ABSTRACT

Extreme weather changes pose a major challenge to food security, affecting the quality and selling price of food because farmers still use manual methods in determining crop types and planting times. This makes them vulnerable to crop failure amidst unpredictable weather changes. To overcome this problem, research was conducted in Wangunharja Village, Lembang District, West Bandung Regency, West Java, to provide more accurate solutions to vegetable farmers through modern technology.

This research uses methods based on the Internet of Things (IoT) and machine learning with the Q-learning algorithm. This algorithm is a reinforcement learning algorithm that is used to find optimal policies in an environment, where the agent interacts with the environment to maximize the total reward received over time. The Q-learning system works off-policy, allowing the agent to learn from random actions and gradually direct the agent toward the optimal policy.

This research solution uses an ESP32 microcontroller connected to several sensors to monitor soil conditions in real-time, with data stored on Firebase. This data is then processed using machine learning with the Q-Learning algorithm in the Google Colab Cloud service to predict the types of plants that are suitable for planting and the ideal planting time. Monitoring and prediction results can be accessed by farmers via an Android application created with the Flutter framework and Dart programming language. This research succeeded in producing predictions with an accuracy of 94.49%, and the system worked well, providing great potential to increase crop yields and land management efficiency in the future.

Keywords: Android application, Internet of Things, machine learning, weather changes, Q-learning