In [1]:
```
import numpy as np
import pandas as pd
```

In [2]:
```
dict1={'Names':['Ramesh','Suresh',np.nan,'Mahesh'],
      'Age':[31,32,33,np.nan],
      'City':[np.nan,'Hyd','Mumbai','Chennai']}
```

In [4]:
```
data1=pd.DataFrame(dict1)
```

In [5]:
```
data1.isnull()
```

Out[5]:

|   | Names | Age | City |
|---|---|---|---|
| **0** | False | False | True |
| **1** | False | False | False |
| **2** | True | False | False |
| **3** | False | True | False |

In [6]:
```
data1.isnull().sum()
# every column has one missing value is there
```

Out[6]:
```
Names     1
Age       1
City      1
dtype: int64
```

In [7]:
```
data1.isnull().sum()/len(data1)
```

Out[7]:
```
Names     0.25
Age       0.25
City      0.25
dtype: float64
```

In [8]:
```
data1.isnull().sum()*100/len(data1)
```

Out[8]:
```
Names     25.0
Age       25.0
City      25.0
dtype: float64
```

In [10]:

```
dict2={'Names':['Ramesh','Suresh',None,'Mahesh'],
      'Age':[31,32,33,None],
      'City':[None,'Hyd','Mumbai','Chennai']}
data2=pd.DataFrame(dict2)
data2
```

Out[10]:

| | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | None |
| **1** | Suresh | 32.0 | Hyd |
| **2** | None | 33.0 | Mumbai |
| **3** | Mahesh | NaN | Chennai |

In [11]:

```
data2.isnull()
```

Out[11]:

| | Names | Age | City |
|---|---|---|---|
| **0** | False | False | True |
| **1** | False | False | False |
| **2** | True | False | False |
| **3** | False | True | False |

In [12]:

```
data2.isnull().sum()
```

Out[12]:

```
Names     1
Age       1
City      1
dtype: int64
```

In [13]:

```
dict3={'Names':['Ramesh','Suresh','Null','Mahesh'],
      'Age':[31,32,33,'Null'],
      'City':['Null','Hyd','Mumbai','Chennai']}
data3=pd.DataFrame(dict3)
data3
```

Out[13]:

| | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31 | Null |
| **1** | Suresh | 32 | Hyd |
| **2** | Null | 33 | Mumbai |
| **3** | Mahesh | Null | Chennai |

### Method-1

> Fill the missing values with random number

dataframe name= data1

method name:fillna

In [14]:

```
data1.fillna(40)
```

Out[14]:

| | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | 40 |
| **1** | Suresh | 32.0 | Hyd |
| **2** | 40 | 33.0 | Mumbai |
| **3** | Mahesh | 40.0 | Chennai |

### Method-2

> Fill the missing values with random number on specific column

dataframe name= data1

method name:fillna

In [19]:

```
data1['Names'].fillna('Sathish',inplace=True)
data1
```

Out[19]:

| | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | NaN |
| **1** | Suresh | 32.0 | Hyd |
| **2** | Sathish | 33.0 | Mumbai |
| **3** | Mahesh | NaN | Chennai |

In [20]:

```
#Create the data again
dict1={'Names':['Ramesh','Suresh',np.nan,'Mahesh'],
      'Age':[31,32,33,np.nan],
      'City':[np.nan,'Hyd','Mumbai','Chennai']}
data1=pd.DataFrame(dict1)
```

### Method-3

- bfill
- ffill
- pad
- backfill

In [21]:

```
data1.fillna(method='backfill')
# Names  index 2 has missed value
#        it will replace by index 3 value
#Age  index 3 has missed value
#     we dont have index 4, so the value is NaN
# City index 0 has missed value
#       it replace with index 1 value
```

Out[21]:

|  | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | Hyd |
| **1** | Suresh | 32.0 | Hyd |
| **2** | Mahesh | 33.0 | Mumbai |
| **3** | Mahesh | NaN | Chennai |

In [22]:

```
data1
```

Out[22]:

|  | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | NaN |
| **1** | Suresh | 32.0 | Hyd |
| **2** | NaN | 33.0 | Mumbai |
| **3** | Mahesh | NaN | Chennai |

- bfill and backfill both are same
- pad and ffill both are same

### Method-4

- Mean
- Median
- Mode

In [23]:

```
data1
```

Out[23]:

|  | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | NaN |
| **1** | Suresh | 32.0 | Hyd |
| **2** | NaN | 33.0 | Mumbai |
| **3** | Mahesh | NaN | Chennai |

In [24]:

```
age_mean=data1['Age'].mean()
age_mean
```

Out[24]:

```
32.0
```

```
In [25]: data1['Age'].fillna(age_mean)
```

```
Out[25]: 0    31.0
         1    32.0
         2    33.0
         3    32.0
         Name: Age, dtype: float64
```

```
In [27]: # instead of providing a random number
         # we are filling with mean of the data
         age_median=data1['Age'].median()
         age_median
         data1['Age'].fillna(age_median)
```

```
Out[27]: 0    31.0
         1    32.0
         2    33.0
         3    32.0
         Name: Age, dtype: float64
```

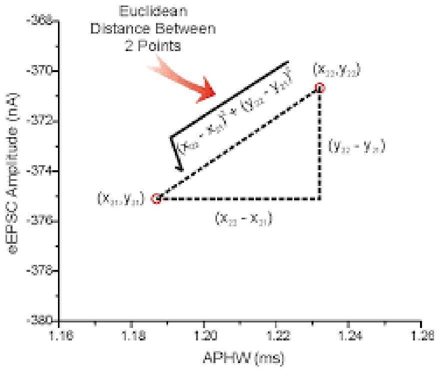
```
In [ ]: # Level1: Mean median mode
        # Level2: bfill fill
        # level3:
```

### Method-5:KNN imputer

KNN: K nearest neighbours

- in the KNN imputer instead of taking mean of all the values
- will choose neigbours data
- will take those mean only

### KNN Imputer



```
In [ ]: n_neighbors is parameter can choose by user

        if we dont choose by default it will takes as =5
```

In [31]:

```
from sklearn.impute import KNNImputer
knn=KNNImputer(n_neighbors=2)
knn.fit_transform(data1[['Age']])
```

Out[31]:

```
array([[31.],
       [32.],
       [33.],
       [32.]])
```

In [33]:

```
data1
```

Out[33]:

| | Names | Age | City |
|---|---|---|---|
| **0** | Ramesh | 31.0 | NaN |
| **1** | Suresh | 32.0 | Hyd |
| **2** | NaN | 33.0 | Mumbai |
| **3** | Mahesh | NaN | Chennai |

### Method-6

- Based on other columns
- Some times all above methods will not provide good justification
- at that time we need to check other columns dependancy also
- Most of the time will pick a column which have highest correlation

In [ ]:

```
1
```

In [ ]:

In [ ]:

In [ ]:

In [ ]: