Assignment 1: Image Classification

Due Date: April 24, 2018

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1   Introduction

In this assignment, you will implement 4 basic tasks and 1 bonus task. For the 4 basic tasks, you need to achieve 4 different Convolutional Neural Networks from simple to difficult, as shown in Fig. 1.

* Here are some points to be emphasized:

1) During doing experiments on network (1) Fig. 1, for Convolutional layers (Conv) and Fully-Connected layers (FC), you need to do contrastive experiments by using different activation functions such as sigmoid, tanh, relu after Conv and FC operation. And Jupyter Notebook is recommended for the first experiment as a useful tool for coding.

2) For every pooling operation, you also should choose the most effective pooling method by doing contrastive experiments.

3) For experiments on network (4), the Stem Block, Inception-resnet-A block and Reduction-A Block of Inception-ResNet V2 are recommended.
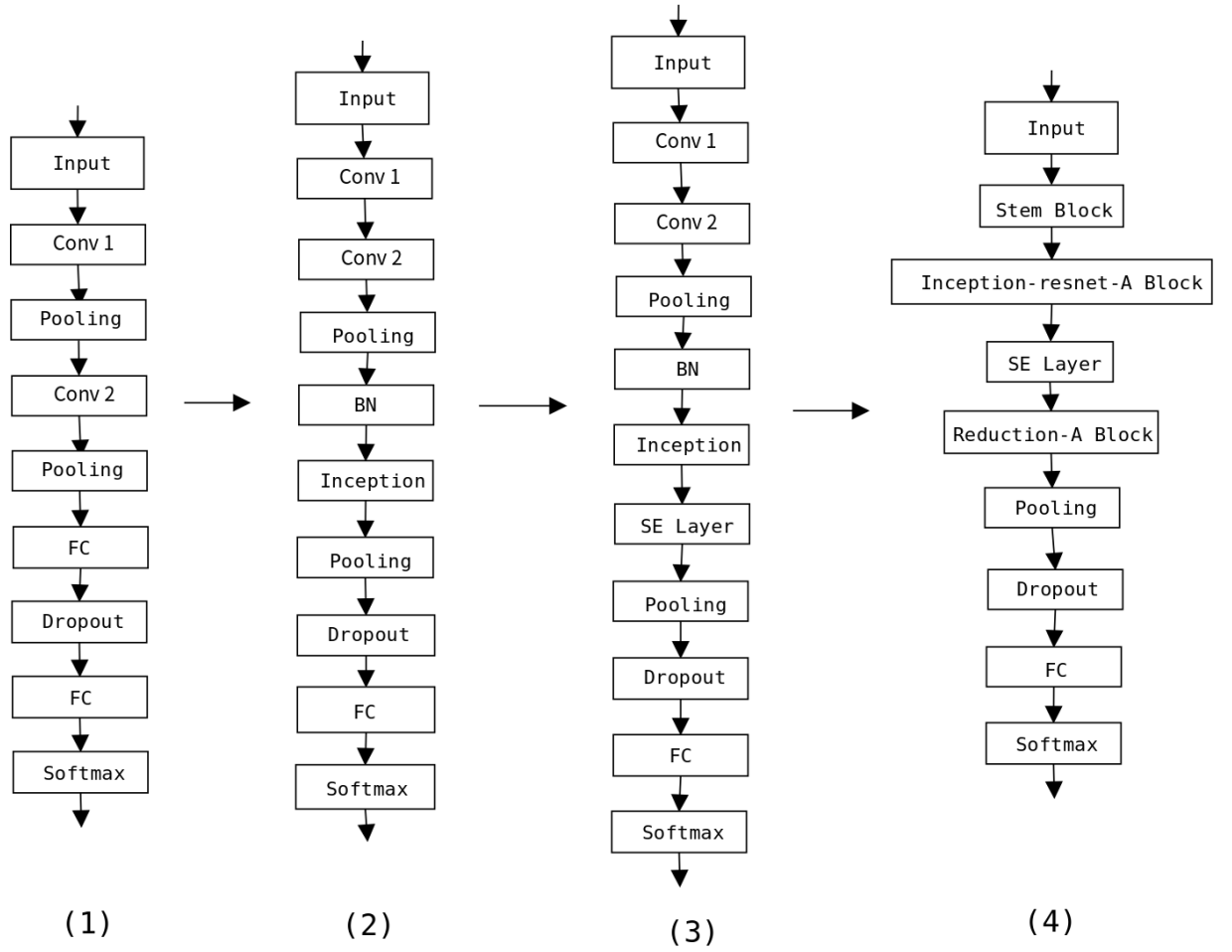
Figure 1: Network structures of the 4 experiments.

4) You'd better pay enough attention to the feature map dimensions during the process of building a network, which is important for the code to run successfully.

2 Objective

1) Learn how to build a Convolutional Neural Network for image classification.

2) Master in TensorFlow which is a frequently-used open-source machine learning framework.

3 Environment

* **TensorFlow is recommended for the experiments.**

1) MacOS, Linux, Windows all support Tensorflow now.

2) You can refer to the installation information of the TensorFlow official network to install TensorFlow, GPU is not essential.

https://tensorflow.org

* **Tips:**

1) If you have not installed Python before, you need to install it first.

2) The way to install TensorFlow in each system with PIP command is recommended.

3) For Windows users, the simplest way to install TensorFlow is to install Anacanda.

4) If some problems happen during the installation process, don't worry, there are a lot of resources on the Internet that will help you solve these problems.

4 Dataset

The CIFAR-10 dataset is recommended in these experiments, you can download it from the link:

https://www.cs.toronto.edu/~kriz/cifar.html

* **Tips:**

1) The CIFAR-10 dataset consists of 60000 32x32 color images in 10 classes, with 6000 images per class. There are 50000 training images and 10000 test images.

2) Without GPU, the training process may take a very long time, so you can use a small version CIFAR-10 dataset. E.g. Just choose 1 data_batch for training, test_batch for testing.
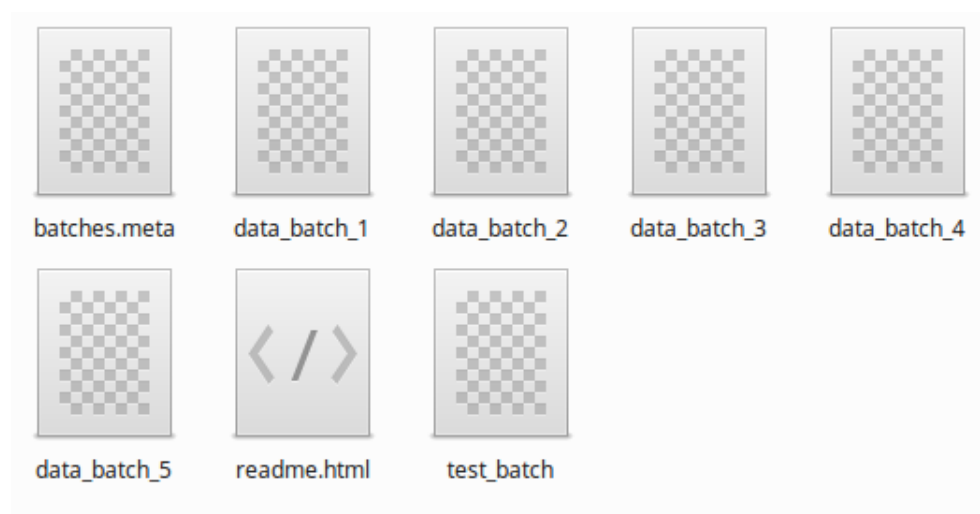

Figure 2: The format of the downloaded CIFAR-10 dataset.

5 Submission

1) Your code.

2) A report of your experimental analysis especially the comparisons between different models.

Zip all your files and submit your assignment to ouceecv@163.com before due date with the subject: YourName_Assignment1.zip. The format of your report should be PDF.

6   Bonus task

In the process of training your network, you should feel free to implement anything that you want to get better performance. You can modify the solver, implement additional layers, use different types of regularization, use an ensemble of models, or anything else that comes to mind. If you implement these or other ideas not covered in the assignment then you will be awarded some bonus points. Ps. Write it clearly in your report.

7   References

* **Hope these references can give you some help:**

CS231n Convolutional Neural Networks for Visual Recognition
TensorFlow Convolutional Neural Networks
Convolutional Neural Network TensorFlow Tutorial

8   Most important of all

* **Trust yourself, search more, ask more, good luck!**