titanic

June 21, 2024

[6]:

```python
# Import necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split, GridSearchCV
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix

# Load dataset
df = sns.load_dataset('titanic')

# EDA: Data Overview
print(df.head())
print(df.info())
print(df.describe())

# EDA: Missing Values
plt.figure(figsize=(10, 6))
sns.heatmap(df.isnull(), cbar=False, cmap='viridis')
plt.title('Missing Values in Titanic Dataset')
plt.show()

# EDA: Categorical Variables
plt.figure(figsize=(12, 6))
sns.countplot(x='survived', data=df)
plt.title('Count of Survived vs. Not Survived')
plt.show()

plt.figure(figsize=(12, 6))
sns.countplot(x='pclass', hue='survived', data=df)
plt.title('Survival Count by Passenger Class')
plt.show()

plt.figure(figsize=(12, 6))
sns.countplot(x='sex', hue='survived', data=df)
plt.title('Survival Count by Gender')
```

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plt.show()

plt.figure(figsize=(12, 6))
sns.boxplot(x='survived', y='age', data=df)
plt.title('Age Distribution by Survival')
plt.show()

# EDA: Pair Plot
sns.pairplot(df.dropna(), hue='survived', vars=['age', 'fare', 'pclass',
 ↪'sibsp', 'parch'])
plt.show()

# Feature Engineering
# Fill missing values
df['age'].fillna(df['age'].median(), inplace=True)
df['embarked'].fillna(df['embarked'].mode()[0], inplace=True)

# Add 'Unknown' category to 'deck' and fill missing values
df['deck'] = df['deck'].cat.add_categories('Unknown')
df['deck'].fillna('Unknown', inplace=True)

# Convert categorical variables to numerical
df = pd.get_dummies(df, columns=['sex', 'embarked', 'deck', 'class', 'who',
 ↪'adult_male', 'embark_town', 'alive', 'alone'], drop_first=True)

# Drop irrelevant columns
#df.drop(columns=['passenger_id', 'name', 'ticket', 'fare'], inplace=True)

# Split dataset into features and target variable
X = df.drop(columns=['survived'])
y = df['survived']

# Train-test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
 ↪random_state=42)

# Hyperparameter tuning using GridSearchCV
param_grid = {
    'n_estimators': [100, 200, 300],
    'max_features': ['auto', 'sqrt', 'log2'],
    'max_depth': [4, 6, 8],
    'criterion': ['gini', 'entropy']
}

rf = RandomForestClassifier(random_state=42)
grid_search = GridSearchCV(estimator=rf, param_grid=param_grid, cv=5,
 ↪n_jobs=-1, verbose=2)
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```python
grid_search.fit(X_train, y_train)

print(f'Best Parameters: {grid_search.best_params_}')

# Train model with best parameters
best_rf = grid_search.best_estimator_
best_rf.fit(X_train, y_train)

# Predict and evaluate
y_pred = best_rf.predict(X_test)
print(classification_report(y_test, y_pred))

# Confusion Matrix
plt.figure(figsize=(8, 6))
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True, fmt='d', cmap='Blues')
plt.title('Confusion Matrix')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.show()
```

```
   survived  pclass     sex   age  sibsp  parch     fare embarked  class  \
0         0       3    male  22.0      1      0   7.2500        S  Third
1         1       1  female  38.0      1      0  71.2833        C  First
2         1       3  female  26.0      0      0   7.9250        S  Third
3         1       1  female  35.0      1      0  53.1000        S  First
4         0       3    male  35.0      0      0   8.0500        S  Third

     who  adult_male deck  embark_town alive  alone
0    man        True  NaN  Southampton    no  False
1  woman       False    C    Cherbourg   yes  False
2  woman       False  NaN  Southampton   yes   True
3  woman       False    C  Southampton   yes  False
4    man        True  NaN  Southampton    no   True
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   survived     891 non-null    int64
 1   pclass       891 non-null    int64
 2   sex          891 non-null    object
 3   age          714 non-null    float64
 4   sibsp        891 non-null    int64
 5   parch        891 non-null    int64
 6   fare         891 non-null    float64
 7   embarked     889 non-null    object
 8   class        891 non-null    category
```

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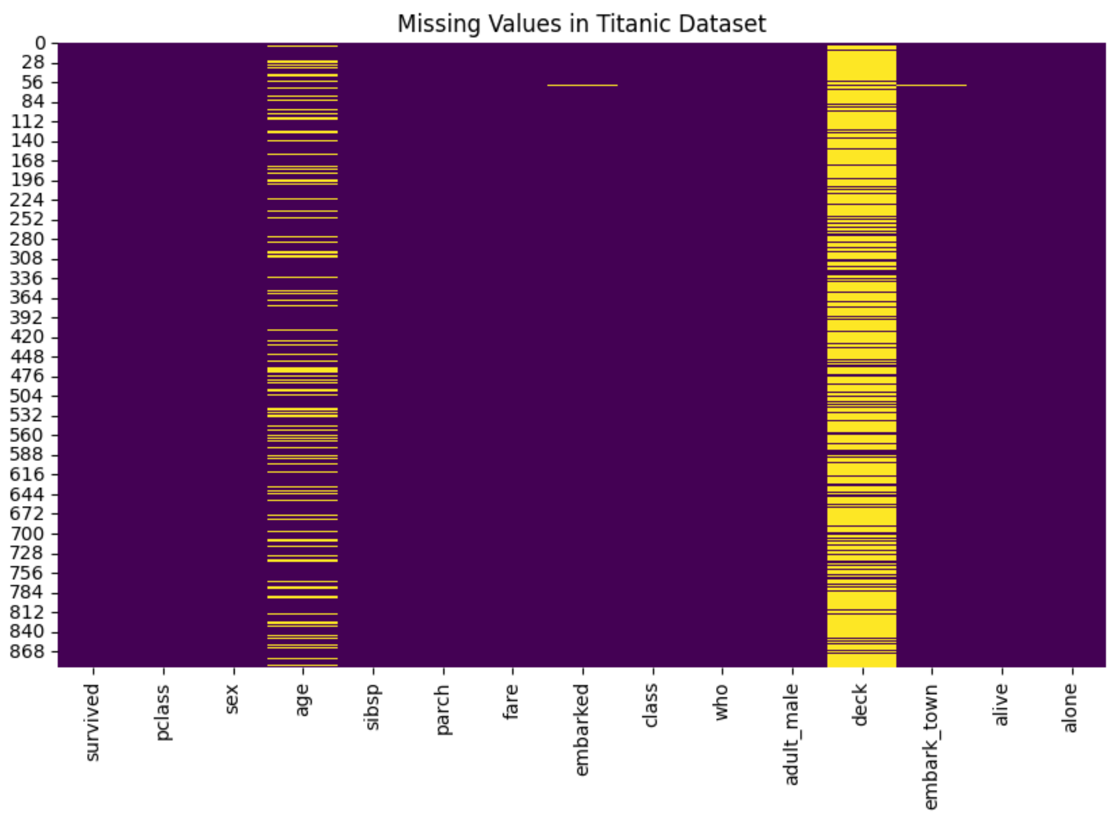
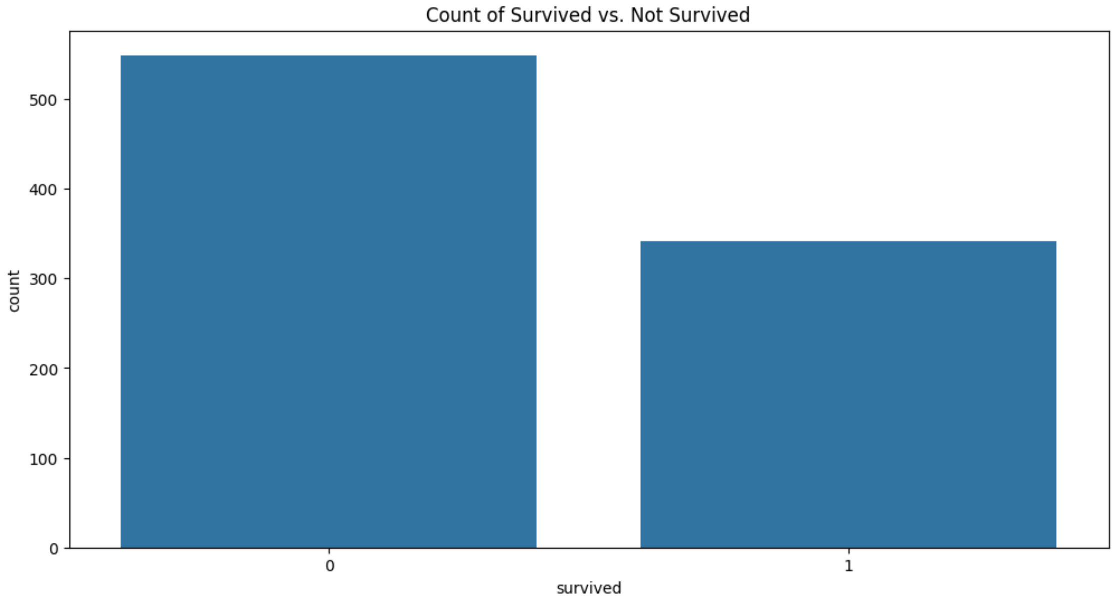
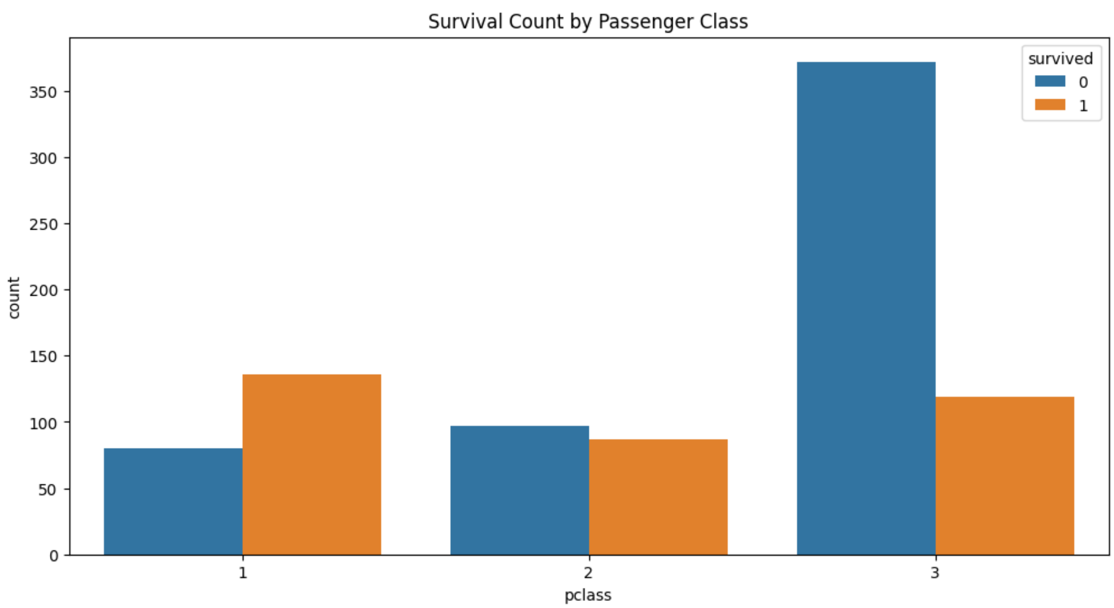
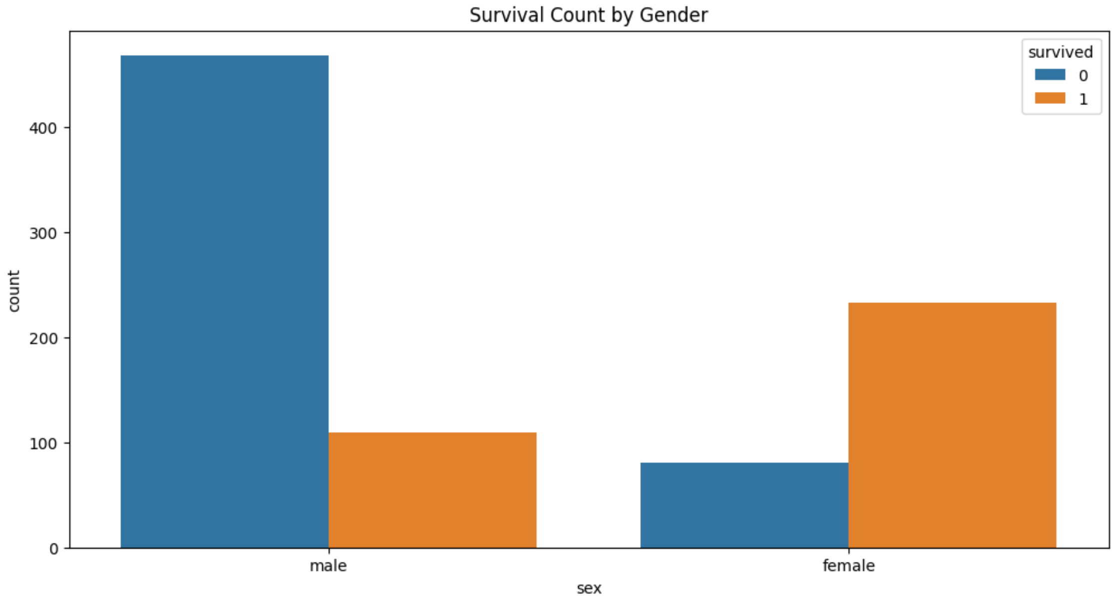
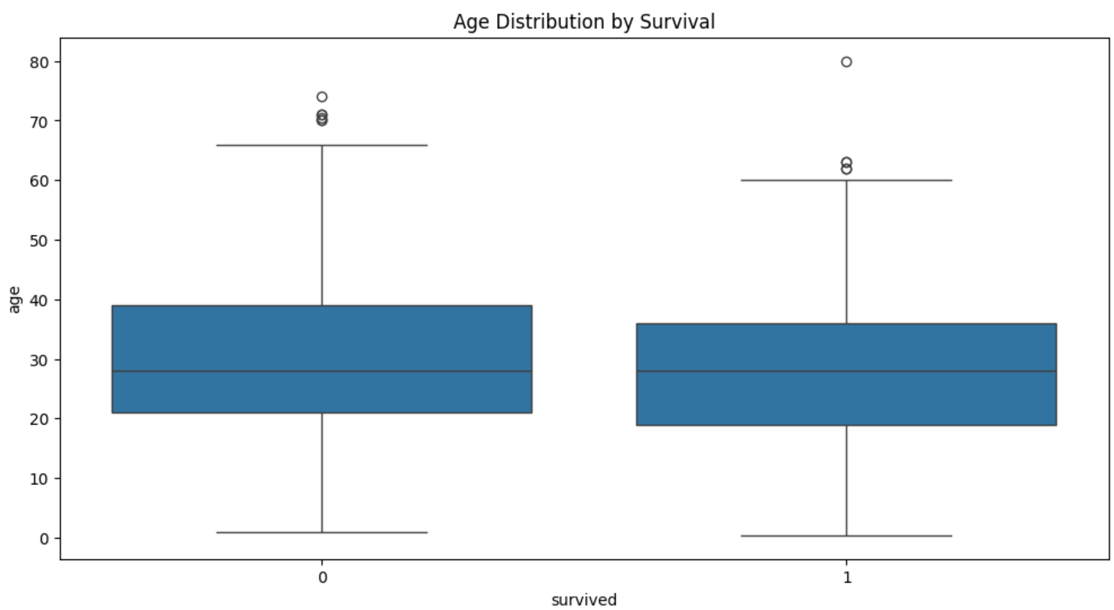
 9   who          891 non-null    object
 10  adult_male   891 non-null    bool
 11  deck         203 non-null    category
 12  embark_town  889 non-null    object
 13  alive        891 non-null    object
 14  alone        891 non-null    bool
dtypes: bool(2), category(2), float64(2), int64(4), object(5)
memory usage: 80.7+ KB
None
         survived      pclass         age       sibsp       parch        fare
count  891.000000  891.000000  714.000000  891.000000  891.000000  891.000000
mean     0.383838    2.308642   29.699118    0.523008    0.381594   32.204208
std      0.486592    0.836071   14.526497    1.102743    0.806057   49.693429
min      0.000000    1.000000    0.420000    0.000000    0.000000    0.000000
25%      0.000000    2.000000   20.125000    0.000000    0.000000    7.910400
50%      0.000000    3.000000   28.000000    0.000000    0.000000   14.454200
75%      1.000000    3.000000   38.000000    1.000000    0.000000   31.000000
max      1.000000    3.000000   80.000000    8.000000    6.000000  512.329200
```

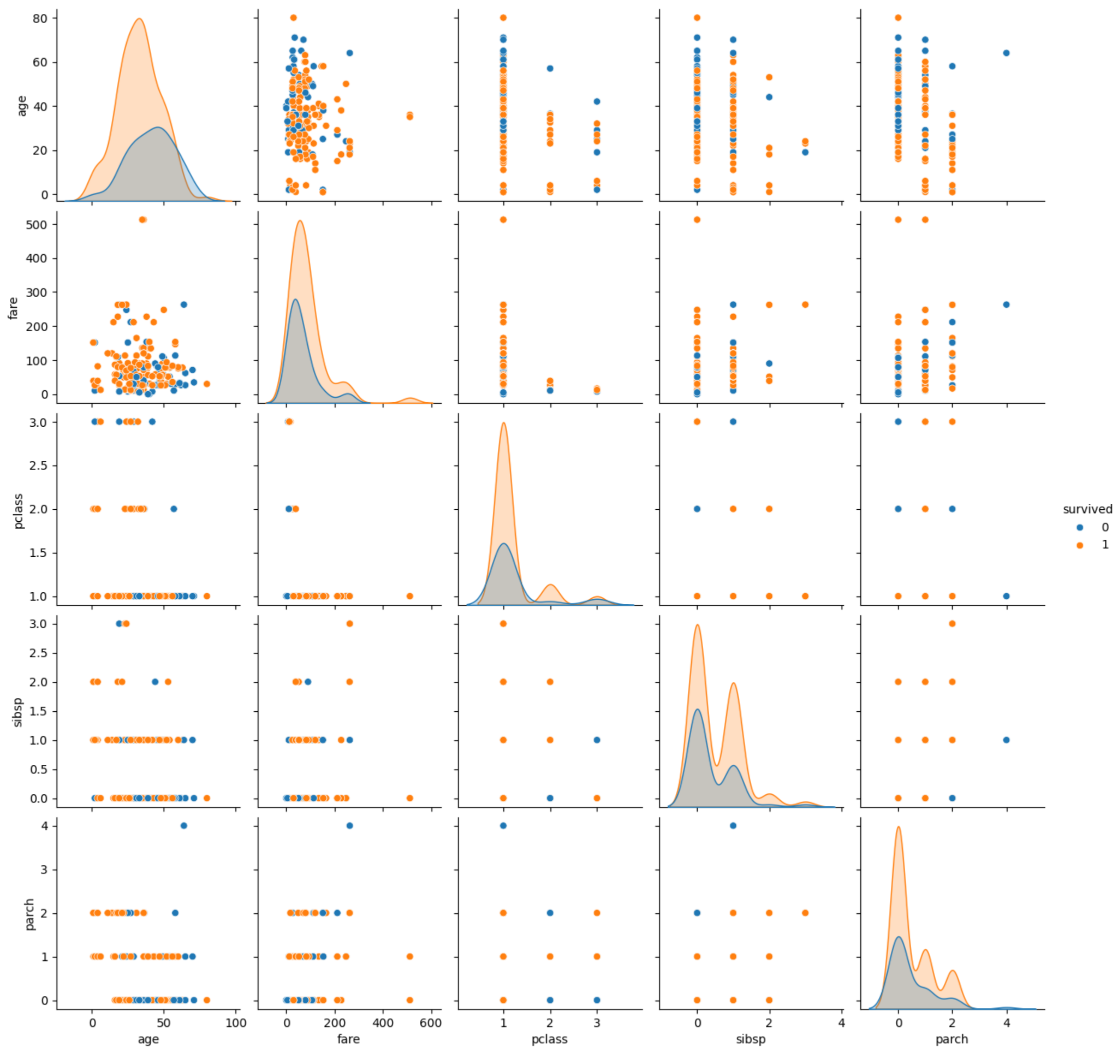



Count of Survived vs. Not Survived
count
500
400
300
200
100
0
0
1
survived


Survival Count by Passenger Class
count
350
300
250
200
150
100
50
0
1
2
3
pclass
survived
0
1


Survival Count by Gender
survived
0
1
400
300
200
100
0
count
male
female
sex


Age Distribution by Survival
80
70
60
50
40
30
20
10
0
age
0
1
survived




```
Fitting 5 folds for each of 54 candidates, totalling 270 fits

/usr/local/lib/python3.10/dist-packages/sklearn/ensemble/_forest.py:424:
FutureWarning: `max_features='auto'` has been deprecated in 1.1 and will be
removed in 1.3. To keep the past behaviour, explicitly set `max_features='sqrt'`
or remove this parameter as it is also the default value for
RandomForestClassifiers and ExtraTreesClassifiers.
  warn(

Best Parameters: {'criterion': 'gini', 'max_depth': 8, 'max_features': 'auto',
'n_estimators': 200}

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FutureWarning: `max_features='auto'` has been deprecated in 1.1 and will be
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or remove this parameter as it is also the default value for
RandomForestClassifiers and ExtraTreesClassifiers.
```

```
warn(
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       105
           1       1.00      1.00      1.00        74

    accuracy                           1.00       179
   macro avg       1.00      1.00      1.00       179
weighted avg       1.00      1.00      1.00       179
```