PROJECT PROPOSAL

PROJECT TITLE

Harnessing Convolutional Neural Networks for Enhanced Detection of Potato Plant Diseases.

TEAM MEMBERS

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DESCRIPTION OF THE PROBLEM

This project is about building a model that uses deep learning methods—more particularly, Convolutional Neural Networks (CNNs)—to precisely identify and categorize late blight and early blight, the two main diseases that affect potato plants. The technology will identify disease signals by examining photos of the afflicted leaves that were taken using the app and applying sophisticated digital image processing techniques.

To improve the precision of plant disease detection, the core technology will make use of CNNs, pooling layers, completely linked dense layers, and efficient activation functions. In order to help farmers and crop producers who might not have a lot of experience with plant diseases identify problems early on, the program is made to be user-friendly. A timely and precise diagnosis is essential to stopping the disease's spread, avoiding crop damage, and averting significant financial losses.

Using computer vision and object recognition methods, the application will be a vital resource for managing crop health in real time. Additionally, its interoperability feature will guarantee device compatibility, encouraging accessibility and wider use. The objective of this research is to improve food security and sustainable farming practices by utilizing deep learning in agricultural techniques.

A BRIEF SURVEY OF WHAT HAVE BEEN DONE AND HOW THE PROPOSED WORK IS DIFFERENT

We were already finding the potential problems in agriculture which can be solved using machine learning. So, we found the potato plant disease classification a useful problem to solve using machine learning.
There have been a lot of diseases given to potato plants. Economists and agricultural researchers have already determined the details about the disease. So, collection of data and enough domain knowledge has already been done. But we propose to work on classifying the diseases just by looking at the image of potato plant leaves.

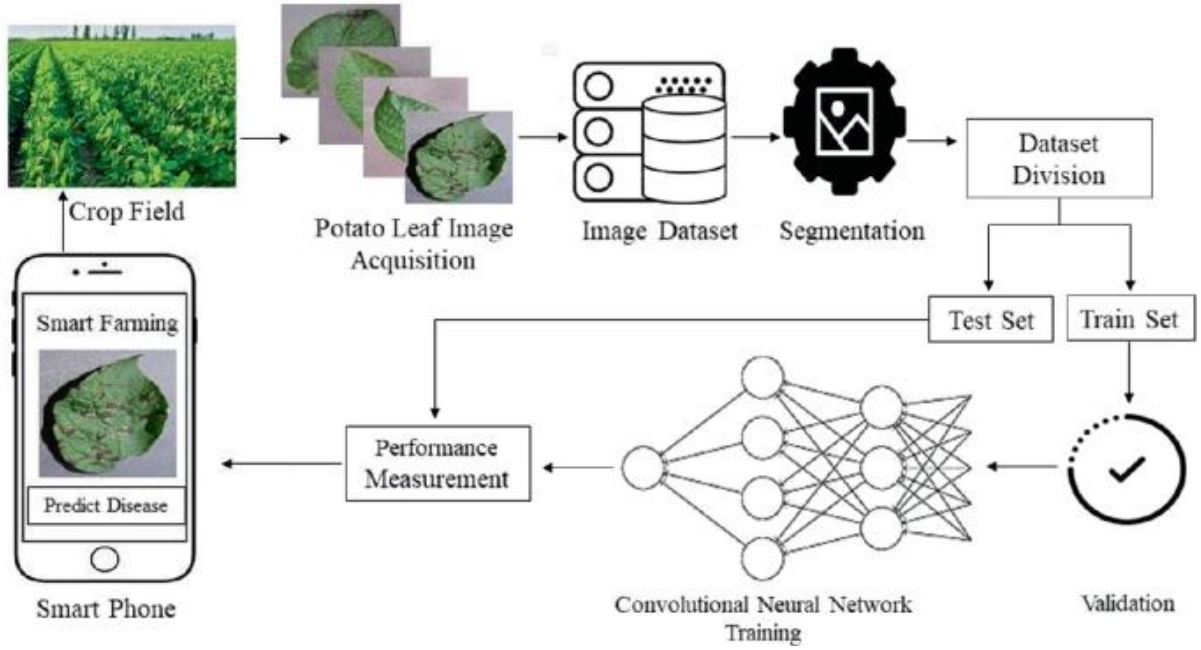
Previously what have been done:

- Observations and scientific evaluation of many diseases already have been done by many researchers in the agriculture field.

- We used those domains specific knowledge to solve the problem of classifying the disease by image recognition. For that we already have machine learning algorithms to classify the image.
- We have already studied the appropriate algorithms and models to work on this problems like CNN (Convolutional Neural Network)

Proposed work:

We propose to work on applying various image classification algorithms and train the images by experimenting with various neural network architecture and finally choosing the most effective and optimized model for this image classification problem.



How our proposed work is different:

- We are trying to detect the disease before we pluck the potato so that we can save the potato from being infected early and also it can help other plants to remain safe.
- We are also using the latest and most advanced machine learning models to train and we will be using different neural network architecture including ResNet-50, AlexNet etc.. To find the perfect model.
- Good training environment: We will try to train our model using thousands of images and with good variety to get the good accuracy on testing various plants.

PRELIMINARY PLAN & CONTRIBUTIONS (MILESTONES)

1. **Data Collection (Saurin Patel & Minal Kyada):**
    a. Gather a dataset containing diverse images of potato plants with various diseases.
    b. Categorize images into healthy leaves, late-blight-affected leaves, and early-blight-affected leaves.
2. **Data Preprocessing (Jay Damani):**
    a. Apply image processing techniques, including data augmentation, to enhance the dataset.
    b. Clean and prepare the data for training.

3. **Model Development (Minal Kyada & Jay Damani):**
    a. Design and implement the Potato Plant Disease Detection Neural Network (PPDDNN).
    b. Train the model using the pre-processed dataset.
    c. Optimize the model architecture for accuracy and efficiency.
4. **Application Development (Saurin Patel):**
    a. Develop a web application for desktop users to upload and analyze images.
    b. Create a mobile application using React Native for on-the-go disease detection.
    c. Integrate the trained model into both applications.
5. **Testing and Validation (Minal Kyada):**
    a. Test the applications with a set of known images to validate accuracy.
    b. Conduct real-time testing with unseen images to evaluate the performance in practical scenarios.
6. **Documentation and Reporting (Minal Kyada, Saurin Patel & Jay Damani):**
    a. Prepare comprehensive documentation detailing the system architecture, model, and application usage.
    b. Compile a report summarizing the project's goals, methodologies, results, and future possibilities.

GITHUB Link: https://github.com/saurin16/IML_PROJECT

REFERENCES (LIST OF PAPERS):

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2. Grinblat, G. L., Uzal, L. C., Larese, M. G., Granitto, P. M. (2016). "Deep Neural Networks Based Recognition of Plant Diseases by Leaf Image Classification." **Computational Intelligence and Neuroscience, 2016. doi: 10.1155/2016/3289801**.
3. Tambe, U. Y., et al. (2023). Potato Leaf Disease Classification using Deep Learning: A Convolutional Neural Network Approach. *arXiv:2311.02338*. Available at: https://doi.org/10.48550/arXiv.2311.02338
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6. Md. Akter Hossain, Mohammed Nazim Uddin, Mohammad Arif Hossain and Yeong Min Jang, "Predicting rice yield for Bangladesh by exploiting weather conditions", international conference on information and communication technology convergence (ICTC), pp. 589-594, October 2017.