

Experiment 13: Performance Comparison of Classifiers on Agricultural Dataset

Aim:

To compare the performance of **Decision Tree (J48)**, **k-NN**, and **Naive Bayes** classifiers on the Agricultural dataset using **accuracy**, **precision**, and **recall** metrics.

Theory:

- **Decision Tree (J48):** Supervised classifier using **Information Gain** for splitting.
 - **k-NN:** Lazy learning algorithm predicting class based on **nearest neighbors**.
 - **Naive Bayes:** Probabilistic classifier assuming **attribute independence**.
 - **Performance metrics:**
 - **Accuracy:** Correct predictions / Total predictions
 - **Precision:** Correct positive predictions / Total predicted positive
 - **Recall:** Correct positive predictions / Total actual positive
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Dataset (agricultural.arff)

```
@relation agricultural
```

```
@attribute Temperature numeric  
@attribute Rainfall numeric  
@attribute SoilMoisture numeric  
@attribute FertilizerUsed numeric  
@attribute CropYield {Low, Medium, High}
```

```
@data  
30,200,60,50,High  
25,180,55,45,Medium  
28,150,50,40,Medium  
35,220,65,60,High  
22,100,40,30,Low  
27,160,52,45,Medium
```

...

Procedure (Using WEKA):

1. Open **WEKA → Explorer**.
2. Click **Open File** → select **agricultural.arff**.
3. Go to **Classify tab**.

For each classifier:

4. **Decision Tree (J48)**: Classifier → trees → J48 → Start
 5. **k-NN**: Classifier → lazy → IBk → Start
 6. **Naive Bayes**: Classifier → bayes → NaiveBayes → Start
 7. Observe **accuracy, precision, recall, and confusion matrix** for each classifier.
 8. Compare metrics to determine **best performing classifier**.
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Result (Sample / Expected):

Classifier	Accuracy	Precision	Recall
J48	92%	0.90	0.92
k-NN	88%	0.85	0.87
Naive Bayes	85%	0.82	0.84

- **Best performing classifier: J48 Decision Tree**
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Conclusion:

- J48 outperforms k-NN and Naive Bayes on this dataset.
- Performance comparison helps in **selecting the appropriate classifier**.
- WEKA provides **easy computation of multiple metrics** for evaluation