Computer Vision 2024 Project [SC]
Product Classification & Verification

Product classification and recognition is important task to automate tasks such as inventory management, pricing. For example, a retailer could use this technology to automatically identify and classify products in a store, and then use this information to update inventory levels, calculate products prices, and provide with information about the products.

Project Objectives:

1. Apply Image preprocessing or Feature Extraction techniques where needed.
2. Train at least one classification model to determine the product category. You can use Classical computer vision or deep learning.
3. Train a one/few shot learning model (e.g., Siamese) to verify if a product exists and recognize its type.

<u>Minimum Requirements:</u>
a. You must use at least one classification model (classical or deep learning) for recognizing the product 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 Siamese model for one/few shot learning task.

Dataset Description

The dataset for part 1 of the project can be found [here].

This dataset Consists of 2 parts for each of the two required tasks.

Part A) Product Classification Data

The Dataset for the classification part has 20 different products where each product has training folder and validation folder, the number of training images for each product ranges from (6-11 images), while the number of validation images for each product ranges from (1-3 images).

➔ In Part 1 classification, you should train the model using all the training images belonging to the 20 different product classes. You should also report the validation accuracy on all the validation images. So, you should concatenate the validation sets from the 20 folders in this part.

Part B) Product Verification/Recognition.

The Dataset for the Verification/Recognition part has 60 different products, where each product has number of images ranging from (6-14). Since here the task is one/few shot learning thus the validation folders are totally different from the training folders where the first 40 product are considered the training data, and the remaining 20 products are considered the validation data.

➔ In Part 2, you should train the model using all the training images belonging to the 40 different product classes for one/few shot learning task. and you should validate the model performance on the 20 unseen products in the validation folders. You should also report the validation accuracy.

Practical Exam Project Deliverables:

1. Product Classification part (Deliver Code).
2. Product Recognition/Verification (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 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 that we will give you many images of different products and you should check these images belongs to (is most similar to) which of the existing products in the training data products (when you compare the test images with the products in the training data you can compare each test image with one reference image or few reference images from each product in the training data). the second case that we will give you some images to new products unseen in the validation and training data (N images) and will give you a reference image (Anchor), and you should compare this reference images with all other given unseen images (N images) and recognize to whom image/product does it belong to (most similar to).

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 Verification/recognition training and validation accuracies.