```
Python 3.9.12 (main, Apr  4 2022, 05:22:27) [MSC v.1916 64 bit (AMD64)]
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IPython 8.2.0 -- An enhanced Interactive Python.

In [1]:          'D:/ML_LAB_KAUSHIK/untitled0.py'       ='D:/ML_LAB_KAUSHIK'
     Product ID  Air temperature [K]  ...  Torque [Nm]  Tool wear [min]
0        M14860                298.1  ...         42.8                0
1        L47181                298.2  ...         46.3                3
2        L47182                298.1  ...         49.4                5
3        L47183                298.2  ...         39.5                7
4        L47184                298.2  ...         40.0                9
...         ...                  ...  ...          ...              ...
9995     M24855                298.8  ...         29.5               14
9996     H39410                298.9  ...         31.8               17
9997     M24857                299.0  ...         33.4               22
9998     H39412                299.0  ...         48.5               25
9999     M24859                299.0  ...         40.2               30

[10000 rows x 6 columns]
      Product ID  Air temperature [K]  ...  Torque [Nm]  Tool wear [min]
0              2              0.00000  ...     0.000000         0.000000
1              1              0.00000  ...     0.005495         0.000000
2              1              0.00000  ...     0.010989         0.000000
3              1              0.01087  ...     0.024725         0.000000
4              1              0.01087  ...     0.027473         0.000000
...          ...                  ...  ...          ...              ...
9995           2              0.98913  ...     0.958791         0.972332
9996           0              0.98913  ...     0.971154         0.972332
9997           2              0.98913  ...     0.983516         0.972332
9998           0              0.98913  ...     0.994505         0.992095
9999           2              1.00000  ...     1.000000         1.000000

[10000 rows x 6 columns]
        UDI Product ID Type  Air temperature [K]  ...  HDF  PWF  OSF  RNF
0         1     M14860    M                298.1  ...    0    0    0    0
1         2     L47181    L                298.2  ...    0    0    0    0
2         3     L47182    L                298.1  ...    0    0    0    0
3         4     L47183    L                298.2  ...    0    0    0    0
4         5     L47184    L                298.2  ...    0    0    0    0
...     ...        ...  ...                  ...  ...  ...  ...  ...  ...
9995   9996     M24855    M                298.8  ...    0    0    0    0
9996   9997     H39410    H                298.9  ...    0    0    0    0
9997   9998     M24857    M                299.0  ...    0    0    0    0
9998   9999     H39412    H                299.0  ...    0    0    0    0
9999  10000     M24859    M                299.0  ...    0    0    0    0

[10000 rows x 14 columns]
   Product ID  Air temperature [K]  ...  Torque [Nm]  Tool wear [min]
0           2              0.00000  ...     0.000000              0.0
1           1              0.00000  ...     0.005495              0.0
2           1              0.00000  ...     0.010989              0.0
3           1              0.01087  ...     0.024725              0.0
4           1              0.01087  ...     0.027473              0.0

[5 rows x 6 columns]
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 6 columns):
```
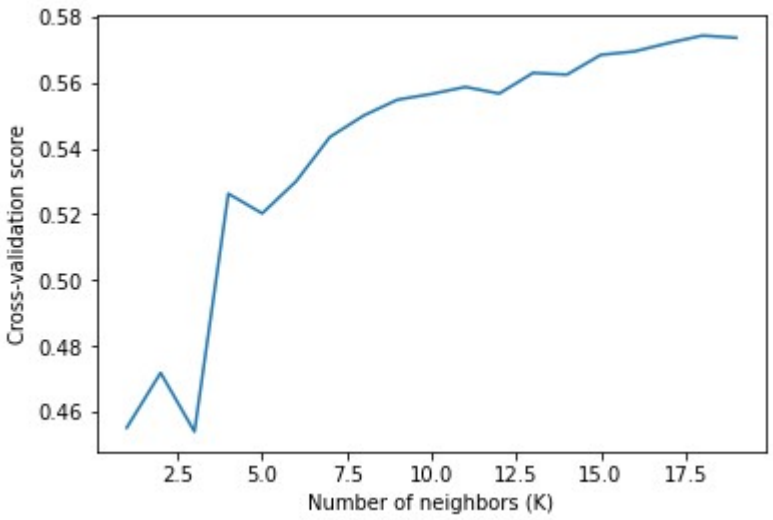

```
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   Product ID               10000 non-null  int64
 1   Air temperature [K]      10000 non-null  float64
 2   Process temperature [K]  10000 non-null  float64
 3   Rotational speed [rpm]   10000 non-null  float64
 4   Torque [Nm]              10000 non-null  float64
 5   Tool wear [min]          10000 non-null  float64
dtypes: float64(5), int64(1)
memory usage: 468.9 KB
None
Accuracy: 0.5036
```




```
[[  19  205   50]
 [ 124 1115  268]
 [  57  537  125]]
              precision    recall  f1-score   support

           0       0.10      0.07      0.08       274
           1       0.60      0.74      0.66      1507
           2       0.28      0.17      0.22       719

    accuracy                           0.50      2500
   macro avg       0.33      0.33      0.32      2500
weighted avg       0.45      0.50      0.47      2500
```

```
In [2]:          'D:/ML_LAB_KAUSHIK/untitled0.py'      ='D:/ML_LAB_KAUSHIK'
     Product ID  Air temperature [K]  ...  Torque [Nm]  Tool wear [min]
0        M14860                298.1  ...         42.8                0
1        L47181                298.2  ...         46.3                3
2        L47182                298.1  ...         49.4                5
3        L47183                298.2  ...         39.5                7
4        L47184                298.2  ...         40.0                9
...         ...                  ...  ...          ...              ...
9995     M24855                298.8  ...         29.5               14
9996     H39410                298.9  ...         31.8               17
9997     M24857                299.0  ...         33.4               22
9998     H39412                299.0  ...         48.5               25
9999     M24859                299.0  ...         40.2               30
```

```
[10000 rows x 6 columns]
      Product ID  Air temperature [K]  ...  Torque [Nm]  Tool wear [min]
0              2              0.00000  ...     0.000000         0.000000
1              1              0.00000  ...     0.005495         0.000000
2              1              0.00000  ...     0.010989         0.000000
3              1              0.01087  ...     0.024725         0.000000
4              1              0.01087  ...     0.027473         0.000000
...          ...                  ...  ...          ...              ...
9995           2              0.98913  ...     0.958791         0.972332
9996           0              0.98913  ...     0.971154         0.972332
9997           2              0.98913  ...     0.983516         0.972332
9998           0              0.98913  ...     0.994505         0.992095
9999           2              1.00000  ...     1.000000         1.000000

[10000 rows x 6 columns]
        UDI Product ID Type  Air temperature [K]  ...  HDF  PWF  OSF  RNF
0         1     M14860    M                298.1  ...    0    0    0    0
1         2     L47181    L                298.2  ...    0    0    0    0
2         3     L47182    L                298.1  ...    0    0    0    0
3         4     L47183    L                298.2  ...    0    0    0    0
4         5     L47184    L                298.2  ...    0    0    0    0
...     ...        ...  ...                  ...  ...  ...  ...  ...  ...
9995   9996     M24855    M                298.8  ...    0    0    0    0
9996   9997     H39410    H                298.9  ...    0    0    0    0
9997   9998     M24857    M                299.0  ...    0    0    0    0
9998   9999     H39412    H                299.0  ...    0    0    0    0
9999  10000     M24859    M                299.0  ...    0    0    0    0

[10000 rows x 14 columns]
   Product ID  Air temperature [K]  ...  Torque [Nm]  Tool wear [min]
0           2              0.00000  ...     0.000000              0.0
1           1              0.00000  ...     0.005495              0.0
2           1              0.00000  ...     0.010989              0.0
3           1              0.01087  ...     0.024725              0.0
4           1              0.01087  ...     0.027473              0.0

[5 rows x 6 columns]
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 6 columns):
 #   Column                  Non-Null Count  Dtype
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 0   Product ID              10000 non-null  int64
 1   Air temperature [K]     10000 non-null  float64
 2   Process temperature [K] 10000 non-null  float64
 3   Rotational speed [rpm]  10000 non-null  float64
 4   Torque [Nm]             10000 non-null  float64
 5   Tool wear [min]         10000 non-null  float64
dtypes: float64(5), int64(1)
memory usage: 468.9 KB
None
Accuracy: 0.5156
```

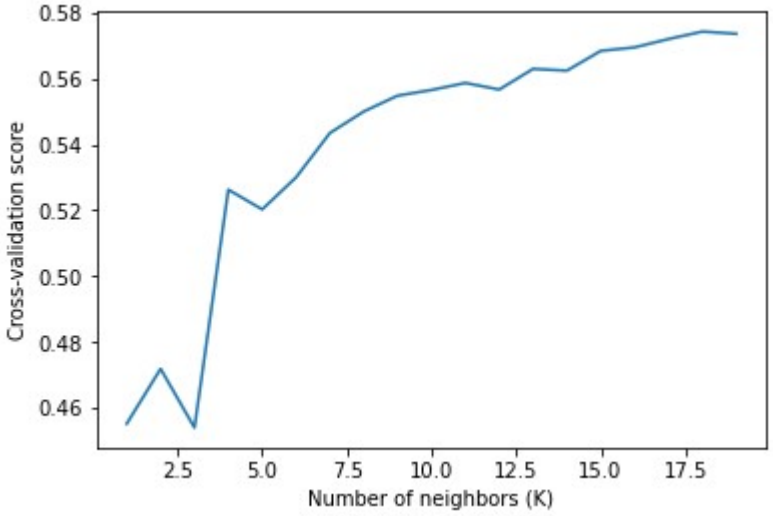


```
[[   7  219   48]
 [  87 1163  257]
 [  43  557  119]]
              precision    recall  f1-score   support

           0       0.05      0.03      0.03       274
           1       0.60      0.77      0.67      1507
           2       0.28      0.17      0.21       719

    accuracy                           0.52      2500
   macro avg       0.31      0.32      0.31      2500
weighted avg       0.45      0.52      0.47      2500
```

In [3]: