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Rice Leaf Disease Classification Using Machine Leaning

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ABSTRACT
Rice is one of the major cultivated crops in India which is affected by various diseases at various stages of its cultivation. It is very difficult for the farmers to manually identify these diseases accurately with their limited knowledge. Recent developments in Deep Learning show that Automatic Image Recognition systems using Convolutional Neural Network(CNN) models can be very beneficial in such problems. Since rice leaf disease image dataset is not easily available, we have created our own dataset which is small in size hence we have used Transfer Learning to develop our deep learning model. The proposed CNN architecture is based on VGG-16 and is trained and tested on the dataset collected from rice fields and the internet. The accuracy of the proposed model is 92.46%.

1 INTRODUCTION

Deep Learning:

Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the back propagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech.
Machine-learning technology powers many aspects of modern society: from web searches to content filtering on social networks to recommendations on e- commerce websites, and it is increasingly present in consumer products such as cameras and smart phones. Machine-learning systems are used to identify objects in images, transcribe speech into text, match news items, posts or products with users' interests, and select relevant results of search. Increasingly, these applications make use of a class of techniques called deep learning. Conventional machine-learning techniques were limited in their ability to process natural data in their raw form. For decades, constructing a pattern-recognition or machine- learning system required careful engineering and considerable domain expertise to design a feature extractor that transformed the raw data (such as the pixel values of an image) into a suitable internal representation or feature vector from which the 2 learning subsystem, often a classifier, could detect or classify patterns in the input. Representation learning is a set of methods that allows a machine to be fed with raw data and to automatically discover the representations needed for detection or classification. Deep-learning methods are representation-learning methods with multiple levels of representation, obtained by composing simple but non-linear modules that each transform the representation at one level (starting with the raw input) into a representation at a higher, slightly more abstract level. With the composition of enough such transformations, very complex functions can be learned. For classification tasks, higher layers of representation amplify aspects of the input that are important for discrimination and suppress irrelevant variations. An image, for example, comes in the form of an array of pixel values, and the learned features in the first layer of representation typically represent the presence or absence of edges at particular orientations and locations in the image. The second layer typically detects motifs by spotting particular arrangements of edges, regardless of small variations in the edge positions. The third layer may assemble motifs

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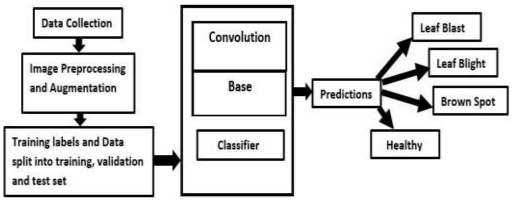
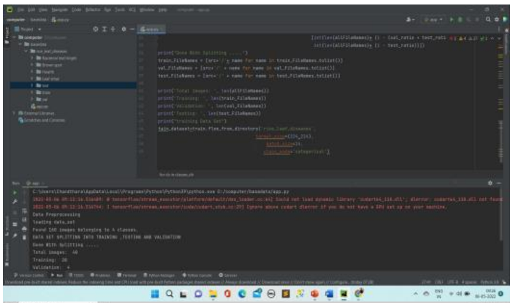
into larger combinations that correspond to parts of familiar objects, and subsequent layers would detect objects as combinations of these parts. The key aspect of deep learning is that these layers of features are not designed by human engineers: they are learned from data using a general-purpose learning procedure. Deep learning is making major advances in solving problems that have resisted the best attempts of the artificial intelligence community for many years. It has turned out to be very good at discovering intricate structures in high-dimensional data and is therefore applicable to many domains of science, business and government. In addition to beating records in image recognition and speech recognition, it has beaten other machine-learning techniques at predicting the activity of potential drug molecules, analysing particle accelerator data, reconstructing brain circuits, and predicting the effects of mutations in non-coding DNA on gene expression.

2.1 SYSTEM ARCHITECTURE



3.0 RESULTS AND DISCUSSION



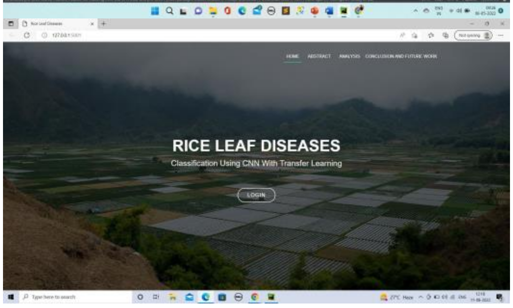


Figure : Home page and user login page

Figure : User signup page

Figure : Add data page

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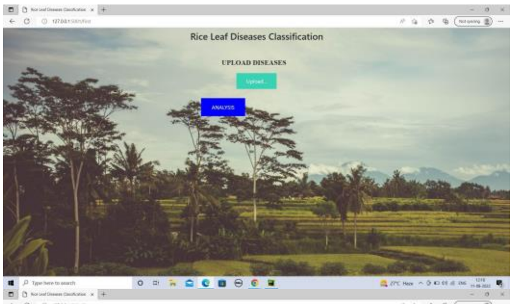

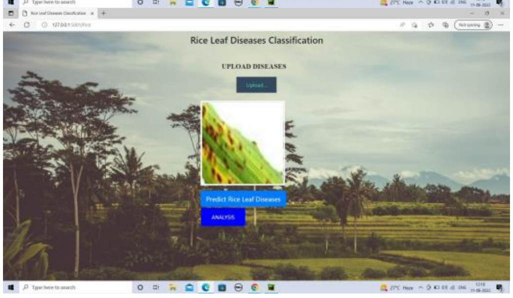

4.0 CONCLUSION

In this paper we have proposed a deep learning architecture with training on 1509 images of rice leaves and testing on different 647 images and that correctly classifies 92.46% of the test images. Transfer Learning using fine-tuning the predefined VGG Net has greatly improved the performance of the model which otherwise did not produce satisfactory results on such small dataset. The number of epochs used was stopped at 25because we had received a cut point after which the accuracy was not improving and the loss was not decreasing on both training and validation data.

In future work, we would like to collect more images from agricultural fields and Agricultural Research institutes so that we can improve the accuracy further. We would like to add cross-validation process in future in order to validate our results. We would also like to use better deep learning models and other state-of the art works and compare it with the results obtained. The developed model can be used in future to detect other plant leaf diseases.

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