1. Impoting Dependencies :

In [ ]:
```
import numpy as np
import pandas as pd
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn import svm
from sklearn.metrics import accuracy_score
from sklearn.preprocessing import StandardScaler
```

2. Data Collcetion and Analysis:

A- Loading dataset :

In [ ]:
```
data_parkinson = pd.read_csv("C:/Machine_learning Python/projets/ParkinssonDisea
```

B- View the data (head)

In [ ]:
```
data_parkinson.head()
```

Out[ ]:

	name	MDVP:Fo(Hz)	MDVP:Fhi(Hz)	MDVP:Flo(Hz)	MDVP:Jitter(%)	MDVP
0	phon_R01_S01_1	119.992	157.302	74.997	0.00784	
1	phon_R01_S01_2	122.400	148.650	113.819	0.00968	
2	phon_R01_S01_3	116.682	131.111	111.555	0.01050	
3	phon_R01_S01_4	116.676	137.871	111.366	0.00997	
4	phon_R01_S01_5	116.014	141.781	110.655	0.01284	

5 rows × 24 columns

C- type of the data (head)

In [ ]:
```
type(data_parkinson)
```

Out[ ]:
```
pandas.core.frame.DataFrame
```

D-Number of row & columns:

In [ ]:
```
data_parkinson.shape
```

Out[ ]:
```
(195, 24)
```

E- More information about the data

In [ ]:
```
data_parkinson.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 24 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   name              195 non-null    object 
 1   MDVP:Fo(Hz)       195 non-null    float64
 2   MDVP:Fhi(Hz)      195 non-null    float64
 3   MDVP:Flo(Hz)      195 non-null    float64
 4   MDVP:Jitter(%)    195 non-null    float64
 5   MDVP:Jitter(Abs)  195 non-null    float64
 6   MDVP:RAP          195 non-null    float64
 7   MDVP:PPQ          195 non-null    float64
 8   Jitter:DDP        195 non-null    float64
 9   MDVP:Shimmer      195 non-null    float64
 10  MDVP:Shimmer(dB)  195 non-null    float64
 11  Shimmer:APQ3      195 non-null    float64
 12  Shimmer:APQ5      195 non-null    float64
 13  MDVP:APQ          195 non-null    float64
 14  Shimmer:DDA       195 non-null    float64
 15  NHR               195 non-null    float64
 16  HNR               195 non-null    float64
 17  status            195 non-null    int64  
 18  RPDE              195 non-null    float64
 19  DFA               195 non-null    float64
 20  spread1           195 non-null    float64
 21  spread2           195 non-null    float64
 22  D2                195 non-null    float64
 23  PPE               195 non-null    float64
dtypes: float64(22), int64(1), object(1)
memory usage: 36.7+ KB
```

2. Statisctical measures :

A- General Statistic:

In [ ]:
```
data_parkinson.describe()
```

Out[ ]:

	MDVP:Fo(Hz)	MDVP:Fhi(Hz)	MDVP:Flo(Hz)	MDVP:Jitter(%)	MDVP:Jitter(Abs)
count	195.000000	195.000000	195.000000	195.000000	195.000000
mean	154.228641	197.104918	116.324631	0.006220	0.000044
std	41.390065	91.491548	43.521413	0.004848	0.000035
min	88.333000	102.145000	65.476000	0.001680	0.000007
25%	117.572000	134.862500	84.291000	0.003460	0.000020
50%	148.790000	175.829000	104.315000	0.004940	0.000030
75%	182.769000	224.205500	140.018500	0.007365	0.000060
max	260.105000	592.030000	239.170000	0.033160	0.000260

8 rows × 23 columns

B- Number of missing value in each column;

In [ ]:
```
data_parkinson.isnull().sum()
#0 missing value
```

Out[ ]:
```
name                0
MDVP:Fo(Hz)         0
MDVP:Fhi(Hz)        0
MDVP:Flo(Hz)        0
MDVP:Jitter(%)      0
MDVP:Jitter(Abs)    0
MDVP:RAP            0
MDVP:PPQ            0
Jitter:DDP          0
MDVP:Shimmer        0
MDVP:Shimmer(dB)    0
Shimmer:APQ3        0
Shimmer:APQ5        0
MDVP:APQ            0
Shimmer:DDA         0
NHR                 0
HNR                 0
status              0
RPDE                0
DFA                 0
spread1             0
spread2             0
D2                  0
PPE                 0
dtype: int64
```

C- How many peapole have parkinsson and how many people don't have:

In [ ]:
```
data_parkinson["status"].value_counts()
#147: have parkinsson
#48 : havn't parkinsson
```

Out[ ]:
```
status
1    147
0     48
Name: count, dtype: int64
```

D- Grouping the data based on the target variable

In [ ]:
```
data_parkinson = data_parkinson.select_dtypes(include=[np.number])
data_parkinson.groupby('status').mean()
```

Out[ ]:

	MDVP:Fo(Hz)	MDVP:Fhi(Hz)	MDVP:Flo(Hz)	MDVP:Jitter(%)	MDVP:Jitter(Abs)
status					
0	181.937771	223.636750	145.207292	0.003866	0.000023
1	145.180762	188.441463	106.893558	0.006989	0.000051

2 rows × 22 columns

3. Data Preprocessing:

A- Separating a features & target:

In [ ]:
```
X = data_parkinson.drop(columns= ['status'] , axis= 1)
Y = data_parkinson['status']
print(X)
print(Y)
```

```
     MDVP:Fo(Hz)  MDVP:Fhi(Hz)  MDVP:Flo(Hz)  MDVP:Jitter(%)  \
0        119.992       157.302        74.997         0.00784   
1        122.400       148.650       113.819         0.00968   
2        116.682       131.111       111.555         0.01050   
3        116.676       137.871       111.366         0.00997   
4        116.014       141.781       110.655         0.01284   
..           ...           ...           ...             ...   
190      174.188       230.978        94.261         0.00459   
191      209.516       253.017        89.488         0.00564   
192      174.688       240.005        74.287         0.01360   
193      198.764       396.961        74.904         0.00740   
194      214.289       260.277        77.973         0.00567   

     MDVP:Jitter(Abs)  MDVP:RAP  MDVP:PPQ  Jitter:DDP  MDVP:Shimmer  \
0             0.00007   0.00370   0.00554     0.01109       0.04374   
1             0.00008   0.00465   0.00696     0.01394       0.06134   
2             0.00009   0.00544   0.00781     0.01633       0.05233   
3             0.00009   0.00502   0.00698     0.01505       0.05492   
4             0.00011   0.00655   0.00908     0.01966       0.06425   
..                ...       ...       ...         ...           ...   
190           0.00003   0.00263   0.00259     0.00790       0.04087   
191           0.00003   0.00331   0.00292     0.00994       0.02751   
192           0.00008   0.00624   0.00564     0.01873       0.02308   
193           0.00004   0.00370   0.00390     0.01109       0.02296   
194           0.00003   0.00295   0.00317     0.00885       0.01884   

     MDVP:Shimmer(dB)  ...  MDVP:APQ  Shimmer:DDA      NHR     HNR      RPDE  \
0               0.426  ...   0.02971      0.06545  0.02211  21.033  0.414783   
1               0.626  ...   0.04368      0.09403  0.01929  19.085  0.458359   
2               0.482  ...   0.03590      0.08270  0.01309  20.651  0.429895   
3               0.517  ...   0.03772      0.08771  0.01353  20.644  0.434969   
4               0.584  ...   0.04465      0.10470  0.01767  19.649  0.417356   
..                ...  ...       ...          ...      ...     ...       ...   
190             0.405  ...   0.02745      0.07008  0.02764  19.517  0.448439   
191             0.263  ...   0.01879      0.04812  0.01810  19.147  0.431674   
192             0.256  ...   0.01667      0.03804  0.10715  17.883  0.407567   
193             0.241  ...   0.01588      0.03794  0.07223  19.020  0.451221   
194             0.190  ...   0.01373      0.03078  0.04398  21.209  0.462803   

          DFA   spread1   spread2        D2       PPE  
0    0.815285 -4.813031  0.266482  2.301442  0.284654  
1    0.819521 -4.075192  0.335590  2.486855  0.368674  
2    0.825288 -4.443179  0.311173  2.342259  0.332634  
3    0.819235 -4.117501  0.334147  2.405554  0.368975  
4    0.823484 -3.747787  0.234513  2.332180  0.410335  
..        ...       ...       ...       ...       ...  
190  0.657899 -6.538586  0.121952  2.657476  0.133050  
191  0.683244 -6.195325  0.129303  2.784312  0.168895  
192  0.655683 -6.787197  0.158453  2.679772  0.131728  
193  0.643956 -6.744577  0.207454  2.138608  0.123306  
194  0.664357 -5.724056  0.190667  2.555477  0.148569  

[195 rows x 22 columns]
0      1
1      1
2      1
3      1
4      1
      ..
190    0
```

```
191    0
192    0
193    0
194    0
Name: status, Length: 195, dtype: int64
```

B- Test Split

In [ ]:
```
X_train, X_test, Y_train , Y_test = train_test_split(X,Y, test_size=0.2,stratify
```

In [ ]:
```
print(X.shape,X_train.shape, X_test.shape)
```

```
(195, 22) (156, 22) (39, 22)
```

4. Data Standarisation:

In [ ]:
```
scaler = StandardScaler()
```

In [ ]:
```
scaler.fit(X_train)
```

Out[ ]:
```
▾ StandardScaler
StandardScaler()
```

In [ ]:
```
X_train = scaler.transform(X_train)
X_test = scaler.transform(X_test)
print(X_train)
print(X_test)
```

```
[[-3.37789850e-01 -1.86151275e-01 -9.11085922e-01 ...  3.02808525e-01
   3.67380761e-01 -1.01626972e-01]
 [ 1.09942206e+00  2.52399879e-01  7.59431971e-01 ...  9.62684763e-01
   2.30410182e-01  7.25430092e-03]
 [-8.75220075e-01 -5.64868721e-01 -3.69947894e-01 ... -1.24083946e-03
  -1.27562573e+00 -5.03037967e-01]
 ...
 [ 9.67834202e-01  1.38914623e-01 -8.24451036e-01 ...  5.83176337e-01
   5.94403638e-01 -2.56870663e-01]
 [-7.69983726e-01 -6.17537239e-01 -4.08691589e-01 ...  2.01206260e-01
  -9.18334164e-01 -4.43401072e-01]
 [ 1.19847659e+00  4.93351249e-01  1.11785168e+00 ... -1.03979251e-01
   5.12603529e-01 -5.39510027e-01]]
[[ 6.75664548e-01  4.30692802e-02  9.17000470e-01 -4.65043840e-01
  -7.49745604e-01 -3.93228335e-01 -3.77439566e-01 -3.94525767e-01
   4.45619551e-01  2.19598173e-01  5.21466719e-01  5.50343466e-01
   2.33273889e-01  5.21470425e-01  1.16130564e-01 -1.29432625e+00
   8.21532645e-01  1.19747938e-01  1.25597046e-02  1.02371713e+00
   1.83847640e+00 -9.57975551e-02]
 [ 2.14053706e+00  5.75095585e-01  2.69990518e+00 -7.34959454e-01
  -1.06696913e+00 -6.19284025e-01 -6.30896620e-01 -6.20586823e-01
  -6.53557602e-01 -6.64300480e-01 -5.71749737e-01 -6.30067211e-01
  -6.80568916e-01 -5.72107026e-01 -4.63775964e-01  2.99892220e-01
  -4.08092287e-01 -1.53468433e+00 -1.02431660e+00 -8.41894550e-01
  -3.00324761e-01 -1.00212990e+00]
 [-1.38183818e+00 -9.55917721e-01 -7.26885474e-01  1.56841734e-01
   8.36372029e-01  2.13175024e-01  2.32999252e-01  2.14284168e-01
   5.35991668e-01  3.84392837e-01  6.79342665e-01  5.16269755e-01
   2.32711870e-01  6.79681691e-01 -1.47813603e-01 -6.35730329e-01
   4.42804024e-01  8.75799415e-01  1.12314644e+00 -8.79399218e-01
   6.88972147e-01  1.29665790e+00]
 [ 5.23179722e-01  4.78660424e-01 -9.63631913e-01  1.59495213e+00
   1.15359556e+00  1.05639863e+00  7.64902082e-01  1.05752779e+00
  -3.65627832e-01 -1.54935154e-01 -3.11601952e-01 -3.64779038e-01
  -4.46769034e-01 -3.11621114e-01  2.29951855e+00 -9.03835372e-01
  -8.97853679e-01 -1.15565864e+00 -1.01851889e+00 -8.39681431e-01
   7.74907245e-01 -8.45707221e-01]
 [-8.24407961e-01 -7.39891602e-01 -6.26772507e-01  1.52523085e-01
   5.19148502e-01  2.27527766e-01 -1.77529778e-01  2.27441161e-01
  -1.69121018e-01 -2.54810708e-01 -9.71289686e-02 -3.32327886e-01
  -2.49500385e-01 -9.74732292e-02  6.19523559e-01 -2.29785050e-03
   1.48685008e+00 -1.09106004e+00  1.30802601e+00 -6.35672130e-01
   1.93817938e-01  4.17627751e-01]
 [-7.97292813e-02 -3.57875547e-01  6.68999138e-01 -6.16196584e-01
  -7.49745604e-01 -5.58284870e-01 -5.41651178e-01 -5.59586221e-01
  -4.51271176e-01 -4.44574261e-01 -4.23803096e-01 -3.84249730e-01
  -4.47331053e-01 -4.24156324e-01 -4.85794247e-01  2.68552296e-01
  -1.65972644e+00  6.40660486e-01 -5.52850905e-01 -1.42025228e+00
  -4.21497494e-01 -5.76724411e-01]
 [-6.48795865e-01 -6.76660981e-01 -7.23648222e-02 -3.74352194e-01
  -1.15298551e-01 -7.12576849e-01 -6.45175890e-01 -7.12685772e-01
  -5.10118136e-01 -5.09493371e-01 -4.35718262e-01 -6.94158237e-01
  -4.76556039e-01 -4.35740831e-01 -5.19096900e-01  7.31102123e-01
   7.84160775e-02  6.96958614e-01 -9.29000327e-01  7.40284091e-01
   1.44828350e-01 -1.12664361e+00]
 [-1.12947458e+00 -9.10993288e-01 -5.27840609e-01 -6.98873813e-02
   5.19148502e-01 -1.38467160e-01 -1.09703242e-01 -1.38562455e-01
   1.01307238e+00  7.68913720e-01  1.09339467e+00  1.05252505e+00
   6.68276552e-01  1.09374507e+00  1.84662470e-01 -1.09210367e+00
   1.35139517e+00  4.08530258e-01  3.38124739e-01  1.07676097e+00
```

```
  6.85711134e-04  3.69868019e-01]
 [ 7.99555439e-02 -7.40968733e-02  6.23516402e-01  3.16631778e-01
   2.01924976e-01  1.52175869e-01  1.75882170e-01  1.52087475e-01
   5.20754509e-01  3.04492394e-01  1.38195555e-01  4.53801287e-01
   1.03864704e+00  1.38519726e-01  2.76588801e-01 -1.07082913e+00
   1.46608150e+00 -6.17684983e-01  1.02002288e+00  1.31098467e+00
   1.22450541e+00  1.23261073e+00]
 [-3.91220145e-01 -3.23032625e-01 -1.15545141e+00  6.51327139e-01
   8.36372029e-01  6.36580919e-01  4.04350499e-01  6.35307934e-01
   5.62838573e-02  1.04741286e-01  5.57823251e-02 -4.51351849e-02
   7.92806981e-02  5.57732478e-02  8.22774541e-02 -4.24357411e-01
  -1.31278341e-02  1.43109626e-01  3.16894142e-01 -2.80993239e-01
  -2.11731274e-01  1.86110404e-01]
 [-5.85862541e-01  3.09670738e+00 -6.40250589e-01 -8.71619806e-02
   2.01924976e-01 -3.17876438e-01 -1.27552331e-01 -3.17975991e-01
  -5.23253619e-01 -3.29717374e-01 -7.27639822e-01 -5.65976184e-01
  -4.09113765e-01 -7.27339419e-01 -2.76816394e-03  6.65448413e-01
  -1.14499211e-01 -6.52196567e-01 -4.69727179e-01  5.98017250e-01
   7.91345545e-01 -6.19735461e-01]
 [ 2.40844005e+00  7.13298562e-01  1.54901134e+00 -9.42254645e-01
  -1.16213619e+00 -8.52516085e-01 -8.45085679e-01 -8.52628331e-01
  -9.73012530e-01 -9.18983143e-01 -9.60978485e-01 -8.79941086e-01
  -9.00318323e-01 -9.61346458e-01 -5.30656498e-01  1.13714858e+00
   1.08326950e+00 -1.51810107e+00 -1.50453457e+00 -3.37646709e-01
  -8.80003547e-01 -1.34055263e+00]
 [ 5.74961532e-01  2.08742461e-01 -7.39599334e-01 -3.48440295e-01
  -4.32522078e-01 -4.32698376e-01 -4.59545372e-01 -4.31604565e-01
  -9.64080402e-01 -8.49070255e-01 -1.04041292e+00 -9.61068968e-01
  -7.63185700e-01 -1.04012110e+00 -3.30014895e-01  1.21973043e+00
  -9.70914923e-01 -1.14682722e+00  8.77096851e-01  6.17958988e-01
   7.13840539e-01  2.79577564e-01]
 [-8.28565536e-02 -3.91178390e-01  4.10136603e-01 -7.86783252e-01
  -7.49745604e-01 -7.66399632e-01 -7.70119508e-01 -7.65313743e-01
  -8.71081188e-01 -8.04126255e-01 -9.15303683e-01 -8.08548550e-01
  -7.88476553e-01 -9.15670402e-01 -4.90473132e-01  1.27806386e+00
  -1.30891720e+00 -1.78205479e-02 -1.21044246e+00 -2.26328024e-01
  -9.66985735e-01 -1.05148344e+00]
 [ 6.56755460e-01  5.53462222e-02  1.37926161e+00 -7.28481479e-01
  -7.49745604e-01 -6.33636767e-01 -6.55885343e-01 -6.33743816e-01
  -8.19590098e-01 -7.79157367e-01 -8.49770271e-01 -7.54192870e-01
  -7.14852071e-01 -8.50135192e-01 -5.85977434e-01  1.12182176e+00
  -9.33832361e-01  8.00457971e-01 -7.12528220e-01 -2.02480783e-01
  -2.68050494e-01 -7.34347901e-01]
 [-8.91268557e-01  4.20635069e+00 -5.01417085e-01 -7.65190003e-01
  -7.49745604e-01 -7.69987818e-01 -7.20142061e-01 -7.70098104e-01
  -8.95250475e-01 -8.49070255e-01 -9.44098667e-01 -8.32075636e-01
  -7.40704943e-01 -9.44466176e-01 -4.62399821e-01  7.29500813e-01
   2.83376360e-01 -1.01051531e+00 -6.27580269e-01 -1.33457973e+00
  -5.66204342e-01 -7.67763339e-01]
 [-9.42274610e-01 -7.84116991e-01 -9.00294193e-01 -8.71619806e-02
   2.01924976e-01 -1.09761676e-01 -1.20412695e-01 -1.11052379e-01
   5.28110379e-01  5.94131501e-01 -2.80057314e-03  1.45515337e-01
   9.28491324e-01 -3.14224445e-03 -7.90064688e-02 -3.19585986e-01
   1.50110283e+00 -4.67409155e-01  4.43427696e-01  3.52988328e-01
  -5.68649246e-01  3.90260060e-01]
 [-8.00698873e-01 -7.59661410e-01 -2.36927103e-01 -7.58712028e-01
  -7.49745604e-01 -7.66399632e-01 -7.66549691e-01 -7.65313743e-01
  -1.04131704e+00 -9.83902253e-01 -1.09800289e+00 -9.95142678e-01
  -8.76151508e-01 -1.09804364e+00 -5.15518929e-01  1.03740985e+00
  -7.94388011e-02 -3.79080600e-02 -2.01236322e-01 -3.95602014e-01
```

```
 -6.76021737e-01 -2.79751668e-01]
[ 4.34767613e-01  1.32503089e-01 -9.35517839e-01 -3.59236919e-01
 -4.32522078e-01 -2.85582768e-01 -4.13137743e-01 -2.85681555e-01
 -5.45321229e-01 -5.04499593e-01 -6.87922603e-01 -5.23789686e-01
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```
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```

6. Training the model (SVM):

A- Loading the model

In [ ]:
```
model = svm.SVC(kernel='linear')
```

B- Training the support Vector Machine Model:

In [ ]:
```
model.fit(X_train, Y_train)
```

Out[ ]:
```
▾          SVC
SVC(kernel='linear')
```

7. Model Evaluation:

A- Accuracy score of training data:

In [ ]:
```
X_train_prediction = model.predict(X_train)
data_accuracy = accuracy_score(X_train_prediction, Y_train)
```

In [ ]:
```
print('Accuracy on training data : ', data_accuracy)
```

```
Accuracy on training data :  0.8974358974358975
```

B- Accuracy score of testing data:

In [ ]:
```
X_test_prediction = model.predict(X_test)
data_accuracy2 = accuracy_score(X_test_prediction, Y_test)
```

In [ ]:
```
print('Accuracy on testing data : ', data_accuracy2)
```

```
Accuracy on testing data :  0.8974358974358975
```

C- Exemple

In [ ]:
```
def  predictionF(MDVPFo,MDVPFhi,MDVPFlo,MDVPJitter,MDVPJitterAbs,MDVPRAP,MDVPPPQ
    input_data = (MDVPFo,MDVPFhi,MDVPFlo,MDVPJitter,MDVPJitterAbs,MDVPRAP,MDVPPP
    #Input the data into the numpy array:
    input_dataNumpuy = np.asarray(input_data)
    #Reshape the data:
    input_dataReshaped = input_dataNumpuy.reshape(1,-1)
    #Predict the model:
    prediction = model.predict(input_dataReshaped)
    print(prediction[0])
    if(prediction[0] == 1):
        print("The person is affected")
```

```
    else:
        print("The person is not affected")


predictionF(95.05600,120.10300,91.22600,0.00532,0.00006,0.00268,0.00332,0.00803,
```

```
0
The person is not affected
```