Active Learning for Computer Vision Curriculum

Project 10 Solution: Active Transfer Learning

Total Points Possible: 50

Problem 1 (10 points)

How does transfer learning address the problem of learning with weak supervision? Explain with an example.

In a traditional machine learning setup, the training and test data are assumed to come from the same probability distribution. In real-world applications, often, this assumption is violated and there is a domain / distribution difference between the training and test sets. Transfer learning algorithms attempt to transfer relevant knowledge from a source domain (where there are abundant labeled examples) to a target domain (where labeled data is scarce) in order to develop a robust machine learning model in the target domain. It leverages labeled data from a different probability distribution (source) to produce a model in the target domain, which is weakly supervised (not enough labeled samples).

For instance, consider the application of facial expression recognition. We are interested to develop a machine learning model which will recognize the emotion of a person from face images. Suppose, our training set consist of images only from Asian subjects; but the test set contains images from Caucasian subjects. There is a domain disparity between the training and test sets, as the data come from different probability distributions. A transfer learning algorithm is necessary to adapt the source (training) data and develop a model for the target (test) data.

Problem 2 (40 points)

A sample output is shown below. The correct answer should resemble this output.

Note: this graph is from the paper by Chattopadhyay et al. (discussed in the lecture material). This experiment was conducted on a different dataset with different training, unlabeled and test splits. Thus, the output on the Office dataset may not exactly match this output. This should just be used as a reference.