Steps for prepocessing

1.import the necessary libraries 2.import the dataset 3.Handling the null values(churn-leaving the company) 4.Separate dependent and independent variables(dep-out,indep-input) 5.Encoding 6.Splitting into training and testing set 7.Feature scaling

D.Harshita VIT-AP

In [1]:
```
pip install seaborn
```

```
Requirement already satisfied: seaborn in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (0.12.2)
Requirement already satisfied: numpy!=1.24.0,>=1.17 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from seaborn) (1.24.3)
Requirement already satisfied: pandas>=0.25 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from seaborn) (2.0.3)
Requirement already satisfied: matplotlib!=3.6.1,>=3.1 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from seaborn) (3.7.2)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (1.1.0)
Requirement already satisfied: cycler>=0.10 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (4.41.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (1.4.4)
Requirement already satisfied: packaging>=20.0 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (23.1)
Requirement already satisfied: pillow>=6.2.0 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (10.0.0)
Requirement already satisfied: pyparsing<3.1,>=2.3.1 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from pandas>=0.25->seaborn) (2023.3)
Requirement already satisfied: tzdata>=2022.1 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from pandas>=0.25->seaborn) (2023.3)
Requirement already satisfied: six>=1.5 in c:\users\harsh\appdata\local\programs\python\python311\lib\site-packages (from python-dateutil>=2.7->matplotlib!=3.6.1,>=3.1->seaborn) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

1.Import the necessary libraries

In [2]:
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

2. import the dataset

In [4]:
```python
#(.csv, .tsv, json, .excel)
dataset=pd.read_csv("Titanic-Dataset.csv")
```

In [5]:
```python
dataset
```

Out[5]:

	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
...	...	...	...	...	...	...	...	...	...	...	...	...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	Q

891 rows × 12 columns

In [6]:
```python
dataset.head(3)
```

Out[6]:

	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

In [7]:
```python
dataset.tail() #default last 5 rows
```

Out[7]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.00	NaN	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00	B42	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.45	NaN	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.00	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.75	NaN	Q

In [8]:
```python
dataset.shape
```

Out[8]:
```
(891, 12)
```

In [9]:
```python
dataset.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 [10]:
```python
dataset.describe()
```

Out[10]:

	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

exited- dependent variable--output

inputs--independent variables

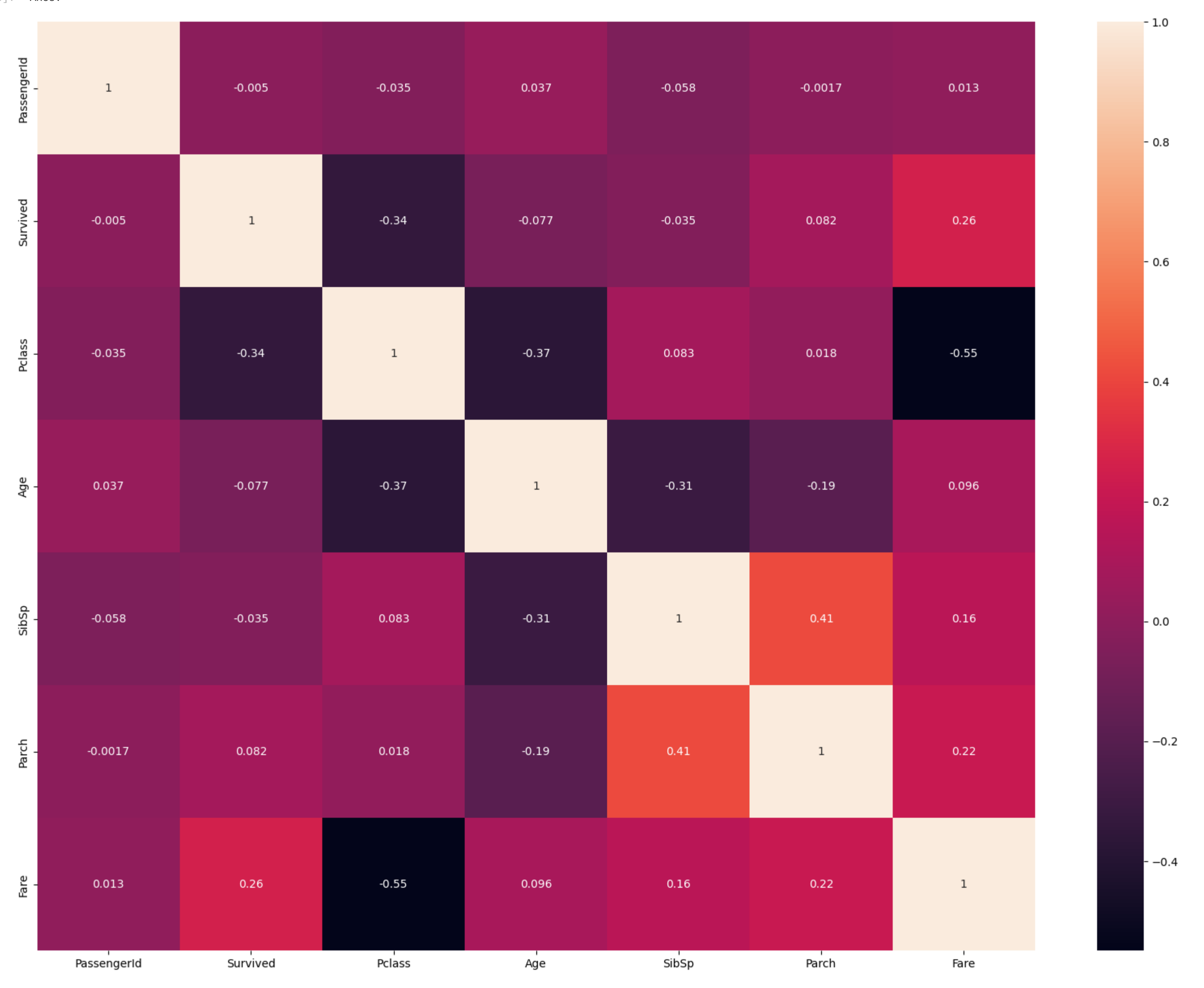
In [11]:
```python
numeric_dataset = dataset.select_dtypes(include=[np.number])
numeric_dataset.corr()
#we can write datset.corr() or dataset.select_dtypes(include=[np.number]).corr()
```

Out[11]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.000000	-0.005007	-0.035144	0.036847	-0.057527	-0.001652	0.012658
Survived	-0.005007	1.000000	-0.338481	-0.077221	-0.035322	0.081629	0.257307
Pclass	-0.035144	-0.338481	1.000000	-0.369226	0.083081	0.018443	-0.549500
Age	0.036847	-0.077221	-0.369226	1.000000	-0.308247	-0.189119	0.096067
SibSp	-0.057527	-0.035322	0.083081	-0.308247	1.000000	0.414838	0.159651
Parch	-0.001652	0.081629	0.018443	-0.189119	0.414838	1.000000	0.216225
Fare	0.012658	0.257307	-0.549500	0.096067	0.159651	0.216225	1.000000

In [16]:
```python
plt.subplots(figsize=(20,15))
sns.heatmap(numeric_dataset.corr(),annot = True)
```

Out[16]:
```
<Axes: >
```



In [17]:
```python
dataset.Parch.value_counts()
```

Out[17]:
```
Parch
0    678
1    118
2     80
5      5
3      5
4      4
6      1
Name: count, dtype: int64
```

3.Handling null values

In [18]:
```python
dataset.isnull().any()
```

Out[18]:
```
PassengerId    False
Survived       False
Pclass         False
Name           False
Sex            False
Age             True
SibSp          False
Parch          False
Ticket         False
Fare           False
Cabin           True
Embarked        True
dtype: bool
```

In [19]:
```python
dataset.isnull().sum()
```

Out[19]:
```
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 [20]:
```python
dataset.head()
```

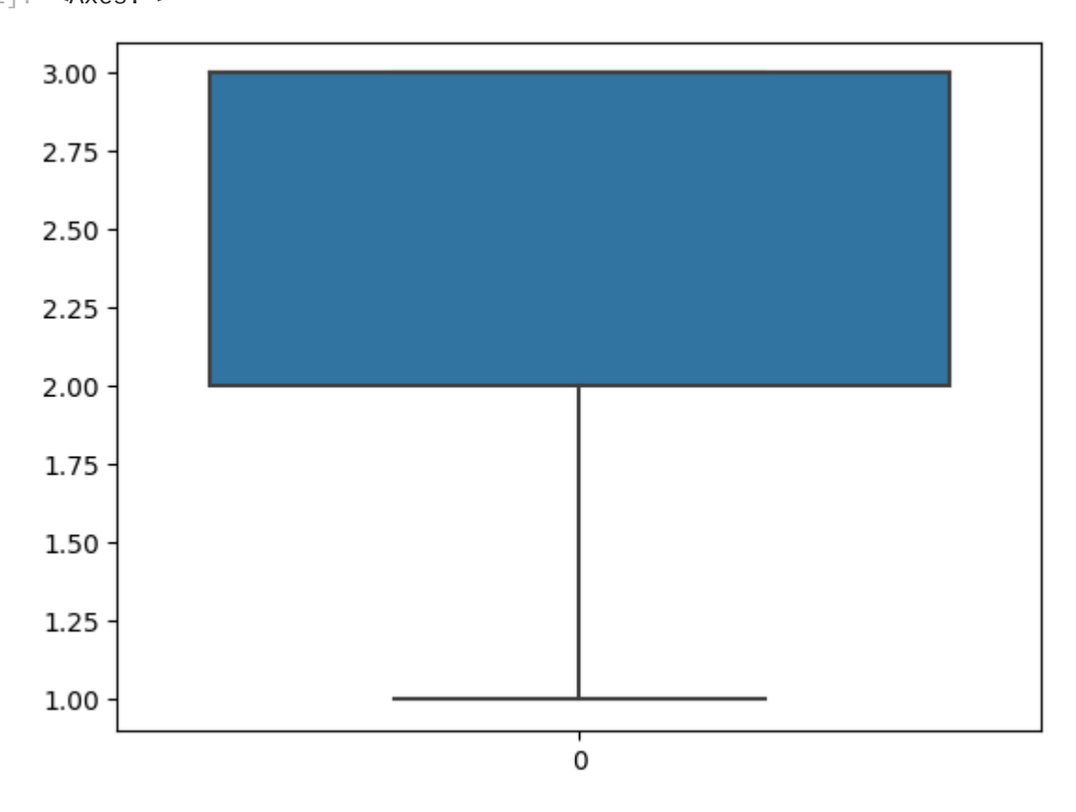
Out[20]:

	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

4.outliers

In [21]:
```python
sns.boxplot(dataset.Pclass)
```

Out[21]:
```
<Axes: >
```



5.Seperate dependent and independent variables

In [26]:
```python
x=dataset.iloc[:,3:13]
y=dataset.iloc[:,3:14]
print(x.head())
print(x.tail())
```

```
                                                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
                                         Name     Sex   Age  SibSp  Parch  \
886                     Montvila, Rev. Juozas    male  27.0      0      0
887              Graham, Miss. Margaret Edith  female  19.0      0      0
888  Johnston, Miss. Catherine Helen "Carrie"  female   NaN      1      2
889                     Behr, Mr. Karl Howell    male  26.0      0      0
890                       Dooley, Mr. Patrick    male  32.0      0      0

         Ticket   Fare Cabin Embarked
886      211536  13.00   NaN        S
887      112053  30.00   B42        S
888  W./C. 6607  23.45   NaN        S
889      111369  30.00  C148        C
890      370376   7.75   NaN        Q
```

In [27]:
```python
print(y.head())
print(y.tail())
```

```
                                                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
                                         Name     Sex   Age  SibSp  Parch  \
886                     Montvila, Rev. Juozas    male  27.0      0      0
887              Graham, Miss. Margaret Edith  female  19.0      0      0
888  Johnston, Miss. Catherine Helen "Carrie"  female   NaN      1      2
889                     Behr, Mr. Karl Howell    male  26.0      0      0
890                       Dooley, Mr. Patrick    male  32.0      0      0

         Ticket   Fare Cabin Embarked
886      211536  13.00   NaN        S
887      112053  30.00   B42        S
888  W./C. 6607  23.45   NaN        S
889      111369  30.00  C148        C
890      370376   7.75   NaN        Q
```

In [28]:
```python
print(dataset.shape)
print(x.shape)
print(y.shape)
```

```
(891, 12)
(891, 9)
(891, 9)
```

6.Encoding

In [29]:
```python
#(Categorical colums=gender and geography)
from sklearn.preprocessing import LabelEncoder
```

In [30]:
```python
le=LabelEncoder()
```

In [33]:
```python
x["Age"]=le.fit_transform(x["Age"])
x["Age"]
```

Out[33]:
```
0      28
1      51
2      34
3      47
4      47
       ..
886    35
887    24
888    88
889    34
890    42
Name: Age, Length: 891, dtype: int64
```

In [35]:
```python
x["Age"].value_counts()
```

Out[35]:
```
Age
88    177
31     30
28     27
23     26
36     25
     ...
49      1
71      1
4       1
30      1
86      1
Name: count, Length: 89, dtype: int64
```

In [36]:
```python
x["Age"].nunique()
```

Out[36]:
```
89
```

In [37]:
```python
x.head()
```

Out[37]:

	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	Braund, Mr. Owen Harris	male	28	1	0	A/5 21171	7.2500	NaN	S
1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	51	1	0	PC 17599	71.2833	C85	C
2	Heikkinen, Miss. Laina	female	34	0	0	STON/O2. 3101282	7.9250	NaN	S
3	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	47	1	0	113803	53.1000	C123	S
4	Allen, Mr. William Henry	male	47	0	0	373450	8.0500	NaN	S

One hot encoding on geography column

In [38]:
```python
x.shape
```

Out[38]:
```
(891, 9)
```

In [41]:
```python
SibSp=pd.get_dummies(x["SibSp"],drop_first=True)
SibSp
```

Out[41]:

	1	2	3	4	5	8
0	True	False	False	False	False	False
1	True	False	False	False	False	False
2	False	False	False	False	False	False
3	True	False	False	False	False	False
4	False	False	False	False	False	False
...	...	...	...	...	...	...
886	False	False	False	False	False	False
887	False	False	False	False	False	False
888	True	False	False	False	False	False
889	False	False	False	False	False	False
890	False	False	False	False	False	False

891 rows × 6 columns

In [45]:
```python
x1=pd.concat([x,SibSp],axis=1)
x1
```

Out[45]:

	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	1	2	3	4	5	8
0	Braund, Mr. Owen Harris	male	28	1	0	A/5 21171	7.2500	NaN	S	True	False	False	False	False	False
1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	51	1	0	PC 17599	71.2833	C85	C	True	False	False	False	False	False
2	Heikkinen, Miss. Laina	female	34	0	0	STON/O2. 3101282	7.9250	NaN	S	False	False	False	False	False	False
3	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	47	1	0	113803	53.1000	C123	S	True	False	False	False	False	False
4	Allen, Mr. William Henry	male	47	0	0	373450	8.0500	NaN	S	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
886	Montvila, Rev. Juozas	male	35	0	0	211536	13.0000	NaN	S	False	False	False	False	False	False
887	Graham, Miss. Margaret Edith	female	24	0	0	112053	30.0000	B42	S	False	False	False	False	False	False
888	Johnston, Miss. Catherine Helen "Carrie"	female	88	1	2	W./C. 6607	23.4500	NaN	S	True	False	False	False	False	False
889	Behr, Mr. Karl Howell	male	34	0	0	111369	30.0000	C148	C	False	False	False	False	False	False
890	Dooley, Mr. Patrick	male	42	0	0	370376	7.7500	NaN	Q	False	False	False	False	False	False

891 rows × 15 columns

In [48]:
```python
x.drop(["Name"],axis=1,inplace=True)
x.head()
```

Out[48]:

	Sex	Age	Parch	Ticket	Fare	Cabin	Embarked
0	male	28	0	A/5 21171	7.2500	NaN	S
1	female	51	0	PC 17599	71.2833	C85	C
2	female	34	0	STON/O2. 3101282	7.9250	NaN	S
3	female	47	0	113803	53.1000	C123	S
4	male	47	0	373450	8.0500	NaN	S

In [49]:
```python
x.shape
```

Out[49]:
```
(891, 7)
```

7.splitting into training and testing set

In [50]:
```python
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=0)
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

Out[50]:
```
((623, 7), (268, 7), (623, 9), (268, 9))
```

8.Feature Scaling

In [63]:
```python
from sklearn.preprocessing import StandardScaler

# Create a StandardScaler instance
scaler = StandardScaler()

# Fit and transform the training data
x_train = scaler.fit_transform(x_train)

# Transform the test data using the same scaler
x_test = scaler.transform(x_test)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
~\AppData\Local\Temp\ipykernel_24320\282210836.py in ?()
      3 # Create a StandardScaler instance
      4 scaler = StandardScaler()
      5 
      6 # Fit and transform the training data
----> 7 x_train = scaler.fit_transform(x_train)
      8 
      9 # Transform the test data using the same scaler
     10 x_test = scaler.transform(x_test)

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\utils\_set_output.py in ?(self, X, *args, **kwargs)
    138     @wraps(f)
    139     def wrapped(self, X, *args, **kwargs):
--> 140         data_to_wrap = f(self, X, *args, **kwargs)
    141         if isinstance(data_to_wrap, tuple):
    142             # only wrap the first output for cross decomposition
    143             return_tuple = (

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\base.py in ?(self, X, y, **fit_params)
    911         # non-optimized default implementation; override when a better
    912         # method is possible for a given clustering algorithm
    913         if y is None:
    914             # fit method of arity 1 (unsupervised transformation)
--> 915             return self.fit(X, **fit_params).transform(X)
    916         else:
    917             # fit method of arity 2 (supervised transformation)
    918             return self.fit(X, y, **fit_params).transform(X)

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\preprocessing\_data.py in ?(self, X, y, sample_weight)
    833             Fitted scaler.
    834         """
    835         # Reset internal state before fitting
    836         self._reset()
--> 837         return self.partial_fit(X, y, sample_weight)

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\base.py in ?(estimator, *args, **kwargs)
   1147                 skip_parameter_validation=(
   1148                     prefer_skip_nested_validation or global_skip_validation
   1149                 )
   1150             ):
-> 1151                 return fit_method(estimator, *args, **kwargs)

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\preprocessing\_data.py in ?(self, X, y, sample_weight)
    869         self : object
    870             Fitted scaler.
    871         """
    872         first_call = not hasattr(self, "n_samples_seen_")
--> 873         X = self._validate_data(
    874             X,
    875             accept_sparse=("csr", "csc"),
    876             dtype=FLOAT_DTYPES,

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\base.py in ?(self, X, y, reset, validate_separately, cast_to_ndarray, **check_params)
    600                 out = y
    601             else:
    602                 out = X, y
    603         elif not no_val_X and no_val_y:
--> 604             out = check_array(X, input_name="X", **check_params)
    605         elif no_val_X and not no_val_y:
    606             out = _check_y(y, **check_params)
    607         else:

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\utils\validation.py in ?(array, accept_sparse, accept_large_sparse, dtype, order, copy, force_all_finite, ensure_2d, allow_nd, ensure_min_samples, ensure_min_features, estimator, input_name)
    914                         )
    915                     array = xp.astype(array, dtype, copy=False)
    916                 else:
    917                     array = _asarray_with_order(array, order=order, dtype=dtype, xp=xp)
--> 918             except ComplexWarning as complex_warning:
    919                 raise ValueError(
    920                     "Complex data not supported\n{}\n".format(array)
    921                 ) from complex_warning

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\utils\_array_api.py in ?(array, dtype, order, copy, xp)
    376         # Use NumPy API to support order
    377         if copy is True:
    378             array = numpy.array(array, order=order, dtype=dtype)
    379         else:
--> 380             array = numpy.asarray(array, order=order, dtype=dtype)
    381 
    382         # At this point array is a NumPy ndarray. We convert it to an array
    383         # container that is consistent with the input's namespace.

~\AppData\Local\Programs\Python\Python311\Lib\site-packages\pandas\core\generic.py in ?(self, dtype)
   1996     def __array__(self, dtype: npt.DTypeLike | None = None) -> np.ndarray:
   1997         values = self._values
-> 1998         arr = np.asarray(values, dtype=dtype)
   1999         if (
   2000             astype_is_view(values.dtype, arr.dtype)
   2001             and using_copy_on_write()
```

```
ValueError: could not convert string to float: 'hola'
```