Indraprastha Institute of Information Technology Delhi

CSE641 - Deep Learning

Assignment 03

Date:26-03-2021 **Total Marks: 180 + 20 (bonus)**

Deadline: 06-04-2021 [11:59 AM]

Instructions:

1. The assignment can be submitted in a group of maximum of three members. Group details can be found here.
2. For Plagiarism, institute policies will be followed strictly.
3. Extension policy as discussed in class can be found here. Spamming +1s on Classroom will lead to usage of your group's one extension.
4. Make sure to use Pickle or any other library to save all your trained models. There will not be enough time during the demo to retrain your model. This is a strict requirement. You must upload your best models on Classroom to reproduce your results during the demo. If you are not able to reproduce your results during the demo then no marks will be given.
5. You need to submit README.pdf, Code files (it should include both .py files and .ipynb files), Output.pdf, and models dumped after training.
6. Mention methodology, helper functions, preprocessing steps, any assumptions you may have, and contribution of each member in README.pdf.
7. Mention your sample outputs in the output.pdf.
8. You are advised to prepare a well-documented code file.
9. Submit code, models, readme, and output files in ZIP format with the following name: A3_Member1_Member2_Member3.zip
10. Use classroom discussion for any doubt.

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Part 1 - Assignment 3 **Marks: 100 + 20 bonus**

For the given dataset design a CNN architecture taking inspirations from VGGNet. You need to have 3 blocks of convolutions with a total of 6 convolutional layers. Please follow the following architecture: **`[block1:[16×3×3]×X]`**, **`[block2:[32×3×3]×Y]`**, **`[block3:[64×3×3]×Z]`** **(Pooling between blocks is optional)**. Here X + Y + Z = 6. Each block should have at least one conv layer.

You can decide upon the number of FC layers to use in your network. You are free to use other techniques like batchnorm, layernorm, optimizers, weight initialization, data augmentation etc. Choice activation function is restricted to tanh or ReLU.

1. Implement a CNN architecture with
   a. block1 followed by FC layers, and a softmax layer
   b. block1, 2 followed by FCs, and a softmax layer
   c. block 1,2, 3, followed by FCs and a softmax layer
2. For all the three architectures apply the Tanh or ReLU activation function on all layers.
3. Implement Dropout and use i) After convolutional layers, ii) Between FC layers

Deliverables

1. Visualize 10 random images from each class. [Paste two from each class in the report and rest in a drive folder] **[10 marks]**
2. Analyze the accuracy and loss while adding block 1, block 2 and block 3 with mentioned non-linearities. **[30 marks]**
3. Analyze the accuracy and loss while changing the dropout probability. Report the results obtained on CNN with all three blocks. Try at least 3 different dropout probabilities. **[10 marks]**
4. Report the best accuracy with model architecture and detailed analysis of choosing specific hyperparameters, different training techniques and data augmentation used (if any). **[20 marks]**
5. Visualize some convolutional filters and feature maps obtained after each block. **[20 marks]**
6. Analyze the results of the best model when all the activation functions are removed. Justify the performance drop. **[10 marks]**
7. **[Bonus]** During demo your are given labels of test data (format will be same as training data), you have to evaluate the test accuracy of your best model. Group with maximum accuracy will get full marks. Reports of 3 best groups will be made public and they will have to write a clarification **[20 marks]**

Part 2 - Assignment3 **Marks: 80**

1. You have to implement the architecture given in the paper Sentence Classification that measures the sensitivity of CNN to sentence classification. …… **[30 marks]**
2. Use the TREC dataset given at the link : Dataset. Dataset is based on the task of question classification with **6 coarse-level classes and 47 fine-level classes separated by colon followed by a space and the question text i.e <coarse - label : fine-label<space><question_text>>.** You are requested to preprocess the data file to remove fine-labels and work only with coarse labels.
3. Keep 80% of the data in point 2. for the Train set and 20% of the data for the Test set.
4. Use Word2vec or GloVe pretrained embedding models for word representations.
5. Implement and give the analysis as in the paper in the following Sections :
   a) Section 4.2 - Effect of input word vectors ……. **[10 marks]**
   Note : You have to implement either of the embedding methods as mentioned in point 4 and present the analysis for the same. You do not need to draw any comparisons here.
   b) Section 4.6 - Effect of pooling strategy ……. **[30 marks]**

6. Report everything asked in point 5. and additionally, the following : **[10 marks]**
   a) Confusion matrix
   b) ROC
   c) F-measure
   d) Accuracy
   e) All the assumptions/resource issues, if any and the process to run your codes.

7. Make two files
    a) Output file - covering points 4. a), b) and 5 a) - d)
    b) README - covering point 5. e)
8. Report all the measures in the tabular form.

Submission Guidelines.

1. Save and upload your best models, otherwise marks will be deducted.
2. All your codes files.
3. README and Output files
4. Submit all the things covered in points 1. - 3. in the zipped folder. Give the name to the folder
   Assignment3_<RollNo-1>_<Name-1>_<RollNo-2>_<Name-2>...<RollNo-N>_<Name-N> i.e. all the team members names and roll numbers with the first name and roll no. of the member who will make the submission.