

## Experiment 13: Performance Comparison of Classifiers on Agricultural Dataset

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### 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.

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### 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**:  $\text{Correct predictions} / \text{Total predictions}$
    - **Precision**:  $\text{Correct positive predictions} / \text{Total predicted positive}$
    - **Recall**:  $\text{Correct positive predictions} / \text{Total actual positive}$
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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

...

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#### 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