Machine Learning 2 - HW2

Submission: January 12th, 2023

Please note that the submission is individual

1. **Convolutional Neural Networks**

   In the following exercise, you will create a classifier for the CIFAR10 database. You should write your own training code and satisfy the mentioned constraints. The performance parameters appear below.
   This exercise aims to get you familiar with training a convolutional neural network. You should try different model architectures (different depths, filter sizes, types of pooling layers, etc.) and different hyperparameters (learning rate, batch size, etc.) to see how it affects the performance.

   Classification Network requirement:
   Write a complete training procedure for a classification network on CIFAR10 dataset. Design and train your network so that it will satisfy the 2 following goals:
   a. Final accuracy on the test set should be > 80%
   b. The number of trainable parameters (weights) should be less than 50,000.

2. **Names generation**

   In this exercise, you will train a character-level language model. Use the names data from the TA session and RNN network to generate names given their origin country and first letter.
   Specify in the report 5 examples of names generated by your model and specify the corresponding inputs.
   Think about:
   - How should the input data be represented?
   - What do you predict?
   - When do you predict? At each timestep? At the end of the sequence?

Submission instructions

Submission will contain, for each answer, a short report containing:

- Model architecture description, and training procedure (data augmentation, hyperparameters, optimization details, etc.).
- Two convergence graphs - for error and loss as a function of time (epochs). Each graph should depict both training and test performance.
- A short summary of your attempts and conclusions. your conclusions should be based on the results you received during your attempts.
- Your best test error (of the submitted model) should be written explicitly in your report.

In addition, you should supply:

- A function called "train_model_q1/2().py" to train the model and produce the plots. We should be able to reproduce your results - we might test it on different variants on these datasets.
- The trained network with trained weights (model_q1/2.pkl). If the model size is less than 500MB you should submit it on Moodle. Otherwise, upload it to your Google- Drive.
- A function called "evaluate_model_q1/2()".
    - In the case of CNN the function should load the CIFAR10 test set, load your trained network (you can assume that the model file is located in the script folder), and return the average error on the test set.
    - In the language model, the function will get a source country and a first letter. Then it will return a generated name.

  Use this line to load your model:
  model.load_state_dict(torch.load('model.pkl',map_location=lambda storage, loc: storage))

Moodle submission will contain:

2 python files for each question (training procedure, evaluation)

1 .pkl file for each question

1 pdf file (containing your name, ID, and a Google-Drive link to your model if needed)