Machine learning and Deep learning - 2019/2020

PROJECT PROPOSAL

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Incremental Learning in Image Classification

Overview

Incremental learning approach as we know already know from different articles and introduction of TA, is model which learns new information by minimizing the cross distilled loss of obtaining new knowledge from new classes and cross entropy loss ,where a modified cross-entropy loss is used to preserve the knowledge in the original model.

There are a lot of various types of time domain datasets, which are interesting to work on and of course to obtain benefits as well as information based and financially, for instance face recognition, online fraud detection, forecasting rather for weather or financial markets etc. However for doing hard work we have to start from simpler ones.

What is the problem that you will be investigating? Why is it interesting?

We will be investigating Incremental learning in image classification. It's a really practical technique, not only in image classification tasks but also in almost all kinds of machine learning tasks where the trained model can be complex. What's more, considering the case that we deploy a trained model in an enterprise environment, when new data needs to be trained, the cost of retraining a model may be relatively high. Therefore, incremental learning can be a good topic to study on.

What reading will you examine to provide context and background? What data will you use?

We will first check the following 4 papers given by our TA Fabio Cermelli:

[1] P. Dhar, R. V. Singh, K. C. Peng, Z. Wu, and R. Chellappa, "Learning without memorizing," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., vol. 2019-June, pp. 5133–5141, 2019.
[2] S. Hou, X. Pan, C. C. Loy, Z. Wang, and D. Lin, "Learning a unified classifier incrementally via rebalancing," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., vol. 2019-June, pp. 831–839, 2019.
[3] S. Rebuffi, A. Kolesnikov, G. Sperl, and C. H. Lampert, "Incremental Classifier and Representation Learning.pdf," pp. 2001–2010, 2001.
[4] H. Liang et al., "Distilling the knowledge in a neural network (Godfather's Work)," Stud. Conserv., vol. 59, no. sup1, pp. S96–S99, 2014.

Afterwards we will try to find more papers around the topics of "incremental learning", "distillation", "forgetting" and so on. We will use the CIFAR-100 dataset as required in the project description.

What method or algorithm are you proposing? How do you plan to improve or modify existing implementations?

First we will re-implement the algorithms described in iCaRL: Incremental Classifier and Representation Learning, as required in the project description. Then we will try different classification and distillation losses, and different classifiers, as suggested in the project description.

How will you evaluate your results? Qualitatively and Quantitatively

We will plot figures to show the results of accuracy, with 10 classes per step. Since CIFAR-100 has 100 classes containing 600 images each, it's a balanced dataset so we can use accuracy as performance metric.