Computer Vision 2025 Project [SC]

Plant Classification and Disease Recognition

Plant recognition and disease detection is a crucial task to automate agricultural management and enhance crop health monitoring. For instance, a farmer or agricultural specialist could leverage this technology to automatically identify plant types and detect diseases affecting them. This information can then be used to provide recommendations for treatment, optimize farming practices, and monitor plant health over time. Such a system could significantly improve productivity, reduce crop losses, and contribute to sustainable agriculture by enabling early detection.

Project Objectives:

1. Apply Image preprocessing or Feature Extraction techniques where needed.
2. There are two identification stages required in the project: the first stage is to determine the plant type (e.g., tomato, potato, apple, …etc.), the second stage is to recognize the disease.
3. Train at least one classification model to determine the plant type (first stage). You can use Classical computer vision or deep learning.
4. Train a one/few shot learning model (e.g., Siamese) to recognize the plant disease (second stage).

Minimum Requirements:

a. You must use at least one classification model (classical or deep learning) for recognizing the plant type.
b. You cannot use pixels directly as features in case of classical computer vision. You must use a feature extraction method first (e.g., BoW using SIFT) and then use a classifier like SVM or logistic regression.

c. You must Train a one/few shot learning model (e.g., Siamese) for one/few shot learning task.

Dataset Description

The dataset for the project can be found [here].

The dataset consists of training and validation folder, The training folder and validation folder consists of 9 plant types belonging to 33 category (folder)

In Part A (1st stage classification), you are only required to train a model responsible for classifying the plant type (9 classes) regardless of the diseases, so the categories belonging to the same plant type should have one label. You should also report the validation accuracy on all the validation images belonging to the 9 different types.

In Part B (2nd stage one/few shot recognition), you are required to train a one/few shot learning model, which is responsible for determining the plant category type (healthy and diseased types).

Practical Exam Project Deliverables:

1. Plant type Classification part (1st stage) (Deliver Code).
2. Plant disease Recognition/Verification (2nd stage) (Deliver Code).
3. If you trained the deep learning/Siamese models using a notebook, you must deliver the notebook with the output cell saved displaying the training logs. If you trained the model using IDE (i.e Pycharm). **You must deliver screenshots of the training process**.
4. Create a test script that takes set of images and classify them to one of the plant types and print the accuracy on those unseen test images

(For part A). The test script in **part B** should handle two cases, the first case is to recognize the disease type by giving the unseen test images to the first-stage model (responsible for recognizing the plant type) and based on the recognized type from the first stage, the model should recognize the disease in the second stage (he should only compare the test images with the ones belonging to the recognized type from the 1st stage for boosting testing accuracy). the second case that we will give you some images to new plant categories unseen in the validation and training data (N images) and will give you a reference image (Anchor), and you should compare this Anchor image with all other given unseen images (N images) and recognize to whom image/plant category does it belong to (most similar to), or if it isn't similar to any of the images then you can say that there is no match.

5. A Report that includes description of:
   - Your data preparation process.
   - Brief description of the models and techniques used in each task.
   - Training and Testing times for each model.
   - Image Classification training and validation accuracy.
   - Provide screenshots of the validation sets classification with visualization.
   - Image recognition (one/few shot learning model) training and validation accuracies.

Additional Bonus:

- Segmenting the plant leaves for the 33 different categories [data will be announced soon].

Note: This is not the only bonus in the project, any enhancements in any of the two stages or experimenting and understanding powerful

models in both stages, good accuracy on the unseen data, …etc, are also considered bonus.