Computer Vision: Spring 2023

Assignment - 3: Fun with CNN

Deadline: 25th February 2023 23:59

1. Build a basic Neural Network for Image Classification on CIFAR-10 Dataset. You can refer to this tutorial for implementation of this model. **(10 Marks)**

2. Write a code to visualize the feature maps. Your code should be able to visualize feature maps of a trained model for any layer for the given image**. (30 Marks)**

   You can refer to these repos for reference code

   i. Keras: Github Repo; Notebook

   ii. Pytorch: Github Repo

3. Perform the following experiments and evaluate: (1) Model's accuracy (F-1 score) (2) visualize intermediate feature maps (choose any 3 layers) **(30 Marks)**
   a. Change the number of layers in your model (Try different possibilities like increasing CNN layers while keeping MLP layers same, increasing both, decreasing both, decreasing one, increasing the other etc).
   b. Change the size of your convolution filters (Try a mix of different things like increasing and decreasing filter size).
   c. Compare the effect of using and not using dropout layers.
   d. Visualize some initial and final layers of your trained model and report the difference between there feature maps.
   e. Visualize image from different classes (at least 3) and evaluate the feature maps of any 1 layer for all classes.
   f. Try to vary the learning rate, batch size, number of epochs and report the differences in training time and accuracy metrics.
4. Build a classification model for the provided dataset (Link)**.** For the encoder part, you can use a fully custom classification model coded up by you, or you can use some

model available in pytorch/keras. The MLP layer architecture should be implemented by you (but you can use PyTorch's nn.Linear() or tensorflow's layers.Linear()). (**30 Marks**)

a. Code up a data loader which works reliably. Note that you'll need to use one-hot encodings (or something similar) for loading the test labels (**10 Marks**)
b. Repeat the experiment mentioned in task-3 for this model & dataset. How same/different are the feature maps now from what you saw earlier **(20 Marks**).

Instructions

- For each experiments make sure that you summarize all your results and key observations.

  Specially:

  1. The difference in accuracy, training times while using different architectures
  2. The differences observed between outputs of different layers and for different kinds of inputs.
- Make sure you run all cells and then commit the notebook (outputs should be saved)