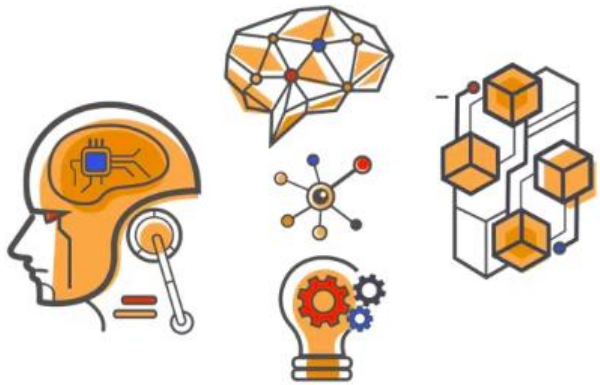
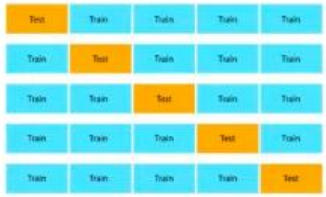
Siddhardhan

Cross Validation, Hyperparameter Tuning, & Evaluation metrics

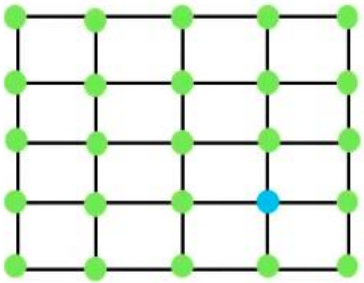


Module 8 - Outline

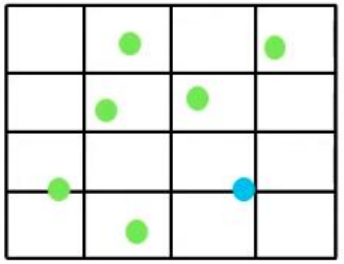


Cross Validation

Hyperparameter Tuning

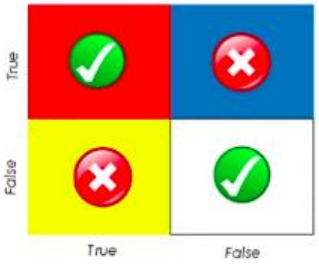


GridSearchCV



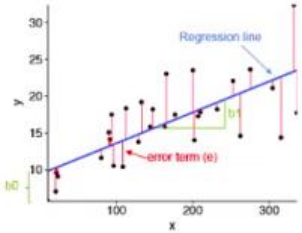
RandomizedSearchCV

Model Selection



Accuracy & Confusion Matrix

Precision, Recall, F1 Score



Metrics for Regression

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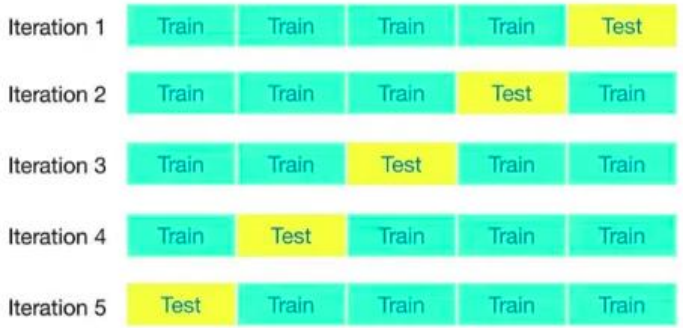
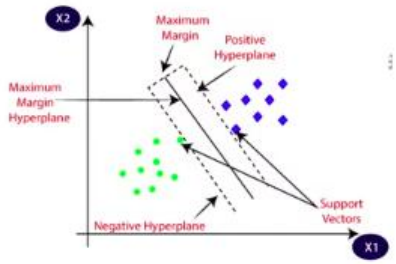
K-Fold Cross-Validation



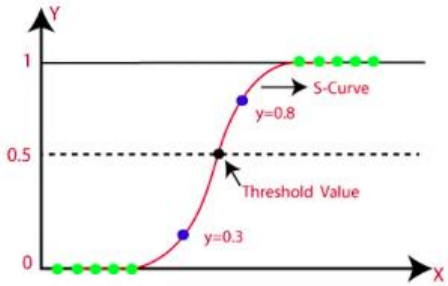
K-Fold Cross-Validation

In K-Fold Cross Validation, we split the dataset into **"K"** number of **folds** (subsets). One chunk of data is used as test data for evaluation & the remaining part of the data is used for training the model. Each time, a different chunk will be used as the test data.

K = 5	Dataset				
Iteration 1	Train	Train	Train	Train	Test
Iteration 2	Train	Train	Train	Test	Train
Iteration 3	Train	Train	Test	Train	Train
Iteration 4	Train	Test	Train	Train	Train
Iteration 5	Test	Train	Train	Train	Train

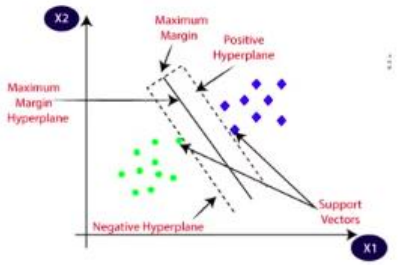


Support Vector Machine



Logistic Regression

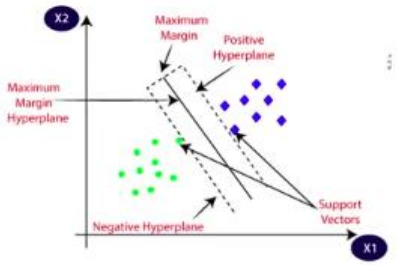
K-Fold Cross-Validation



Support Vector Machine

K = 5

K-Fold Cross-Validation



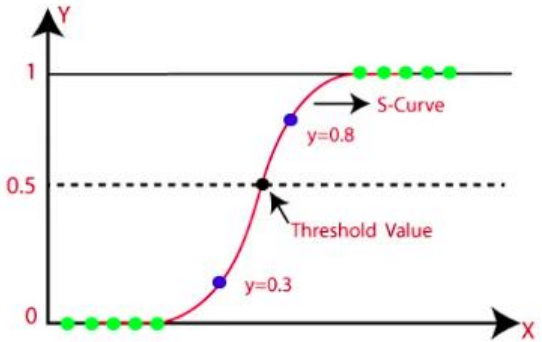
Support Vector Machine

K = 5

	Dataset					*Accuracy*
Iteration 1	Train	Train	Train	Train	Test	88%
Iteration 2	Train	Train	Train	Test	Train	83%
Iteration 3	Train	Train	Test	Train	Train	86%
Iteration 4	Train	Test	Train	Train	Train	81%
Iteration 5	Test	Train	Train	Train	Train	84%

$$\text{Mean Accuracy} = \frac{88 + 83 + 86 + 81 + 84}{5} = 84.4\ \%$$

K-Fold Cross-Validation



Logistic Regression

K = 5

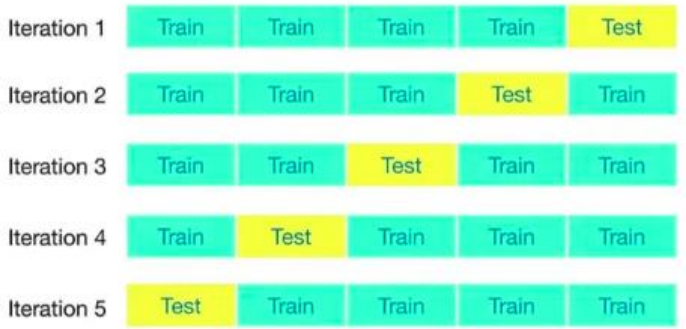
	Dataset					*Accuracy*
Iteration 1	Train	Train	Train	Train	Test	90%
Iteration 2	Train	Train	Train	Test	Train	88%
Iteration 3	Train	Train	Test	Train	Train	86%
Iteration 4	Train	Test	Train	Train	Train	91%
Iteration 5	Test	Train	Train	Train	Train	85%

$$\text{Mean Accuracy} = \frac{90 + 88 + 86 + 91 + 85}{5} = 88\ \%$$

K-Fold Cross-Validation

✓ *Accuracy score for SVM = 84.4 %*

✓ *Accuracy score for Logistic Regression = 88 %*



Advantages of using K-Fold Cross-validation:

- Better alternative for train-test split when the dataset is small
- Better for multiclass classification problems
- More reliable
- Useful for Model Selection

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Hyperparameter Tuning:

- GridSearchCV
- RandomizedSearchCV

Types of Parameters

Model Parameters

These are the parameters of the model that can be determined by training with training data. These can be considered as internal Parameters.

- **Weights**
- **Bias**

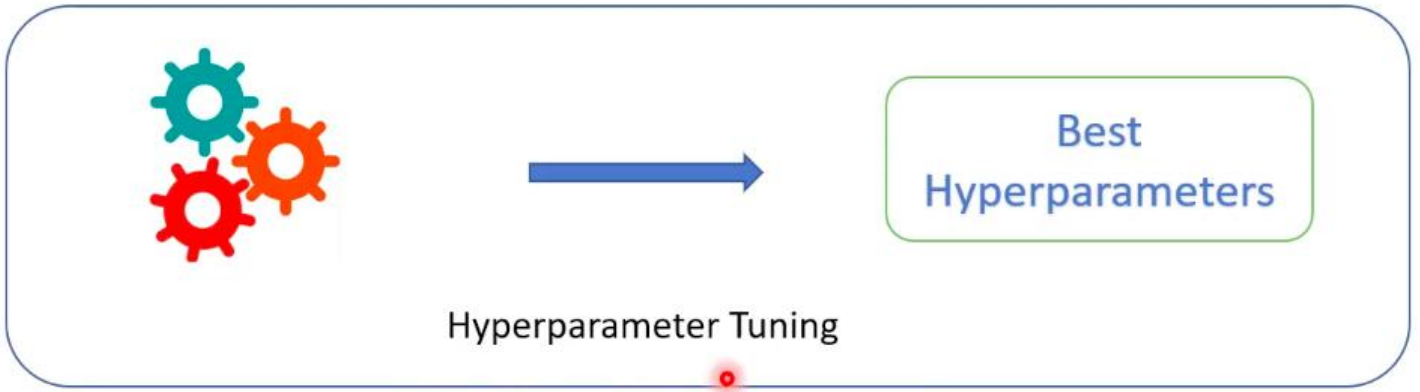
$$Y = w*X + b$$

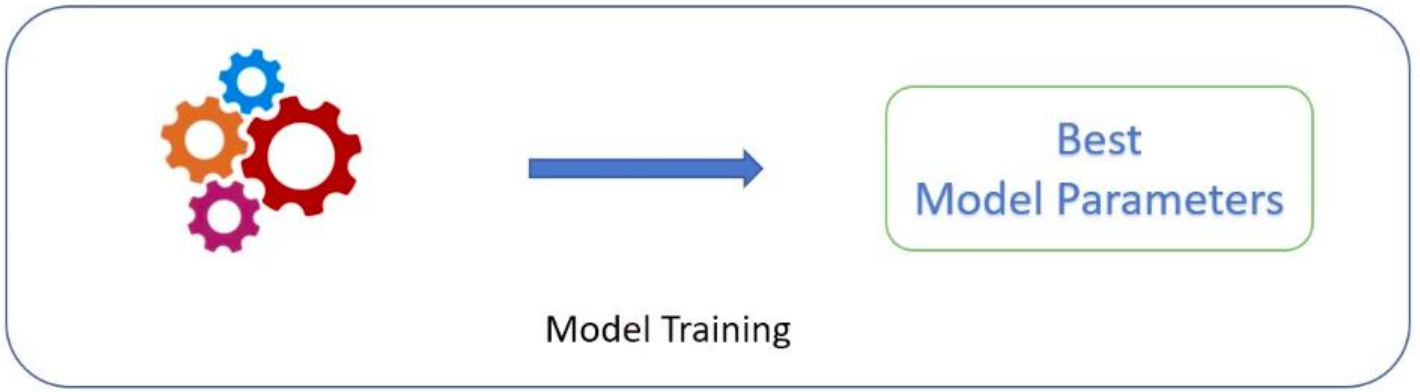
Hyperparameters

Hyperparameters are parameters whose values control the learning process. These are adjustable parameters used to obtain an optimal model. External Parameters.

- **Learning rate**
- **Number of Epochs**
- **n_estimators**

Hyperparameter Tuning

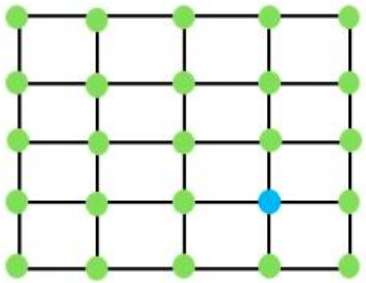




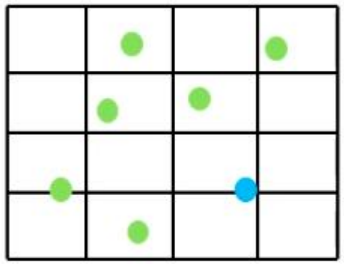
Hyperparameter Tuning

Hyperparameter Tuning refers to the process of choosing the optimum set of hyperparameters for a Machine Learning model. This process is also called **Hyperparameter Optimization.**

Hyperparameter Tuning Types:



GridSearchCV



RandomizedSeaechCV

Support Vector Classifier:
C: [1,5,10]
kernel: ('linear', 'poly', 'rbf', 'sigmoid')