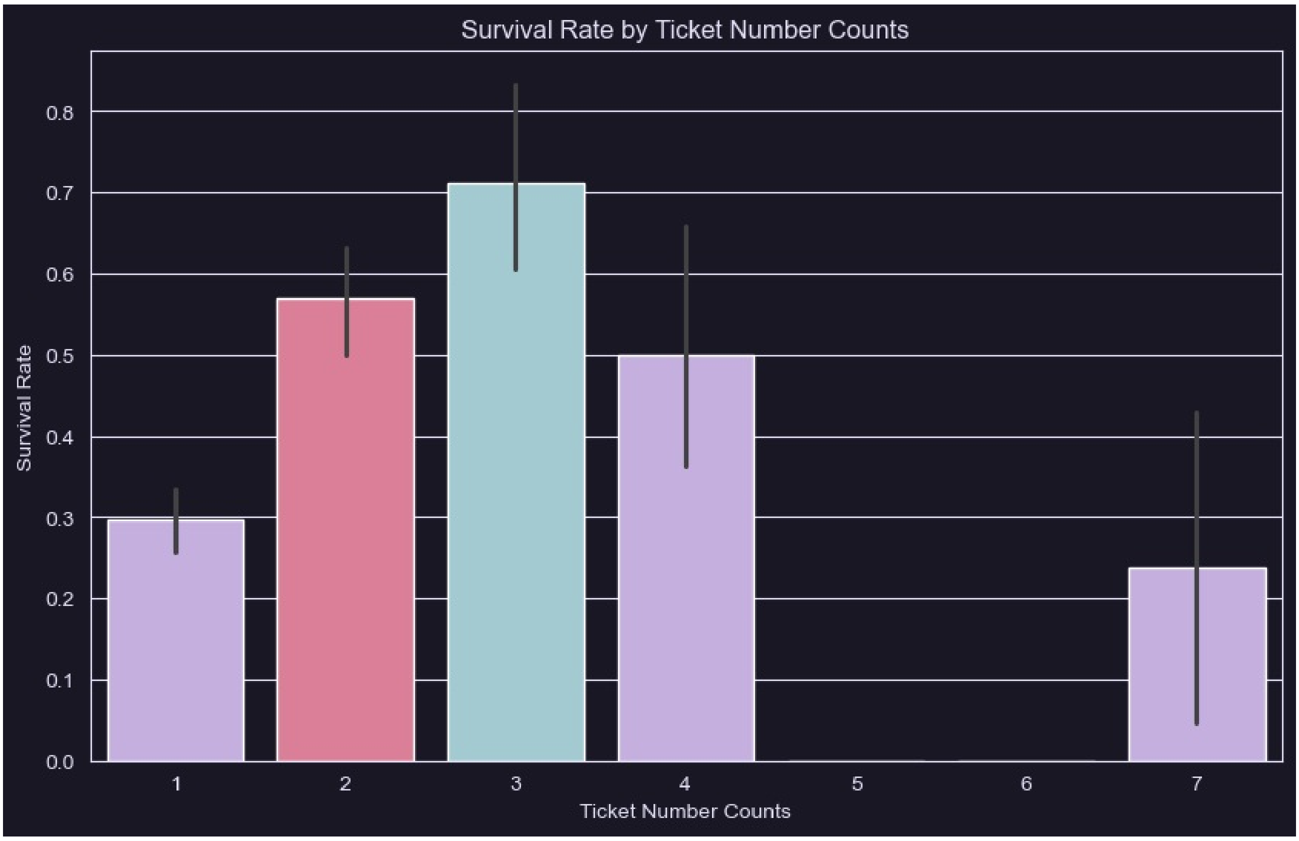
```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\3594287259.py:3: UserWarning: The palette list has more valu
es (3) than needed (2), which may not be intended.
  sns.countplot(data=train_df, x='Sex', hue='Survived', palette=custom_palette)
```



In [294…

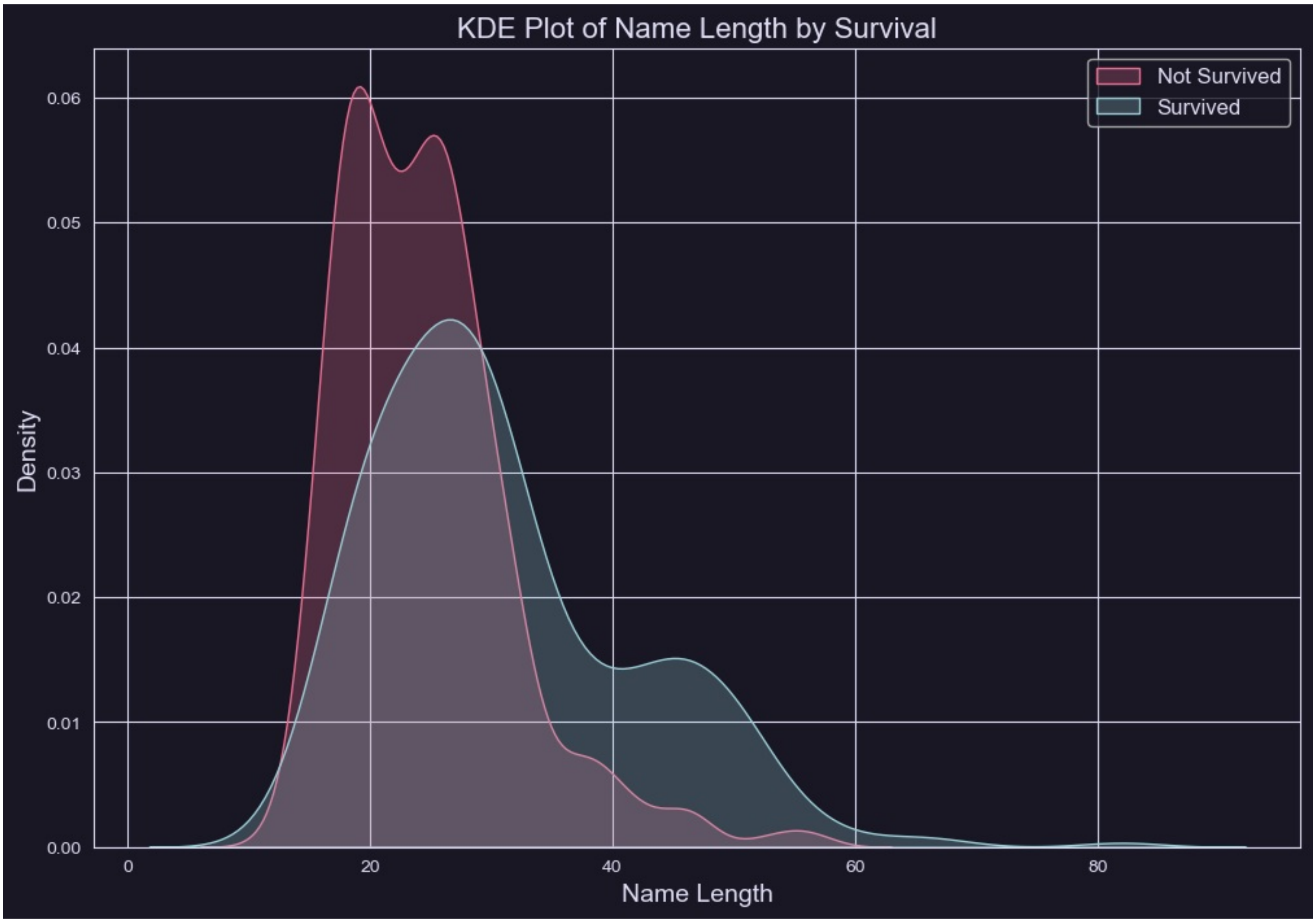
```
# Survival by Ticket Number Counts
plt.figure(figsize=(10, 6))
sns.barplot(x='TicketNumberCounts', y='Survived', data=train_df, palette=custom_palette)
plt.title('Survival Rate by Ticket Number Counts', color=rosepine_colors['foreground'])
plt.xlabel('Ticket Number Counts')
plt.ylabel('Survival Rate')
plt.show()
```

```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\4278457340.py:3: FutureWarning: 

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable
to `hue` and set `legend=False` for the same effect.

  sns.barplot(x='TicketNumberCounts', y='Survived', data=train_df, palette=custom_palette)
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_20724\4278457340.py:3: UserWarning: 
The palette list has fewer values (3) than needed (7) and will cycle, which may produce an uninterpretable plot.
  sns.barplot(x='TicketNumberCounts', y='Survived', data=train_df, palette=custom_palette)
```



In [304…

```
plt.figure(figsize=(12, 8))  # Adjusted the figure size for better visibility

# Plot for passengers who did not survive
g = sns.kdeplot(
    train_df['Name_Length'][(train_df['Survived'] == 0) & (train_df['Name_Length'].notnull())],
    color=rosepine_colors['muted'], fill=True, label='Not Survived'
)

# Plot for passengers who survived
g = sns.kdeplot(
    train_df['Name_Length'][(train_df['Survived'] == 1) & (train_df['Name_Length'].notnull())],
    color=rosepine_colors['accent'], fill=True, label='Survived'
)

# Customizing labels and title
g.set_xlabel('Name Length', fontsize=14, color=rosepine_colors['foreground'])
g.set_ylabel('Density', fontsize=14, color=rosepine_colors['foreground'])
g.set_title('KDE Plot of Name Length by Survival', fontsize=16, color=rosepine_colors['foreground'])

# Setting the legend
g.legend(['Not Survived', 'Survived'], loc='upper right', fontsize=12)

# Show the plot
plt.show()
```



In [56]:
```
train_df['Age'].fillna(train_df['Age'].mean(), inplace=True)
test_df['Age'].fillna(test_df['Age'].mean(), inplace=True)
test_df['Fare'].fillna(test_df['Fare'].mean(), inplace=True)
```

```
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_1696\623714052.py:1: FutureWarning: A value is trying to be set on
a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on w
hich we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)'
or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.


  train_df['Age'].fillna(train_df['Age'].mean(), inplace=True)
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_1696\623714052.py:2: FutureWarning: A value is trying to be set on
a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on w
hich we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)'
or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.


  test_df['Age'].fillna(test_df['Age'].mean(), inplace=True)
C:\Users\Sarvamm\AppData\Local\Temp\ipykernel_1696\623714052.py:3: FutureWarning: A value is trying to be set on
a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on w
hich we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)'
or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.


  test_df['Fare'].fillna(test_df['Fare'].mean(), inplace=True)
```

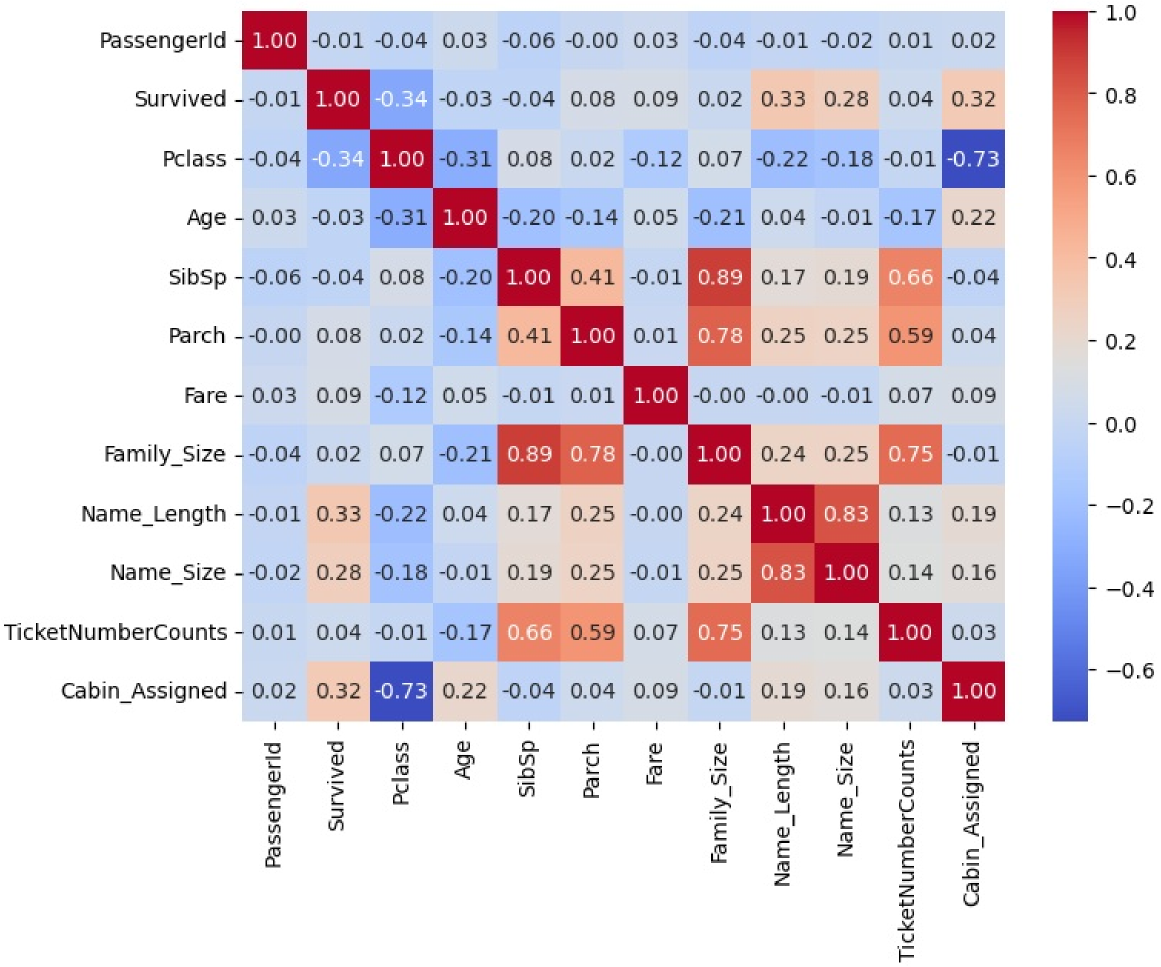
In [57]:
```
ohe = OneHotEncoder(sparse_output=False)
ode = OrdinalEncoder
SI = SimpleImputer(strategy='most_frequent')
```

In [58]:
```
ode_cols = ['Family_Size_Grouped']
ohe_cols = ['Sex', 'Embarked']
```

In [59]:
```
correlation_matrix = train_df.corr(numeric_only=True)

# Create a heatmap using Seaborn
```

```
plt.figure(figsize=(8, 6))  # Adjust the figure size as needed
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f")
```

Out[59]: <Axes: >



In [60]:
```
X = train_df.drop(['Survived', 'SibSp', 'Parch'], axis=1)
y = train_df['Survived']
X_test = test_df.drop(['Age_Cut', 'Fare_Cut', 'SibSp', 'Parch'], axis=1)
```

In [61]:
```
X_train, X_valid, y_train, y_valid = train_test_split(X, y, test_size=0.2, stratify = y, random_state=21)
```

In [62]:
```
ordinal_pipeline = Pipeline(steps=[
    ('impute', SimpleImputer(strategy='most_frequent')),
    ('ord', OrdinalEncoder(handle_unknown='use_encoded_value', unknown_value=-1))
])
```

In [63]:
```
ohe_pipeline = Pipeline(steps=[
    ('impute', SimpleImputer(strategy='most_frequent')),
    ('one-hot', OneHotEncoder(handle_unknown = 'ignore', sparse_output=False))
])
```

In [64]:
```
col_trans = ColumnTransformer(transformers=[
    ('impute', SI, ['Age']),
    ('ord_pipeline', ordinal_pipeline, ode_cols),
    ('ohe_pipeline', ohe_pipeline, ohe_cols),
   # ('passthrough', 'passthrough', ['Pclass', 'TicketNumberCounts', 'Cabin_Assigned', 'Name_Size', 'Age', 'Fare
     ('passthrough', 'passthrough', ['Pclass', 'Cabin_Assigned', 'Name_Size', 'Age', 'Fare', 'TicketNumberCount
    ],
    remainder='drop',
    n_jobs=-1)
```

In [65]:
```
rfc = RandomForestClassifier()
```

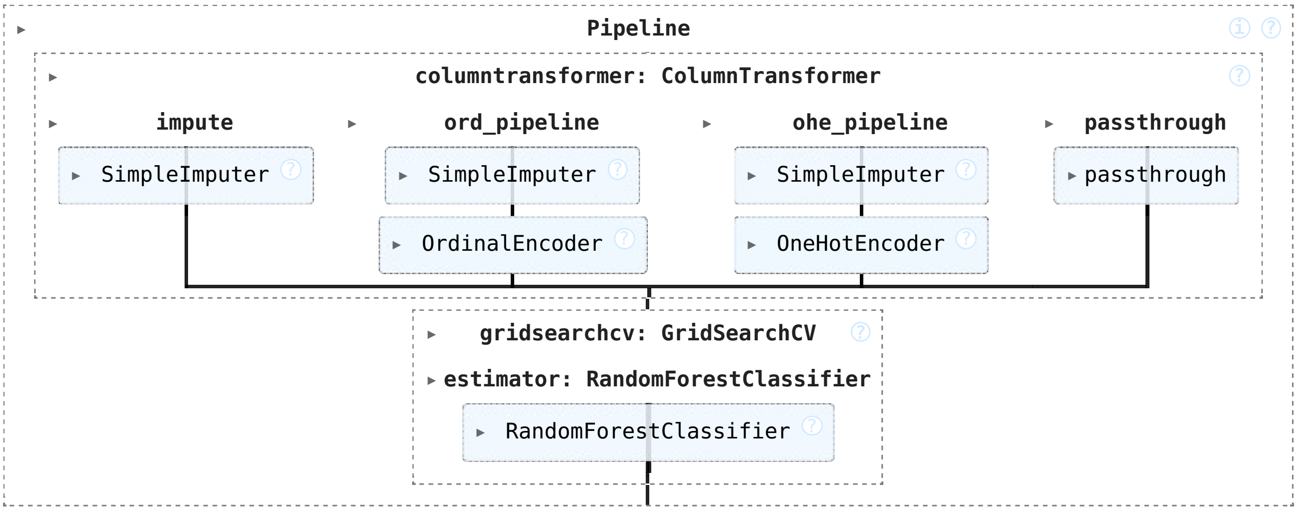
In [66]:
```
param_grid = {
    'n_estimators': [150, 200, 300, 500],
    'min_samples_split': [5, 10, 15],
    'max_depth': [10, 13, 15, 17, 20],
    'min_samples_leaf': [2, 4, 5, 6],
    'criterion': ['gini', 'entropy'],
}
```

In [67]:
```
CV_rfc = GridSearchCV(estimator=rfc, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [68]:

```
pipefinalrfc = make_pipeline(col_trans, CV_rfc)
pipefinalrfc.fit(X_train, y_train)
```

Out[68]:



In [69]:

```
print(CV_rfc.best_params_)
print(CV_rfc.best_score_)
```

```
{'criterion': 'entropy', 'max_depth': 10, 'min_samples_leaf': 2, 'min_samples_split': 15, 'n_estimators': 150}
0.8272136314389836
```

In [70]:

```
dtc = DecisionTreeClassifier()
```

In [71]:

```
param_grid = {
    'min_samples_split': [5, 10, 15],
    'max_depth': [10, 20, 30],
    'min_samples_leaf': [1, 2, 4],
    'criterion': ['gini', 'entropy'],
}
```

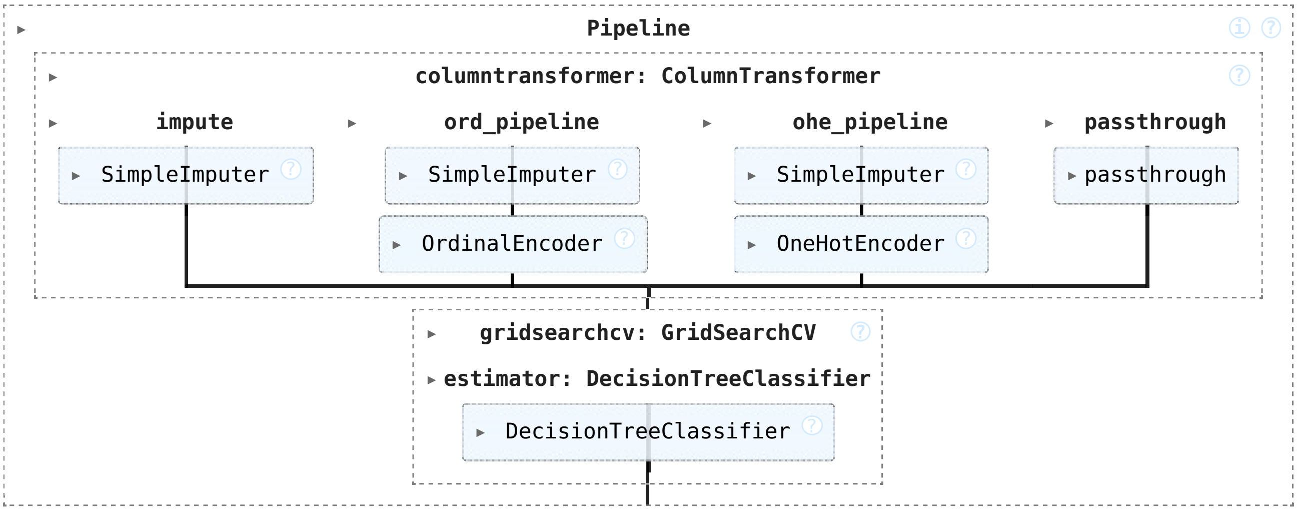
In [72]:

```
CV_dtc = GridSearchCV(estimator=dtc, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [73]:

```
pipefinaldtc = make_pipeline(col_trans, CV_dtc)
pipefinaldtc.fit(X_train, y_train)
```

Out[73]:



In [74]:

```
print(CV_dtc.best_params_)
print(CV_dtc.best_score_)
```

```
{'criterion': 'entropy', 'max_depth': 20, 'min_samples_leaf': 4, 'min_samples_split': 10}
0.8075642667191962
```

In [75]:

```
knn = KNeighborsClassifier()
```

In [76]:

```
param_grid = {
    'n_neighbors': [3, 5, 7, 9, 11],
    'weights': ['uniform', 'distance'],
    'algorithm': ['auto', 'ball_tree', 'kd_tree', 'brute'],
    'p': [1,2],
}
```

In [77]:

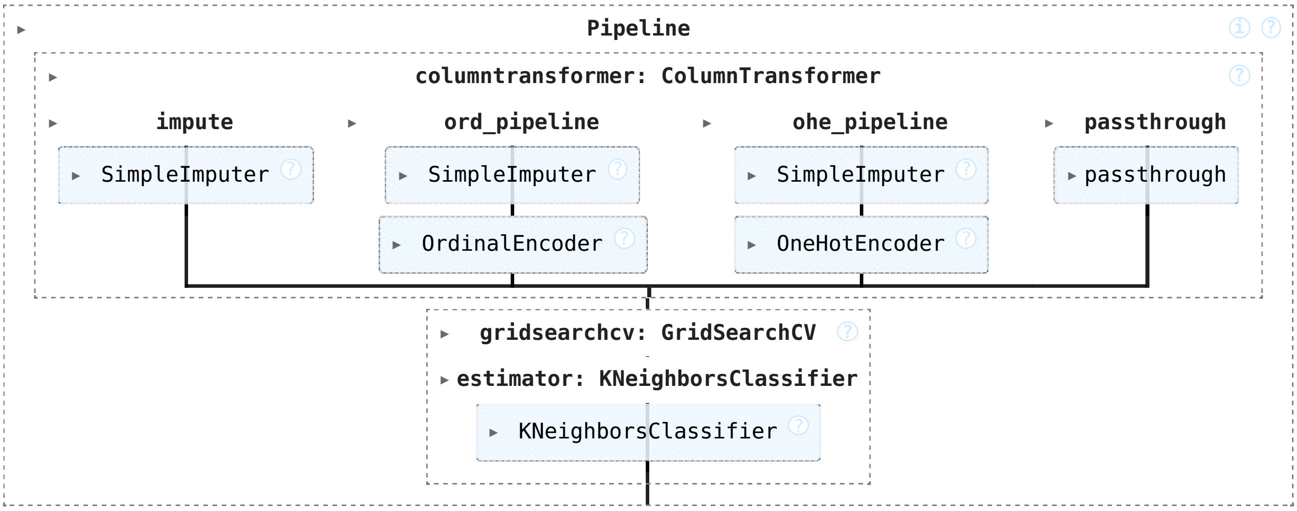
```
CV_knn = GridSearchCV(estimator=knn, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [78]:

```
pipefinalknn = make_pipeline(col_trans, CV_knn)
```

```
pipefinalknn.fit(X_train, y_train)
```

Out[78]:



In [79]:

```
print(CV_knn.best_params_)
print(CV_knn.best_score_)
```

```
{'algorithm': 'brute', 'n_neighbors': 11, 'p': 1, 'weights': 'uniform'}
0.8047572146163695
```

In [80]:

```
svc = SVC(probability=True)
```

In [81]:

```
param_grid = {
    'C': [100,10, 1.0, 0.1, 0.001, 0.001],
    'kernel':['linear', 'poly', 'rbf', 'sigmoid'],
}
```

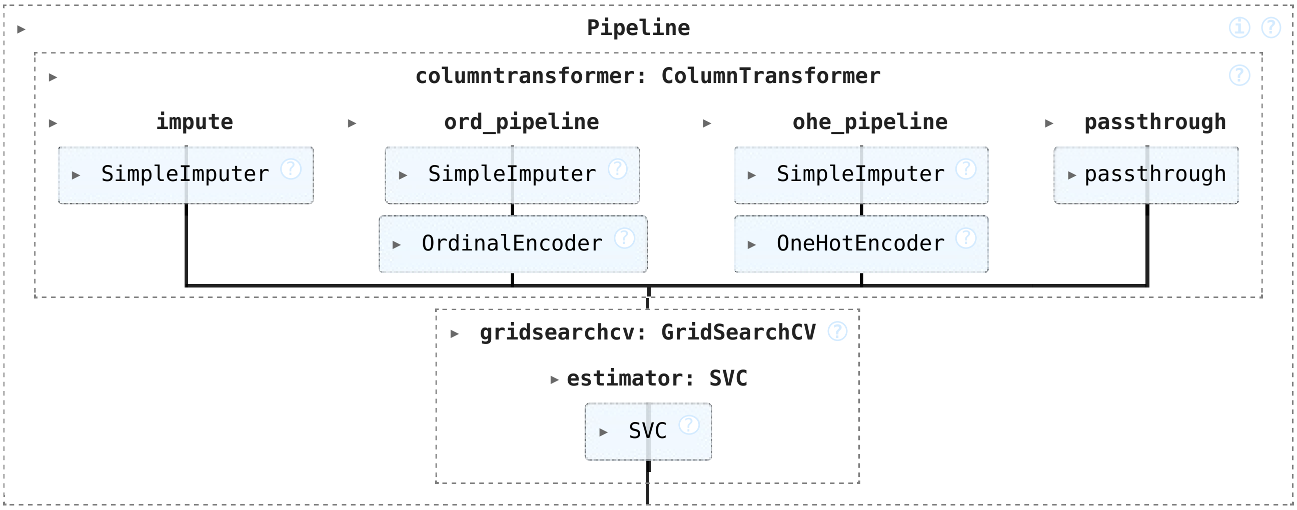
In [82]:

```
CV_svc = GridSearchCV(estimator=svc, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [83]:

```
pipefinalsvc = make_pipeline(col_trans, CV_svc)
pipefinalsvc.fit(X_train, y_train)
```

Out[83]:



In [84]:

```
print(CV_svc.best_params_)
print(CV_svc.best_score_)
```

```
{'C': 10, 'kernel': 'rbf'}
0.8005614104205654
```

In [85]:

```
lr = LogisticRegression()
```

In [86]:

```
param_grid = {
    'C': [100,10, 1.0, 0.1, 0.001, 0.001],
}
```

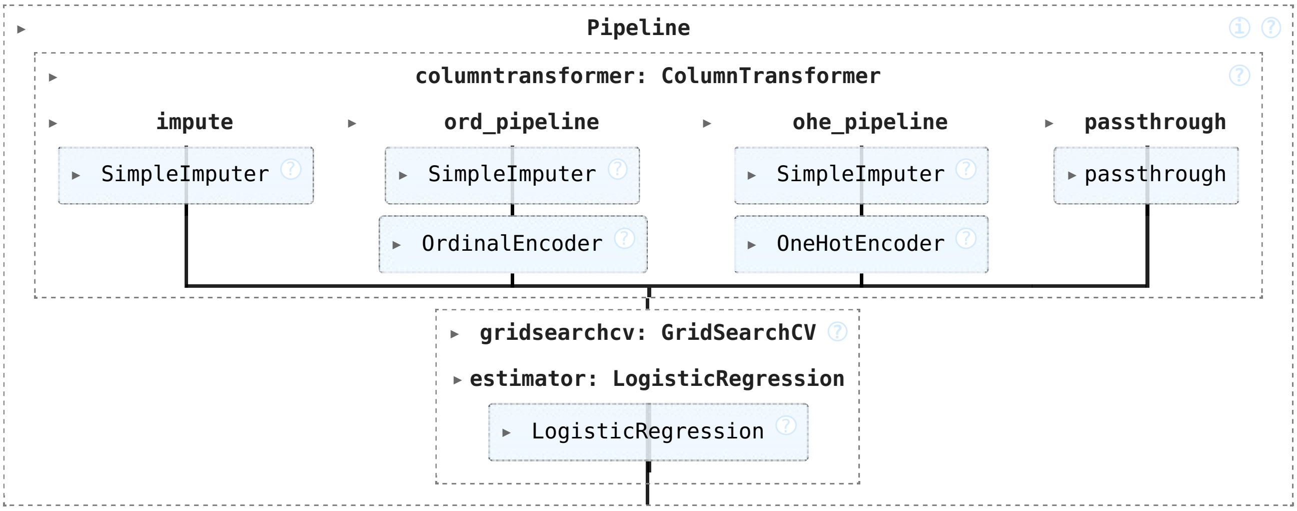
In [87]:

```
CV_lr = GridSearchCV(estimator=lr, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [88]:

```
pipefinallr= make_pipeline(col_trans, CV_lr)
pipefinallr.fit(X_train, y_train)
```

Out[88]:



```
In [89]: print(CV_lr.best_params_)
         print(CV_lr.best_score_)
```

```
{'C': 0.1}
0.8047867625332413
```

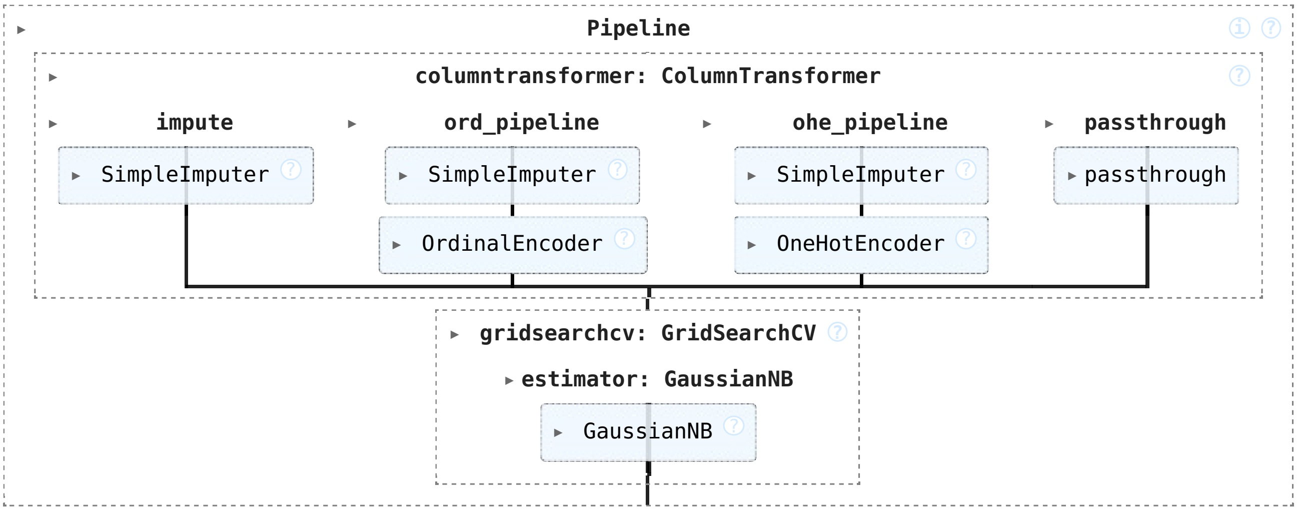
```
In [90]: gnb = GaussianNB()
```

```
In [91]: param_grid = {
             'var_smoothing': [0.00000001, 0.000000001, 0.00000001],
         }
```

```
In [92]: CV_gnb = GridSearchCV(estimator=gnb, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

```
In [93]: pipefinalgnb= make_pipeline(col_trans, CV_gnb)
         pipefinalgnb.fit(X_train, y_train)
```

Out[93]:



```
In [94]: print(CV_gnb.best_params_)
         print(CV_gnb.best_score_)
```

```
{'var_smoothing': 1e-08}
0.7654781837880429
```

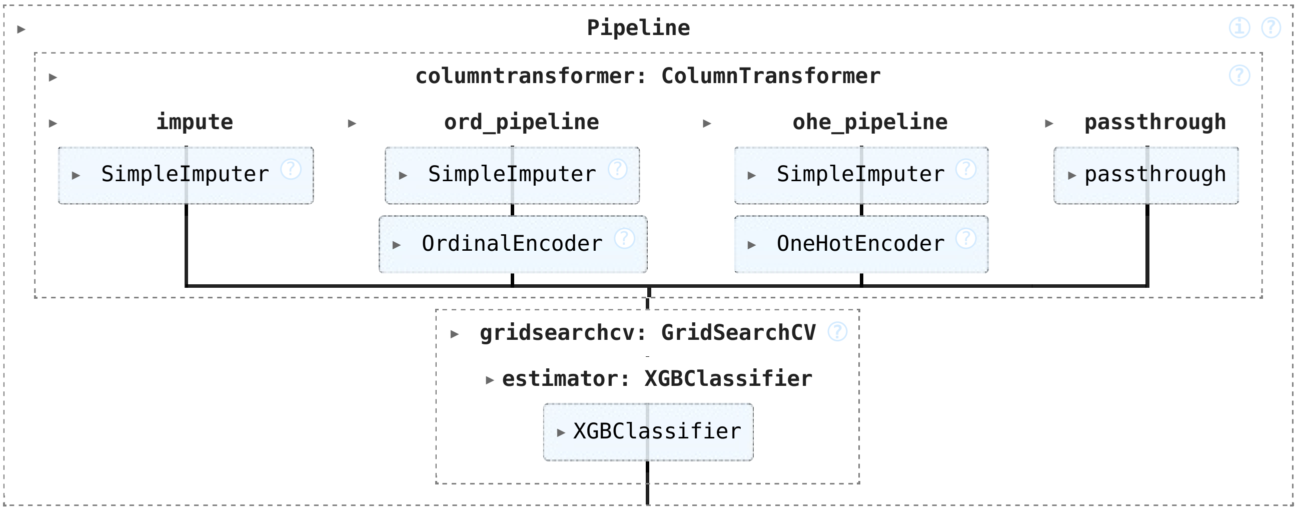
```
In [95]: xg = XGBClassifier()
```

```
In [96]: param_grid = {
              'booster': ['gbtree', 'gblinear','dart'],
         }
```

```
In [97]: CV_xg = GridSearchCV(estimator=xg, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

```
In [98]: pipefinalxg= make_pipeline(col_trans, CV_xg)
         pipefinalxg.fit(X_train, y_train)
```

Out[98]:



In [99]:

```
print(CV_xg.best_params_)
print(CV_xg.best_score_)
```

```
{'booster': 'gblinear'}
0.8019600118191667
```

In [100…

```
abc = AdaBoostClassifier()
```

In [101…

```
dtc_2 = DecisionTreeClassifier(criterion = 'entropy', max_depth=10,min_samples_leaf=4, min_samples_split=10)
svc_2 = SVC(probability=True, C=10, kernel='rbf')
lr_2 = LogisticRegression(C=0.1)
lr_3 = LogisticRegression(C=0.2)
lr_4 = LogisticRegression(C=0.05)
```

In [102…

```
param_grid = {
    'estimator': [dtc_2, svc_2, lr_2],
    'n_estimators':  [5, 10, 25, 50, 100],
    'algorithm': ['SAMME', 'SAMME.R'],
    'learning_rate': [(0.97 + x / 100) for x in range(1, 7)]
}
```

In [103…

```
CV_abc = GridSearchCV(estimator=abc, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [104…

```
etc = ExtraTreesClassifier()
```

In [105…

```
param_grid = {
              "max_features": [1, 3, 10],
              "min_samples_split": [2, 3, 10],
              "min_samples_leaf": [1, 3, 10],
              "n_estimators" :[100,300],
}
```

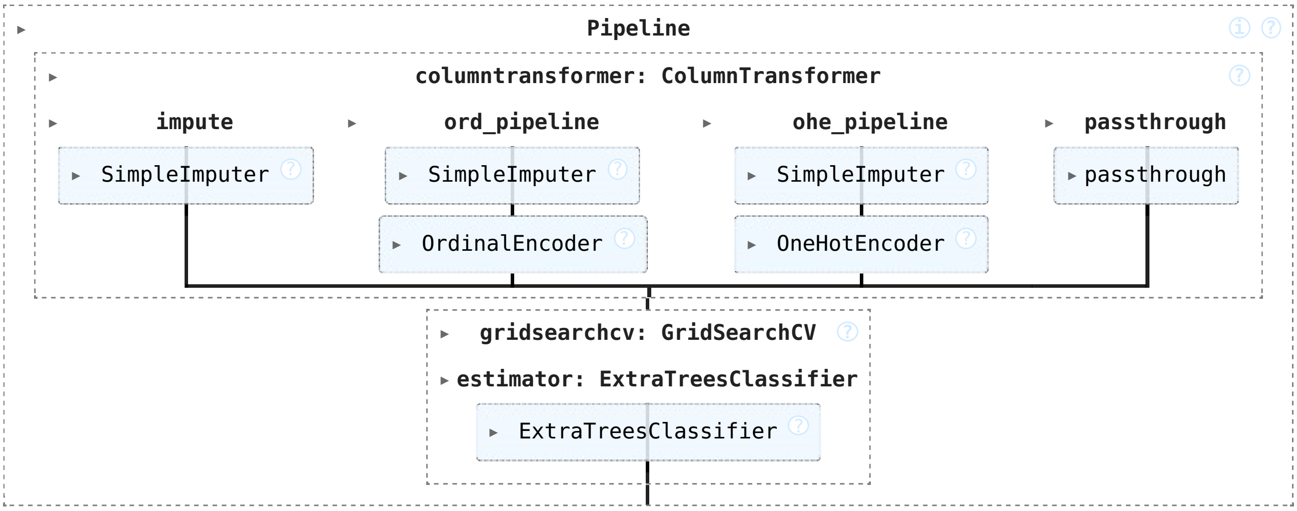
In [106…

```
CV_etc = GridSearchCV(estimator=etc, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [107…

```
pipefinaletc= make_pipeline(col_trans, CV_etc)
pipefinaletc.fit(X_train, y_train)
```

Out[107…



In [108…

```
print(CV_etc.best_params_)
print(CV_etc.best_score_)
```

```
{'max_features': 3, 'min_samples_leaf': 3, 'min_samples_split': 2, 'n_estimators': 100}
0.8132276174529695
```

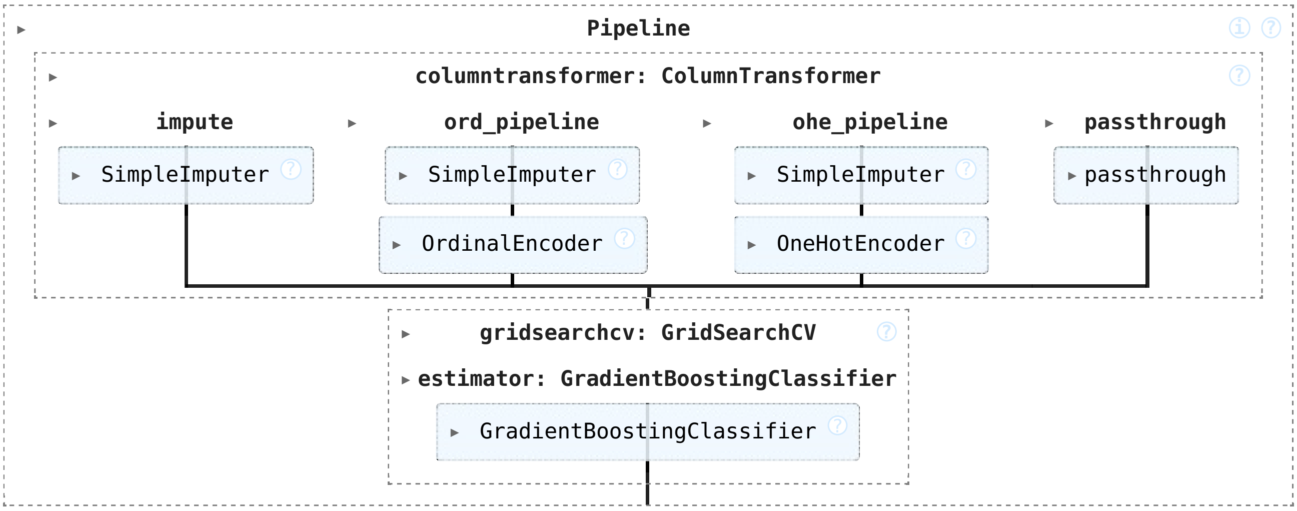
In [109…
```
GBC = GradientBoostingClassifier()
```

In [110…
```
param_grid = {
              'n_estimators' : [300, 400, 500],
              'learning_rate': [ 0.1, 0.3, 0.6, 1.0],
              'max_depth': [8, 10, 12],
              'min_samples_leaf': [50, 100, 120, 150],
              'max_features': [0.1, 0.3, 0.5]
              }
```

In [111…
```
CV_gbc = GridSearchCV(estimator=GBC, param_grid=param_grid, cv=StratifiedKFold(n_splits=5))
```

In [112…
```
pipefinalgbc= make_pipeline(col_trans, CV_gbc)
pipefinalgbc.fit(X_train, y_train)
```

Out[112…



In [113…
```
print(CV_gbc.best_params_)
print(CV_gbc.best_score_)
```

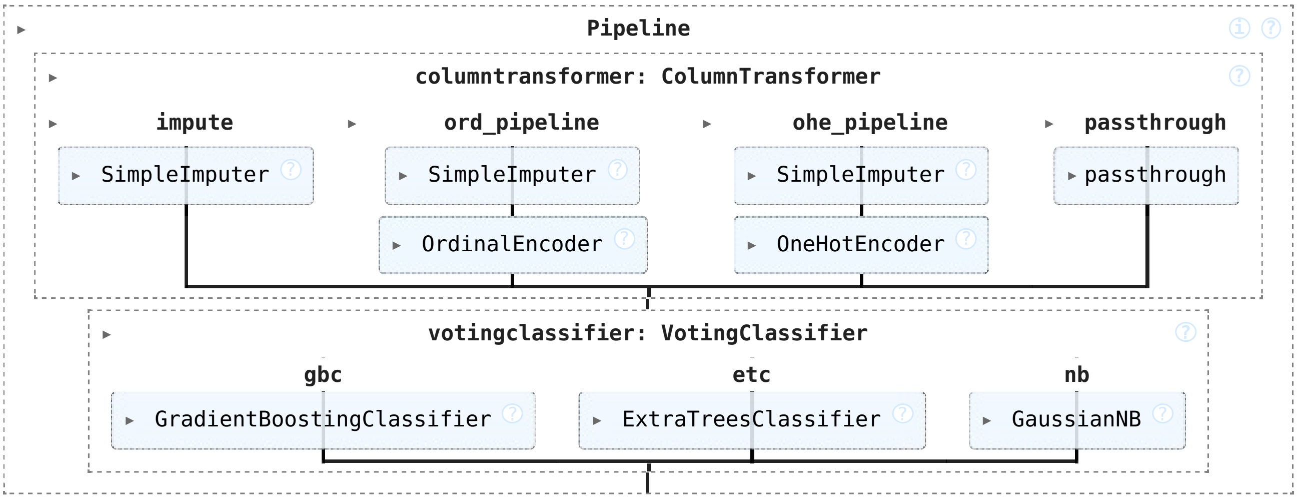
```
{'learning_rate': 0.6, 'max_depth': 12, 'max_features': 0.3, 'min_samples_leaf': 100, 'n_estimators': 400}
0.8286713286713286
```

In [114…
```
vc1 = VotingClassifier([('gbc', CV_gbc.best_estimator_),
                         ('etc', CV_etc.best_estimator_),
                           ('nb', CV_gnb.best_estimator_)
                          ], voting='hard', weights=[1,2,3] )
```

In [124…
```
pipefinalcv1 = make_pipeline(col_trans, vc1)
```

In [126…
```
pipefinalcv1.fit(X_train, y_train)
```

Out[126…



In [130…
```
Y_pred = pipefinalrfc.predict(X_test)
Y_pred2 = pipefinaldtc.predict(X_test)
Y_pred3 = pipefinalknn.predict(X_test)
Y_pred4 = pipefinalsvc.predict(X_test)
Y_pred5 = pipefinallr.predict(X_test)
Y_pred6 = pipefinalgnb.predict(X_test)
Y_pred7 = pipefinalxg.predict(X_test)
Y_pred8 = pipefinalabc.predict(X_test)
Y_pred9 = pipefinaletc.predict(X_test)
```

```
Y_pred10 = pipefinalgbc.predict(X_test)
Y_pred11 = pipefinalcv1.predict(X_test)
Y_pred12 = pipefinalcv2.predict(X_test)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[130], line 8
      6 Y_pred6 = pipefinalgnb.predict(X_test)
      7 Y_pred7 = pipefinalxg.predict(X_test)
----> 8 Y_pred8 = pipefinalabc.predict(X_test)
      9 Y_pred9 = pipefinaletc.predict(X_test)
     10 Y_pred10 = pipefinalgbc.predict(X_test)

NameError: name 'pipefinalabc' is not defined
```

In [142…

```
submission = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred
})

submission2 = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred2
})

submission3 = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred3
})

submission4 = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred4
})

submission5 = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred5
})

submission6 = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred6
})

submission7 = pd.DataFrame({
    'PassengerId': test_df['PassengerId'],
    'Survived': Y_pred7
})
```

In [144…

```
submission.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic1.csv', index=False)
submission2.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic2.csv', index=False)
submission3.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic3.csv', index=False)
submission4.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic4.csv', index=False)
submission5.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic5.csv', index=False)
submission6.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic6.csv', index=False)
submission7.to_csv('C:/Users/Sarvamm/Documents/Projects/Titanic/titanic7.csv', index=False)
```

In [ ]: