|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PROCEDURE** | **ACCURACY** | **PRECESION** | **RECALL** | **F1** | **FIT** |
| **Supervised Learning** | 0.8878 | 0.9138 | 0.7483 | 0.8228 | Moderately Overfit |
| **Semi Supervised Learning** | 0.8772 | 0.898 | 0.7335 | 0.8074 | Underfit |
| **5-Fold Validation** | 0.8822 | 0.9082 | 0.7385 | 0.8146 | Highly Overfit |
| **10-Fold Validation** | 0.8846 | 0.9117 | 0.7428 | 0.8186 | Highly Overfit |
| **20-Fold Validation** | 0.8853 | 0.9121 | 0.7435 | 0.8192 | Highly Overfit |
| **m-Fold Validation** | 0.9058 | - | - | - | Highly Underfit |
| **Ensemble Learning 30** | 0.8358 | - | - | - | Underfit |
| **Ensemble Learning 20** | 0.7537 | - | - | - | Moderately Underfit |
| **Ensemble Learning 10** | 0.7358 | - | - | - | Moderately Underfit |
| **Ensemble Learning 5** | 0.7134 | - | - | - | Highly Underfit |

**CSE472: Machine Learning Sessional**

**Assignment 4 (50%) Report**

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**Analysis 1.1 (Supervised vs Semi-Supervised Learning)**

Semi supervised learning performs a little worse than Supervised learning as expected. Because, Supervised learning has training set larger than Semi-supervised learning as Semi-supervised learning takes a small portion of the training set, creates a Decision Tree and based upon that, creates new training set by classifying them which, in turn, create better Decision Tree. As these new portion of training set were not actually classified, it must show that deficiency in the final training data. Thus, Semi-supervised learning is underfit.

**Analysis 1.2 (k-Fold and m-Fold Validation)**

All the k-Fold Validation perform better than supervised learning as the whole example set is used again and again by folding them into k distinct groups. As far as 5/10/20 k-Fold Validation is concerned, they perform almost equally and the variation is largely dependent on the dataset. For our given data set, it seems 20-Fold Validation performs slightly better.

For m-Fold Validation, the performance is reduced. It is because, testing on a single data every time might or might not show perfect prediction and so, it shows highly underfit.

**Analysis 1.3 (Ensemble Learning)**

As ensemble learning that I have used was for weak Learner like AdaBoost with depth 1, it shows poor performance with respect to ID3. Although, running with more iteration shows improvement. On the other hand, using it on the ID3 shows improvement, about 95% plus. The table shows results for iteration 30, 20, 10, 5.