Crop Yield Prediction Using Supervised Machine Learning Techniques

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Introduction

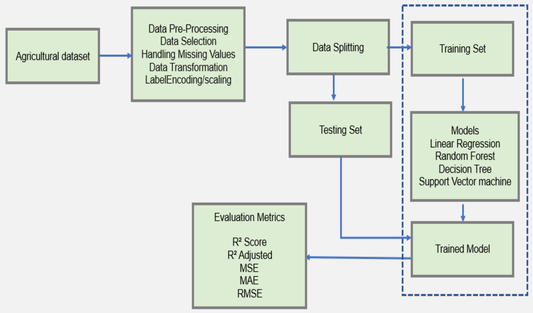
Embarking on a quest to enhance the decision-making process in agriculture, we propose the development of an intelligent system that leverages Supervised Learning (SL) to predict crop yield within our Machine Learning (ML) semester project. Drawing on a confluence of expertise in ML and data analytics, our objective is to devise a model with the capability to accurately estimate crop yields based on a diverse array of factors. The ”Crop Yield Prediction” project is designed to replicate a complex, real-world task of agricultural forecasting, offering a sophisticated tool to navigate the dynamic landscape of farming—a challenge that calls for strategic foresight and analytical prowess.

Problem domain

The problem domain for our project lies at the intersection of agriculture and machine learning. We aim to apply Supervised Learning to predict crop yields by analyzing key factors like cultivation area, rainfall, pesticide usage, crop type, and temperature. This transforms the problem into a regression problem. The goal is to craft a predictive model that provides accurate yield forecasts to assist farmers and agribusinesses in strategic planning and optimizing resource allocation.

Methodology

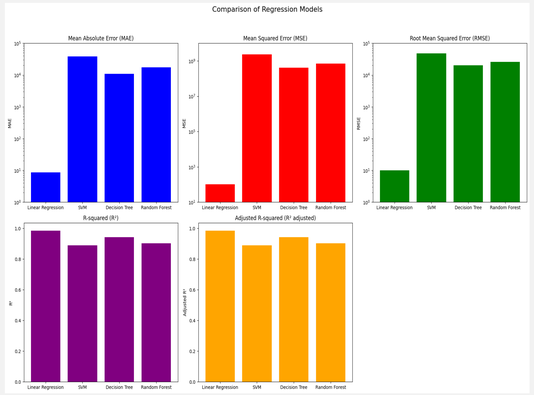
Methodology employed for Crop yield prediction using supervised learning is shown below:



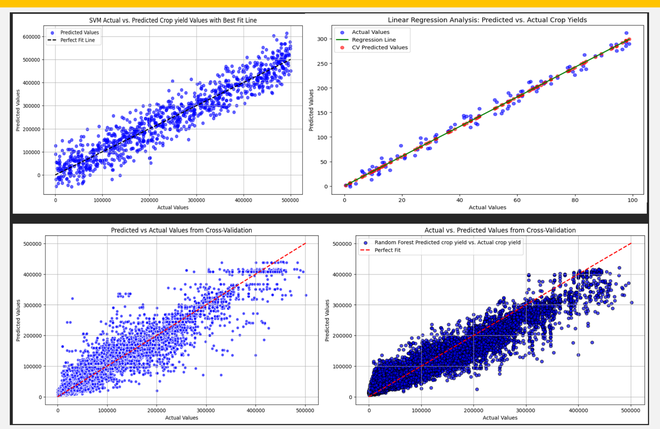
Mathematical Section

Linear Regression: $y = mx + b$ Describes a linear relationship between y and x, with m as the slope and b as the intercept.
SVM: Finds optimal hyperplane for class separation in high-dimensional space.
Decision Tree: Tree-like model where nodes represent features and branches are decisions.
Random Forest: Ensemble method using multiple decision trees, outputting mode or mean prediction.

Evaluation Metrics



Important Result



Images show models predicted values vs actual crop yields.

Conclusion

Employing Supervised Learning to predict crop yields marks an innovative approach in agricultural analytics. In our project, we leveraged a variety of regression techniques, each known for its unique characteristics and strengths. We Evaluate these methods using metrics such as R^2, RMSE, and MAE to determine their effectiveness comprehensively

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