Crop Recommendation System

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Introduction

- Focus: optimize agricultural productivity
- Align crops with regional climate conditions
- Benefits:
  - Increased crop yield
  - Improved resource utilization
  - Reduced risk of crop failure
  - Sustainable farming practices

Our Machine Learning Driven Solution

Our approach combines environmental data analysis with machine learning to create a reliable crop recommendation system.

- **Dataset source:** We used a curated dataset from Kaggle containing agricultural data from various hypothetical regions in India
- **Data quality:** Each crop had 100 entries, ensuring balanced representation
- **Data refinement:** We started with 21 crops and refined to 10 unique crops by removing similar varieties

Data Description

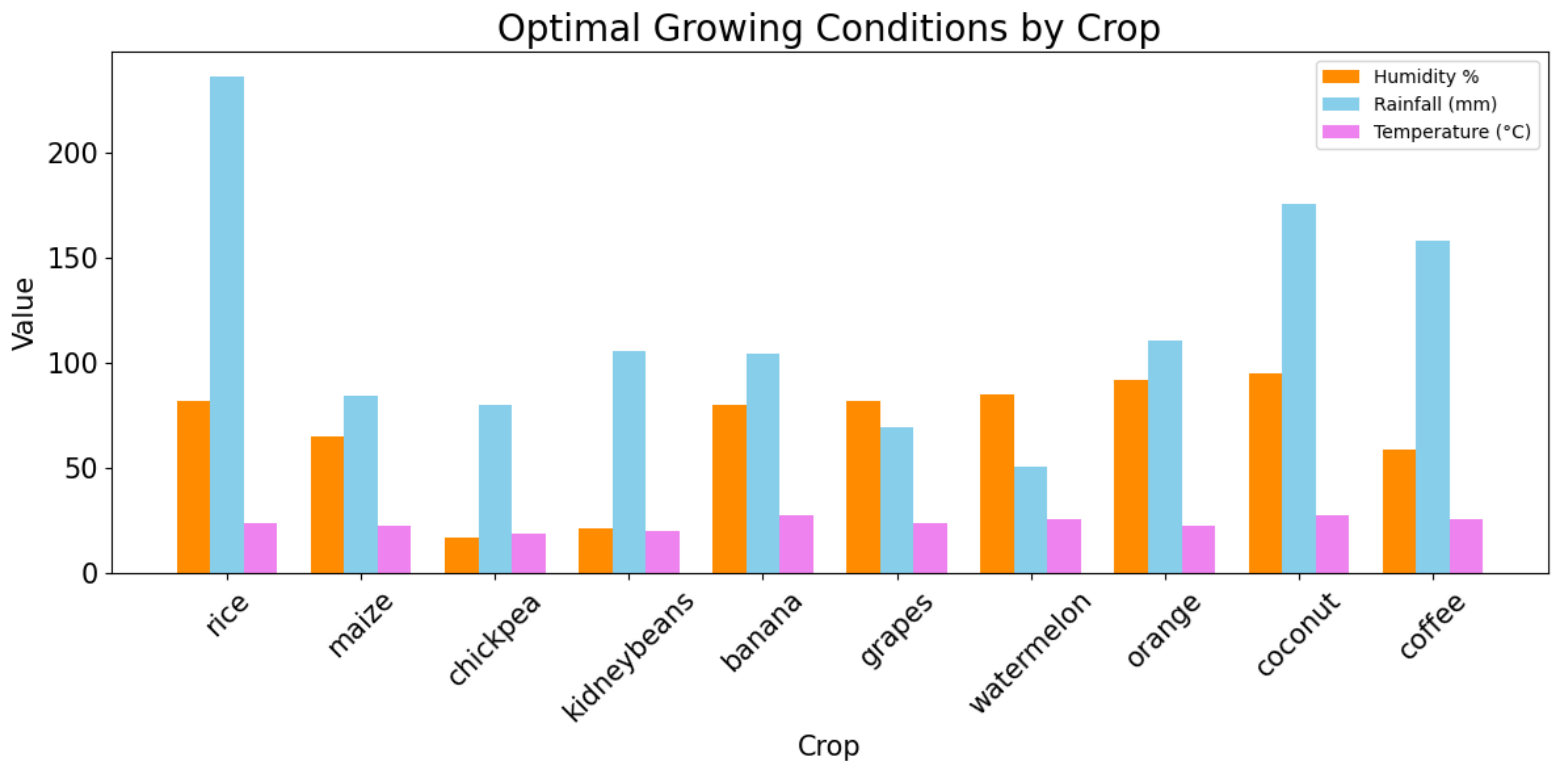
Soil components

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- pH

Environmental factors

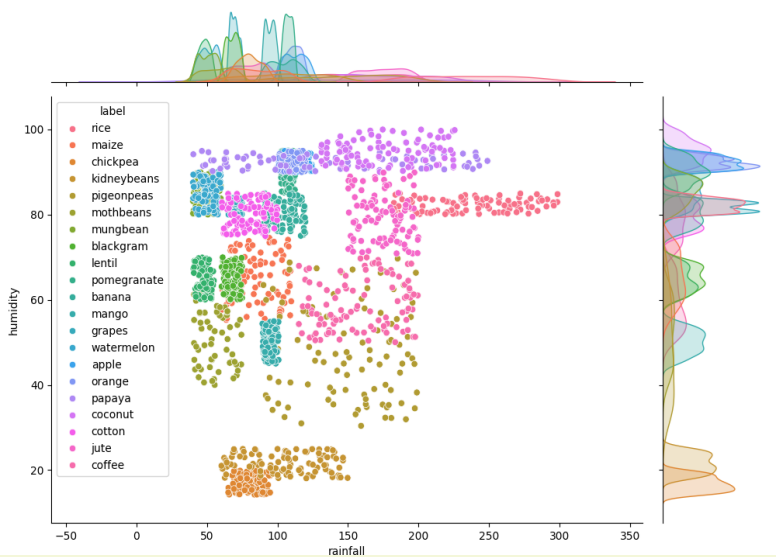
- Temperature
- Humidity
- Rainfall

Data Description

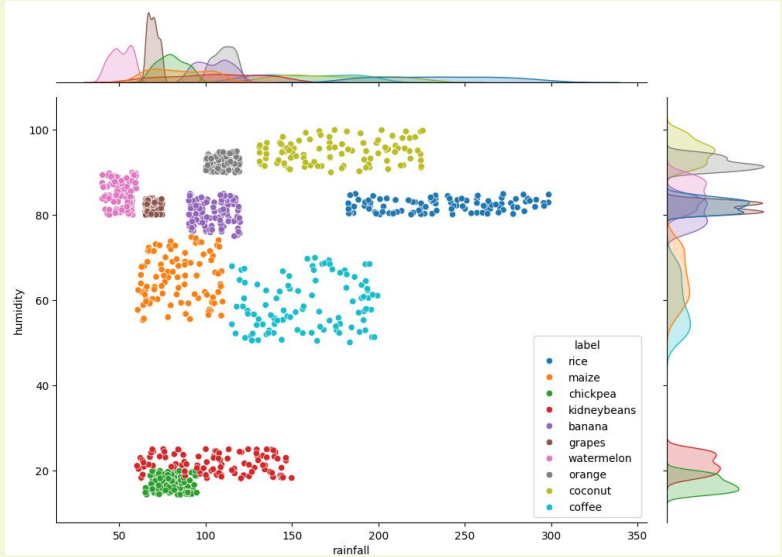


Data Description

- Output labels (21 -> 10)
- Pairwise euclidean distance



Raw (label numbers = 21)



Subset (label numbers = 10)

Workflow

Full Dataset
(n = 1000)

Data Preprocessing
Standardization
Label encoding

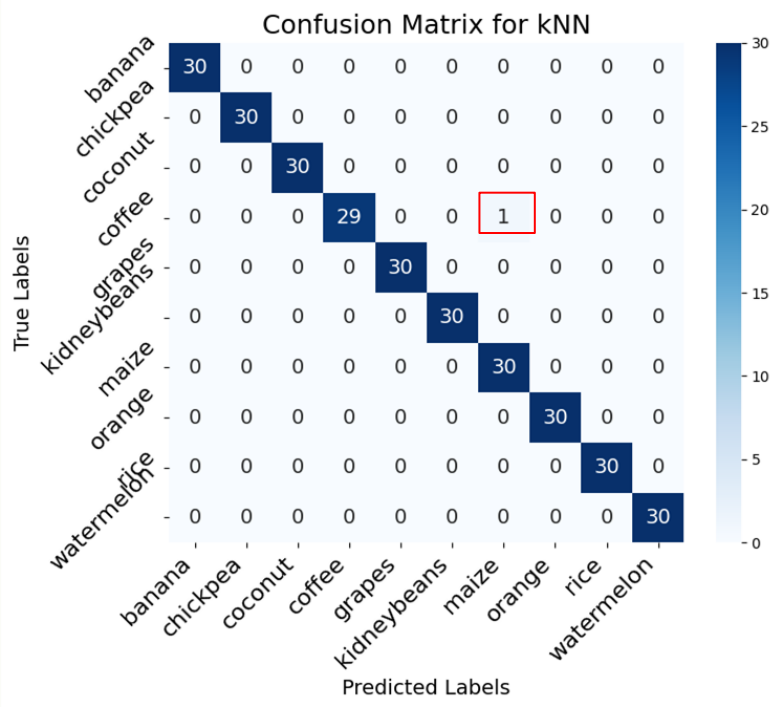
Data Splitting
Stratified data split
Training (70%)
Test (30%)

Model Training
Precision (average = 'macro')
10-fold CV
Decision Tree
Random Forest
kNN (k=3)
Logistic Regression
SVM

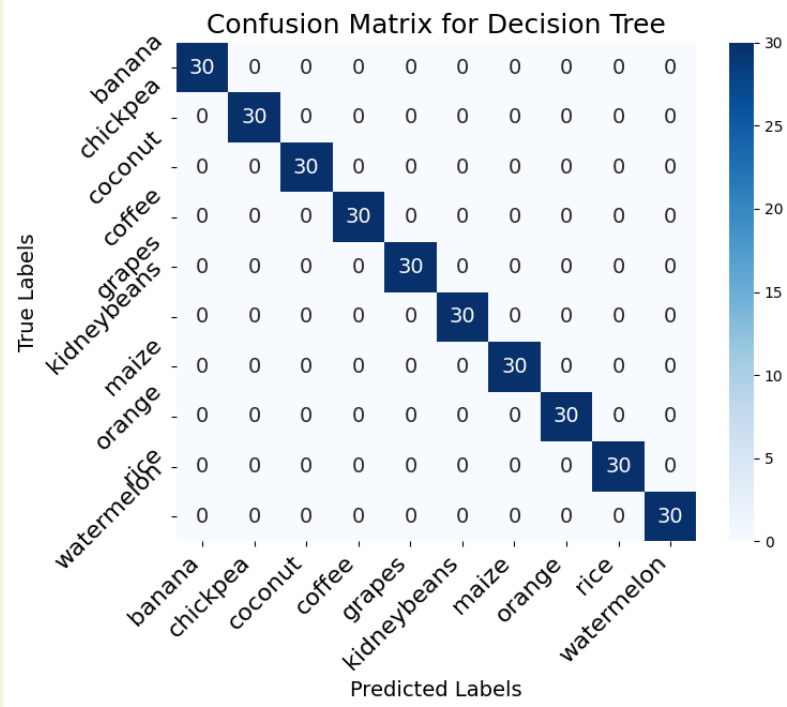
Model Evaluation
Accuracy
Precision
Recall

Confusion Matrix

kNN



LR, DT, RF, SVM



Model Comparison Result

Model	Accuracy	Precision	Recall
Decision Tree	1.000	1.000	1.000
Random Forest	1.000	1.000	1.000
Logistic Regression	1.000	1.000	1.000
SVM	1.000	1.000	1.000
kNN	0.997	0.997	0.997

Crop Recommendation

- Soil nutrients and environmental factors

Example 1 - hot and humid

```
Recommended Crop for Input [50, 40, 60, 29.6, 87, 6.5, 260]:
Decision Tree: rice
Random Forest: rice
Logistic Regression: rice
SVM: rice
```

Example 2 - warm and moderately humid

```
Recommended Crop for Input [100, 80, 52, 27, 80, 6.1, 120]:
Decision Tree: banana
Random Forest: banana
Logistic Regression: banana
SVM: banana
```


Thank You