

## **ABSTRACT**

Tomato cultivation is a vital component of global agriculture, contributing significantly to both food security and economic development. However, the occurrence of diseases in tomato plants poses a significant threat to crop yield and quality. Early detection and diagnosis of these diseases are crucial for effective disease management. In recent years, Artificial Intelligence (AI) techniques, particularly Convolutional Neural Networks (CNNs) such as DCNN, have shown promise in automating the detection and classification of plant diseases. This research explores the application of DCNN in the context of tomato leaf disease detection. The study involves the collection of a diverse dataset of tomato leaf images representing various diseases and healthy states. The dataset is pre-processed to enhance the model's ability to generalize across different conditions. DCNN, a type of deep neural network architecture known for its dense connectivity and feature reuse, is employed for the classification task. The model is trained on the prepared dataset, utilizing transfer learning techniques to leverage knowledge gained from pre-trained models on large image datasets. The training process involves optimizing model parameters through back propagation, enabling the network to learn discriminative features for distinguishing between different tomato leaf conditions. The effectiveness of the model is assessed through rigorous testing on an independent dataset, and performance metrics such as accuracy, precision, recall, and F1-score are computed. The results demonstrate the potential of DCNN in accurately identifying and classifying tomato leaf diseases. The AI model exhibits robust performance even in the presence of variations in lighting conditions, leaf orientations, and disease severity. Moreover, the ability to detect diseases at an early stage holds promise for timely intervention and disease management strategies.