Dealing with Missing Values

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

In [2]:
```
# Load the data
data = sns.load_dataset('titanic')
data.head()
```

Out[2]:

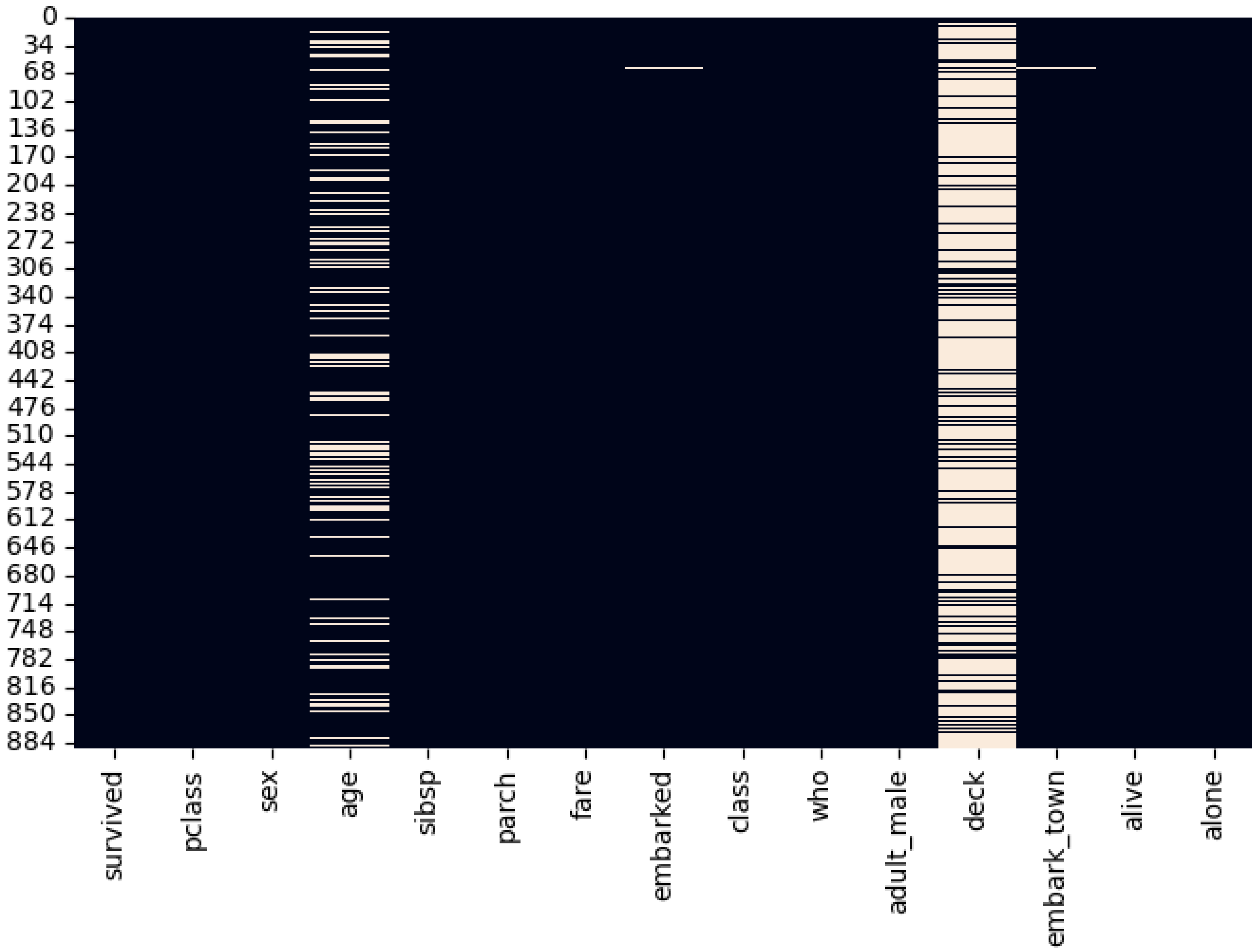
	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alon
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	Fals
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	Fals
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	Tru
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	Fals
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	Tru

In [3]:
```
# Import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

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

# Visualize the data
plt.figure(figsize=(8, 5))
```

```
sns.heatmap(data.isnull(), cbar=False)
plt.show()
```



In [4]:
```
data.info()
```

```
<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
 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
```

In [5]:
```
data.isnull().sum().sort_values(ascending=False)
```

Out[5]:
```
deck           688
age            177
embarked         2
embark_town      2
survived         0
pclass           0
sex              0
sibsp            0
parch            0
fare             0
class            0
who              0
adult_male       0
alive            0
alone            0
dtype: int64
```

In [6]:
```
round(data.isnull().sum() / len(data) * 100, 2).sort_values(ascending=False)
```

Out[6]:
```
deck           77.22
age            19.87
embarked        0.22
embark_town     0.22
survived        0.00
pclass          0.00
sex             0.00
sibsp           0.00
parch           0.00
fare            0.00
class           0.00
who             0.00
adult_male      0.00
alive           0.00
alone           0.00
dtype: float64
```

In [7]:
```
# Import libraries
import pandas as pd
import numpy as np
import seaborn as sns
# load titanic dataset
data = sns.load_dataset('titanic')

# calculate missing values
print("----------------------------------------")
print(f"Missing values in each column:\n{data.isnull().sum().sort_values(ascending=False)}")
print("----------------------------------------")
print(f"Percentage of missing values in each column:\n{round(data.isnull().sum() / len(data) * 100, 2).sort_values(as
----------------------------------------
Missing values in each column:
deck           688
age            177
embarked         2
embark_town      2
survived         0
pclass           0
sex              0
sibsp            0
parch            0
fare             0
class            0
who              0
adult_male       0
alive            0
alone            0
dtype: int64
----------------------------------------
Percentage of missing values in each column:
deck           77.22
age            19.87
embarked        0.22
embark_town     0.22
survived        0.00
pclass          0.00
sex             0.00
sibsp           0.00
parch           0.00
fare            0.00
class           0.00
who             0.00
adult_male      0.00
alive           0.00
alone           0.00
dtype: float64
```

In [8]:
```
data.head()
```

Out[8]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alon
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	Fals
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	Fals
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	Tru
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	Fals
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	Tru

In [9]:
```
round(data['age'].mean(), 2)
```
Out[9]:
```
29.7
```

In [10]:
```
data['age'].median()
```
Out[10]:
```
28.0
```

In [11]:
```
# Mean of age to fill age missing values
data['age'] = data['age'].fillna(data['age'].median())

# drop deck column
data.drop('deck', axis=1, inplace=True)
data.head()
```

Out[11]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	Southampton	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	Southampton	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	Southampton	no	True

In [12]:
```
data['embark_town'].value_counts()
```

Out[12]:
```
embark_town
Southampton    644
Cherbourg      168
Queenstown      77
Name: count, dtype: int64
```

In [13]:
```
# replacing embarked missing values with mode
data['embark_town'] = data['embark_town'].fillna(data['embark_town'].mode()[0])
data['embarked'] = data['embarked'].fillna(data['embarked'].mode()[0])

data.isnull().sum().sort_values(ascending=False)
```

Out[13]:
```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
embark_town    0
alive          0
alone          0
dtype: int64
```

we can also impute using sk learn

In [14]:
```
# import libraries
import pandas as pd
import numpy as np
import seaborn as sns

from sklearn.impute import SimpleImputer
```

In [15]:
```
df = sns.load_dataset('titanic')


# impute age column using simpleimputer from sklearn
imputer = SimpleImputer(strategy='mean')


df['age'] = imputer.fit_transform(df[['age']])
df.isnull().sum().sort_values(ascending=False)
```

Out[15]:
```
deck           688
embarked         2
embark_town      2
survived         0
pclass           0
sex              0
age              0
sibsp            0
parch            0
fare             0
class            0
who              0
adult_male       0
alive            0
alone            0
dtype: int64
```

In [16]:
```
df.head()
```

Out[16]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alon
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	Fals
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	Fals
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	Tru
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	Fals
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	Tru

multivariate imputation

In [17]:
```
df = sns.load_dataset('titanic')


from sklearn.experimental import enable_iterative_imputer
from sklearn.impute import IterativeImputer

# impute age column using iterativeimputer from sklearn
imputer = IterativeImputer(max_iter=20, n_nearest_features=5)
df['age'] = imputer.fit_transform(df[['age']])


df.isnull().sum().sort_values(ascending=False)
```

Out[17]:
```
deck           688
embarked         2
embark_town      2
survived         0
pclass           0
sex              0
age              0
sibsp            0
parch            0
fare             0
class            0
who              0
adult_male       0
alive            0
alone            0
dtype: int64
```

ffill and backward fill

In [18]:
```
df = sns.load_dataset('titanic')
```

```
df.isnull().sum().sort_values(ascending=False)
```

Out[18]:

```
deck           688
age            177
embarked         2
embark_town      2
survived         0
pclass           0
sex              0
sibsp            0
parch            0
fare             0
class            0
who              0
adult_male       0
alive            0
alone            0
dtype: int64
```

In [19]:

```
# using forward fill impute age column
df['age'] = df['age'].bfill()
```

using KNN imputer

In [20]:

```
from sklearn.impute import KNNImputer

# impute age column using KNNImputer from sklearn
imputer = KNNImputer(n_neighbors=5)
df['age'] = imputer.fit_transform(df[['age']])


# drop rows having missing values
df.dropna(inplace=True)


df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 201 entries, 1 to 889
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype   
---  ------       --------------  -----   
 0   survived     201 non-null    int64   
 1   pclass       201 non-null    int64   
 2   sex          201 non-null    object  
 3   age          201 non-null    float64 
 4   sibsp        201 non-null    int64   
 5   parch        201 non-null    int64   
 6   fare         201 non-null    float64 
 7   embarked     201 non-null    object  
 8   class        201 non-null    category
 9   who          201 non-null    object  
 10  adult_male   201 non-null    bool    
 11  deck         201 non-null    category
 12  embark_town  201 non-null    object  
 13  alive        201 non-null    object  
 14  alone        201 non-null    bool    
dtypes: bool(2), category(2), float64(2), int64(4), object(5)
memory usage: 20.1+ KB
```

In [21]:
```
df.isnull().sum().sort_values(ascending=False)
```

Out[21]:
```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
deck           0
embark_town    0
alive          0
alone          0
dtype: int64
```

```
In [ ]:
```