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School of Computer Science and Engineering

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Digital Assignment-5

Technical Answers for Real World Problems (TARP)

Course code: CBS1901

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Discussion

The implementation of machine learning for precision irrigation presents a promising solution to address water wastage in agriculture. By leveraging historical weather data and environmental parameters, this model provides farmers with a data-driven approach to decision-making. Unlike traditional IoT-based solutions that require expensive hardware, our model relies solely on predictive analytics, making it a cost-effective and accessible alternative for small and medium-scale farmers.

One of the key strengths of this system is its ability to integrate multiple factors such as soil moisture, temperature, humidity, and rainfall predictions to optimize irrigation schedules. The logistic regression model used in this study demonstrates reasonable accuracy, but there is scope for improvement by employing more advanced algorithms such as Random Forest, XGBoost, or Neural Networks. Additionally, integrating real-time weather data through APIs would further enhance the model's reliability and applicability.

Despite its advantages, some challenges must be acknowledged. Since this approach depends on historical data, inaccuracies in weather forecasting may impact the effectiveness of irrigation recommendations. Furthermore, user adoption and ease of data entry remain critical factors that influence the model's practical implementation. Providing farmers with a user-friendly web or mobile interface can bridge this gap and ensure seamless usability.

Another aspect worth discussing is the scalability of the model. As different crops have unique water requirements, expanding the dataset to include a wider variety of crops and soil types would improve the model’s generalizability. Future iterations of this project can also explore hybrid approaches that combine ML predictions with IoT sensors for real-time monitoring, ensuring both affordability and precision.

Conclusion

This project successfully demonstrates the feasibility of using machine learning for precision irrigation, contributing to sustainable water management in agriculture. The developed model provides an efficient, cost-effective alternative to sensor-based irrigation systems by predicting whether irrigation is required based on environmental conditions.

The key takeaways from this study include:

- Machine learning can effectively assist farmers in making irrigation decisions, reducing water wastage, and improving crop health.
- A web-based platform enables easy user interaction, eliminating the need for expensive IoT infrastructure.
- Future improvements, such as real-time data integration and more advanced ML models, can enhance prediction accuracy and scalability.

Overall, this project highlights the potential of technology-driven solutions in addressing real-world agricultural challenges. With further refinement and development, this approach can be expanded to larger-scale farming operations, ensuring sustainable water usage and increased agricultural productivity.