

AI Lab6 - SVM

180010019-Karan Sharma

180010008-Balsher Singh

1. **Library** – sklearn.svm and pandas
2. **Methodology** – Support vector machines (SVMs) are a set of supervised learning methods used for classification, regression and outlier's detection.

The advantages of support vector machines are:

- Effective in high dimensional spaces.
- Still effective in cases where number of dimensions is greater than the number of samples.
- Versatile: different Kernel functions can be specified for the decision function. Common kernels are provided, but it is also possible to specify custom kernels.

```
class sklearn.svm.SVC(*, C=1.0, kernel='rbf', degree=3, gamma='scale', coef0=0.0,
shrinking=True, probability=False, tol=0.001, cache_size=200, class_weight=None,
verbose=False, max_iter=-1, decision_function_shape='ovr', break_ties=False,
random_state=None)
```

We can vary different parameter by changing the argument in the SVC function. For regularization use C argument and for kernel use kernel argument to pass rbf, linear, poly as suitable.

In the poly kernel of svc class, we can set degree of polynomial function in the degree argument of class initialization.

Linear:

```
1 model = SVC(C=100, kernel="linear")
```

Quadratic:

```
model = SVC(C=100, kernel="poly", degree=2)
```

RBF: `model = SVC(C=100, kernel="rbf")`

3. Experimental Results

Kernel	C	Accuracy (%)
Linear	1	93.26
	10	91.74
	100	92.25
Quadratic	1	66.61
	10	68.21
	100	69.94
RBF	100	83.05
	1000	91.88
	10000	93.12

4. Analysis

Linear: As we increase the C accuracy decreases. Smaller value of C working well for linear kernel as it looks for larger margin separating hyperplane.

Quadratic: It perform poorly as the accuracy get saturated with highest value of 69.94% with C = 100.

RBF: RBF perform poorly for smaller C but with larger C it performs as equal to linear kernel.

Conclusion: Training data is linear separable because for kernel other than linear model perform poorly with low value of C. For very tiny values of C, we should get misclassified examples, often even if our training data is linearly separable.