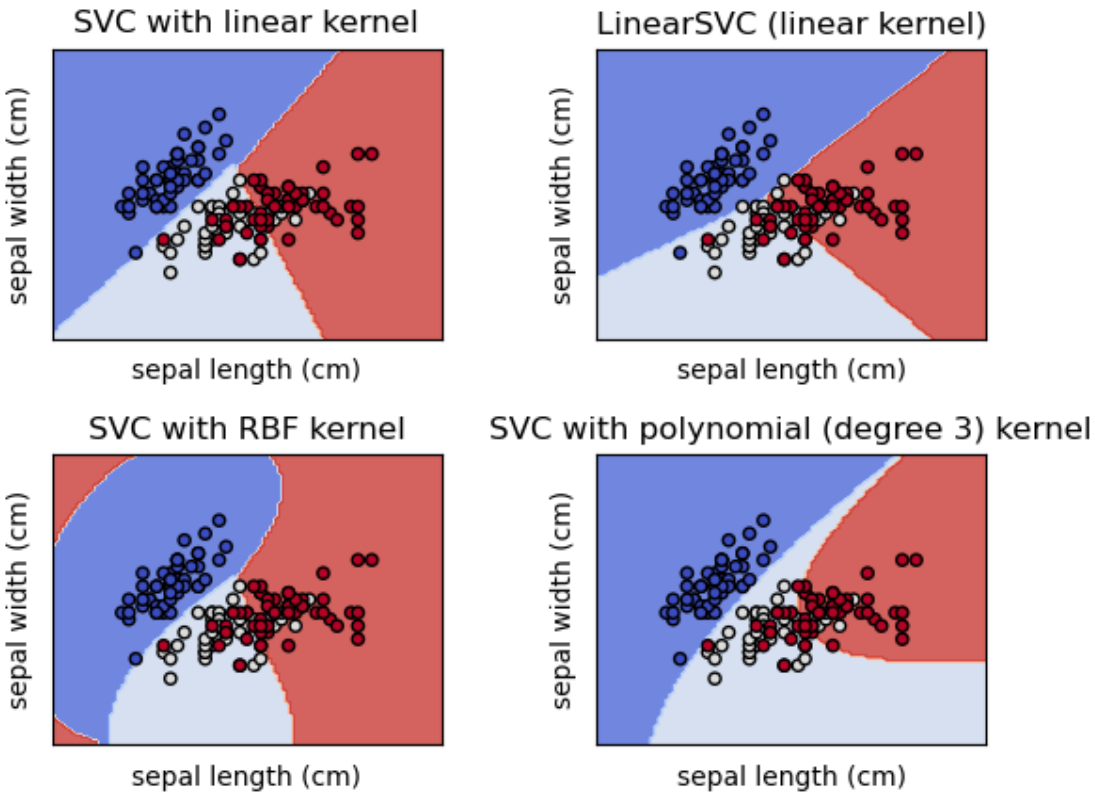
Support Vector Machine in Sleep Stage Prediction Model

Support Vector Machine(SVM) is a supervised machine learning algorithm used for both classification and regression. The objective of SVM algorithm is to find a hyperplane in an N-dimensional space that distinctly classifies the data points. The dimension of the hyperplane depends upon the number of features. If the number of input features is two, then the hyperplane is just a line. If the number of input features is three, then the hyperplane becomes a 2-D plane.

Advantages of SVM:

- Effective in high dimensional cases
- Its memory efficient as it uses a subset of training points in the decision function called support vectors
- Different kernel functions can be specified for the decision functions and its possible to specify custom kernels

Support Vector Machines offer various kernel functions for the support vector classifiers. They are demonstrated in the example given below :-



Classification Report

SVC(kernel = 'linear')

```
print(classification_report(Y_test, Y_pred_linear))
```

	precision	recall	f1-score	support
0	0.61	1.00	0.76	7621
1	0.00	0.00	0.00	444
2	0.00	0.00	0.00	1834
3	0.00	0.00	0.00	1632
4	0.00	0.00	0.00	969
accuracy			0.61	12500
macro avg	0.12	0.20	0.15	12500
weighted avg	0.37	0.61	0.46	12500

LinearSVC

```
print(classification_report(Y_test, Y_pred))
```

	precision	recall	f1-score	support
0	0.63	0.96	0.76	7621
1	0.00	0.00	0.00	444
2	0.28	0.04	0.06	1834
3	0.27	0.10	0.15	1632
4	0.00	0.00	0.00	969
accuracy			0.61	12500
macro avg	0.24	0.22	0.20	12500
weighted avg	0.46	0.61	0.49	12500

SVC(kernel = ‘rbf’)

```
print(classification_report(Y_test, Y_pred_rbf))
```

	precision	recall	f1-score	support
0	0.77	0.96	0.86	7621
1	0.81	0.24	0.37	444
2	0.59	0.37	0.45	1834
3	0.58	0.57	0.58	1632
4	0.79	0.10	0.18	969
accuracy			0.73	12500
macro avg	0.71	0.45	0.49	12500
weighted avg	0.72	0.73	0.69	12500

SVC(kernel = ‘poly’)

```
print(classification_report(Y_test, Y_pred_poly))
```

	precision	recall	f1-score	support
0	0.64	0.99	0.78	7621
1	0.76	0.14	0.23	444
2	0.63	0.06	0.10	1834
3	0.71	0.14	0.23	1632
4	0.93	0.03	0.06	969
accuracy			0.64	12500
macro avg	0.73	0.27	0.28	12500
weighted avg	0.67	0.64	0.53	12500

SVC(kernel = ‘sigmoid’)

```
print(classification_report(Y_test, Y_pred_sigmoid))
```

```
              precision    recall  f1-score   support

           0       0.57      0.75      0.65      7621
           1       0.00      0.00      0.00       444
           2       0.07      0.03      0.04      1834
           3       0.04      0.03      0.03      1632
           4       0.07      0.02      0.03       969

    accuracy                           0.47     12500
   macro avg       0.15      0.17      0.15     12500
weighted avg       0.37      0.47      0.41     12500
```