**LITERATURE SURVEY**

**1) Detection and differentiation between potato diseases using calibration models trained with non-imaging spectrometry data**

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The proportion of light at wavelengths across the electromagnetic spectrum that is either absorbed, transmitted or reflected from a plant leaf is dependent on leaf structure, physiology and biochemistry. Since these elements are influenced by pests, pathogens and their associated induced diseases, the detection, differentiation and diagnosis of plant diseases is theoretically possible by non-destructive analysis of the light reflected from plant leaves. In this study the utility of analysis of light over the visible and near-infrared (400–1000 nm) portion of the spectrum to detect and distinguish between several economically important potato diseases, using either Partial Least Squares and BackPropagation Neural Network spectral calibration models was explored. Models could detect and distinguish between diseases with obvious foliar symptoms (blackleg and late blight), even pre-symptomatically, correctly classifying spectra from greenhouse experiments with an accuracy of 84.6%. When these diseases were analysed separately, models could distinguish between spectra from healthy and pre-symptomatic leaves, plus three classes of late blight lesion advancement with 92% accuracy. For blackleg, models distinguished between spectra from healthy, pre-symptomatic foliage and plants expressing blackleg symptoms with a 74.6% classification accuracy. However, models trained on spectra from whole-plant readings from field trials did not have this level of accuracy, with an r2 between target and model values of 0.66 for late blight, 0.31 for blackleg symptoms and 0.41 for healthy foliage. Regardless of greenhouse or field environment, models failed to detect or distinguish between diseases with subtle foliar impacts (black dot, powdery scab and Rhizoctonia diseases). While deployment of hand-held spectrometers for disease detection on a broad-acre scale is impractical, these findings could underpin methods to analyse hyperspectral imaging data with sub-plant resolution for incorporation into precision agriculture and Integrated Pest Management programmes for potato blackleg and late blight management.

**2) Detection of Potato Diseases Using Image Segmentation and Multiclass Support Vector Machine**

**AUTHORS:** Monzurul Islam, Anh Dinh, Khan Wahid ,Pankaj Bhowmik

Modern phenotyping and plant disease detection provide promising step towards food security and sustainable agriculture. In particular, imaging and computer vision based phenotyping offers the ability to study quantitative plant physiology. On the contrary, manual interpretation requires tremendous amount of work, expertise in plant diseases, and also requires excessive processing time. In this work, we present an approach that integrates image processing and machine learning to allow diagnosing diseases from leaf images. This automated method classifies diseases (or absence thereof) on potato plants from a publicly available plant image database called ‘Plant Village’. Our segmentation approach and utilization of support vector machine demonstrate disease classification over 300 images with an accuracy of 95%. Thus, the proposed approach presents a path toward automated plant diseases diagnosis on a massive scale.

**3) Detection of Potato Disease Using Image Segmentation and Machine Learning**

**AUTHORS:** Md. Asif Iqbal and Kamrul Hasan Talukder

Potato is one of the prominent food crops all over the world. In Bangladesh, potato cultivation has been getting remarkable popularity over the last decades. Many diseases affect the proper growth of potato plants. Noticeable diseases are seen in the leaf region of this plant. Two common and popular leaf diseases of the potato plants are Early Blight (EB) and Late Blight (LB). However, if these diseases were identified at an early stage it would be very helpful for better production of this crop. To solve this problem by detecting and analyzing these diseases image processing is the best option. This paper proposes an image processing and machine learning-based automatic system that will identify and classify potato leaf diseases. In this paper, image segmentation is done over 450 images of healthy and diseased potato leaf, which is taken from publicly available plant village database and seven classifier algorithms are used for recognition and classification of diseased and healthy leaves. Among them, The Random Forest classifier gives an accuracy of 97%. In this manner, our proposed approach leads to a path of automatic plant leaf disease detection.

**4) Potato Leaf Diseases Detection Using Deep Learning**

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With the enhancement in agricultural technology and the use of artificial intelligence in diagnosing plant diseases, it becomes important to make pertinent research to sustainable agricultural development. Various diseases like early blight and late blight immensely influence the quality and quantity of the potatoes and manual interpretation of these leaf diseases is quite time-taking and cumbersome. As it requires tremendously a good level of expertise, efficient and automated detection of these diseases in the budding phase can assist in ameliorating the potato crop production. Previously, various models have been proposed to detect several plant diseases. In this paper, a model is presented that uses pre-trained models like VGG19 for fine-tuning(transfer learning) to extract the relevant features from the dataset. Then, with the help of multiple classifiers results were perceived among which logistic regression outperformed others by a substantial margin of classification accuracy obtaining 97.8% over the test dataset.

**5) Application of Transfer Learning to Detect Potato Disease from Leaf Image**

**AUTHORS:** Farabee Islam,Md Nazmul Hoq,Professor Dr. Chowdhury Mofizur Rahman

Potato is one of the most significant crops over the world. But production of potato is hampered due to some diseases which cause an increase of the cost as well as affect the life of the farmers. An automatic and early detection of these diseases will increase the production and help to digitize the system. Our main objective is to detect the potato diseases with a few leaf image data using advanced machine learning techniques. In this paper, we demonstrate that transfer learning technique could be used for early detection of potato diseases when it is difficult to collect thousands of new leaf images. Transfer learning uses already trained deep learning model's weight to solve new problem. The experiments included images of 152 healthy leaves, 1000 Late blight leaves, and 1000 early blight leaves. The program predicts with an accuracy of 99.43% in testing with 20% test data and 80% train data. We also compared sequential deep learning model with several pre-trained model applying transfer learning and found that transfer learning provided best result till date. Our output showed that transfer learning outperform all existing works on potato disease detection.