International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

LEAF LENS- A MACHINE LEARNING APPROACH

Navyashree S[1], Keerthana H R[2]

[1]Student, Department Of BCA, BMS College Of Commerce And Management, Bengaluru, Karnataka, India
[2]Assistant Professor, Department Of BCA, BMS College Of Commerce And Management, Bengaluru, Karanataka, India

ABSTRACT :

Let us talk about how cool deep learning techniques are for diagnosing diseases. It's been a hot topic lately, and lots of studies are looking into how we can use these techniques in precision agriculture. This awesome review looks at 70 different studies from respected sources like Scopus, IEEE Xplore, Science Direct, and Google Scholar. They're checking out stuff like what kind of data you, the cameras you use to take pictures of plants, different deep learning tricks, making sure the models work well in various situations, estimating how bad a disease is, comparing how well computers do compared to humans, and what should be looked into next. By tackling these big questions, the goal is to fill in the gaps in our knowledge about plant diseases and help make tools that farmers can actually use. Putting together what we know and figuring out the problems and chances highlighted in these studies can really push forward the use of deep learning for better plant disease spotting and control in farming. Especially in India, where farming is super important to the economy, using technology in agriculture can make a big difference. Plant diseases are a big deal for farmers since they mess with how much and how good their crops are.

Keywords: Machine learning, python, leaf disease detection.

INTRODUCTION :

Leaf disease detection, an essential aspect of modern agriculture, plays a pivotal role in ensuring crop health and optimizing yield. With the advancement of technology, particularly in machine learning and computer vision, the development of innovative methods to detect and diagnose leaf diseases has become increasingly accessible and efficient. This field leverages various image processing techniques, often employing Convolutional Neural Networks (CNNs), to identify and analyze diseases affecting plant foliage. By examining leaf characteristics and patterns, these technologies offer a non-invasive means to detect, classify, and even predict various diseases, enabling early intervention to mitigate potential crop losses. The significance of leaf disease detection is evident in its impact on agricultural productivity and sustainability. Timely identification and treatment of diseases such as Powdery Mildew, Leaf Spot Diseases, and Rust are critical for maintaining crop health. Moreover, this technology aids in reducing the extensive manual labor and subjectivity involved in disease identification. By providing precise and rapid analysis, it assists farmers and agricultural experts in making informed decisions regarding disease management strategies.

LITERATURE SURVEY

The research article titled "Green leaf disease detection and identification using Raspberry Pi," authored by Supriya S and Dr. Aravinda H L, published in the International Research Journal of Engineering and Technology (IRJET), Volume 09, Issue 08, in August 2022, explores the utilization of Raspberry Pi for the detection and identification of green leaf diseases. The study likely delves into the application of this technology, potentially involving image processing and machine learning techniques, aiming to enhance the accuracy and efficiency of disease identification in plant foliage.

The article titled "A survey on using deep learning techniques for plant disease diagnosis and recommendations for development of appropriate tools," authored by Aanis Ahmad, Dharmendra Saraswat, and Aly El Gamal, published in Smart Agricultural Technology, Volume 3 in February 2023, presents a comprehensive survey exploring the application of deep learning techniques for plant disease diagnosis. This study likely examines the use of advanced machine learning methodologies to identify and diagnose plant diseases, with a focus on proposing and developing effective tools for improved agricultural practices and disease management.

The article "Plant Leaf Disease severity classification using agriculture detection framework," authored by Arunangshu Pal and Vinay Kumar, published in the Engineering Applications of Artificial Intelligence, Volume 119, in March 2023, likely focuses on employing an agriculture detection framework for classifying the severity of plant leaf diseases. The study may involve the utilization of artificial intelligence in evaluating the severity levels of various plant diseases, potentially through image processing and classification techniques

METHODOLOGY

Design

Let's get started on creating a big leaf disease database. We need images and info on different leaf problems at various stages. Next up, we'll use Arduino to snap leaf pics with cameras or sensors in farms. Then, we're on to finding spots on the leaf using image tools to spot signs. Time to bring a smart neural network CNN to study those leaf images. Train it our database to spot diseases from those critical leaf spots. After identifying the sickness, let's figure out how severe it is by the pics with cool algorithms for patterns and color changes. Depending on what's wrong with the leaf, we'll suggest treatments or actions from our expert advice base.

3.2 Development Preprocess

Keep tweaking the neural network by adding new data, refining our disease database, and updating solutions for better predictions and management. Now let's try this system out in real farm conditions to see how well it works and make improvements based on feedback from users. The CNN has four layers that help it understand the images better. Each layer pulls out features using special filters, then zaps them with ReLU before standardizing the results. The number of features grows from 32 to 256 as we go along, getting more complex each time. Max pooling steps in after each layer to shrink down the image and prevent overthinking.

Principles

The venture grasps Dexterous standards to cultivate iterative advancement cycles, persistent partner input, and versatile responsiveness to advancing prerequisites. The iterative handle commenced with fastidious arranging and scoping, including thorough prerequisite examination and depiction of extend breakthroughs. The plan stage enveloped iterative wireframing and prototyping to refine client encounter streams and optimize database pattern for streamlined information recovery and control.

Development LifeCycle

The principles of the leaf disease detection project are centered around accuracy, accessibility, and sustainability. Accuracy is paramount, driving the meticulous design and optimization of the CNN model to ensure reliable disease classification. Accessibility is achieved through a user-friendly interface and real-time processing capabilities, making advanced technology readily available to farmers and agricultural professionals. Sustainability is promoted by enabling early disease detection, reducing the need for chemical treatments, and supporting healthier crop management practices.

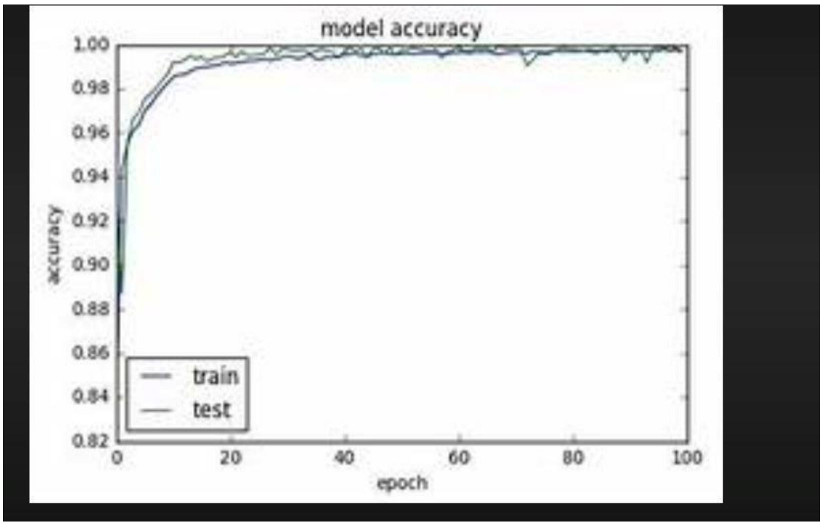
3. RESULTS AND DISCUSSION

The result of the project aligns with our expected result. In our project, we have successfully developed a Convolutional Neural Network (CNN) model to detect plant diseases with an impressive level of accuracy. Leveraging a robust dataset comprising 60 thousand instances, our model has demonstrated remarkable precision in predicting plant ailments. The accuracy of our predictions is evident, highlighting the efficacy of us approach. By utilizing CNN layers, we have engineered the model to discern disease patterns based on subtle color differences in the leaves, allowing for quick and reliable identification. The user interface of our frontend website provides a seamless experience for users interested in diagnosing plant diseases. Through a simple visual analysis of the leaf's color, our model maps it to the extensive dataset and promptly delivers accurate predictions.

Layer	Output Shape	Param #
Conv2d-1	[-1, 32, 224, 224]	896
ReLU-2	[-1, 32, 224, 224]	0
BatchNorm2d-3	[-1, 32, 224, 224]	64
Conv2d-4	[-1, 32, 224, 224]	9,248
ReLU-5	[-1, 32, 224, 224]	0
BatchNorm2d-6	[-1, 32, 224, 224]	64
MaxPool2d-7	[-1, 32, 112, 112]	0
Conv2d-8	[-1, 64, 112, 112]	18,496
ReLU-9	[-1, 64, 112, 112]	0
BatchNorm2d-10	[-1, 64, 112, 112]	128
Conv2d-11	[-1, 64, 112, 112]	36,928
ReLU-12	[-1, 64, 112, 112]	0
BatchNorm2d-13	[-1, 64, 112, 112]	128
MaxPool2d-14	[-1, 64, 56, 56]	0
Conv2d-15	[-1, 128, 56, 56]	73,856
ReLU-16	[-1, 128, 56, 56]	0
BatchNorm2d-17	[-1, 128, 56, 56]	256
Conv2d-18	[-1, 128, 56, 56]	147,584
ReLU-19	[-1, 128, 56, 56]	0
BatchNorm2d-20	[-1, 128, 56, 56]	256
MaxPool2d-21	[-1, 128, 28, 28]	0
Conv2d-22	[-1, 256, 28, 28]	295,168
ReLU-23	[-1, 256, 28, 28]	0
BatchNorm2d-24	[-1, 256, 28, 28]	512
Conv2d-25	[-1, 256, 28, 28]	590,080
ReLU-26	[-1, 256, 28, 28]	0
BatchNorm2d-27	[-1, 256, 28, 28]	512
MaxPool2d-28	[-1, 256, 14, 14]	0
Dropout-29	[-1, 50176]	0
Linear-30	[-1, 1024]	51,381,248
ReLU-31	[-1, 1024]	0
Dropout-32	[-1, 1024]	0
Linear-33	[-1, 39]	39,975

Total params: 52,595,399
Trainable params: 52,595,399
Non-trainable params: 0

Input size (MB): 0.57
Forward/backward pass size (MB): 143.96
Params size (MB): 200.64
Estimated Total Size (MB): 345.17



4. CONCLUSION :

In conclusion, the Leaflens project represents a significant leap forward in the realm of plant pathology, employing a sophisticated machine learning approach for automated disease diagnosis. The implementation of Convolutional Neural Networks (CNN) as the underlying algorithm has proven to be instrumental in achieving accurate and efficient identification of leaf diseases. Through extensive training on diverse datasets, Leaflens has acquired the capability to discern subtle patterns and abnormalities in leaf images, providing a swift and reliable diagnosis for various plant diseases. Moreover, the comprehensive disease descriptions offered by Leaflens further enhance its utility in agricultural settings. By furnishing detailed insights into the identified diseases, including symptoms, causes, and potential mitigation strategies, this innovative system equips farmers and researchers with valuable information to make informed decisions. The amalgamation of advanced machine learning techniques with accessible disease information not only streamlines the diagnostic process but also empowers stakeholders to take proactive measures, ultimately contributing to more sustainable and resilient agriculture practices. Leaflens stands as a testament to the potential of artificial intelligence in revolutionizing plant health monitoring and holds promise for the continued advancement of precision agriculture. Its ability to swiftly and accurately identify diseases enables early intervention, preventing the spread of infections and minimizing crop losses. Additionally, by providing comprehensive disease descriptions, Leaflens facilitates targeted treatment strategies, optimizing resource allocation and reducing the reliance on broad-spectrum pesticides, thus promoting environmentally friendly agricultural practices. The success of the Leaflens project underscores the importance of data-driven approaches in addressing complex challenges in agriculture. Client input given profitable bits of knowledge into the platform's convenience and usefulness, with positive reactions demonstrating fulfillment with the instinctive route and clear checkout handle. These reactions approve the adequacy of the plan and advancement approach in assembly client desires and upgrading by and large client involvement. , Leaflens leverages vast amounts of information to improve disease detection and management. This data-driven approach not only enhances the efficiency and accuracy of diagnosis but also enables ongoing learning and refinement of the system, ensuring its adaptability to emerging threats and evolving agricultural practices. Furthermore, the collaborative nature of the Leaflens project highlights the importance of interdisciplinary research in driving innovation in agriculture. By bringing together experts from fields as diverse as computer science, plant pathology, and agronomy, Leaflens embodies the synergistic potential of crossdisciplinary collaboration. This collaborative effort not only accelerates the pace of innovation but also fosters a holistic understanding of complex agricultural challenges, leading to more effective solutions that benefit farmers, researchers, and the environment alike. Looking ahead, the impact of Leaflens is poised to extend far beyond its initial implementation. As ongoing research continues to refine and enhance the capabilities of the system, its reach and effectiveness are expected to grow exponentially.

5. REFERENCES :

1. Supriya S, Dr. Aravinda H L “Green leaf disease detection and identification using Raspberry Pi", Date of Conference: 07-08 October 2023, Date Added to IEEE Xplore: 18 December 2023, publisher: IEEE.

2. Aanis Ahmad a, Dharmendra Saraswat b, Aly El Gamal ,"A survey on using deep learning techniques for plant disease diagnosis and recommendations for development of appropriate tools", Smart Agricultural Technology, Volume 3, February 2023, 100083.

3. Arunangshu Pal, Vinay Kumar,” AgriDet: Plant Leaf Disease severity classification using agriculture detection framework”, Date of Conference: 16-17 December 2022 Date Added to IEEE Xplore: 28 March 2023, DOI: 10.1109/ICAC3N56670.2022.10074467 publisher: IEEE.