North East University Bangladesh

Department of Computer Science and Engineering

Course Title: Deep Learning Lab

Course Code: CSE-460

Project Proposal

Image Classification Using Deep Learning with TensorFlow

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1. Project Overview: This project focuses on developing an image classification model using deep learning techniques in Python with TensorFlow. The model is designed to classify images of fruits and vegetables, following a structured approach that includes data preprocessing, model building, training, evaluation, and deployment.

2. Objective: The objective of this project is to develop an accurate and efficient image classification model using deep learning techniques with TensorFlow. The model aims to classify images of fruits and vegetables by leveraging a structured workflow, including data preprocessing, deep neural network training, and evaluation.

Additionally, the project seeks to deploy the trained model as a web application, enabling users to classify images in real-time. This implementation enhances practical understanding of deep learning, model optimization, and real-world deployment of AI-based applications..

3. Methodology:

1. Data Collection & Preprocessing:

- Images of fruits and vegetables are collected and organized into respective folders.
- The dataset is loaded and converted into numerical arrays for TensorFlow processing.
- Image augmentation techniques (such as resizing, normalization, and rotation) are applied to improve model generalization.
- The dataset is split into training, validation, and testing sets.

2. Model Development:

- A Sequential Deep Learning Neural Network is designed using TensorFlow and Keras.
- The model consists of multiple layers, including:
- Convolutional Layers (CNN) or others for feature extraction.
- Pooling Layers to reduce dimensionality and improve computational efficiency.
- Fully Connected (Dense) Layers for final classification.

3. Model Training & Evaluation:

- The model is trained using the training dataset with an optimized learning rate and batch size.
- The categorical cross-entropy loss function and Adam optimizer are used to improve accuracy.
- The trained model is evaluated on the validation and test datasets.

- Performance metrics such as accuracy, precision, recall, and F1-score are analyzed.

4. Model Optimization & Fine-Tuning:

- Hyperparameter tuning (adjusting learning rate, batch size, number of layers) is performed to improve accuracy.
- Techniques like dropout and batch normalization are applied to prevent overfitting.
- The final model is saved and converted into a deployable format.

5. Deployment as a Web Application:

- A web application is developed to allow users to upload images for classification.
- The trained deep learning model is integrated into the web app.
- The app processes the uploaded image and provides real-time classification results..

5. Expected Outcomes: By completing this project, we will:

- **Develop a Complete Deep Learning Workflow:** Learn how to collect, prepare, and process data, build and train a model, and evaluate its performance.
- **Deploy Models on Cloud Platforms**: Understand how to make our trained models accessible online, allowing others to use them.
- **Use Tools for Efficient Collaboration:** Explore how to work together effectively using tools like GitHub for version control and GitHub Actions for automating tasks

6. Conclusion: This project aims to develop a comprehensive deep learning pipeline for classifying images of fruits and vegetables.

Image processing techniques have been used in various agricultural productions, It can be effective in fruit quality assessment, fruit defect detection. Several models can be selected in the deep learning algorithm for the implementation and classification of digital fruit images.

We will collect and preprocess a diverse dataset, build and train a model, and evaluate its performance to ensure accuracy and efficiency. Our approach will also include deploying the trained model on cloud platforms, making it accessible for real-time use.