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"Convolutional Neural Network for the Detection of Mushroom Disease Diagnosis"

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Abstract - Mushrooms are commonly consumed and offer various nutrients, antioxidants, proteins, minerals, and vitamins, holding medicinal value. The fleshy fruiting bodies of fungi, grown on the soil, are known as mushrooms. Unlike other crops, mushrooms are susceptible to microbial, bacterial, and viral infections, with common diseases such as wet bubble, dry bubble, cobweb, and bacterial blotches. This paper aims to develop a unique approach using machine learning models for detecting and classifying mushroom diseases, reducing human involvement, and comparing model performance. Initial image pre-processing is conducted, followed by texture feature extraction using GLCM. Various classifiers, such as Multiclass Support Vector Machine (MSVM) and Random Forest, are applied to categorize mushroom diseases. Experimental results reveal that the Random Forest algorithm outperforms MSVM, achieving an accuracy rate of 82% compared to 76%. Performance evaluation, using a confusion matrix, includes parameters like precision, recall, and F1 score.

***Key Words*: -** Mushroom Disease Detection and Classification Using Machine Learning

INTRODUCTION

Mushrooms cultivation and consumption is increasing worldwide in many countries because of its medicinal, nutritional, antioxidant, and therapeutic values [1]. A mushroom is a spore-bearing and fleshy fruit body of a fungus produced above soil or on its food source. There are many types of mushrooms, among which few are edible and the others are toxic. The edible mushrooms include Button mushroom Disease in commercial mushroom production can severely reduce the yield and productivity. The spreading of disease makes controlling disease outbreaks more challenging. Disease control depends on the hygiene in preparing mush- room bed or soil casings and growing rooms [5]. Knowledge on disease diagnosis is needed to control the disease spread within and between crops. Manual disease detection is definitely a challenging task, as it requires good knowledge of diseases and is a time consuming process. Besides this, human errors may happen which could result in loss of mushrooms which are healthy too. So, computer aided automatic mushroom disease detection using image processing segmentation and classification Techniques are a key step to get results almost nearer to accuracy and correct estimation of diseased mushrooms.

SYSTEM ANALYSIS:

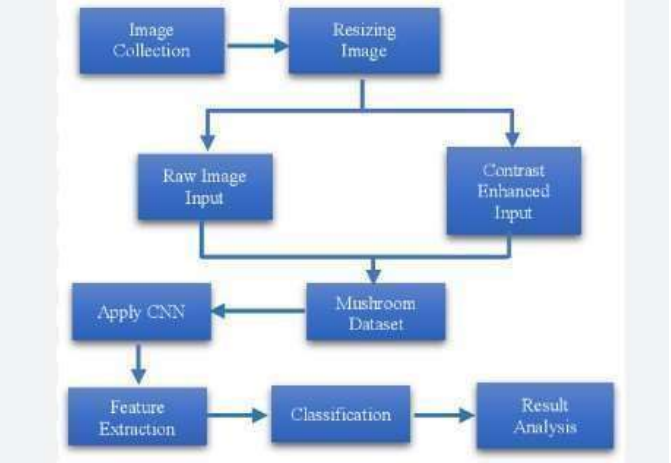
Existing System:

Existing systems for mushroom disease diagnosis using deep learning typically involve the use of convolutional neural networks (CNNs) or other deep learning architectures trained on image datasets of diseased and healthy mushrooms. These systems often preprocess images to enhance features relevant to disease symptoms, then employ CNNs to learn discriminative patterns for accurate classification. Some approaches also integrate transfer learning from pretrained models to improve generalization on limited datasets. Overall, these systems aim to automate and improve the accuracy of disease diagnosis in mushrooms, aiding farmers in timely intervention and crop management decisions.

Proposed System

The proposed system for mushroom disease diagnosis using deep learning aims to leverage recent advancements in computer vision and deep learning techniques to enhance accuracy and efficiency. The system will utilize state-of-the-art convolutional neural networks (CNNs) trained on a comprehensive dataset of mushroom images encompassing various diseases and healthy states. Preprocessing techniques such as image augmentation and feature extraction will be employed to enhance model robustness and performance. Transfer learning from pretrained models like ResNet or Efficient Net will be explored to maximize generalization and adaptability across different mushroom species and environmental conditions. The ultimate goal is to develop a user-friendly tool that can swiftly and accurately identify diseases in mushrooms, assisting farmers in prompt and effective disease management strategies.

ARCHITECTURE DIAGRAM



Research Methodology

The methodology for developing a mushroom disease diagnosis system using deep learning typically involves several key steps:

1. Data Collection and Preprocessing: Gather a large dataset of high-quality images containing various mushroom species affected by different diseases, as well as images of healthy mushrooms. Preprocess the images to standardize size, color, and orientation, and possibly augment the dataset to increase variability and improve model generalization.

2. Model Selection: Choose an appropriate deep learning architecture such as Convolutional Neural Networks (CNNs). CNNs are well-suited for image classification tasks due to their ability to automatically learn hierarchical representations of features from raw pixel data.

3. Training: Split the dataset into training, validation, and testing sets. Train the selected model using the training set, optimizing model parameters to minimize a suitable loss function (e.g., categorical cross-entropy for multi-class classification

Results and Analysis:

Figure 1: Predicted Result

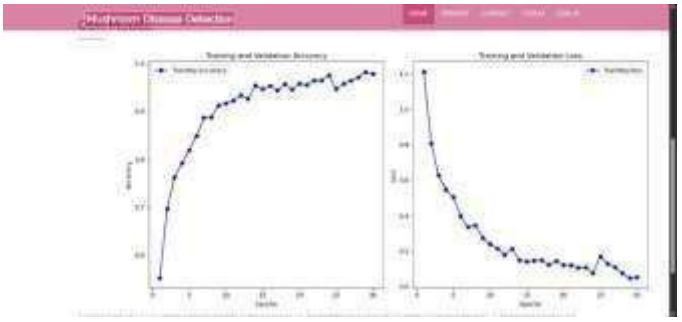


Figure 2: Training and Validation Accuracy

Conclusion:

This paper made an innovative attempt to detect the mush- room diseases using an automatic digital image processing techniques. Different image processing Techniques were applied early in the field of vegetation. In this work major cultivated mushroom ie., button is considered in the botanical platform and different segmentation technique is proposed to extract the diseased part of a mushroom from the input image. The goals of this paper it to detect the diseases using simple and effective algorithm (multi-thresholding technique) and maintain sufficient amount of accuracy

The proposed method is able to detect budding to fully grown stage of mushroom disease. It avoids the time consumption of manual verification and human errors of manual verification, eliminates human errors and increases the gross productivity of mushroom. The proposed technique is built to segment different diseases with fixed thresholding but analysis for threshold estimation was carried out with less number of images, so accuracy in segmenting complete part of the disease on some types of mushrooms like Wet bubble is at compromising level.

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