# Data Wrangling

### IMPORT REQUIRED LIBRARIES

In [ ]:

```
import pandas as pd
import seaborn as sns
import numpy as np
```

### LOAD TITANIC DATASET

In [ ]:

```
Kas = sns.load_dataset("Titanic")
```

### GET DATA DETAILS

In [ ]:

```
Kas.head()
Kas.shape
```

Out[ ]:

```
(891, 15)
```

> CHECKING FIRST 10 ROWS OF 'AGE' COLUMN

In [ ]:

```
# simple operations (maths operator)
(Kas["age"]+6).head(10)
# the above code will add 6 in age col
```

Out[ ]:

```
0    28.0
1    44.0
2    32.0
3    41.0
4    41.0
5     NaN
6    60.0
7     8.0
8    33.0
9    20.0
Name: age, dtype: float64
```

# - Dealing with missing values

```
- In as data missing values are either: N/A/NaN/0/blank cell
- if we have missing value in any col or row
```

# - Perform the following Steps:

```
1. Recollect the data and check the mistakes

2. remove the column having missing values if is not effecting the
whole data or useless

3. Replace the missing value

   1. How
      1. Take Average/Mean of entire columns and replace that with
missing values
      2. frequency/ MODE replacement
      3. USE ML Algorithms
      4. Leave it like that
   2. Why?
      1. its better because no data is lost
      2. Avoid less accuracy
```

In [ ]:

```
#Find where exactly missing values are
Kas.isnull().sum()
```

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

```
In [ ]: #removing null values from a column:deck
        Kas.dropna(subset=["deck"], axis=0, inplace= True)
        #inplace=True will made the changes in original dataframe
        print(Kas.shape)
```

```
(203, 15)
```

```
In [ ]: Kas.isnull().sum()
```

Out[ ]:

```
survived        0
pclass          0
sex             0
age            19
sibsp           0
parch           0
fare            0
embarked        2
class           0
who             0
adult_male      0
deck            0
embark_town     2
alive           0
alone           0
dtype: int64
```

In [ ]:

```
#remove null values from whole dataset
Kas=Kas.dropna()
Kas.isnull().sum()
```

Out[ ]:

```
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 [ ]:

```
Kas.shape
```

Out[ ]:

```
(182, 15)
```

# Replacing missing values

```
  -  by taking mean/average of relevant column
```

In [ ]:

```
kas1 = sns.load_dataset("titanic")
```

In [ ]:

```
kas1.shape
```

Out[ ]:

```
(891, 15)
```

In [ ]:

```
# Finding mean of age column as it contains 177 missing values
mean= kas1["age"].mean()
mean
```

Out[ ]:

```
29.69911764705882
```

In [ ]:

```
#replacing NaN with mean of the data ( also updating the column)
kas1["age"]=kas1["age"].replace(np.nan, mean)
```

In [ ]:

```
kas1.isnull().sum()
```

Out[ ]:

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

> ## Replacing NaN values of "deck" & "embark_town" Column

In [ ]:

```python
Kas['deck'] = Kas['deck'].fillna(Kas['deck'].mode()[0])
```

In [ ]:

```python
Kas.dropna()
Kas.isnull().sum()
```

```
Out[ ]: 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
```

> ## Data Formatting
>
> - Make the data as per standardized format
> - Make sure that the data is consistent and understandable
>     - easy to gather
>     - easy to workwith
>     - names should be uniformed
>         - e.g use Lahore or LHR on all place dont mix

> - if a columns has different unit like kg, g or pounds, make a single unit for all entries i.e: all entries should b kg/g etc
> - one standard unit for each col
> -

In [ ]:

```
# check data types of columns
kas1.dtypes
```

Out[ ]:

```
survived          int64
pclass            int64
sex              object
age             float64
sibsp             int64
parch             int64
fare            float64
embarked         object
class          category
who              object
adult_male         bool
deck           category
embark_town      object
alive            object
alone              bool
dtype: object
```

> # TYPECASTING

In [ ]:

```
# convert data type of one column into other
Kas["survived"] = Kas["survived"].astype("float64")
```

In [ ]:

```
Kas.dtypes
```

Out[ ]:

```
survived        float64
pclass            int64
sex              object
age             float64
sibsp             int64
parch             int64
fare            float64
embarked         object
class            object
who              object
adult_male         bool
deck             object
embark_town      object
alive            object
alone              bool
dtype: object
```

In [ ]:

```
# converting age cols into days instead of years
kas1["age"] = kas1["age"]*365
kas1.head()
```

Out[ ]:

| | survived | pclass | sex | age | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 8030.0 | 1 | 0 | 7.2500 | S | Third | man | True |
| **1** | 1 | 1 | female | 13870.0 | 1 | 0 | 71.2833 | C | First | woman | False |
| **2** | 1 | 3 | female | 9490.0 | 0 | 0 | 7.9250 | S | Third | woman | False |
| **3** | 1 | 1 | female | 12775.0 | 1 | 0 | 53.1000 | S | First | woman | False |
| **4** | 0 | 3 | male | 12775.0 | 0 | 0 | 8.0500 | S | Third | man | True |

> # Removing decimal numbers from "age" Column

In [ ]:

```
kas1["age"] = kas1["age"].astype("int64")
kas1.head()
```

Out[ ]:

|  | survived | pclass | sex | age | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 8030 | 1 | 0 | 7.2500 | S | Third | man | True |
| **1** | 1 | 1 | female | 13870 | 1 | 0 | 71.2833 | C | First | woman | False |
| **2** | 1 | 3 | female | 9490 | 0 | 0 | 7.9250 | S | Third | woman | False |
| **3** | 1 | 1 | female | 12775 | 1 | 0 | 53.1000 | S | First | woman | False |
| **4** | 0 | 3 | male | 12775 | 0 | 0 | 8.0500 | S | Third | man | True |

In [ ]:

```
# renaming column name
kas1.rename(columns={"age":"age in days"}, inplace=True)
kas1.head()
```

Out[ ]:

| | survived | pclass | sex | age in days | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 8030 | 1 | 0 | 7.2500 | S | Third | man | True |
| **1** | 1 | 1 | female | 13870 | 1 | 0 | 71.2833 | C | First | woman | False |
| **2** | 1 | 3 | female | 9490 | 0 | 0 | 7.9250 | S | Third | woman | False |
| **3** | 1 | 1 | female | 12775 | 1 | 0 | 53.1000 | S | First | woman | False |
| **4** | 0 | 3 | male | 12775 | 0 | 0 | 8.0500 | S | Third | man | True |

> # Data Normalization
>
> - Makes the data uniform
> - They have same impact
> - bring both variables or datasets in a range for making comparison
> - Also for computational purpose

In [ ]:

```
kas1.head()
```

Out[ ]:

| | survived | pclass | sex | age in days | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 8030 | 1 | 0 | 7.2500 | S | Third | man | True |
| **1** | 1 | 1 | female | 13870 | 1 | 0 | 71.2833 | C | First | woman | False |
| **2** | 1 | 3 | female | 9490 | 0 | 0 | 7.9250 | S | Third | woman | False |
| **3** | 1 | 1 | female | 12775 | 1 | 0 | 53.1000 | S | First | woman | False |
| **4** | 0 | 3 | male | 12775 | 0 | 0 | 8.0500 | S | Third | man | True |

In [ ]:

```
kas2 = kas1[["age in days", "fare"]]
kas2.head()
```

Out[ ]:

| | age in days | fare |
|---|---|---|
| **0** | 8030 | 7.2500 |
| **1** | 13870 | 71.2833 |
| **2** | 9490 | 7.9250 |
| **3** | 12775 | 53.1000 |
| **4** | 12775 | 8.0500 |

The above data is in above range as values in age in days and values in fare have huge gap, here we need to normalize the data

> # Methods to normalize the data
>
> 1. simple feature scaling
>     - x(new)= x(old)/x(max)
> 2. Min-Max method
> 3. Z-score (standard score) -3 to +3 (0 to 3)
> 4. Log transformation

> # Method-1: Simple Feature Scaling

```
In [ ]: kas2["fare"] = kas2["fare"]/kas2["fare"].max()
        kas2["age in days"] = kas2["age in days"]/kas2["age in days"].max()
        kas2.head()
```

```
C:\Users\My Net\AppData\Local\Temp\ipykernel_8120\956855613.py:2: SettingWithCopyW
arning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  kas2["fare"] = kas2["fare"]/kas2["fare"].max()
C:\Users\My Net\AppData\Local\Temp\ipykernel_8120\956855613.py:3: SettingWithCopyW
arning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  kas2["age in days"] = kas2["age in days"]/kas2["age in days"].max()
```

Out[ ]:

|  | age in days | fare |
|---|---|---|
| **0** | 0.2750 | 0.014151 |
| **1** | 0.4750 | 0.139136 |
| **2** | 0.3250 | 0.015469 |
| **3** | 0.4375 | 0.103644 |
| **4** | 0.4375 | 0.015713 |

# Method-2: Min-Max

In [ ]:

```
kas1["fare"] = (kas1["fare"]-kas1["fare"].min())/(kas1["fare"]-kas1["fare"].max())
kas1.head()
```

Out[ ]:

| | survived | pclass | sex | age in days | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 8030 | 1 | 0 | -0.014354 | S | Third | man | True |
| **1** | 1 | 1 | female | 13870 | 1 | 0 | -0.161623 | C | First | woman | False |
| **2** | 1 | 3 | female | 9490 | 0 | 0 | -0.015712 | S | Third | woman | False |
| **3** | 1 | 1 | female | 12775 | 1 | 0 | -0.115629 | S | First | woman | False |
| **4** | 0 | 3 | male | 12775 | 0 | 0 | -0.015963 | S | Third | man | True |

## Method-3: Z-score

In [ ]:

```
kas2["fare"] = kas2["fare"]-kas2["fare"].mean()
kas2["age in days"] = kas2["age in days"]-kas2["age in days"].mean()
kas2.head()
```

```
C:\Users\My Net\AppData\Local\Temp\ipykernel_8120\2287191071.py:2: SettingWithCopy
Warning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  kas2["fare"] = kas2["fare"]-kas2["fare"].mean()
C:\Users\My Net\AppData\Local\Temp\ipykernel_8120\2287191071.py:3: SettingWithCopy
Warning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  kas2["age in days"] = kas2["age in days"]-kas2["age in days"].mean()
```

Out[ ]:

| | **age in days** | **fare** |
|---|---:|---:|
| **0** | -0.096237 | -0.048707 |
| **1** | 0.103763 | 0.076277 |
| **2** | -0.046237 | -0.047390 |
| **3** | 0.066263 | 0.040786 |
| **4** | 0.066263 | -0.047146 |

# Method-4: Log Transformation

In [ ]:

```
k= sns.load_dataset("titanic")
k["fare"] = np.log(k["fare"])
k.head()
```

```
C:\Users\My Net\AppData\Local\Programs\Python\Python310\lib\site-packages\pandas\c
ore\arraylike.py:397: RuntimeWarning: divide by zero encountered in log
  result = getattr(ufunc, method)(*inputs, **kwargs)
```

Out[ ]:

| | survived | pclass | sex | age | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 1.981001 | S | Third | man | True |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 4.266662 | C | First | woman | False |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 2.070022 | S | Third | woman | False |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 3.972177 | S | First | woman | False |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 2.085672 | S | Third | man | True |

# Bining

- Grouping values (less or more continous) into smaller number of bins
- convert numeric into categories (child, young, old) etc

> - To have better understanding of groups
>     - low vs mid high price

> # Bining "age" column into three groups

In [ ]:

```
K5=sns.load_dataset("titanic")
K5=K5.dropna()
K5.isnull().sum()
K5["age"] = K5["age"].astype("int64")

bins = K5['age'].value_counts(bins=4, sort=True)
bins= np.sort(bins)
age_groups = ["Childern", " Young", " Old"]
K5["age"]= pd.cut(K5["age"], bins, labels= age_groups, include_lowest=True)
K5=K5.dropna()
K5.isnull().sum()
K5.head()
```

Out[ ]:

| | survived | pclass | sex | age | sibsp | parch | fare | embarked | class | who | adult_ma |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 1 | female | Young | 1 | 0 | 71.2833 | C | First | woman | Fal |
| **3** | 1 | 1 | female | Young | 1 | 0 | 53.1000 | S | First | woman | Fal |
| **6** | 0 | 1 | male | Young | 0 | 0 | 51.8625 | S | First | man | Tru |
| **11** | 1 | 1 | female | Old | 0 | 0 | 26.5500 | S | First | woman | Fal |
| **21** | 1 | 2 | male | Young | 0 | 0 | 13.0000 | S | Second | man | Tru |

> # converting categories into dummies
>
> - easy to use for computations
> - e.g male,female=0,1

In [ ]:

```
pd.get_dummies(kas1["sex"])
kas1.head()
```

Out[ ]:

| | survived | pclass | sex | age in days | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 8030 | 1 | 0 | -0.014354 | S | Third | man | True |
| **1** | 1 | 1 | female | 13870 | 1 | 0 | -0.161623 | C | First | woman | False |
| **2** | 1 | 3 | female | 9490 | 0 | 0 | -0.015712 | S | Third | woman | False |
| **3** | 1 | 1 | female | 12775 | 1 | 0 | -0.115629 | S | First | woman | False |
| **4** | 0 | 3 | male | 12775 | 0 | 0 | -0.015963 | S | Third | man | True |

> # How to get dummies to change data inside a dataframe?

In [ ]:

```
kk = sns.load_dataset("titanic")
kk = pd.get_dummies(kk, columns=['sex'])
kk.head()
```

```
Out[ ]:    survived  pclass   age  sibsp  parch     fare  embarked  class    who  adult_male  deck  em
        0         0       3  22.0      1      0   7.2500         S  Third    man        True   NaN  Sc
        1         1       1  38.0      1      0  71.2833         C  First  woman       False     C
        2         1       3  26.0      0      0   7.9250         S  Third  woman       False   NaN  Sc
        3         1       1  35.0      1      0  53.1000         S  First  woman       False     C  Sc
        4         0       3  35.0      0      0   8.0500         S  Third    man        True   NaN  Sc
```

# More Explanation of Bining

```
In [ ]: import matplotlib.pyplot as plt
```

```
In [ ]: kk = sns.load_dataset("titanic")
```

```
In [ ]: kk.head(10)
```

Out[ ]:

| | survived | pclass | sex | age | sibsp | parch | fare | embarked | class | who | adult_male |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S | Third | man | True |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 71.2833 | C | First | woman | False |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S | Third | woman | False |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S | First | woman | False |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S | Third | man | True |
| **5** | 0 | 3 | male | NaN | 0 | 0 | 8.4583 | Q | Third | man | True |
| **6** | 0 | 1 | male | 54.0 | 0 | 0 | 51.8625 | S | First | man | True |
| **7** | 0 | 3 | male | 2.0 | 3 | 1 | 21.0750 | S | Third | child | False |
| **8** | 1 | 3 | female | 27.0 | 0 | 2 | 11.1333 | S | Third | woman | False |
| **9** | 1 | 2 | female | 14.0 | 1 | 0 | 30.0708 | C | Second | child | False |

In [ ]:

```
kk["age"].dtype
```

Out[ ]:

```
dtype('float64')
```

In [ ]:

```
kk["age"].isnull().sum()
```

Out[ ]:

```
177
```

In [ ]:

```
kk["age"].dropna()
```

Out[ ]:

```
0      22.0
1      38.0
2      26.0
3      35.0
4      35.0
       ... 
885    39.0
886    27.0
887    19.0
889    26.0
890    32.0
Name: age, Length: 714, dtype: float64
```

# disturibute data into equal parts

- As in our example we want to divide age column into three equal parts.

In [ ]:

```
np.linspace(1,90, 3)
```

Out[ ]:

```
array([ 1. , 45.5, 90. ])
```

In [ ]:

```
#create bins
bins = np.linspace(min(kk["age"]), max(kk["age"]), 5) # we need 3 bins but we alwa
bins
```

Out[ ]:

```
array([ 0.42  , 20.315, 40.21  , 60.105, 80.    ])
```

In [ ]:

```
group_names =["Child", "young","middle-age","old"]
```

In [ ]:

```
#perform bins
kk["age_binned"] = pd.cut(kk["age"], bins, labels=group_names, include_lowest= Tru
```

In [ ]:

```
kk[["age","age_binned"]].head(20)
```

```
Out[ ]:
        age  age_binned
  0    22.0       young
  1    38.0       young
  2    26.0       young
  3    35.0       young
  4    35.0       young
  5     NaN         NaN
  6    54.0  middle-age
  7     2.0       Child
  8    27.0       young
  9    14.0       Child
 10     4.0       Child
 11    58.0  middle-age
 12    20.0       Child
 13    39.0       young
 14    14.0       Child
 15    55.0  middle-age
```

|  | age | age_binned |
|---|---|---|
| **16** | 2.0 | Child |
| **17** | NaN | NaN |
| **18** | 31.0 | young |
| **19** | NaN | NaN |

In [ ]:

```
kk["age_binned"].value_counts(sort= True)
# shows number of childs, young and old people in dataset
```

Out[ ]:

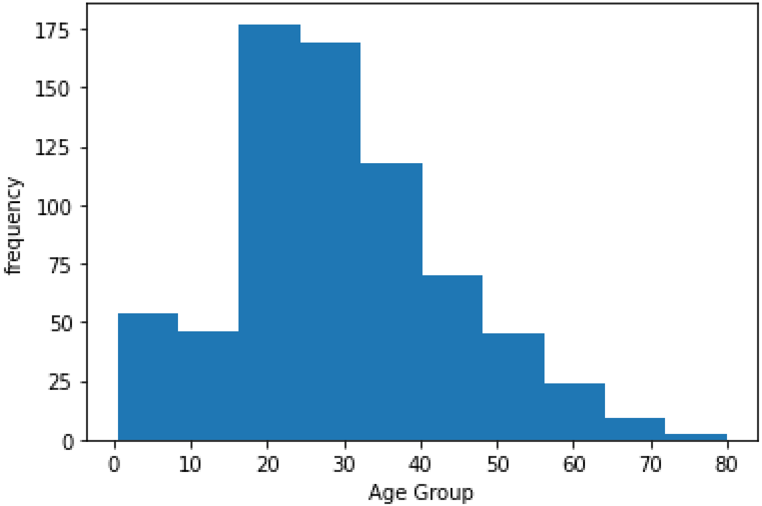
```
young         385
Child         179
middle-age    128
old            22
Name: age_binned, dtype: int64
```

In [ ]:

```
plt.hist(kk["age"])
plt.xlabel("Age Group")
plt.ylabel("frequency")
```

Out[ ]:

```
Text(0, 0.5, 'frequency')
```


175
150
125
100
75
50
25
0
frequency
0
10
20
30
40
50
60
70
80
Age Group