* Supervised Learning: If we have expected results to feed into the model, then it is called supervised learning.
* Classification : Predicts a classification or a class.
  + Fraud detection
  + Spam Filtering
  + Image classification
* Regression: Predicts a value.
  + Risk assessment
  + Score predictions
* Unsupervised Learning: If we don’t have any expected results to feed into the model, then it is called unsupervised learning.
  + - Clustering.
* Evaluating and Optimisation Performance:
  + Objective Function : These functions that we want to minimize or maximize
  + Error Function : Check the deviation of these prediction from the actual, and they are used in calculating SSE, MSE and RMSE
  + Cost Function: These function evaluate how well our algorithm models our datasets, with higher cost considered bad and lower cost considered good.
  + Loss Function : Quantifies incorrect predictions
* Iterative Optimisation: It is an algorithm to modify params with each iteration to reduce the cost/error / loss.
  + An initial state or parameter value is taken
  + The learning error is calculated
  + Parameters/Weights are tweaked by a small amount called in learning rate.
  + The tweaking should always be in the direction of reducing cost
  + When done for sufficient number of times, we get a local minima
  + When the learning converges, the model is trained.

**EVALUATION METRICS**

**Accuracy** : Ratio of correct predictions got from the total predictions that were made.

**Accuracy** = Correct Predictions / Total Predictions

**Confusion Matrix** : table that pits predicted values against actual values

array([[17, 0, 0],

[ 0, 6, 7],

[ 0, 2, 13]],

* Row1 means that for category 1 , 17 were predicted to be category 1.
* Row 2 means that for category 2, 6 were picked as category 2 and 7 category 3. Meaning 7 incorrect values.
* Row 3 means that for category 3, 2 were picked as category 2 and 13 category 3. Meaning 7 incorrect values.

|  |  |  |
| --- | --- | --- |
|  | Predicted Positive | Predicted Negative |
| Actual Positive | True Positive | False Negative |
| Actual Negative | False Positive | True Negative |

False Negative and False Positive must be minimized.

**Precision** = True Positive/True Positive + False Positive

**Recall** = True Positive/True Positive + False Negative

* Also known as True Positive Rate.

F1 Score : Weighted harmonic mean of precision and recall.

* 2\*(precision\*recall)/(precision + recall)

Classification Report:

precision recall f1-score support

0 1.00 1.00 1.00 17

1 0.75 0.46 0.57 13

2 0.65 0.87 0.74 15

accuracy 0.80 45

macro avg 0.80 0.78 0.77 45

weighted avg 0.81 0.80 0.79 45