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Crop Pest Recognition and Classification Using Deep Neural Networks

C. Aravinth[1], M. Jagadeesh[2], G. Thangaraj[3], Ms. R. Sathya[4]

Student, Dept. of CSE., Sir Issac Newton College of Engg. & Technology, Nagapattinam, Tamil Nadu, India[1-3]

Assistant Professor, Dept. of CSE., Sir Issac Newton College of Engg. & Technology, Nagapattinam, Tamil Nadu, India[4]

ABSTRACT: Agricultural productivity is significantly affected by pest infestation, posing a serious threat to crop yield and quality. In this project propose a novel approach leveraging deep neural networks for the recognition and classification of crop pests. The objective is to develop an automated system capable of accurately identifying various pests commonly affecting crops, aiding in timely intervention and management strategies. The methodology involves the collection of extensive datasets comprising images of diverse pests along with healthy crops, ensuring a wide range of variations and scenarios. These datasets are utilized to train on the deep neural network architectures, including convolutional neural networks (CNNs) and possibly more advanced models like PestNet model. The training process involves fine-tuning the networks to effectively differentiate between different types of pests. Furthermore deep learning techniques employed to enhance model performance, particularly in cases where limited annotated data are available.

KEYWORDS: Smart Farming, Agriculture, Crop Pest, Deep learning, CNN.

I. INTRODUCTION

Smart farming, propelled by the fusion of deep learning and image processing technologies, heralds a new era of agricultural innovation and efficiency. Smart farming leverages advanced algorithms to analyze vast amounts of data gleaned from various sources such as drones, satellites, and sensors, revolutionizing traditional agricultural practices. Deep learning, a subset of artificial intelligence, empowers machines to learn from data representations, enabling them to recognize patterns and make decisions with human-like proficiency. Image processing techniques further enhance this capability by extracting valuable insights from visual data, facilitating real-time monitoring and analysis of crops, soil, and environmental conditions. By harnessing the power of deep learning and image processing, smart farming optimizes resource allocation, minimizes waste, and maximizes yield These technologies enable precise crop monitoring, detecting anomalies such as diseases, pests, or nutrient deficiencies at early stages, allowing for targeted interventions. Moreover, they facilitate predictive analytics, forecasting crop yields, and optimizing irrigation and fertilization schedules based on dynamic environmental factors. Through automated data-driven decision-making, farmers can mitigate risks and enhance productivity while reducing operational costs and environmental impact. Furthermore, the integration of deep learning and image processing into farming systems fosters sustainability and resilience. By promoting precision agriculture, smart farming minimizes the use of chemical inputs and water resources, promoting eco- friendly practices. Real-time monitoring of crop health and environmental parameters enables proactive management strategies, mitigating the impact of climate change and extreme weather events. Additionally, by empowering farmers with actionable insights and decision support tools, these technologies promote knowledge sharing and capacity building, fostering a culture of innovation and collaboration in the agricultural sector.

II. RELATED WORK

1) TITLE: Energy neutral machine learning based IOT device for pest detection in precision agriculture
AUTHOR: D. Brunelli,A. Albanese,D. d'Acunto,and M. Nardello
YEAR: 2019
DESCRIPTION: The most common problem for these crops is the attack of the codling moth, which is a dangerous parasite for apples. IoT sensing devices can nowadays run near sensor machine learning algorithms, thus giving not only the possibility of collecting data over wide coverage but even featuring immediate data analysis and anomaly detection.

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2) TITLE: Pest Net: An end-to-end deep learning approach for large-scale multi-class pest detection and classification
AUTHOR: L. Liu, R. Wang, C. Xie, P. Yang
YEAR: 2019
DESCRIPTION: This paper proposes a region-based end-to-end approach named PestNet for large-scale multi-class pest detection and classification based on deep learning. PestNet consists of three major parts. First, a novel module channel-spatial attention (CSA) is proposed to be fused into the convolutional neural network (CNN) backbone for feature extraction and enhancement.

3) TITLE: A unified matrix-based convolutional neural network for fine grained image classification of wheat leaf diseases
AUTHOR: Z. Lin, S. Mu, F. Huang, K. A. Mateen
YEAR: 2019
DESCRIPTION: Crop disease classification is affected by various visual interferences, including uneven illumination, dew, and equipment jitter. It demands an effective algorithm to accurately discriminate one category from the others. Thus, the representational ability of algorithm needs to be strengthened to learn a robust domain-specific discrimination through an effective way.

4) TITLE: A large scale benchmark dataset for insect pest recognition
AUTHOR: X. Wu, C. Zhan, Y.K. Lai, M.-M. Cheng
YEAR: 2019
DESCRIPTION: In this paper, we collect a large-scale dataset named IP102 for insect pest recognition. Specifically, it contains more than 75, 000 images belonging to 102 categories, which exhibit a natural long-tailed distribution. In addition, we annotate about 19, 000 images with bounding boxes for object detection.

III. EXISTING SYSTEM

A. *Existing System:*

Existing approach focus on crop disease classification using Convolutional Neural Networks (CNNs) is an imperative task in agriculture to ensure timely and accurate detection of diseases, thereby aiding in effective pest management and crop yield optimization. This study analyzes a CNN-based approach for automated classification of crop diseases from images. The model leverages the hierarchical features learned by the convolutional layers to discern patterns indicative of various diseases. Preprocessing techniques such as data augmentation and normalization are employed to enhance model generalization and robustness. Through extensive experimentation and evaluation on diverse crop disease datasets, the proposed CNN model demonstrates superior performance in terms of accuracy, precision, and recall. The results indicate its potential for real-world application in agriculture, offering an early disease detection and intervention.

B. *Disadvantages:*

- Poor quality images are utilized which affects the accuracy model.
- This system focus only limited number of crop disease detection.
- Leading to poor generalization performance on unseen data.

IV. PROPOSED SYSTEM

A. *Proposed System:*

The proposed system implements the pest identification which is the application of deep learning, specifically Convolutional Neural Networks (CNNs), integrated with platforms like PestNet. By harnessing the power of CNNs, which excel at image recognition tasks, PestNet can efficiently identify various pests impacting crops. This solution collecting a diverse dataset of images showcasing different pests, along with their associated crops and damage. These images are then fed into the CNN, which learns to extract relevant features and patterns crucial for accurate pest identification

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B. *Advantages:*

- Automate the process of pest identification, reducing the need for manual inspection and saving time and labor costs.
- This automation also enables continuous monitoring, leading to early detection of pests.
- This integration of pest identification with pesticide details facilitates informed decision-making, helping farmers choose the most appropriate and effective pest management strategies.

C. *System Architecture:*

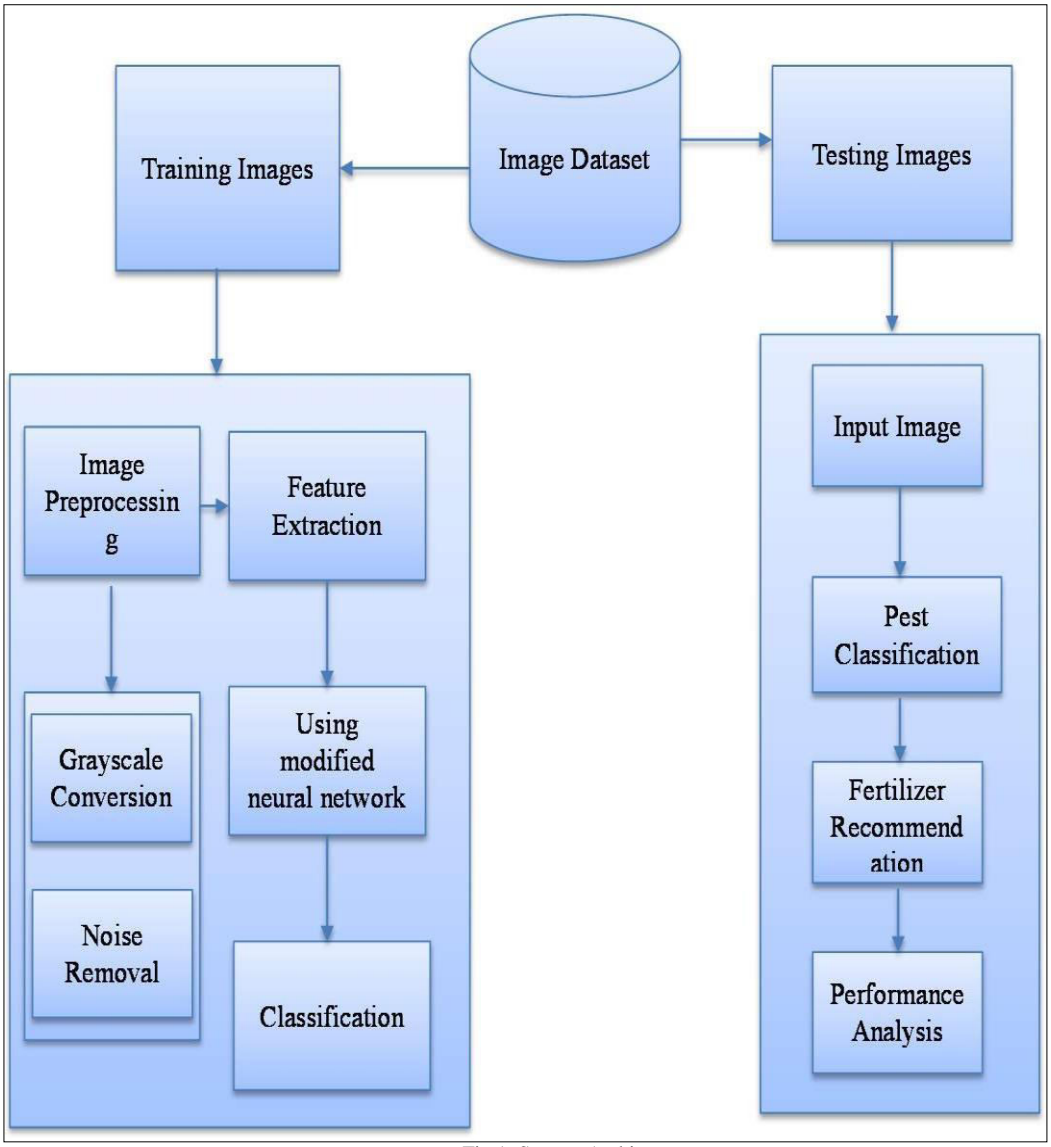

Fig 1: System Architecture

V. CONCLUSION AND FUTURE WORK

The integration of deep learning, particularly Convolutional Neural Networks (CNN), with platforms like PestNet marks a significant leap forward in pest identification and pesticide management. By leveraging the power of artificial intelligence, this approach offers unparalleled accuracy and efficiency in identifying various pests, from insects to plant diseases, enabling farmers and agricultural experts to swiftly diagnose and address threats to crops.

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In future work develop an Android application integrating such technology could revolutionize pest identification and pesticide selection. By leveraging advanced deep learning platforms, this app could swiftly identify pests through uploaded images, providing users with instant access to comprehensive pesticide details tailored to the specific pest species.

REFERENCES

1. D. Brunelli, A. Albanese, D. d'Acunto, and M. Nardello, ''Energy neutral machine learning based IoT vice for pest detection in precision agriculture,'' IEEE Internet Things Mag., vol. 2, no. 4, pp. 10–13, Dec.2019.
2. L. Liu, R. Wang, C. Xie, P. Yang, F. Wang, C. Xie, P. Yang, F. Wang, S.Sudirman, and W. Liu, ''PestNet: An end-to-end deep learning approach for large-scale multi-class pest detection and classification,''IEEE Access, vol.7, pp. 45301–45312, 2019.
3. Z. Lin,S.Mu, F. Huang, K. A. Mateen, M. Wang, W. Gao, and J. Jia, ''unified matrix-based convolutional neural network for finegrained image classification of wheat leaf diseases,'' IEEE Access, vol.7,pp.11570–11590, 2019.
4. X. Wu, C. Zhan, Y.K. Lai, M.-M. Cheng, and J. Yang, ''Ip102: Alargescale benchmark dataset for insect pest recognition,'' in Proc. IEEE Conf. Comput. Vis. Pattern Recognit., Jun. 2019, pp. 8787–8796.
5. T. Chen and F. Meng, ''Development and performance test of a height-adaptive pesticide spraying system,''IEEEAccess,vol.6,pp.12342–12350,2018.

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