Object Recognition using Transfer Learning for Feature Discovery

Project Proposal

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Abstract

A commonly encountered problem in most machine learning tasks is the unavailability of sufficiently large datasets to train the model. Transfer Learning [1] tries to solve this problem by learning from one dataset and using the learnt parameters to perform a task on another dataset which has a different distribution. This helps in achieving better results on the smaller dataset without having to manually create a larger dataset. In this project, we propose to use transfer learning techniques for the problem of object recognition.

1 Introduction

The major problem in object recognition is the unavailability of a large number of labeled images of an object. However, all natural images share some characteristics independent of the object. Raina et al [2] proposed the concept of self-taught learning for constructing higher level features from unlabeled data which is easily available. Convolutional Deep Belief Networks in contrast to normal Deep Belief Networks exploit the 2-D structure in images and makes the model easily scalable to real life sized images.

2 Problem and Our Approach

CIFAR-100 dataset has only 600 images of each class which makes it difficult to train any supervised machine learning algorithm properly. We plan to take up this task and apply self taught learning to it, which makes use of unlabelled images available, and compare our results with a supervised machine learning model using only the labelled images for training. We will be using Convolutional Deep Belief Networks in our Self taught learning algorithm.

3 Past Work

Transfer Learning is a relatively new domain and most of the work on it has been theoretical. Raina et al proposed the concept of Self Taught learning. He used it to match many state of the art results in different domains like image classification, music genre classification and UseNet article classification. Lee et al [3] used CDBNs to match the best results on Caltech 101 dataset using a model which was very generic in nature and used limited training examples. The state of the art work on CIFAR 100 dataset obtained 61.43% accuracy using Maxout Networks [4] in 2013.

4 Dataset

We plan to use the CIFAR-100 dataset and CIFAR-10 datasets. CIFAR 100 has objects from 100 different classes with 600 examples of each and similarly CIFAR-10 consists of 10 different object classes with 6000 samples of each. We plan to use CIFAR-10 images as unlabelled samples to train the model and then classify images belonging to the CIFAR-100 dataset.

References

[1] *Sinno Jialin Pan, Qiang Yang.* A Survey on Transfer Learning.

[2] *Rajat Raina, Alexis Battle, Honglak Lee, Benjamin Packer, Andrew Y.Ng.* Self-taught Learning: Transfer Learning from Unlabeled Data.

[3] *Honglak Lee, Roger Grosse, Rajesh Ranganath, Andrew Y. Ng.* Convolutional Deep Belief Networks for Scalable Unsupervised Learning of Hierarchical Representations.

[4] *Ian J. Goodfellow, David Warde-Farley, Mehdi Mirza, Aaron Courville, Yoshua Bengio.* Maxout Networks.