In [113…
```
import os
```

In [114…
```
os.getcwd()
```

Out[114… 'C:\\Users\\DELL\\OneDrive\\Desktop\\EDA'

In [115…
```
os.chdir('C:\\Users\\DELL\\OneDrive\\Desktop\\EDA')
```

## Imported Some Libraries:

In [116…
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [117…
```
print(dir(pd))
```

```
['ArrowDtype', 'BooleanDtype', 'Categorical', 'CategoricalDtype', 'CategoricalIndex', 'DataFrame', 'DateOffset', 'DatetimeIndex', 'DatetimeTZDtype', 'ExcelFile', 'ExcelWriter', 'Flags', 'Float32Dtype', 'Float64Dtype', 'Grouper', 'HDFStore', 'Index', 'IndexSlice', 'Int16Dtype', 'Int32Dtype', 'Int64Dtype', 'Int8Dtype', 'Interval', 'IntervalDtype', 'IntervalIndex', 'MultiIndex', 'NA', 'NaT', 'NamedAgg', 'Period', 'PeriodDtype', 'PeriodIndex', 'RangeIndex', 'Series', 'SparseDtype', 'StringDtype', 'Timedelta', 'TimedeltaIndex', 'Timestamp', 'UInt16Dtype', 'UInt32Dtype', 'UInt64Dtype', 'UInt8Dtype', '__all__', '__builtins__', '__cached__', '__doc__', '__docformat__', '__file__', '__git_version__', '__loader__', '__name__', '__package__', '__path__', '__spec__', '__version__', '_built_with_meson', '_config', '_is_numpy_dev', '_libs', '_pandas_datetime_CAPI', '_pandas_parser_CAPI', '_testing', '_typing', '_version_meson', 'annotations', 'api', 'array', 'arrays', 'bdate_range', 'compat', 'concat', 'core', 'crosstab', 'cut', 'date_range', 'describe_option', 'errors', 'eval', 'factorize', 'from_dummies', 'get_dummies', 'get_option', 'infer_freq', 'interval_range', 'io', 'isna', 'isnull', 'json_normalize', 'lreshape', 'melt', 'merge', 'merge_asof', 'merge_ordered', 'notna', 'notnull', 'offsets', 'option_context', 'options', 'pandas', 'period_range', 'pivot', 'pivot_table', 'plotting', 'qcut', 'read_clipboard', 'read_csv', 'read_excel', 'read_feather', 'read_fwf', 'read_gbq', 'read_hdf', 'read_html', 'read_json', 'read_orc', 'read_parquet', 'read_pickle', 'read_sas', 'read_spss', 'read_sql', 'read_sql_query', 'read_sql_table', 'read_stata', 'read_table', 'read_xml', 'reset_option', 'set_eng_float_format', 'set_option', 'show_versions', 'test', 'testing', 'timedelta_range', 'to_datetime', 'to_numeric', 'to_pickle', 'to_timedelta', 'tseries', 'unique', 'util', 'value_counts', 'wide_to_long']
```

In [118…
```
train = pd.read_csv('titanic_train.csv')
```

## THE DATA : Titanic_Story

In [119…
```
train.head()
```

Out[119…

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | F |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | Braund, Mr. Owen Harris | male | 22.0 | 1 | 0 | A/5 21171 | 7.2 |
| **1** | 2 | 1 | 1 | Cumings, Mrs. John Bradley (Florence Briggs Th... | female | 38.0 | 1 | 0 | PC 17599 | 71.2 |
| **2** | 3 | 1 | 3 | Heikkinen, Miss. Laina | female | 26.0 | 0 | 0 | STON/O2. 3101282 | 7.9 |
| **3** | 4 | 1 | 1 | Futrelle, Mrs. Jacques Heath (Lily May Peel) | female | 35.0 | 1 | 0 | 113803 | 53.1 |
| **4** | 5 | 0 | 3 | Allen, Mr. William Henry | male | 35.0 | 0 | 0 | 373450 | 8.0 |

In [120…

```
train.isnull().sum()
```

Out[120…

```
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
```

In [121…

```
train.isnull()
```

Out[121…

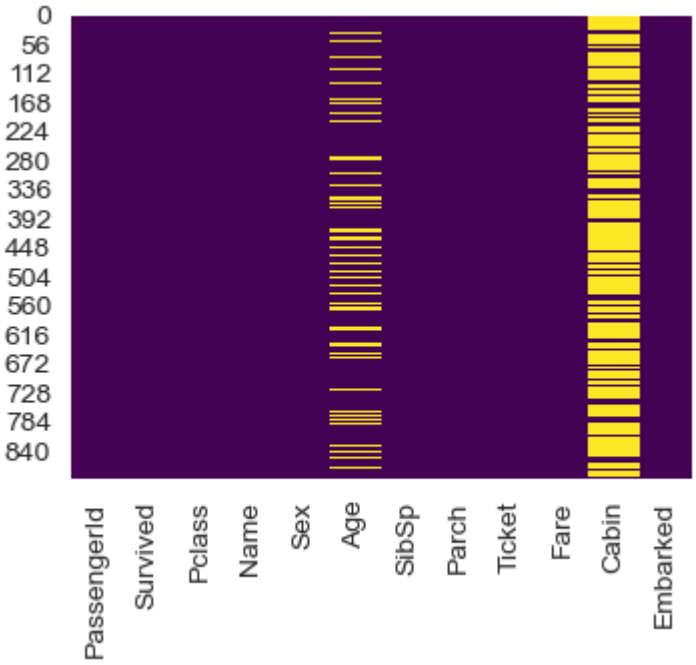
| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | False | False | False | T |
| **1** | False | False | False | False | False | False | False | False | False | False | Fa |
| **2** | False | False | False | False | False | False | False | False | False | False | T |
| **3** | False | False | False | False | False | False | False | False | False | False | Fa |
| **4** | False | False | False | False | False | False | False | False | False | False | T |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| **886** | False | False | False | False | False | False | False | False | False | False | T |
| **887** | False | False | False | False | False | False | False | False | False | False | Fa |
| **888** | False | False | False | False | False | True | False | False | False | False | T |
| **889** | False | False | False | False | False | False | False | False | False | False | Fa |
| **890** | False | False | False | False | False | False | False | False | False | False | T |

891 rows × 12 columns

In [122…
```
train.columns
```

Out[122…
```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked'],
      dtype='object')
```

In [123…
```
sns.heatmap(train.isnull(),cbar=False,cmap='viridis')
plt.show()
plt.figure (figsize=(2,3))
```



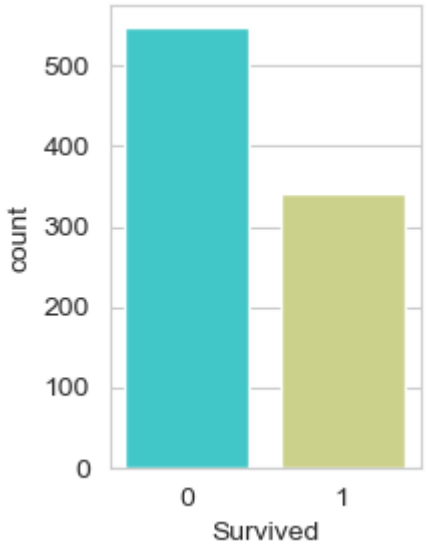

Out[123…
```
<Figure size 200x300 with 0 Axes>
```

# 1. Missing Values Heatmap

The heatmap shows patterns of missing values. Some columns (like Age and Cabin) have a significant number of missing entries, which need attention before modeling.

In [124…
```
sns.set_style('whitegrid')
sns.countplot(x='Survived',data=train,palette='rainbow')
plt.show()
plt.figure (figsize=(4,3))
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_30080\7671277.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.countplot(x='Survived',data=train,palette='rainbow')
```

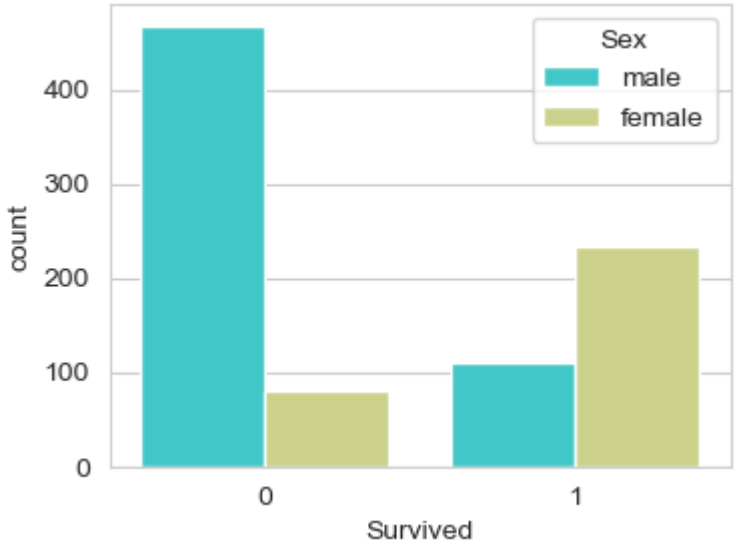



Out[124…
```
<Figure size 400x300 with 0 Axes>
```

# 2. Survival Count Plot

The dataset is imbalanced: it shows count of survived and not survived people.

In [125…
```
sns.set_style('whitegrid')
sns.countplot(x='Survived',hue='Sex',data=train,palette='rainbow')
plt.show()
plt.figure (figsize=(5,4))
```

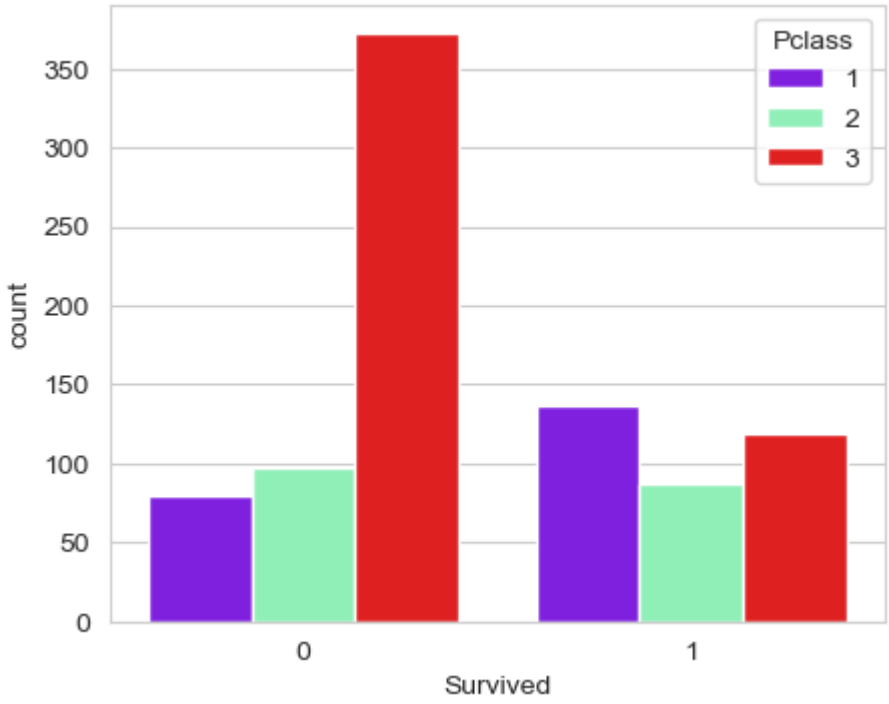



Out[125… <Figure size 500x400 with 0 Axes>

## 3. Survival by Sex

Females had a much higher survival rate than males, indicating gender strongly influenced survival probability.

In [126…
```
sns.set_style('whitegrid')
sns.countplot(x='Survived',hue='Pclass',data=train,palette='rainbow')
plt.show()
plt.figure (figsize=(4,3))
```



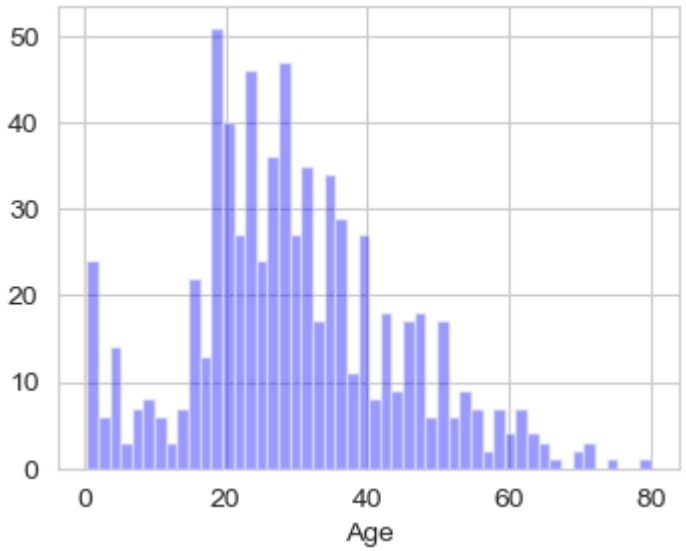

Out[126… <Figure size 400x300 with 0 Axes>

## 4. Survival by Passenger Class

Higher-class passengers (1st class) were more likely to survive, while 3rd-class passengers faced the lowest survival chances.

In [127…
```
sns.distplot(train['Age'].dropna(),kde=False,color='blue',bins=50)
plt.show()
plt.figure (figsize=(4,3))
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_30080\3452275775.py:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(train['Age'].dropna(),kde=False,color='blue',bins=50)
```



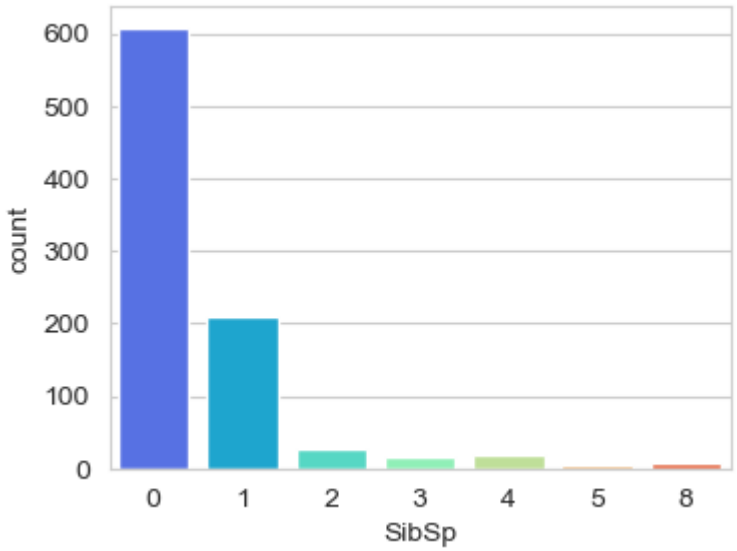

Out[127… <Figure size 400x300 with 0 Axes>

## 5. Age Distribution

The distribution of age is slightly right-skewed, with most passengers between 20–40 years old. Some younger children and elderly passengers are present, but in smaller numbers.

In [128…
```
sns.countplot(x='SibSp',data=train,palette='rainbow')
plt.show()
plt.figure (figsize=(4,3))
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_30080\143978404.py:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.countplot(x='SibSp',data=train,palette='rainbow')
```

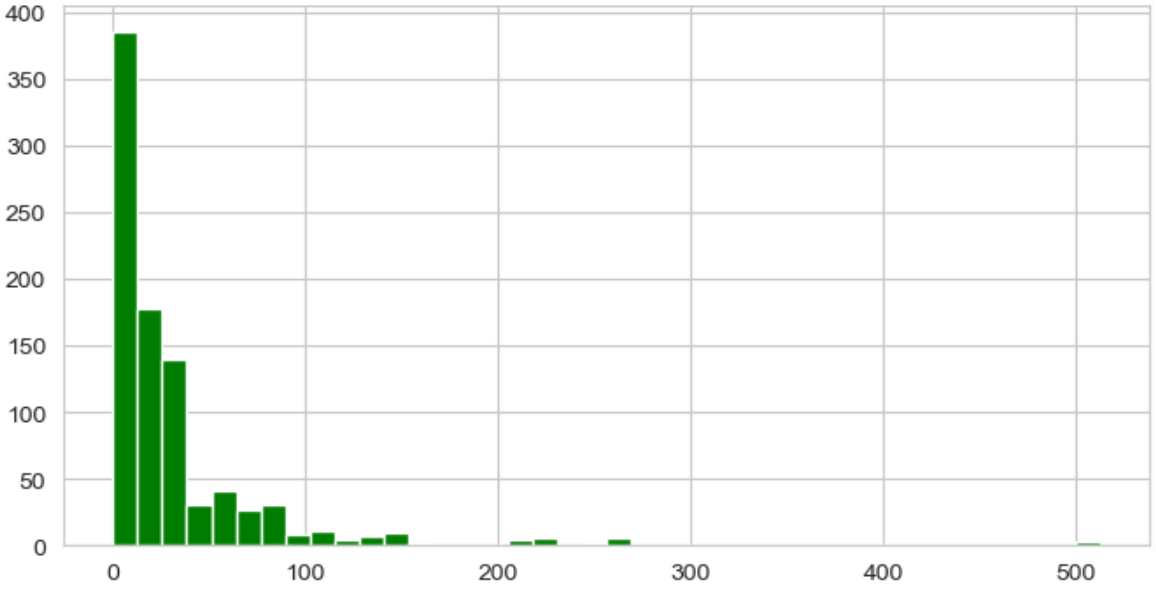



Out[128… <Figure size 400x300 with 0 Axes>

## 6. Siblings/Spouses (SibSp) Distribution

The majority of passengers traveled alone (SibSp = 0). A smaller number had 1–2 family members, with very few having larger family groups.

In [129…
```
train['Fare'].hist(color='green',bins=40,figsize=(8,4))
plt.show()
```

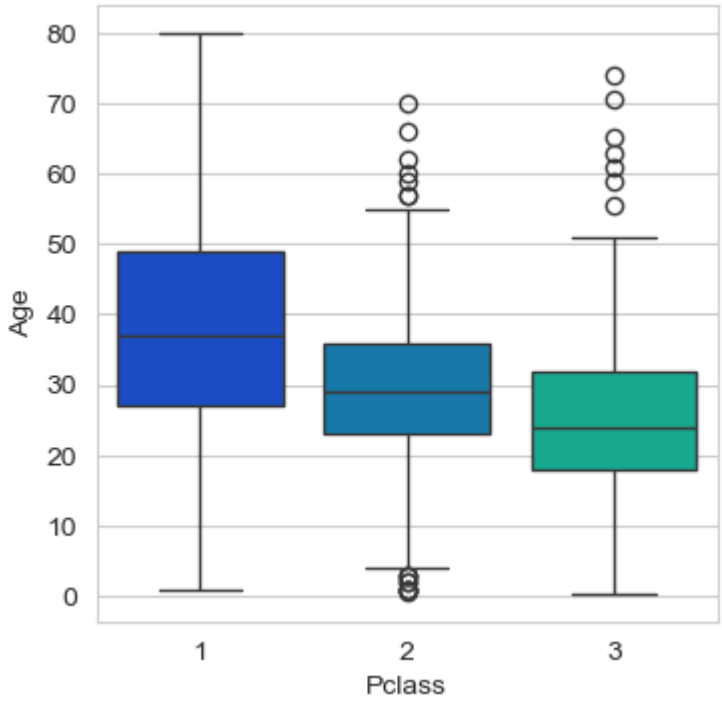



## 7. Fare Distribution

Most passengers paid relatively low fares, with a small group paying much higher fares. This reflects strong class-based differences in ticket pricing.

In [130…
```
plt.figure(figsize=(4,4))
sns.boxplot(x='Pclass',y='Age',data= train,palette='winter')
plt.show()
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_30080\392527481.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.boxplot(x='Pclass',y='Age',data= train,palette='winter')
```




## 8. Boxplot: Age vs Passenger Class

The boxplot also reveals several *outliers in age*, especially in 2nd and 3rd class, indicating some passengers' ages were unusually high or low compared to the majority.

In [131…

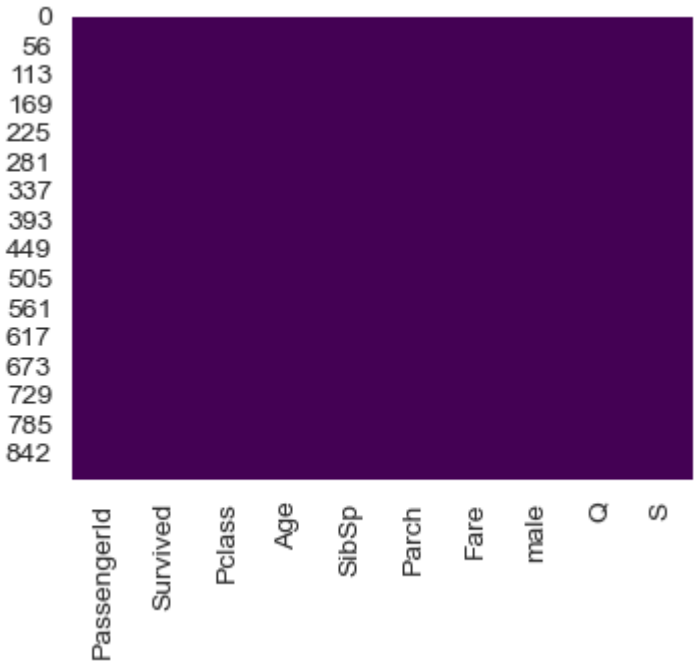
```
def impute_age(cols):
    Age = cols[0]
    Pclass = cols[1]


    if pd.isnull(Age):
        if Pclass == 1:
            return 37
        elif Pclass == 2:
            return 29
        else:
            return 24
    else:
        return Age
```

In [132…

```
train['Age'] = train[['Age','Pclass']].apply(impute_age,axis=1)
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_30080\3118387306.py:2: FutureWarning:
Series.__getitem__ treating keys as positions is deprecated. In a future version,
integer keys will always be treated as labels (consistent with DataFrame behavio
r). To access a value by position, use `ser.iloc[pos]`
  Age = cols[0]
C:\Users\DELL\AppData\Local\Temp\ipykernel_30080\3118387306.py:3: FutureWarning:
Series.__getitem__ treating keys as positions is deprecated. In a future version,
integer keys will always be treated as labels (consistent with DataFrame behavio
r). To access a value by position, use `ser.iloc[pos]`
  Pclass = cols[1]
```

In [144…
```
sns.heatmap(train.isnull(),cbar=False,cmap='viridis')
plt.show()
plt.figure (figsize=(2,3))
```




Out[144…
```
<Figure size 200x300 with 0 Axes>
```

## 9. Outliers treated.

In [134…
```
train.drop('Cabin',axis=1,inplace=True)
```

In [135…
```
train.head()
```

Out[135…

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | Braund, Mr. Owen Harris | male | 22.0 | 1 | 0 | A/5 21171 | 7.2 |
| **1** | 2 | 1 | 1 | Cumings, Mrs. John Bradley (Florence Briggs Th... | female | 38.0 | 1 | 0 | PC 17599 | 71.2 |
| **2** | 3 | 1 | 3 | Heikkinen, Miss. Laina | female | 26.0 | 0 | 0 | STON/O2. 3101282 | 7.9 |
| **3** | 4 | 1 | 1 | Futrelle, Mrs. Jacques Heath (Lily May Peel) | female | 35.0 | 1 | 0 | 113803 | 53.1 |
| **4** | 5 | 0 | 3 | Allen, Mr. William Henry | male | 35.0 | 0 | 0 | 373450 | 8.0 |

In [136…
```
train.dropna(inplace= True)
```

In [137…
```
train.info()
```

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

In [138…
```
pd.get_dummies(train['Embarked'],drop_first=True).head()
```

Out[138...

| | Q | S |
|---|---|---|
| **0** | False | True |
| **1** | False | False |
| **2** | False | True |
| **3** | False | True |
| **4** | False | True |

In [139...
```
sex = pd.get_dummies(train['Sex'],drop_first=True)
embark = pd.get_dummies(train['Embarked'],drop_first=True)
```

In [140...
```
train.drop(['Sex','Embarked','Name','Ticket'],axis=1,inplace=True)
```

In [141...
```
train.head()
```

Out[141...

| | PassengerId | Survived | Pclass | Age | SibSp | Parch | Fare |
|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | 22.0 | 1 | 0 | 7.2500 |
| **1** | 2 | 1 | 1 | 38.0 | 1 | 0 | 71.2833 |
| **2** | 3 | 1 | 3 | 26.0 | 0 | 0 | 7.9250 |
| **3** | 4 | 1 | 1 | 35.0 | 1 | 0 | 53.1000 |
| **4** | 5 | 0 | 3 | 35.0 | 0 | 0 | 8.0500 |

In [142...
```
train = pd.concat([train,sex,embark],axis=1)
```

In [143...
```
train.head()
```

Out[143...

| | PassengerId | Survived | Pclass | Age | SibSp | Parch | Fare | male | Q | S |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | 22.0 | 1 | 0 | 7.2500 | True | False | True |
| **1** | 2 | 1 | 1 | 38.0 | 1 | 0 | 71.2833 | False | False | False |
| **2** | 3 | 1 | 3 | 26.0 | 0 | 0 | 7.9250 | False | False | True |
| **3** | 4 | 1 | 1 | 35.0 | 1 | 0 | 53.1000 | False | False | True |
| **4** | 5 | 0 | 3 | 35.0 | 0 | 0 | 8.0500 | True | False | True |

## 10. Concatenating Encoded Features

The processed Sex and Embarked dummy variables are added back into the dataset, ensuring all features are numeric and machine-learning ready.