IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

AI–infused Plant Pathology: An App-Based Disease Detection System

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Abstract : Rapid advances in AI (AI) technology have had a major impact on various sectors, and agriculture is a prominent beneficiary. This article examines AI applications in system detection and focuses on developing AI-injected app-based systems. The system aims to improve early detection and processing through machine learning technology, mobile application development, and robust data processing methods. It revolutionizes traditional agricultural practices. Specific machine-learning techniques are used to detect system diseases. We discuss the development of mobile applications for disease recognition. This highlights the importance of a user-friendly interface and actual data processing. Various data records train effective models. Model training and optimization strategies are also covered. In other words, hyperparameter adjustments and cross-validation contribute to the model output. The integration and delivery of AI models in real-world applications are explored, demonstrating the challenges and solutions connected to the field through the provision of AI technology: improved models and wider access to farmers. The conclusions reflect the potential of AI for system disease conversion and outline the ongoing efforts needed to maximize its impact on global agriculture. Collecting, model optimization, agricultural technology, AI integration, *IndexTerms* - Component, formatting, style, styling, insert.

INTRODUCTION

In recent years, the agriculture sector has become increasingly technologically innovative to overcome the complex challenges of plant disease management. Integration of artificial intelligence (AI) into plant pathology has proven to be a progressive approach. It uses advanced algorithms and mobile technologies to improve disease detection and management. This paper deals with the development of an AP-based, app-based disease recognition system that examines the potential for innovative diagnostics of the health of the system. Plant diseases are a serious threat to global agriculture and affect crop yield, quality, and, ultimately, nutritional safety. Traditional methods for disease recognition are often based on visual inspections and laboratory analysis that are labourintensive, time-consuming, and prone to inaccuracy.

With the demand for more efficient and more accurate solutions, AI Technologies offers promising options. AI systems, particularly systems that use algorithms for machine learning (ML), can analyze large amounts of data to identify patterns and anomalies that indicate plant disease. These applications use AI performance to provide real diagnostics through mobile devices. Farmers can use their smartphones to capture photos of the plants, which are then analyzed by AI algorithms to, recognize possible diseases. This approach not only accelerates the cognitive process but also democratizes access to advanced diagnostic tools. This article examines various aspects of AI-injected plant pathology, including current challenges, the role of AI technology in agriculture, machine learning techniques, and the development of mobile applications.

It also covers data collection and preprocessing, model training and optimization, integration and AI model delivery, and real-world applications and case studies. By examining these components, this paper aims to provide a comprehensive overview of the current state and future direction of AI in plant disease detection. The ability to use AI for Real-Time Diagnostics a powerful tool for farmers who can more effectively recognize and tackle system diseases. While technology is developing, the possibilities of AI are becoming increasingly apparent to change agricultural practices, paving the way for a more sustainable and efficient approach to plant disorder management.

NEED OF THE STUDY

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The need for this study arises from the rapid advancements in artificial intelligence (AI) and its increasing integration into various industries, necessitating a comprehensive review of its applications, challenges, and future prospects. With AI transforming fields such as healthcare, finance, education, and automation, it becomes crucial to assess its impact, ethical considerations, and potential risks. The study aims to bridge gaps in existing literature by analyzing current trends, evaluating technological limitations, and identifying opportunities for further innovation. By providing insights into AI's evolving role, the research seeks to guide policymakers, researchers, and industry leaders in leveraging AI responsibly and effectively.

3.1Population and Sample

While significant advancements have been made in applying AI and machine learning (ML) to plant disease detection, several research gaps remain. Current models primarily focus on specific crops or diseases, limiting their applicability to broader agricultural contexts. There is a lack of generalizable solutions that can address a wide range of plant species and pathogens effectively. Most existing systems also rely heavily on high-quality, labelled datasets, which are often limited in size and diversity, leading to models that may not perform well in real-world conditions with varied and noisy data.

3.2 Data and Sources of Data

Data Collection and Preprocessing are key steps in the development of AI models for system detection. Effective data collection involves the collection of a variety of high-quality data from a variety of sources, including satellite imagery, drone materials, and field sensors. These data often contain images of plants, environmental conditions, and disease symptoms. The quality and quantity of data directly affect the performance of your AI model. This is essential to ensure comprehensive and representative data records. Preprocessing involves cleaning and preparation of data collected for analysis. This includes tasks such as removing noise, correcting errors, and normalizing data to ensure consistency. Regarding plant disease detection, preprocessing also includes an interest in disease designation and annotation of images in segmentation regions. Techniques such as data expansion, which artificially increases the size of data records by creating variations of existing data, are usually used to improve the strength and community of the model. Improved performance in detecting and diagnosing system diseases. This is a fundamental step that directly affects the accuracy and reliability of the final prediction model.

3.3 Theoretical framework

Integration and provision of AI models into the realworld agricultural environment involves several important considerations. Integration involves embedding a trained model into a user-friendly application or a system that is easily accessible and used by farmers. This often involves developing an interface where users can enter data, receive predictions, and display results in a format that allows them to understand. Embedded system. Scalability and robustness are important as models handle a variety of data inputs, and performance needs to be maintained under different conditions. Available. This ensures that your AI system remains accurate and relevant over time.

RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study,Data and Sources of Data, study’s variables and analytical framework. The detailsare as follows;

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3.4Statistical tools and econometric models

The review paper primarily focuses on analyzing existing literature rather than conducting empirical research using statistical tools or econometric models. However, if any statistical tools or models are referenced, they are likely drawn from the studies reviewed rather than applied directly in this paper. Common statistical tools in AI research include regression analysis, machine learning algorithms, predictive modeling, and data mining techniques, which help analyze AI's impact across various domains. Econometric models, such as time series analysis and panel data models, may be discussed in relation to AI-driven economic forecasting, automation's effect on labor markets, or AI's role in productivity growth. Since this is a literature review, the paper likely synthesizes findings from studies that employ these tools rather than applying them independently.

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3.4.1 Descriptive Statistics

Since this is a review paper, it does not generate original data or perform descriptive statistical analysis. However, it may summarize and interpret findings from various studies that utilize descriptive statistics, such as mean, median, standard deviation, and percentage distributions, to present trends in artificial intelligence (AI). The paper likely discusses statistical insights from existing research, such as AI adoption rates, growth in AI-driven industries, efficiency improvements due to automation, or the percentage of organizations implementing AI technologies. These descriptive statistics help provide a clearer understanding of AI's impact, challenges, and future potential across different sectors

RESULTS AND DISCUSSION

Finally, the integration of AI technology into plant disease detection is a major advance in agricultural science, offering the potential to improve plant management and improve revenue. The use of AI is extremely important for managing plant disease challenges. AI can change plant health monitoring and management using machine learning technology to optimize mobile application development and data processing workflows. The continued development of these technologies promises to address current limitations and expand their applications in a variety of agricultural contexts.

ACKNOWLEDGMENT

We express our sincere gratitude to all researchers and scholars whose work contributed to this study. We also appreciate the guidance and support from academic mentors, peer reviewers, and institutions that provided valuable insights and resources. Their contributions have been instrumental in shaping this review paper..

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