ABSTRACT

Wheat, being one of the most significant cereal crops globally, faces numerous challenges due to various diseases affecting its yield and quality. Leveraging the advancements in deep learning, this study proposes a novel hybrid model integrating the strengths of both Inception v3 and MobileNet v2 architectures to enhance the accuracy and efficiency of wheat disease detection. The proposed hybrid model combines the deep hierarchical features extracted by Inception v3 with the lightweight and computationally efficient characteristics of MobileNet v2. This fusion aims to capitalize on the superior feature representation capabilities of Inception v3 while maintaining the speed and resource efficiency provided by MobileNet v2, thus achieving a balance between accuracy and computational cost.

To evaluate the effectiveness of the proposed hybrid model, a comprehensive dataset comprising diverse instances of wheat diseases was collected and pre-processed. The dataset was divided into training, validation, and testing sets to train and assess the performance of the hybrid model. Extensive experiments were conducted, employing various data augmentation techniques and hyperparameter tuning strategies to optimize the model's performance. The results demonstrate the superior efficacy of the hybrid model, achieving an impressive accuracy of 98.45% in wheat disease detection. This remarkable accuracy signifies the model's capability to reliably classify wheat images into multiple disease categories with high precision and recall rates. Moreover, the hybrid model exhibits robustness against noise and environmental variations, further enhancing its practical applicability in real-world scenarios.

Furthermore, comparative analyses were conducted to benchmark the performance of the hybrid model against individual Inception v3 and MobileNet v2 models. The results indicate a significant performance improvement achieved by the hybrid model, outperforming both standalone architectures in terms of accuracy and computational efficiency.