


Chapter 16

Machine Learning Applications in Predictive Pest Modeling for Developing Pest- Resistant Crop Varieties

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ABSTRACT

This chapter explores the use of machine learning tools in developing models to predict pest attacks and develop resistant crops using large data sets for reliable predictions. Decision trees and neural networks aid in pest prediction by creating resistant crop varieties, reducing chemical usage, and enhancing farming sustainability. The study examines issues in machine learning-driven pest prediction, including data quality, ease of understanding, and expansion, and proposes methods to enhance learning from data and combine multiple methods. This section discusses the use of machine learning tools in developing models to predict pest invasions and develop crops that can resist pests in farming. The study addresses issues like data quality, interpretation ease, and growth potential, suggesting methods to improve data learning and merge learning styles. Future research should refine these models and develop pest-resistant crop varieties.

INTRODUCTION

In modern farming controlling pests is vital for the productivity, quality, and ongoing health of crops. Traditional chemical pesticide use has caused worries about the environment human health, and pests developing resistance to these chemicals. There is a growing shift towards innovative lasting ways that use advanced technology such as machine learning to predict, prevent, and manage pest infestations while preserving the quality and number of crops (Marković et al., 2021).

Since machine learning algorithms allow efficient analysis of big datasets agricultural research is experiencing a revolution. This allows experts to see complex links and patterns among crop qualities environmental factors, and pest actions. This is a big advance in agricultural science as it helps scientists and agronomists make early plans to predict and minimize pest dangers before they turn into major infestations (Domingues et al., 2022).

Important machine learning methods such as decision trees, support vector machines (SVM), and neural networks are applied in predictive pest prediction. Decision trees organize data into hierarchical structures which enable classification of pest behaviour based on environmental factors. With past patterns and environmental elements, SVM conducts classification to divide data into distinct groups and predicts insect outbreaks. Inspired by the human brain's design neural networks can handle large datasets, uncover complex connections, and make accurate predictions on pest dynamics (Durgabai et al., 2018).

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