Identification of Plants and Their Diseases Using Machine Learning

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Abstract
Agriculture plays an important role in the Indian economy and it contributes about 17% of the total GDP. India is among the top three countries in terms of the production of different agricultural products such as rice, wheat, cotton, different vegetables, etc. Plants also suffer from different diseases. Timely and automated identification of diseases is necessary to protect the crops from damage. Machine Learning-based approach particularly deep learning-based techniques will help in automatic identification.
This thesis presents the automated identification of plants and the diseases in plants. To identify the plant's species, we have used the leaf of the plant as the leaves stay with the plant throughout the year whereas flowers and fruits are seasonal. In the identification of plant diseases also we have considered the plant leaves as at first, the disease symptoms appear on plant leaves. A brief description of plants and the diseases in plants are presented in the following subsections.

Introduction
Human beings and the environment are closely related to each other and the ingredients of the environment are used by the human being in the form of food and medicine. Medical plants play an important role not only in the field of traditional medicine but also in trade commodities. As per the record, more than 3/4th world's population depends primarily on plants for their health care. Recently, WHO (World Health Organization) surveyed that 80 percent of worldwide people depend on herbal medicine for their health care, and also according to WHO, around 21000 plant species are used for medicinal purposes. Some common medicinal plants having primary use in traditional medicine that are available in India.

Need of Automated Identification of Diseases in Plants
Diseases in the plant have a large impact on the productivity of crops. According to a study by the Associated Chambers of Commerce and Industry of India, annual crop losses due to pests and diseases amount to Rs.50,000 crore (500 billion), which is significant in a country where at least 200 million Indians go to bed hungry every night. The value of plant science is therefore huge. India is also well known for its cotton production and is the second-biggest cotton producer in the world. Plant science plays a vital role in keeping insects at bay to keep cotton pro- duction and quality high. In 2002, India's farmers planted their first biotech crop, an insect-resistant cotton variety, which protects the plants from the specific insects which can destroy cotton crops.

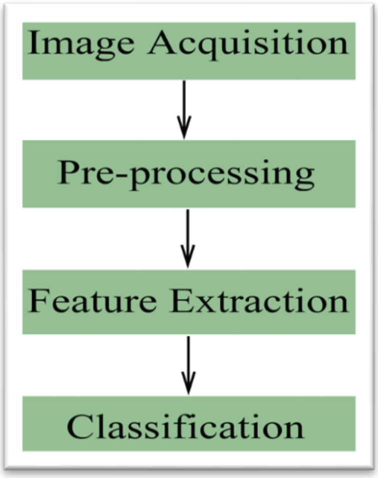

Figure 1 General architecture of Plant identification/Disease detection system

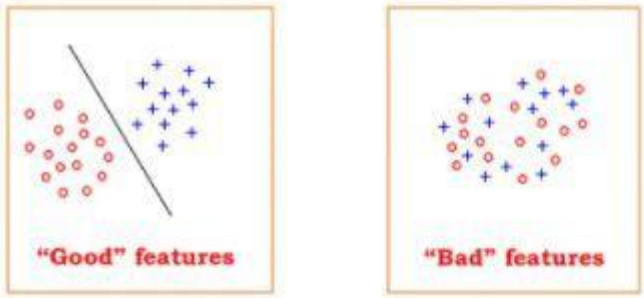

Figure 2 Distinction between good and bad features

It is an ML technique in which learning is performed on unlabeled data. This learning techniques model itself finds the common patterns among the data. Unsupervised learning is defined as a ”type of machine learning in which models are trained using unlabeled dataset and are allowed to act on that data without any supervision”.

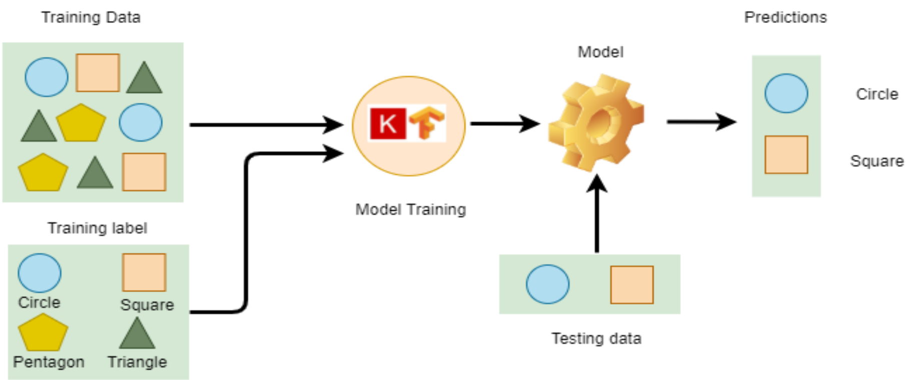

Figure 3 Supervised machine learning technique

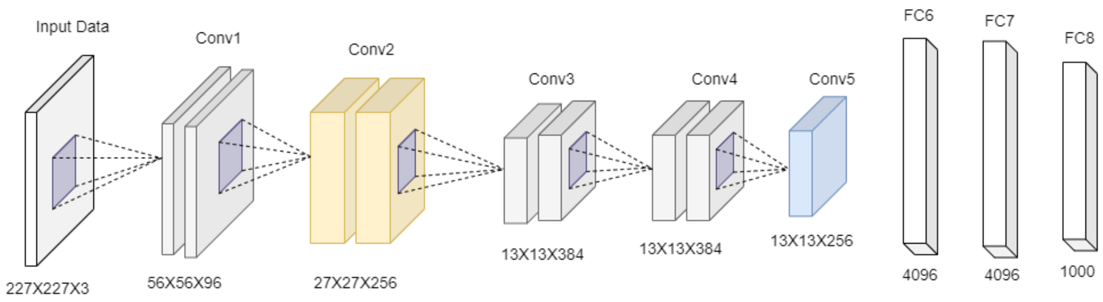

Fig 4 Alex Net architecture

Identification of Plants using Shape and Texture Feature

Automated identification of plant deals with the classification of plant species based on leaf images, flower of plants and with some other organs using machine learning techniques. The problem faces a number of challenges due to inter-class similarities within a plant family and large intra-class variations in background, occlusion, pose, color, and illumination. Efficient classification and identification of plants is an impor- tant aspect towards the conservation and preservation of plant species. Identification of plant species is significant as many plant species are at the verge of extinction due to deforestation. In recent times, machine vision and pattern recognition techniques are used to identify the plant species in efficient way. From this perspective, this work proposes a plant recognition system based on plant leaves using different shape and texture features that are extracted from the leaf images.

Conclusion

Agriculture and botanical field, automated identification and classification of plant species and their diseases is an evolving research area. Manual identification of plant species and their disease provides lack of accuracy for the farmers. Auto-mated identification of plants and diseases improves the quality and quantity of the agricultural product. In large farms, manual diagnosis of diseases using naked eye by continuous monitoring is expensive and time taking. So, automated identification of plant diseases has a great impact in qualitative production. In this regard, different DL based approach is proposed**.**

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