Vivekanand Education Society's
Institute of Technology
(Autonomous Institute Affiliated to University of Mumbai, Approved by AICTE & Recognised by Govt. of Maharashtra)
NAAC accredited with 'A' grade

Semesteí: VI Subject : AIDS - 1

Title of the Project :
Crop Price Prediction using Classification and regression

Member 1: Bhushan Malpani D15C 33
Member 2: Sahil Motiramani D15C 35

Professor Name : Dr. Ravita Mishra

Content

- Overview
- Introduction
- Problem Statement
- Objectives
- Literature Survey
- Proposed System
- Proposed Design
- Implementation
- Conclusion
- References

Introduction to Project

In agricultural markets, predicting the price of crops is crucial for farmers, traders, and policymakers. The price of a crop is influenced by multiple factors such as location, season, demand-supply trends, and external economic conditions. In this project, we aim to build a machine learning model that can:

1. Classify crop prices into categories – High, Moderate, and Low.
2. Predict the exact price of crops per kilogram using regression.

To achieve this, we use two popular Supervised Learning algorithms:

K-Nearest Neighbors (KNN)

Decision Tree (DT)

Problem Statement

Problem Statement:

Predict crop prices using machine learning to help farmers and traders make informed financial decisions

Description : Crop prices fluctuate due to various factors like seasonality, demand-supply changes, and market conditions, making it difficult for farmers and traders to plan their sales. This project aims to develop a machine learning model using KNN and Decision Tree to classify prices into categories (High, Moderate, Low) and predict exact prices using regression. By providing accurate price predictions, this model will assist stakeholders in minimizing risks, optimizing profits, and improving market transparency.

Objectives of the project

- Classify crop prices into High, Moderate, and Low categories using machine learning.
- Predict the exact price per kilogram using regression models.
- Compare KNN and Decision Tree to determine the best-performing model.

Literature Survey

Sr.No	Title	Author	Publish Date/ Year	Description
1	Machine Learning-Based Crop Price Prediction Using Decision Trees and Regression Models	Sharma, R., & Patel, A	2022	This study explores the use of Decision Trees, Random Forest, and Linear Regression for crop price prediction. It found that Decision Trees achieved 85% accuracy in classifying prices into High and Low categories. Regression models, particularly Random Forest and Linear Regression, showed high R^2 values (~0.87), making them effective for price estimation. The study also highlighted the significance of season, location, and demand in determining prices.
2.	Crop Market Price Prediction Using K-Nearest Neighbors and Deep Learning Models	Gupta, S., & Verma, K	2023	K-Nearest Neighbors (KNN), Support Vector Machines (SVM), and Neural Networks for predicting crop prices. It found that KNN achieved 82% accuracy for classification but struggled with large datasets. Neural Networks outperformed other models for regression, achieving an R^2 score of 0.91. The study emphasizes the importance of hyperparameter tuning to optimize performance.

Proposed System

1. Data Preprocessing – Handle missing values, encode categorical features, and scale data.

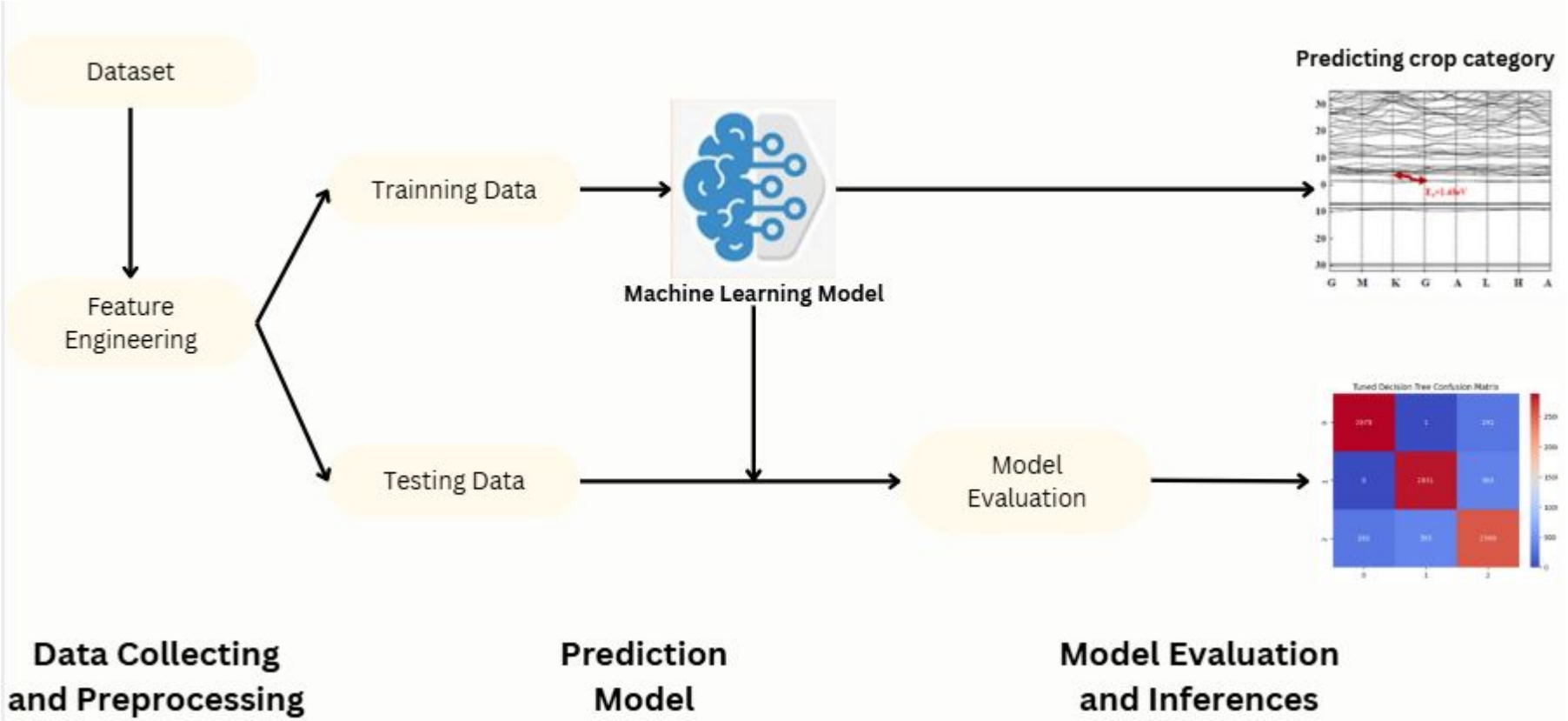
2. Classification (Price Category Prediction) – Use KNN & Decision Tree to classify prices as High, Moderate, or Low.

3. Regression (Exact Price Prediction) – Estimate price per kg using Decision Tree regression models.

4. Model Optimization – Compare models using accuracy, precision, R^2, RMSE, etc.

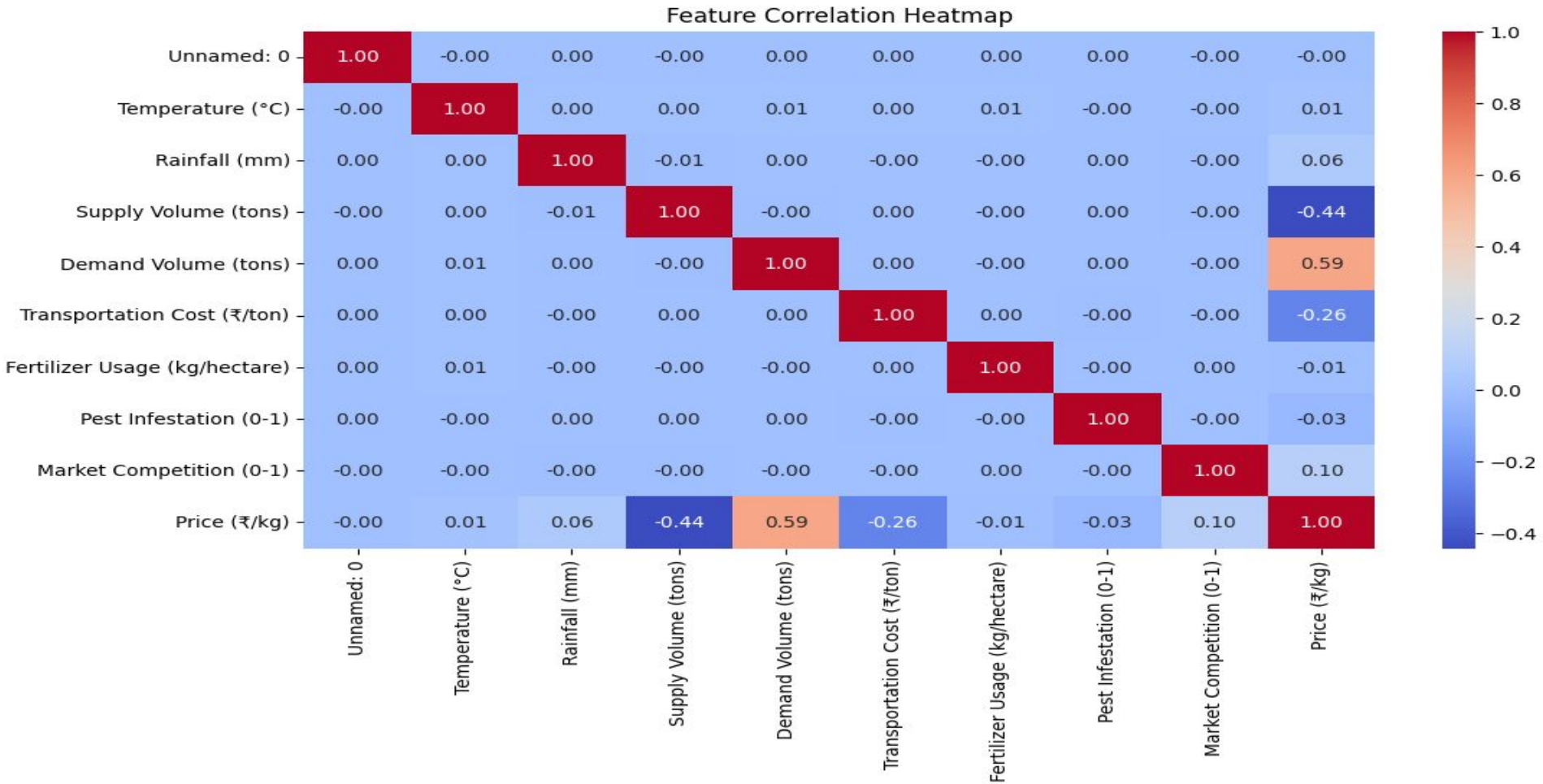
5. Deployment & Prediction Interface – Save models and build a user-friendly input system in Google Colab for real-time predictions.

Proposed Design



Implementation

Correlation Heatmap

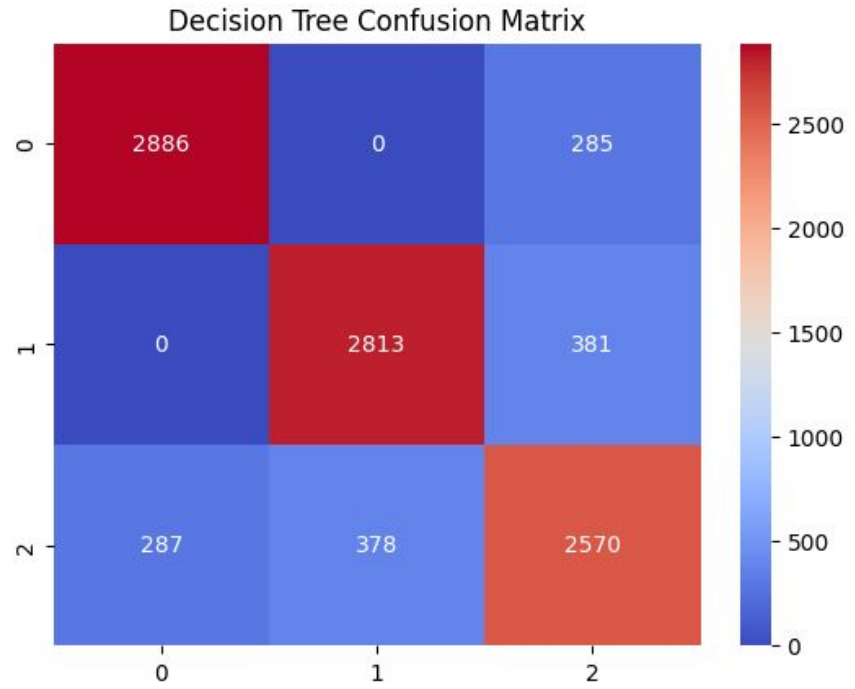


Implementation

Binary Classification Model-1
Algorithm 1: Decision Tree
Description: A Decision Tree is a supervised learning algorithm that splits data into branches based on feature conditions, creating a tree-like model for classification or regression.
Goal: Classify crop prices as High, Moderate, or Low based on input features.
Performance Metrics: Accuracy, Precision, Recall, F1-score.

```
Decision Tree Classification Metrics:
Accuracy: 0.8614
Precision: 0.8614
Recall: 0.8614
F1 Score: 0.8614
```

Confusion Matrix:

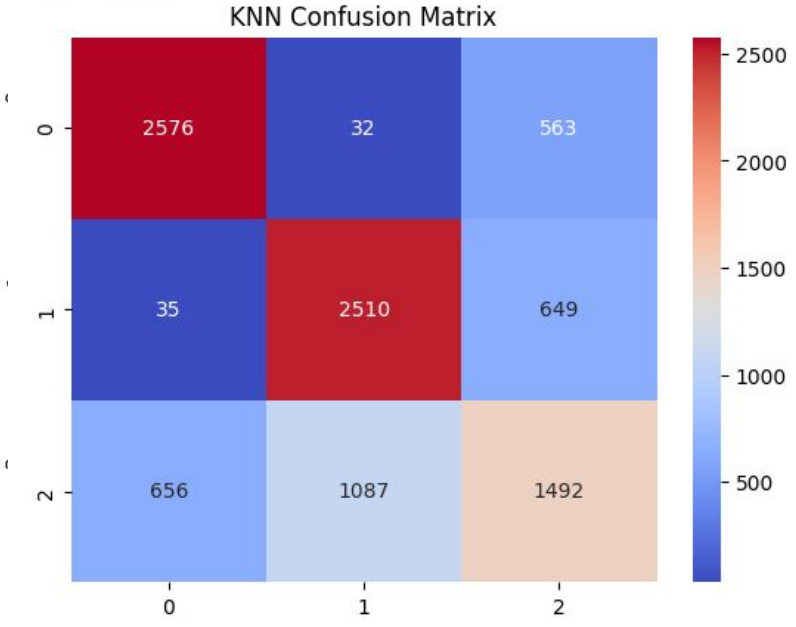


Implementation

Binary Classification Model-2
Algorithm 2: K-Nearest Neighbors (KNN)
Description: KNN is a non-parametric algorithm that classifies data based on the majority vote of its k-nearest neighbors.
Goal: Classify crop prices into High, Moderate, or Low categories.
Performance Metrics: Accuracy, Precision, Recall, F1-score.

```
KNN Classification Metrics:
Accuracy: 0.6852
Precision: 0.6765
Recall: 0.6852
F1 Score: 0.6784
```

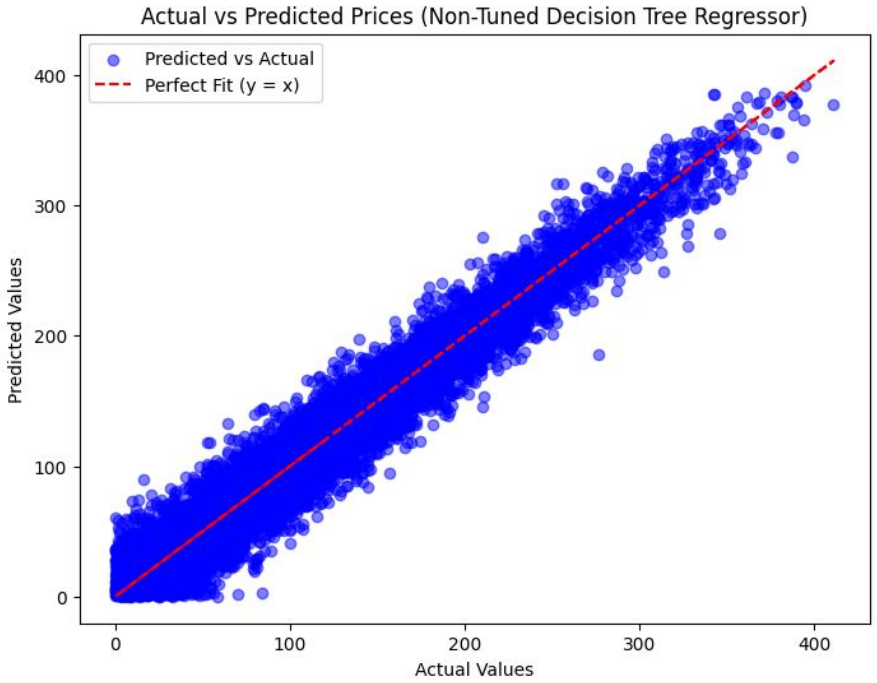
```
Confusion Matrix:
  Confusion Matrix:
```



Implementation

Regression Model-1
Algorithm 3: Decision Tree Regressor
Description: A Decision Tree Regressor splits the dataset into decision nodes to predict continuous values.
Goal: Predict the exact price per kilogram of a crop.
Performance Metrics: R^2 score, RMSE, MAE, MSE.
Inference: The model may overfit; pruning and tuning hyperparameters can improve generalization.

```
Decision Tree Regressor Regression Metrics:
R2 Score: 0.9498
MSE: 340.1861
RMSE: 18.4441
MAE: 14.5912
```



Implementation

Crop Price Predictor

State:

Maharashtra

City:

Mumbai

Crop Type:

Wheat

Season:

Kharif

Temperature (°C):

37.1

Rainfall (mm):

204

Supply Volume (kgs):

2500

Demand Volume (kgs):

2000

Transportation Cost (₹/kg):

5

Fertilizer Usage (kg/hectare):

2

Pest Infestation (0-1):

0.2

Market Competition (0-1):

0.7

Predict Price

Implementation

Prediction Results

Predicted Price: 54.60 ₹/kg

Price Category: High

View Full Report | Download PDF Report

Crop Price Prediction Report

Generated on: 4/15/2025, 2:28:25 PM

Input Parameters

Parameter	Value
State	Maharashtra
City	Mumbai
Crop Type	Wheat
Season	Kharif
Temperature (°C)	37.1°C
Rainfall (mm)	204.0 mm
Supply Volume (kgs)	2500.00 kgs
Demand Volume (kgs)	2000.00 kgs
Transportation Cost (₹/kg)	₹5.00/kg
Fertilizer Usage (kg/hectare)	2.00 kg/hectare
Pest Infestation	20%
Market Competition	70%

Price Prediction

Predicted Price: ₹54.60 per kg

Implementation

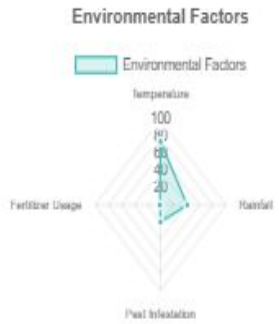
Supply vs Demand Analysis

Supply and demand are relatively balanced (ratio: 1.25), leading to stable price conditions.

Market Factors

Market conditions: Transportation costs are at reasonable levels. Moderate market competition exists.

Environmental Factors



Environmental conditions: High temperatures may stress crops. Rainfall amounts are favorable. Pest pressure is minimal.

Recommendations

- High prices present a good selling opportunity.
- Consider expanding production if conditions permit.
- Consider increasing fertilizer application to boost yields.

Print Report

Conclusion

- **Classification Models:** The Decision Tree classifier outperforms the KNN classifier with an accuracy of 86.14% compared to 68.52%, indicating that Decision Trees are better suited for this dataset.
- **Regression Models:** The Decision Tree Regressor achieves a high R^2 score of 0.9498, significantly outperforming the KNN Regressor ($R^2 = 0.8411$). This suggests that the Decision Tree model provides more precise predictions.
- **Overall Findings:** Decision Tree-based models are more effective than KNN for both classification and regression tasks in this dataset. Further improvements can be explored using ensemble methods like Random Forest or boosting techniques.

References

- **Sharma, R., & Patel, A. (2022).** *Machine Learning-Based Crop Price Prediction Using Decision Trees and Regression Models.*
  DOI: 10.1016/j.compenvurbsys.2022.101768

- **Gupta, S., & Verma, K. (2023).** *Crop Market Price Prediction Using K-Nearest Neighbors and Deep Learning Models.*
  DOI: 10.1007/s00500-023-07458-9