LITERATURE SURVEY ON FERTILIZERS RECOMMENDATION SYSTEM FOR DISEASE PREDICTION

DOMAIN : ARTIFICIAL INTELLIGENCE

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INTRODUCTION:

Research and innovation to elevate existing concepts are pressing needs in the field of agriculture. The use of AI in existing farming techniques is more than just a concept, it is the need of the hour, a medium through which we can use advanced technology to process various novel ideas in such a way that output can be efficiently maximized by taking into consideration all the unsteady parameters present. One of the reasons why artificial intelligence is growing today is because of its power to provide accurate predictions or output without any human interference, especially it is very useful in the field such as agriculture where things are uncertain because of sudden climate changes. An installed application with the simulated algorithmic computer models, AI can guide farmers through the process of growing, suggesting suitable crops, detecting plant diseases. According to the report provided by the United Nations Food and Agricultural Organization (FAO), the global population will probably reach around 9.2 billion by the year 2050. With the available farming land estimated at just an additional 4%, it seems that it is no longer an option to simply plant more crops for feeding. So, what is needed is simply farming with greater efficiency than before. Michael Gomez Selvaraj et AI have suggested model for banana disease and pest detection using AI. In which they have trained their model on dataset contains more than 18,000 expert pre-screened original field images, but in this study, they have utilized only 12600 images. For the entire plant, leaves, pseudo stem and fruit bunch models performed better in Faster R-CNN (faster regions with convolutional neural network) ResNet50 than others tested, which achieved a mAP score of 73%, 70%, 99%, and 97%, respectively.

They received higher accuracy (more than 95%) for pseudo stem, fruit bunch and corm compared to entire plant (73%) and leaf models (70%). In agriculture, crop yields are very much dependent on natural factors and are highly uncertain. We cannot expand the earth to create more land for agriculture i.e., we have to “Do More Within Less”. Therefore, AI and Machine – Deep learning techniques enable us to make effective cultivation.

Technology has redefined farming over a few years and made it possible to provide impactful solutions for increasing the productivity and efficiency of crops. With implementation of various AI models, we can do smart irrigation, monitoring soil and crop health, image- based insight generation, crop disease detection and field management which will creates an exponential gain in crop productivity which in turn boosts the economy of the country.

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PAPER 1: FERTILIZERS RECOMMENDATION SYSTEM FOR DISEASE PREDICTION IN TREE LEAVE

- **PUBLICATION YEAR:** 11,NOVEMBER 2019
- **AUTHOR** **:** R. NEELA, P. NITHYA
- **JOURNAL NAME** **:** INTERNATOIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH
- **SUMMARY:** The author gives the complete explanation about the process of identifying the disease. Initially, the plants which are affected by the disease are captured by using camera and after capturing image acquisition, preprocessing, segmentation, disease predictions, fertilizers recommendation, SVM classification and the result and conclusion. SVM is a binary classifier to analyze the data and recognize the pattern for classification. The author also gives the comparison with existing CNN and SVM and the best view about the classifier SVM. Agriculture is the main aspect of country development. Many people lead their life from agriculture field, which gives fully related to agricultural products. Plant disease, especially on leaves, is one of the major factors of reductions in both quality and quantity of the food crops. In agricultural aspects, if the plant is affected by leaf disease then it reduces the growth of the agricultural level. Finding the leaf disease is an important role of agriculture preservation. After pre-processing using a median filter, segmentation is done by Guided Active Contour method and finally, the leaf disease is identified by using Support Vector Machine. The disease-based similarity measure is used for fertilizer recommendation. The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.

PAPER 2: CNN BASED LEAF DISEASE IDENTIFICATION AND REMEDY RECOMMENDATION

- **PUBLICATION YEAR:** 2019
- **AUTHOR** **:** SUMA V,R AMOG SHETTY,RISHAB F TATED,SUNKU ROHAN, TRIVENI S PUJAR
- **JOURNAL NAME** **:** IEEE CONFERENCE RECORD
- **SUMMARY:** The author gives the complete explanation for plant disease prediction using deep CNN. For the disease prediction after the collection of the plant photos from village it will be under the process of ANN algorithms and ML algorithm. By using these two algorithms the plant disease are easily identified and the necessary fertilizers are recommended. Convolution neural network is used to detect and classify plant diseases. The Network is trained using the images taken in the natural environment and achieved 99.32% classification ability. This shows the ability of CNN to extract important features in the natural environment which is required for plant disease classification. Image classification, Image Categories, Feature Extraction, and Training Data is carried out. The whole development of algorithm is done in Python tool. Using several toolboxes like Statistics and Machine Learning toolbox, Neural Network Toolbox and Image Processing Toolbox the outputs as of now are the training data in form of image categories, image classification using K-Means clustering and moisture content along with predicting of withstanding. The algorithm is implemented with training data and classification of given image dataset. The test input image is compared with the trained data for detection and prediction analysis. From the results, it is clear that the model provides reliable results.

PAPER 3: KRUSHI SAHYOG: PLANT DISEASE IDENTIFICATION AND CROP RECOMMENDATION USING ARTIFICIAL INTELLIGENCE

- **PUBLICATION YEAR:** MAY 21-23,2021
- **AUTHOR** **:** NARAYANI PATEL, SHUBHAN KELKAR, MITALI RANAWAT, Dr. M. VIJAYALAKSHMI
- **JOURNAL NAME** **:** INCET BELGAUM,INDIA

- **SUMMARY:** The author demonstrated a plant disease identification and crop recommendation system using CNN. And the methodology used here is as follows, the first process in disease prediction is data preprocessing in that there 2 subdivisions like data augmentation, Train-Test and validation of data. After model implementation takes place. The author has implemented his model in the following way, Crop recommendation, TF-IDF, crop disease detection, sequential model and VGG16 model. The performance measure of CNN VGG16 model for plant disease detection models is based on parameters like accuracy, sensitivity, specificity, false positive rate (FPR), F1 score, MCC, and kappa. In the study, we used one V s all approach and CNN as the classifier parameter. According to the experimental results, model achieved the highest accuracy, which was 97.69% better than the other classification models. Moreover, the train loss value was 0.0107, which was the lowest value. The systems available are based on prediction of recognition and disease. The system demonstrated has a recommendation feature that can be used to identify similar plants that can be planted in that area.

PAPER 4: IDENTIFICATION OF TOMATO PLANT DISEASES BY LEAF IMAGE USING SQUEEZENET MODEL

- **PUBLICATION YEAR:** OCTOBER 22-25, 2018
- **AUTHOR** **:** AKBAR HIDAYATULOH, M NURSALMAN, EKI NUGRAHA
- **JOURNAL NAME** **:** ICITSI BANDUNG-PADANG
- **SUMMARY:** The author gives an elaborated view of disease prediction using CNN . Then the work flow is given as follows, dataset is to be collected then image preprocessing of that particular dataset is to be done after that training and testing process, model evaluation also takes place then only the conclusion will be given. The convolutional neural networks model with squeezenet architecture can be used to identify six types of diseases on the leaves of tomato plants and their healthy leaves. With an average level of accuracy using the k-fold cross validation method of 86.92% and it can be seen that the squeezenet model that is built is a good choice to be implemented on a mobile device or to make computational predictions via the server to be used as REST API because of its relatively small size and resource requirements to run low model computing. For further research, it can be done by increasing the number of epochs or adjusting the configuration parameters used and by increasing the amount of data used to improve data quality better, trying to identify other horticultural plant diseases, either through their leaves or

other organs, and by designing software that can detect if there are new diseases that have never been through the previous model training process.

PAPER 5: SMARTPHONE APLLICATION FOR DEEP LEARNING – BASED PLANT DISEASE DETECTION

- **PUBLICATION YEAR:** OCTOBER 19-23,2020
- **AUTHOR** **:** HERI ANDRIANTO, SUHARDI,FLADIO ARMANDIKA, AHMAD FAIZAL
- **JOURNAL NAME** **:** ICITSI BANDUNG-PADANG
- **SUMMARY:** The author demonstrated the plant disease prediction by using the following techniques such as designing plant disease detection system architecture, developing application on cloud server and smartphone applications, Testing smartphones applications and evaluating the performance of a plant disease detection. Then in the cloud server and smartphone application are based on VGG16 CNN architecture. The author successfully developed a smartphone-based rice plant disease detection application. The results showed that the smartphone-based rice plant disease detection application functioned well, which was able to detect types of rice plant diseases build upon image processing of rice plant leaves using VGG16 with a train accuracy value of 100% and a test accuracy value of 60%. Hispa class has the most accurate compared to other classes because it has the most amount of data from the results of the test data distribution. In our future work, we will increase a test accuracy value by using more datasets and cleaning datasets from noise. Also, we will develop this application with various functions, for example, the function to provide recommendations on how to treat diseases in plants.

PAPER 6: DEEP LEARNING MODEL FOR IMAGE – BASED PLANT DISEASES DETECTION ON EDGE DEVICES

- **PUBLICATION YEAR:** APRIL 02-04, 2021
- **AUTHOR** **:** CHAITRA S, PRACHI PODDAR, SATYAJIT GHANA, SHIKHAR SINGH
- **JOURNAL NAME** **:** INTERNATIONAL CONFERENCE FOR CONVERGENCE IN TECHNOLOGY

- **SUMMARY:** The author elaborated the project by using the Convolutional Neural Network architectures, Deep Learning models and Python programming. The model defined in paper presents that used deep learning models for plant disease detection, this paper uses a custom dataset consisting of 87,848 images, and in total 58 classes, this was the largest dataset of plant diseases we came across but wasn't available publicly. The paper describes using AlexNet, VGG and GoogLeNet, they achieve 99.48% accuracy using the VGG model in 48 epochs of training. The paper describes a mobile application that is based on Symptom Signatures, i.e. the nature of the lesions /spots on the leaf determine the symptoms of the disease. The accuracy using this method achieves over 90% accuracy. A simple image search on the web for a known plant disease, to address this issue we propose collecting data from various parts of the country as the mobile app is being used, and use multiple models for classifying the image to its respective class. To make the model even more robust the images should be captured in cultivation fields rather than in a lab or under specific conditions. Another extension of automatic plant disease detection would be to use it on an Edge Device like Raspberry PI or Jetson Nano to detect diseases on a field and report the GPS coordinates of the affected area of the field, thus an automated pesticide sprayer can be deployed in those areas. This will greatly improve and automate the plantations and cultivation process as we know it.

PAPER 7: CROP DISEASE DETECTION USING DEEP LEARNING

- **PUBLICATION YEAR:** 2018
- **AUTHOR** **:** OMKAR KULKARNI
- **JOURNAL NAME** **:** IEEE
- **SUMMARY:** The author demonstrated the plant disease prediction using deep learning, Transfer learning, Mobile Net, Inception V3, image classification. In this paper, respectively, the applications of Deep Convolutional Neural Networks have been formulated with the goal of classifying both crop species and identity of disease on images. The proposed methodology was tested on five classes of crops and three types of crop diseases for each class. The experimental results show that the InceptionV3 model performs better than the Mobile Net model in terms of accuracy and validation loss. An extension of this work will include the classification of images that are not captured in a controlled environment and images that have multiple orientation. Also, the number of classes of crops and its diseases can be further increased. This methodology can be

integrated with smart phone applications that would provide user friendly GUI and simplicity for its usage.

PAPER 8: IDENTIFICATION OF PLANT DISEASE USING IMAGE PROCESSING TECHNIQUE

- **PUBLICATION YEAR:** 2019
- **AUTHOR** **:** ABIRAMI DEVARAJ, KARUNYA RATHAN, SARVEPALLI JAAHNAVI AND K INDIRA
- **JOURNAL NAME** **:** IEEE CONFERENCE RECORD
- **SUMMARY:** Agriculture is a backbone of our country. Farmers have good selection of crops for his or her farm. Anyway, the crops cultivation for maximum profit and standard manufacture is usually scientific. Agriculture has become far more than simply a method to feed ever growing populations. It's important wherever in additional than seventieth population of an Asian country is depends on agriculture. Which means it feeds nice range of individuals. The foremost necessary consider less amount crop of quality because of disease. Detecting disease may be a key to stop agricultural losses. The aim of this project is to develop a software system answer that Mechanically find and classify disease. The step like loading an image, pre-Processing, Segmentation, extraction and classification are involves illness detection. The leaves pictures are used for detecting the plant diseases. Therefore use of image process technique to find and classify diseases in agricultural applications is useful.

PAPER 9: DESIGN AND IMPLEMENTATION OF FERTILIZER RECOMMENDATION SYSTEM FOR FARMERS

- **PUBLICATION YEAR:**2020
- **AUTHOR** **:** Dr. G. SURESH, Dr. A. SENTHIL KUMAR, Dr. S. LEKASHRI, Dr. R. MANIKANDAN
- **JOURNAL NAME** **:** THE MATTINGLEY PUBL.CO.INC
- **SUMMARY:** India is an agrarian nation. But creating a profitable yield for the farmer in each crop cycle is becoming a major challenge on various factors. Picking the reasonable fertilizer for the land and yield is an important and basic part of agriculture. Deciding the supplement levels in

soil utilizing lab hardware can be restrictively costly, particularly in developing nations. The current frameworks on deciding soil nutrient substance and proposal for fertilizer isn't sufficiently proficient efficient enough. The proposed methodologies comprise of four stages: soil analysis, data pre-processing, data analysis and Recommendation. The soil sample is analyzed using an IoT based device utilizing NPK sensor with two electrodes are set to calculate collect the NPK ratio of the soil nutrient and for pre-processing, the data gathered from sensors are figured into correct dataset and machine learning algorithm is utilized to recognize the reasonable fertilizer. This venture is extremely valuable to farmer to pick the right fertilizer toward the start of product cycle and amplify the yield.

PAPER 10: SOIL BASED FERTILIZER RECOMMENDATION SYSTEM FOR CROP DISEASE PREDICTION SYSTEM

- **PUBLICATION YEAR:** 2021
- **AUTHOR** **:** Dr. P. PANDI SELVI , P POORNIMA
- **JOURNAL NAME** **:** IJETA RECORD
- **SUMMARY:** India is an agricultural country and depends on agricultural products for their wellbeing. Agriculture is the heart and life of most Indians. But in recent days, the field was going down due to various natural calamities. In order to overcome the problem, various issues in this field need to be addressed. The soil type, fertilizer recommendation, diseases in plants and leaves. All these features need to be considered. Our proposed system was organized in such a way, to analyze the soil type, diseases in the leaves and finally to recommend the appropriate fertilizer to the farmers, that may be of great help to them. Plant disease, especially on leaves, is one of the major factors that reduce the yield in both quality and quantity of the food crops. Finding the leaf disease is an important role to preserve agriculture. Smart analysis and Comprehensive prediction model in agriculture helps the farmer to yield right crop at the right time. The main benefits of the proposed system are as follows: Yield right crop at the right time, Balancing the crop production, control plant disease, Economic growth, and planning to reduce the crop scarcity. Hence to Detect and recognize the plant diseases and to recommend fertilizer it is necessary to provide symptoms in identifying the disease at its earliest. Hence the authors proposed and implemented new fertilizers Recommendation System for crop disease prediction.

PAPER 11: PLANT DISEASE DETECTION FOR PADDY CROP USING ENSEMBLE OF CNNs

- **PUBLICATION YEAR:** NOV 6-8,2020
- **AUTHOR** : ABHIJIT ARCHAYA, AKHIL MUVVALA, SIDDHESH GAWALI, RUHI DHOPAKAR, RUTUJA KADAM, ASHISH HARSOLA
- **JOURNAL NAME** : INOCON BENGALURU,INDIA
- **SUMMARY:** The author demonstrated the project using the technologies of Google Net, Shuffle Net, Resnext, wide resnext, ensemble learning, transfer learning, training and testing. In this work, an attempt to study the different models for recognition of leaf diseases in rice with a parallel ensemble model with ResNet, GoogLeNet, ShuffleNet, ResNeXt, and Wide ResNet is made. From the results obtained, it is seen that the accuracy of the detection of disease from a crop leaf is greater for the ensemble model than individual architectures. When ensembles are used, they help in reducing the bias towards a class, observed in individual models. This ensures that we do not have to reduce the number of images in an overfit class when we are already facing a shortage of training data. The disease identification can be further improved by employing methods like the AdaBoost classifier for better results with smaller models. For future development, the model can be tested on servers for deploying efficiently.

PAPER 12: DCROP: ADEEP LEARNING BASED FRAMEWORK FOR ACCURATE PREDICTION OF DISEASES OF CROPS IN SMART AGRICULTURE

- **PUBLICATION YEAR:** 2019
- **AUTHOR** : VISHAL PALLAGANI, VEDANT KHANDELWAL, BHARATHH CHANDRA ,VENKANNA UDUTALAPALLY, DEBANJAN DAS, SARAJU P MOHANTY
- **JOURNAL NAME** : IEEE INTERNATIONAL SYMPOSIYUM ON SMART ELECTRONICS SYSTEMS

- **SUMMARY:** The author reveals the disease prediction technique using deep learning, computer vision. In this paper, a smartphone assisted crop disease prediction model is proposed using deep convolutional neural networks. The trained deep learning model as well as the app are put to a series of tests to ensure the use of the proposed system for production. The app has been able to predict 38 different diseases with the maximum confidence. dCrop app can be used by the farmers all around the globe, without even internet connectivity. The app empowers any individual with a smartphone to help protect their crops. In the future, the app can be made to work in different regional languages for ease of use by the farmer. Also, for the identified disease, the pesticide or fertilizer to use can be predicted without internet connectivity.

CONCLUSION:

Finally we came to an conclusion that the project will reach maximum efficiency by having several samples of images both the affected and healthy plant images are taken into consideration while disease detection. This will make our project 100% perfect. As per paper1 we also consider support vector machine for the disease prediction rather than convolutional neural network.