parkinsons

December 1, 2023

Importing the Dependencies

[ ]:
```python
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn import svm
from sklearn.metrics import accuracy_score
```

Data Collection & Analysis

[ ]:
```python
# loading the data from csv file to a Pandas DataFrame
parkinsons_data = pd.read_csv('/content/parkinsons.csv')
```

[ ]:
```python
# printing the first 5 rows of the dataframe
parkinsons_data.head()
```

[ ]:
```
             name  MDVP:Fo(Hz)  MDVP:Fhi(Hz)  MDVP:Flo(Hz)  MDVP:Jitter(%)  \
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

   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  …

   Shimmer:DDA      NHR     HNR  status      RPDE       DFA   spread1  \
0      0.06545  0.02211  21.033       1  0.414783  0.815285 -4.813031
1      0.09403  0.01929  19.085       1  0.458359  0.819521 -4.075192
2      0.08270  0.01309  20.651       1  0.429895  0.825288 -4.443179
3      0.08771  0.01353  20.644       1  0.434969  0.819235 -4.117501
4      0.10470  0.01767  19.649       1  0.417356  0.823484 -3.747787

    spread2        D2       PPE
```

```
0  0.266482  2.301442  0.284654
1  0.335590  2.486855  0.368674
2  0.311173  2.342259  0.332634
3  0.334147  2.405554  0.368975
4  0.234513  2.332180  0.410335

[5 rows x 24 columns]
```

[ ]:

```
# number of rows and columns in the dataframe
parkinsons_data.shape
```

[ ]:

```
(195, 24)
```

[ ]:

```
# getting more information about the dataset
parkinsons_data.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
```

```
[ ]: # checking for missing values in each column
     parkinsons_data.isnull().sum()
```

```
[ ]: 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
```

```
[ ]: # getting some statistical measures about the data
     parkinsons_data.describe()
```

```
[ ]:        MDVP:Fo(Hz)  MDVP:Fhi(Hz)  MDVP:Flo(Hz)  MDVP:Jitter(%)  \
     count   195.000000    195.000000    195.000000      195.000000
     mean    154.228641    197.104918    116.324631        0.006220
     std      41.390065     91.491548     43.521413        0.004848
     min      88.333000    102.145000     65.476000        0.001680
     25%     117.572000    134.862500     84.291000        0.003460
     50%     148.790000    175.829000    104.315000        0.004940
     75%     182.769000    224.205500    140.018500        0.007365
     max     260.105000    592.030000    239.170000        0.033160

            MDVP:Jitter(Abs)    MDVP:RAP    MDVP:PPQ  Jitter:DDP  MDVP:Shimmer  \
     count        195.000000  195.000000  195.000000  195.000000    195.000000
     mean           0.000044    0.003306    0.003446    0.009920      0.029709
     std            0.000035    0.002968    0.002759    0.008903      0.018857
     min            0.000007    0.000680    0.000920    0.002040      0.009540
```

```
25%            0.000020    0.001660    0.001860    0.004985      0.016505
50%            0.000030    0.002500    0.002690    0.007490      0.022970
75%            0.000060    0.003835    0.003955    0.011505      0.037885
max            0.000260    0.021440    0.019580    0.064330      0.119080

       MDVP:Shimmer(dB)  …  Shimmer:DDA         NHR         HNR      status  \
count        195.000000  …   195.000000  195.000000  195.000000  195.000000
mean           0.282251  …     0.046993    0.024847   21.885974    0.753846
std            0.194877  …     0.030459    0.040418    4.425764    0.431878
min            0.085000  …     0.013640    0.000650    8.441000    0.000000
25%            0.148500  …     0.024735    0.005925   19.198000    1.000000
50%            0.221000  …     0.038360    0.011660   22.085000    1.000000
75%            0.350000  …     0.060795    0.025640   25.075500    1.000000
max            1.302000  …     0.169420    0.314820   33.047000    1.000000

             RPDE         DFA     spread1     spread2          D2         PPE
count  195.000000  195.000000  195.000000  195.000000  195.000000  195.000000
mean     0.498536    0.718099   -5.684397    0.226510    2.381826    0.206552
std      0.103942    0.055336    1.090208    0.083406    0.382799    0.090119
min      0.256570    0.574282   -7.964984    0.006274    1.423287    0.044539
25%      0.421306    0.674758   -6.450096    0.174351    2.099125    0.137451
50%      0.495954    0.722254   -5.720868    0.218885    2.361532    0.194052
75%      0.587562    0.761881   -5.046192    0.279234    2.636456    0.252980
max      0.685151    0.825288   -2.434031    0.450493    3.671155    0.527367

[8 rows x 23 columns]
```

[ ]:

```python
# distribution of target Variable
parkinsons_data['status'].value_counts()
```

[ ]:

```
1    147
0     48
Name: status, dtype: int64
```

1 –> Parkinson’s Positive

0 –> Healthy

[ ]:

```python
import matplotlib.pyplot as plt
import seaborn as sns
corrMatrix=parkinsons_data.corr()
corrMatrix
```

```
<ipython-input-26-b9b1b4466795>:3: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it will
default to False. Select only valid columns or specify the value of numeric_only
to silence this warning.
  corrMatrix=parkinsons_data.corr()
```

```
[ ]:                  MDVP:Fo(Hz)  MDVP:Fhi(Hz)  MDVP:Flo(Hz)  MDVP:Jitter(%)  \
     MDVP:Fo(Hz)          1.000000      0.400985      0.596546       -0.118003
     MDVP:Fhi(Hz)         0.400985      1.000000      0.084951        0.102086
     MDVP:Flo(Hz)         0.596546      0.084951      1.000000       -0.139919
     MDVP:Jitter(%)      -0.118003      0.102086     -0.139919        1.000000
     MDVP:Jitter(Abs)    -0.382027     -0.029198     -0.277815        0.935714
     MDVP:RAP            -0.076194      0.097177     -0.100519        0.990276
     MDVP:PPQ            -0.112165      0.091126     -0.095828        0.974256
     Jitter:DDP          -0.076213      0.097150     -0.100488        0.990276
     MDVP:Shimmer        -0.098374      0.002281     -0.144543        0.769063
     MDVP:Shimmer(dB)    -0.073742      0.043465     -0.119089        0.804289
     Shimmer:APQ3        -0.094717     -0.003743     -0.150747        0.746625
     Shimmer:APQ5        -0.070682     -0.009997     -0.101095        0.725561
     MDVP:APQ            -0.077774      0.004937     -0.107293        0.758255
     Shimmer:DDA         -0.094732     -0.003733     -0.150737        0.746635
     NHR                 -0.021981      0.163766     -0.108670        0.906959
     HNR                  0.059144     -0.024893      0.210851       -0.728165
     status              -0.383535     -0.166136     -0.380200        0.278220
     RPDE                -0.383894     -0.112404     -0.400143        0.360673
     DFA                 -0.446013     -0.343097     -0.050406        0.098572
     spread1             -0.413738     -0.076658     -0.394857        0.693577
     spread2             -0.249450     -0.002954     -0.243829        0.385123
     D2                   0.177980      0.176323     -0.100629        0.433434
     PPE                 -0.372356     -0.069543     -0.340071        0.721543

                       MDVP:Jitter(Abs)  MDVP:RAP  MDVP:PPQ  Jitter:DDP  \
     MDVP:Fo(Hz)              -0.382027 -0.076194 -0.112165   -0.076213
     MDVP:Fhi(Hz)             -0.029198  0.097177  0.091126    0.097150
     MDVP:Flo(Hz)             -0.277815 -0.100519 -0.095828   -0.100488
     MDVP:Jitter(%)            0.935714  0.990276  0.974256    0.990276
     MDVP:Jitter(Abs)          1.000000  0.922911  0.897778    0.922913
     MDVP:RAP                  0.922911  1.000000  0.957317    1.000000
     MDVP:PPQ                  0.897778  0.957317  1.000000    0.957319
     Jitter:DDP                0.922913  1.000000  0.957319    1.000000
     MDVP:Shimmer              0.703322  0.759581  0.797826    0.759555
     MDVP:Shimmer(dB)          0.716601  0.790652  0.839239    0.790621
     Shimmer:APQ3              0.697153  0.744912  0.763580    0.744894
     Shimmer:APQ5              0.648961  0.709927  0.786780    0.709907
     MDVP:APQ                  0.648793  0.737455  0.804139    0.737439
     Shimmer:DDA               0.697170  0.744919  0.763592    0.744901
     NHR                       0.834972  0.919521  0.844604    0.919548
     HNR                      -0.656810 -0.721543 -0.731510   -0.721494
     status                    0.338653  0.266668  0.288698    0.266646
     RPDE                      0.441839  0.342140  0.333274    0.342079
     DFA                       0.175036  0.064083  0.196301    0.064026
     spread1                   0.735779  0.648328  0.716489    0.648328
     spread2                   0.388543  0.324407  0.407605    0.324377
```

```
D2                          0.310694  0.426605  0.412524    0.426556
PPE                         0.748162  0.670999  0.769647    0.671005

                  MDVP:Shimmer  MDVP:Shimmer(dB)  …  Shimmer:DDA       NHR  \
MDVP:Fo(Hz)          -0.098374         -0.073742  …    -0.094732 -0.021981
MDVP:Fhi(Hz)          0.002281          0.043465  …    -0.003733  0.163766
MDVP:Flo(Hz)         -0.144543         -0.119089  …    -0.150737 -0.108670
MDVP:Jitter(%)        0.769063          0.804289  …     0.746635  0.906959
MDVP:Jitter(Abs)      0.703322          0.716601  …     0.697170  0.834972
MDVP:RAP              0.759581          0.790652  …     0.744919  0.919521
MDVP:PPQ              0.797826          0.839239  …     0.763592  0.844604
Jitter:DDP            0.759555          0.790621  …     0.744901  0.919548
MDVP:Shimmer          1.000000          0.987258  …     0.987626  0.722194
MDVP:Shimmer(dB)      0.987258          1.000000  …     0.963202  0.744477
Shimmer:APQ3          0.987625          0.963198  …     1.000000  0.716207
Shimmer:APQ5          0.982835          0.973751  …     0.960072  0.658080
MDVP:APQ              0.950083          0.960977  …     0.896647  0.694019
Shimmer:DDA           0.987626          0.963202  …     1.000000  0.716215
NHR                   0.722194          0.744477  …     0.716215  1.000000
HNR                  -0.835271         -0.827805  …    -0.827130 -0.714072
status                0.367430          0.350697  …     0.347608  0.189429
RPDE                  0.447424          0.410684  …     0.435237  0.370890
DFA                   0.159954          0.165157  …     0.151132 -0.131882
spread1               0.654734          0.652547  …     0.610971  0.540865
spread2               0.452025          0.454314  …     0.402223  0.318099
D2                    0.507088          0.512233  …     0.467261  0.470949
PPE                   0.693771          0.695058  …     0.645389  0.552591

                       HNR    status      RPDE       DFA   spread1   spread2  \
MDVP:Fo(Hz)       0.059144 -0.383535 -0.383894 -0.446013 -0.413738 -0.249450
MDVP:Fhi(Hz)     -0.024893 -0.166136 -0.112404 -0.343097 -0.076658 -0.002954
MDVP:Flo(Hz)      0.210851 -0.380200 -0.400143 -0.050406 -0.394857 -0.243829
MDVP:Jitter(%)   -0.728165  0.278220  0.360673  0.098572  0.693577  0.385123
MDVP:Jitter(Abs) -0.656810  0.338653  0.441839  0.175036  0.735779  0.388543
MDVP:RAP         -0.721543  0.266668  0.342140  0.064083  0.648328  0.324407
MDVP:PPQ         -0.731510  0.288698  0.333274  0.196301  0.716489  0.407605
Jitter:DDP       -0.721494  0.266646  0.342079  0.064026  0.648328  0.324377
MDVP:Shimmer     -0.835271  0.367430  0.447424  0.159954  0.654734  0.452025
MDVP:Shimmer(dB) -0.827805  0.350697  0.410684  0.165157  0.652547  0.454314
Shimmer:APQ3     -0.827123  0.347617  0.435242  0.151124  0.610967  0.402243
Shimmer:APQ5     -0.813753  0.351148  0.399903  0.213873  0.646809  0.457195
MDVP:APQ         -0.800407  0.364316  0.451379  0.157276  0.673158  0.502188
Shimmer:DDA      -0.827130  0.347608  0.435237  0.151132  0.610971  0.402223
NHR              -0.714072  0.189429  0.370890 -0.131882  0.540865  0.318099
HNR               1.000000 -0.361515 -0.598736 -0.008665 -0.673210 -0.431564
status           -0.361515  1.000000  0.308567  0.231739  0.564838  0.454842
RPDE             -0.598736  0.308567  1.000000 -0.110950  0.591117  0.479905
```

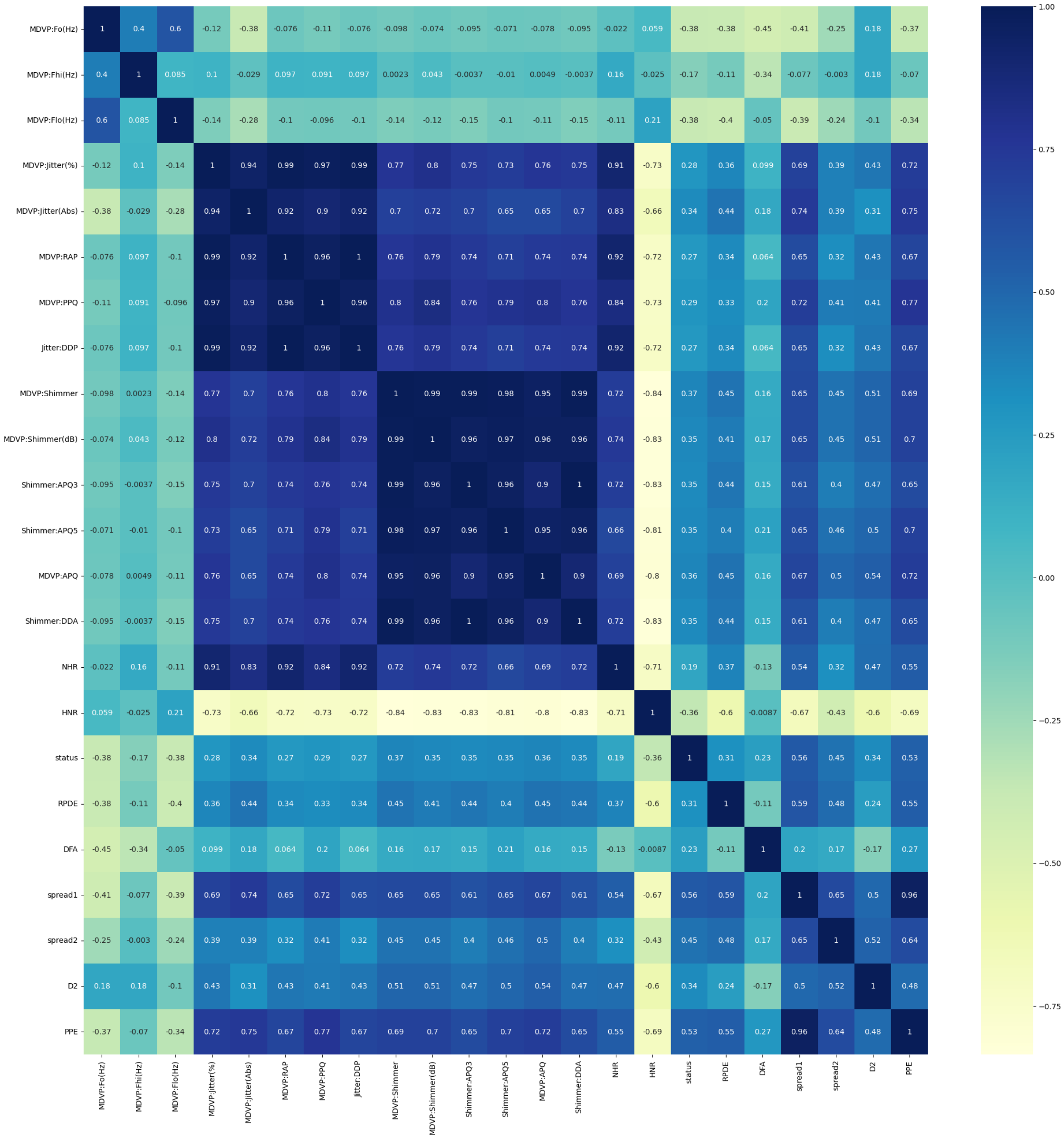
```
DFA              -0.008665  0.231739 -0.110950  1.000000  0.195668  0.166548
spread1          -0.673210  0.564838  0.591117  0.195668  1.000000  0.652358
spread2          -0.431564  0.454842  0.479905  0.166548  0.652358  1.000000
D2               -0.601401  0.340232  0.236931 -0.165381  0.495123  0.523532
PPE              -0.692876  0.531039  0.545886  0.270445  0.962435  0.644711

                        D2       PPE
MDVP:Fo(Hz)       0.177980 -0.372356
MDVP:Fhi(Hz)      0.176323 -0.069543
MDVP:Flo(Hz)     -0.100629 -0.340071
MDVP:Jitter(%)    0.433434  0.721543
MDVP:Jitter(Abs)  0.310694  0.748162
MDVP:RAP          0.426605  0.670999
MDVP:PPQ          0.412524  0.769647
Jitter:DDP        0.426556  0.671005
MDVP:Shimmer      0.507088  0.693771
MDVP:Shimmer(dB)  0.512233  0.695058
Shimmer:APQ3      0.467265  0.645377
Shimmer:APQ5      0.502174  0.702456
MDVP:APQ          0.536869  0.721694
Shimmer:DDA       0.467261  0.645389
NHR               0.470949  0.552591
HNR              -0.601401 -0.692876
status            0.340232  0.531039
RPDE              0.236931  0.545886
DFA              -0.165381  0.270445
spread1           0.495123  0.962435
spread2           0.523532  0.644711
D2                1.000000  0.480585
PPE               0.480585  1.000000

[23 rows x 23 columns]
```

[ ]:

```python
import seaborn as sns
sns.heatmap(corrMatrix,cmap="YlGnBu",annot=True)
plt.gcf().set_size_inches(25, 25)
```



```
[ ]: # grouping the data bas3ed on the target variable
     parkinsons_data.groupby('status').mean()
```

```
<ipython-input-9-fe279e55666c>:2: FutureWarning: The default value of
numeric_only in DataFrameGroupBy.mean is deprecated. In a future version,
numeric_only will default to False. Either specify numeric_only or select only
columns which should be valid for the function.
  parkinsons_data.groupby('status').mean()
```

```
[ ]:         MDVP:Fo(Hz)  MDVP:Fhi(Hz)  MDVP:Flo(Hz)  MDVP:Jitter(%)  \
     status
```

```
0         181.937771    223.636750    145.207292         0.003866
1         145.180762    188.441463    106.893558         0.006989

        MDVP:Jitter(Abs)  MDVP:RAP  MDVP:PPQ  Jitter:DDP  MDVP:Shimmer  \
status
0               0.000023  0.001925  0.002056    0.005776      0.017615
1               0.000051  0.003757  0.003900    0.011273      0.033658

        MDVP:Shimmer(dB)  …  MDVP:APQ  Shimmer:DDA       NHR        HNR  \
status                    …
0               0.162958  …  0.013305     0.028511  0.011483  24.678750
1               0.321204  …  0.027600     0.053027  0.029211  20.974048

            RPDE       DFA   spread1   spread2        D2       PPE
status
0       0.442552  0.695716 -6.759264  0.160292  2.154491  0.123017
1       0.516816  0.725408 -5.333420  0.248133  2.456058  0.233828

[2 rows x 22 columns]
```

Data Pre-Processing

Separating the features & Target

[ ]:
```
X = parkinsons_data.drop(columns=['name','status'], axis=1)
Y = parkinsons_data['status']
```

[ ]:
```
print(X)
```

```
     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]
```

```
[ ]: print(Y)
```

```
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
```

Splitting the data to training data & Test data

```
[ ]: X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2,␣
      ↪random_state=2)
```

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

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

Model Training

Support Vector Machine Model

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

```
[ ]: # training the SVM model with training data
     model.fit(X_train, Y_train)
```

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

Model Evaluation

Accuracy Score

```
[ ]: # accuracy score on training data
     X_train_prediction = model.predict(X_train)
     training_data_accuracy = accuracy_score(Y_train, X_train_prediction)
```

```
[ ]: print('Accuracy score of training data : ', training_data_accuracy)
```

```
Accuracy score of training data :  0.8717948717948718
```

```
[ ]: # accuracy score on training data
     X_test_prediction = model.predict(X_test)
     test_data_accuracy = accuracy_score(Y_test, X_test_prediction)
```

```
[ ]: print('Accuracy score of test data : ', test_data_accuracy)
```

```
Accuracy score of test data :  0.8717948717948718
```

Building a Predictive System

```
[ ]: input_data = (197.07600,206.89600,192.05500,0.00289,0.00001,0.00166,0.00168,0.
      ↪00498,0.01098,0.09700,0.00563,0.00680,0.00802,0.01689,0.00339,26.77500,0.
      ↪422229,0.741367,-7.348300,0.177551,1.743867,0.085569)

     # changing input data to a numpy array
     input_data_as_numpy_array = np.asarray(input_data)
```

```
# reshape the numpy array
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

prediction = model.predict(input_data_reshaped)
print(prediction)


if (prediction[0] == 0):
  print("The Person does not have Parkinsons Disease")

else:
  print("The Person has Parkinsons")
```

```
[0]
The Person does not have Parkinsons Disease
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439: UserWarning: X does
not have valid feature names, but SVC was fitted with feature names
  warnings.warn(
```

Saving the trained model

[ ]:

```
import pickle
```

[ ]:

```
filename = 'parkinsons_model.sav'
pickle.dump(model, open(filename, 'wb'))
```

[ ]:

```
# loading the saved model
loaded_model = pickle.load(open('parkinsons_model.sav', 'rb'))
```

[ ]:

```
for column in X.columns:
  print(column)
```

```
MDVP:Fo(Hz)
MDVP:Fhi(Hz)
MDVP:Flo(Hz)
MDVP:Jitter(%)
MDVP:Jitter(Abs)
MDVP:RAP
MDVP:PPQ
Jitter:DDP
MDVP:Shimmer
MDVP:Shimmer(dB)
Shimmer:APQ3
Shimmer:APQ5
MDVP:APQ
Shimmer:DDA
NHR
HNR
```

```
RPDE
DFA
spread1
spread2
D2
PPE
```

[ ]:

```

```