Assignment 1

AIL861 - SPECIAL TOPICS IN APPLICATIONS

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In this assignment our goal is to design a deep learning based classifier for image classification. Model is going to be trained on UC Merced dataset of 21 classes. First we'll pick 14 classes data out of 21 classes dataset and split the data corresponding to those classes into training and test sets. Then compare max softmax (or any other similar index) for the in-domain test data and the unseen data (the 7 classes not used in training process).

PyTorch is used to design the deep Learning model (ResNet34).

Steps for designing the classifier:

- Downloading and separating the dataset into 14 and 7 classes mini datasets.
- Splitting 14 classes dataset into train and test set 75% and 25% respectively.
- Loading ResNet34(untrained) model and added one extra linear layer 1000 to 14 features. Because acquired ResNet34 has 1000 outputs and we only training for 14 classes.
- Setup the Loss Function as Cross Entropy loss and Optimizer as Stochastic Gradient Decent with Learning Rate 0.1 (Very large learning rate may not converge and very small learning rate may take too much time to converge, 0.1 is balanced for our model).
- Function train_step() and test_step() is made for model training and testing respectively.
- Model trained for 100 epochs and at final epoch
  Train loss: 0.00019 | Train accuracy: 100.00%
  Test loss: 0.30885 | Test accuracy: 91.43%
- Now we compute the Max-softmax of test data and the dataset of 7 classes that we separated at the beginning.
  Mean Value of Max-softmax:
  On Test dataset: 0.9540
  On UnKnown (7 classes dataset): 0.8376
  A high maximum softmax value indicates that the model is very confident in its prediction, while a low maximum softmax value indicates that the model is not very confident in its prediction. On Test dataset mean value of max-softmax is high because test data is similar to the data in which we've trained our model. On rest of the 7 classes dataset mean value is less compare to test dataset because our model never seen those classes and not confident in prediction.