CS6910 : Deep Learning (for Computer Vision)
Programming Assignment 2

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Part-A

Tuning the regularization parameter

Please take the best performing model from Assignment-1A. Experiment with various regularization parameter (by changing the *weight_decay* parameter of the optimizer) values and find the best one. Visualize the train vs test **accuracy, loss** for each value. Describe all your findings and inferences in the report.

Part-B

This part is a written assignment. You need to submit hand written copy (detailed step-by-step derivations are expected).

1. Gradient calculation of common Activation functions

Please derive the gradient formulas for the following activation functions. Can you decompose these formulas so that such gradients can be computed more easily via the chain rule. Please show the decomposition of the function and how you would compute the gradients in such a case.

- Sigmoid
- Hyperbolic Tangent
- ReLU

2. Gradient calculation of common loss functions

Please derive the gradient formulas for the following loss functions. As in part 1, try to decompose these functions for easier computation of the gradient via chain rule:

- Cross entropy loss
- Hinge loss (y_i = correct class of example i)
- L1 loss
- Huber loss
- L2 loss
- Cosine similarity

3. Hand-calculation of gradients

Please perform back-propagation in the following network by hand calculations. Consider sigmoid activation function in both Hidden and Output layers and L2 loss as objective function.
NOTE: *You should perform the calculations with the initial set of network parameters allotted to you. Refer this table for the same.*

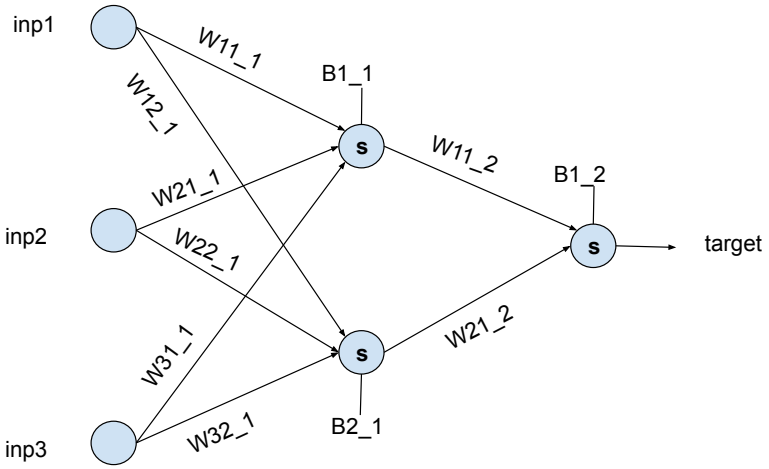

Figure 1: Computation graph with weights on the edges. **s** represents Sigmoid activation function.

Plagiarism

- You should do the assignment yourself. In case you take help from others, please mention in the pdf submitted.
- No sharing of code/experiments etc. will be allowed under any circumstances and may attract disciplinary action by the institute disciplinary committee.

Submission Details

- **Deadline :** 10/31/2020 11 : 59 PM IST
- **What to submit :** You should prepare a report of the results obtained of your work. LaTeX is recommended for ease of work, but not essential. Submit a single tar/zip file containing the following files in the specified directory structure. Use the following naming convention: *rollno_PA1.tar.gz* or *rollno_PA2.zip*. A sample submission would look like this:

```
rollno_PA2
├── Code
│   ├── Q1
│   │   └── ...
│   └── Q2
│       └── ...
├── report.pdf
└── README
```

- **PDF & Code Upload:** On Moodle.

TAs:

- Gouthaman KV
- Arulkumar
- Asrar Ahmed
- Saikat Dutta
- Pawan Prasad

Please ask your doubts via the Moodle QA forum.