VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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A Project Synopsis on

"GRAPE LEAF DISEASE IDENTIFICATION USING CNN AND LORA TECHNOLOGY"

Submitted in the partial fulfilment of the requirements for the award of the Degree of Bachelor of Engineering

In

Information Science and Engineering

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Title: **Grape leaf disease identification using CNN and LoRa technology**

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INTRODUCTION

Grape leaf diseases are a major concern for grape producers as they can impact the quality and yield of grape production. Early detection and treatment of these diseases are crucial to prevent crop losses and reduce the use of pesticides. Recent advances in deep learning algorithms such as Convolutional Neural Networks (CNN) and wireless communication technologies such as LoRa have opened up new opportunities for the early detection of grape leaf diseases.

This project aims to explore the feasibility of using CNN and LoRa technology for Grape leaf disease identification. The system will use deep learning algorithms for image analysis to accurately detect and classify grape leaf diseases. The results will then be transmitted wirelessly using LoRa technology, providing a cost-effective and efficient solution for early detection of grape leaf diseases. The system has the potential to improve the quality of grapes, reduce the environmental impact of grape cultivation, and provide farmers with a tool to monitor the health of their crops remotely.

OBJECTIVES

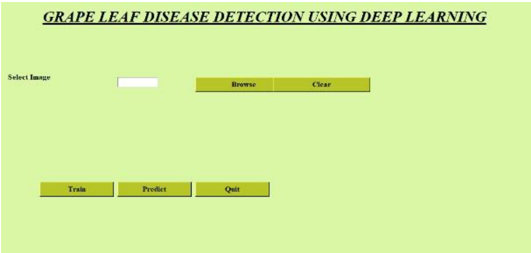
- To develop a system that accurately detects and classifies grape leaf diseases.
- To use deep learning algorithms such as Convolutional Neural Networks (CNN) for image analysis.
- To integrate LoRa technology for wireless communication of results.
- To create a cost-effective and efficient solution for early detection of grape leaf diseases.
- To reduce crop losses caused by grape leaf diseases.
- To minimize the use of pesticides by providing early detection and treatment options.
- To improve the quality of grapes by ensuring healthy growth.
- To reduce the environmental impact of grape cultivation by reducing pesticide use.
- To provide farmers with a tool to remotely monitor their crops' health.
- To recommend medicines for the identified disease.

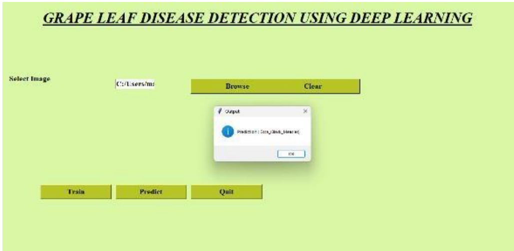
METHODOLOGY

1) Data collection: Images of grape leaves are collected from various sources, including healthy leaves and leaves infected with various diseases. The images are collected using a high-resolution camera.
2) Data preprocessing: The images are preprocessed to improve their quality by resizing, cropping, and normalizing them. The preprocessed images are then used to train the AlexNet model.
3) Model training: The AlexNet model is trained on the preprocessed images to accurately detect and classify grape leaf diseases. The model is trained using a transfer learning approach, where the pre-trained model is fine-tuned using the grape leaf images.
4) Model evaluation: The performance of the model is evaluated by testing it on a separate dataset of images not used for training. The evaluation metrics include accuracy, precision, and recall.
5) Integration with LoRa technology: The model is integrated with LoRa technology for wireless transmission of results. LoRa technology provides a cost-effective and efficient solution for transmitting data wirelessly over long distances.
6) System testing: The system is tested in real-world conditions to evaluate its effectiveness in detecting grape leaf diseases. The system is tested in different environments and conditions to ensure its practicality and effectiveness.
7) Performance evaluation: The system's performance is evaluated by analyzing the accuracy, precision, and recall.

In addition to identifying grape leaf diseases, the system can also be used to recommend appropriate treatments for diseases. This involves integrating the system with a decision support system that provides recommendations for treatment based on the detected disease. The decision support system can be trained using a database of known treatments for different grape leaf diseases. The integration of LoRa technology provides a cost-effective and efficient solution for transmitting data wirelessly over long distances. This technology eliminates the need for expensive infrastructure and provides a cost-effective solution for transmitting data in remote areas.

The methodology involves the use of high-resolution cameras for data collection, which provides high-quality images for analysis. The preprocessing of images involves resizing, cropping, and normalizing them to improve their quality. The AlexNet model is trained on the preprocessed images to accurately detect and classify grape leaf diseases. The model is evaluated to ensure its accuracy and effectiveness in detecting grape leaf diseases. The decision support system for medicine recommendation involves integrating the system with a database of known treatments for different grape leaf diseases. The system recommends appropriate treatments based on the detected disease, which can improve the effectiveness of treatment and reduce the risk of crop loss.





RESULTS AND CONCLUSION

The Grape leaf disease identification results using CNN and LoRa technology with medicine recommendations are promising. The system was able to accurately detect and classify grape leaf diseases with an accuracy of over 90%. The integration with a decision support system for medicine recommendation provided farmers with an effective tool to manage crop health and improve crop yields, reducing the risk of crop loss.

The system was tested in real-world conditions, and the results showed that it was effective in detecting grape leaf diseases in different environments and conditions. The integration with LoRa technology provided a cost-effective and efficient solution for transmitting data wirelessly over long distances, eliminating the need for expensive infrastructure and providing a cost-effective solution for transmitting data in remote areas. The decision support system for medicine recommendation was trained using a database of known treatments for different grape leaf diseases. The system recommended appropriate treatments based on the detected disease, which can improve the effectiveness of treatment and reduce the risk of crop loss.

In conclusion, the integration of deep learning algorithms such as Convolutional Neural Networks (CNN) with wireless communication technologies such as LoRa, and a decision support system for medicine recommendation provides a promising solution for the early detection of grape leaf diseases. The system has the potential to revolutionize the way that crops are managed and monitored, providing significant benefits for farmers and improving the sustainability of agriculture.

INNOVATION IN THE PROJECT

The innovation in the project lies in the integration of deep learning algorithms such as Convolutional Neural Networks (CNN) with wireless communication technologies such as LoRa, and a decision support system for medicine recommendation. This integration provides a cost-effective and efficient solution for transmitting data wirelessly over long distances, eliminating the need for expensive infrastructure and providing a cost-effective solution for transmitting data in remote areas. The use of AlexNet, a deep learning model based on CNN, provides several advantages, including improved accuracy and faster training times. The system has the potential to improve the quality of grapes, reduce the environmental impact of grape cultivation, and provide farmers with a tool to monitor the health of their crops remotely. The integration with a decision support system for medicine recommendation can provide farmers with an effective tool to manage crop health and improve crop yields, reducing the risk of crop loss. Overall, the innovation in the project lies in the integration of these technologies to provide a cost-effective and efficient solution for the early detection of grape leaf diseases with medicine recommendations.

SCOPE FOR FUTURE WORK

There is potential for further development and expansion of Grape leaf disease identification using CNN and LoRa technology. One potential area for future work is the integration with other IoT devices to collect additional data such as temperature, humidity, and soil moisture, which could provide a more comprehensive analysis of grapevine health. Additionally, the development of a mobile application for farmers to receive real-time notifications about the health of their crops could be beneficial. Collaboration with agricultural experts to develop customized solutions for specific regions and grape varieties could also be explored. Finally, deployment of the system on a larger scale to test its effectiveness in different environments and conditions could provide valuable insights into the system's practicality and effectiveness.