Project Design
Solution
Architecture

Date	01 NOVEMBER 2023
Team ID	Team-592145
Project Name	Deep learning model for disease detection in tea leaves
Maximum Marks	4 Marks

Solution Architecture:

Tea leaves were using widely all over the world,many are addicted to it just a like daily chore to complete in their day to get rid of all their stressful life.So we have to be craeful of which tea leaves we are using to lead a healthy life, The manufacturers have to be very clear not to leave any simple matter like **DISEASES IN TEA LEAVES**. we propose a system that uses a deep convolutional neural network (DCNN) to automatically identify and classify different types of diseases from tea leaf images. The DCNN is a machine learning model that can learn from images and extract features that are relevant for classification. The system can take an image of a tea leaf as input and output a prediction of the disease type, such as normal, algal leaf spot, gray blight, white spot, brown blight, red scab, bud blight, or grey blight. The system can also provide suggestions and recommendations for the treatment and prevention of the diseases. The system can be deployed on a web or mobile application that allows users to upload tea leaf images and receive the diagnosis of the disease type.
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Example - Solution Architecture Diagram:

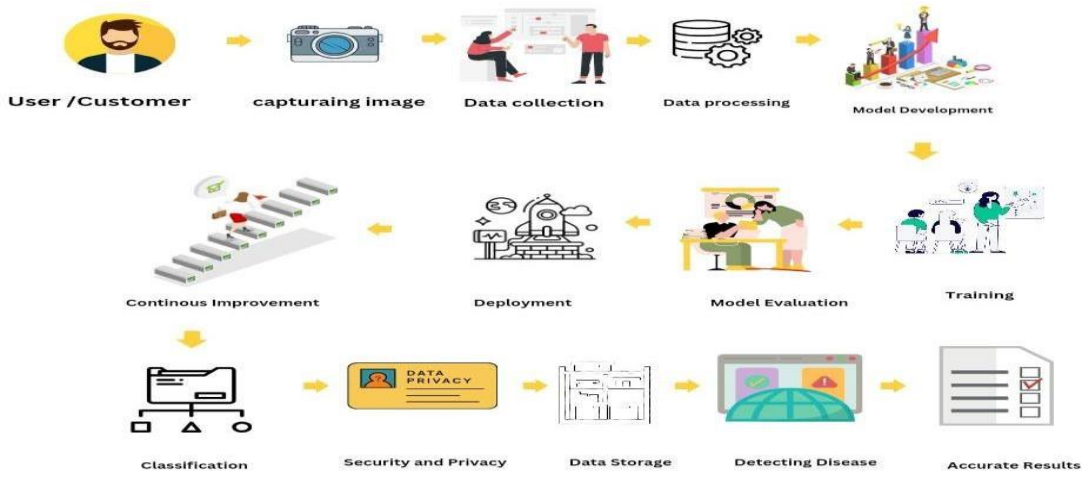

Figure 1: Architecture and data flow of the voice patient diary sample application

Reference: [https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-research- powered-by-ai-on-aws-part-1-architecture-and-design-considerations/](https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-research-powered-by-ai-on-aws-part-1-architecture-and-design-considerations/)

The solution architecture consists of the following components:

- A **deep convolutional neural network (DCNN)**, which is a type of machine learning model that can learn from images and extract features that are relevant for classification. The DCNN takes as input an image of a tea leaf and outputs a prediction of the disease type, such as normal, algal leaf spot, gray blight, white spot, brown blight, red scab, bud blight, or grey blight.
- A **dataset** of tea leaf images with labels indicating the disease type. The dataset is used to train and evaluate the DCNN model. The dataset is divided into training, validation, and test sets.
- A **training process**, which involves optimizing the parameters of the DCNN model using a loss function and a gradient descent algorithm. The training process also involves monitoring the performance of the model on the validation set and applying regularization techniques to prevent overfitting.
- An **evaluation process**, which involves measuring the performance of the DCNN model on the test set using metrics such as accuracy, precision, recall, and F1-score. The evaluation process also involves analyzing the errors and confusions of the model and identifying the areas for improvement.
- A **deployment process**, which involves deploying the DCNN model on a web or mobile application that allows users to upload tea leaf images and receive the diagnosis of the disease type. The deployment process also involves providing suggestions and recommendations for the treatment and prevention of the diseases. The deployment process also involves updating and maintaining the DCNN model based on the feedback and data from the users.

Data Flow:

1. Data Collection: Collect leaves images from various sections of the tea plantations, research centers or even through mobile applications. It will cover all types of diseases occur in tea leaves

2. Data Pre-processing: The pre-processed dataset of tea leaf images to ensure consistency and remove any irrelevant or noisy information. pre-processing steps such as cropping, resizing, and augmentation techniques like rotation or flipping to increase the dataset diversity.

3. Training Data Preparation: It will prepare dataset according to the training and validation sets. Both sets are represent the different disease classes. The training dataset prepared to be used to train the deep learning model ,while the validation dataset is used for the model's performances during training

4. Model Training: The training dataset is fed into deep learning model, and the model is suited for the complexity of tea leaf disease detection set. By implementing the techniques such as k-fold, the model performance is consistent and reliable across different dataset samples.

5. Model Evaluation: It evaluates the accuracy of the model by using the validation dataset to assess its performance. To compute the metrices we use such as precision ,recall, and F1 score for each disease class are caluculated to measure the model's accuracy in detecting tea leaf diseases

6.Model Deployment: The classified data will be secured , such as images of tea leaves and disease related information. we can also save the history of uploaded pictures along with its results in the application for further classifications. Application guidelines , standards will be created to ensure and secure more privacy for application users.

7.Model Updates: Over time, new tea leaf disease images may become available. The model can be updated with these new images to improve its accuracy and robustness. This process typically involves retraining the model with the new data and validating its performance again.

8.Classification : The dataset that includes the various images have been classified huge

collection of image datasets along with corresponding labels and classified according to the pattern of leaves, type of disease present ,and the image we have uploaded.

9.Security,privacy and Data Storage: The classified data will be secured , such as images of tea leaves and disease related information. we can also save the history of uploaded pictures along with its results in the application for further classifications. Application guidelines , standards will be created to ensure and secure more privacy for application users.

10.Results : After scanning and uploading the different types of tea plantation images and going through all the process and information of the model. The application will analyze and share all the details of detected diseases related to lea leaves and it implements the disease management strategies and most of the results were highly accurate and strongly approved.