# Project: Summarizing and Analyzing Research Papers

## Submission Template

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**Topic:** Prediction of Agricultural Crop Price and Machinery Rental Price using Machine Learning Algorithms

**Research Paper**: 372588665\_Prediction\_of\_Agricultural\_Crop\_Price\_and\_Machinery\_Rental\_Price\_using\_Machine\_Learning\_Algorithms

### Initial Prompt

**Description** : Using machine learning algorithms to predict agricultural crop and machinery rental prices.

**Generated Summary:** This project focuses on utilizing machine learning algorithms such as Random Forest, Linear Regression, and Decision Tree Regression to predict agricultural crop and machinery rental prices. The goal is to help farmers and businesses make informed decisions and optimize profits. The performance of these models was evaluated based on accuracy, execution time, MAE, and RMSE metrics.

### Iteration 1

**Description** : Refinement of model parameters and inclusion of Gradient Boosting for performance comparison.

**Generated Summary**: After including Gradient Boosting in the prediction models, performance metrics were compared for crop and machinery prices. Decision Tree Regression outperformed others in crop price predictions, while Linear Regression was the most efficient in predicting machinery rental prices.

### Iteration 2

**Description** : Fine-tuning model selection and hyperparameter adjustments based on execution time and accuracy trade-offs.

**Generated Summary** : Hyperparameter tuning improved the accuracy and efficiency of Decision Tree and Linear Regression models. Decision Tree was finalized for crop price predictions, and Linear Regression was chosen for machinery rental price predictions due to its high accuracy and lower execution time.

### Final Prompt

**Description** : A predictive model to forecast crop prices and machinery rental prices using tuned machine learning algorithms.

**Generated Summary** : The final model uses Decision Tree Regression for crop price predictions and Linear Regression for machinery rental predictions. This model integrates user-friendly interfaces for farmers and rental businesses, allowing them to input variables like crop type, location, and equipment. It achieves high accuracy while maintaining quick execution times.

### Insights and Applications

**Key Insights** : The application of machine learning in agriculture provides critical insights into optimizing both crop pricing and machinery rental pricing. The Decision Tree model's success in crop price predictions and the high accuracy of Linear Regression for machinery pricing highlight the adaptability of different algorithms based on the problem set. The significance of tuning parameters such as depth and estimators, as demonstrated, enhances model performance.

**Potential Applications** : The developed system can be integrated into digital platforms, such as mobile apps or web applications, aimed at aiding farmers in making real-time decisions. These predictions can help reduce price volatility effects on agricultural products and optimize machinery rentals for seasonal demand. Additionally, the model could be expanded to cover a broader range of agricultural sectors or other geographical regions.

### Evaluation

**Clarity** : The final summary and insights are clear, offering straightforward explanations of how different algorithms function within the context of the problem.

**Accuracy** : The results accurately reflect the performance of machine learning models and are consistent with the dataset characteristics. Accuracy for crop and machinery price prediction is reliably demonstrated.

**Relevance** : The insights directly apply to real-world agricultural problems, particularly in improving decision-making for farmers and agricultural equipment businesses.

**Reflection**

This project demonstrated the effective application of machine learning models in an agricultural setting, focusing on price prediction challenges. The most significant challenge faced was selecting the right algorithm and adjusting hyperparameters to balance accuracy with execution time. Decision Tree Regression for crop prices and Linear Regression for machinery rentals were ideal choices after several iterations. These models showed the importance of fine-tuning to improve overall performance.

The process of comparing and validating multiple models provided valuable insights into how each model functions differently with the same dataset. Additionally, learning about the integration of these models into practical tools like web applications brought a new perspective on creating usable solutions for farmers. Overall, this project reinforced the importance of iterative experimentation and model evaluation in machine learning.