Enhancing Precision Agriculture with AI, IoT, and Edge Computing for Real-time Decision Support

Abstract:

Effectively feeding a burgeoning world population is one of the main goals of sustainable agricultural practices. The integration of AI, IoT, and edge computing technologies in agriculture presents a promising solution to improve productivity, optimize resource usage, and achieve sustainable farming. This paper proposes a hybrid system leveraging AI models, IoT devices, and edge computing to address key challenges like latency and real-time decision-making in precision agriculture. By deploying lightweight AI models on edge devices, the approach reduces data processing delays, enhances resource management, and improves crop yield predictions. The system's effectiveness is analyzed based on a combination of historical and synthetic datasets, providing a roadmap for sustainable, adaptable, and efficient precision farming.

Keywords: Precision Agriculture, AI, IoT, Edge Computing, Real-time Decision Support, Resource Optimization, Crop Yield Prediction