Deep learning practice course report
practice#3

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1. Overview

We learned shallow neural network in last lecture. In this report, we compare two kinds of 2-layered net with 1-layered simple neural network.

2. Environment & Requirement

- OS: Ubuntu 18.04
- Language: Python 3.6
- Other open sources & external libraries:
  - Jupyter-notebook: 6.0 (For interactive environment)
  - numpy: 1.18
  - pandas: 1.0 (For saving csv data)
  - matplotlib: 3.2 (For plotting graph)
  - seaborn: 0.10 (For kernel distribution)

3. Implementation

In this report, we use **1000 training samples with 1000 iterations and 100 test samples.**

To make more accurate result, we need to figure out **proper range of initial values(Initial weight/bias, learning rate).**

1. Execute each task 10000 times with wide range of initial values.
2. Extract top 1% accuracy results.(100 samples)
3. Using kernel distribution graph, determine proper range of initial values.
4. Using proper range of initial values, compare each tasks.

4. Result

Proper range of initial values in each task is below.

- Task1
  - Initial bias: 5.0 ~ 7.5
  - Initial weight: [2.5 ~ 3.5], [1.25 ~ 2.25]
  - Learning rate: 0.1 ~ 0.2
- Task2
  - Initial bias: [-2.75 ~ -2.5], [-2.5 ~ -2.25]
  - Initial weight: [-0.5 ~ 0.5, 1.5 ~ 2.5], [-8.0 ~ -7.0]
  - Learning rate: 0.7 ~ 0.8
- Task3
  - Initial bias: [-6.0 ~ -5.0, -2.0 ~ -1.0, -1.0 ~ 0.0], [-4.0 ~ -3.0]
  - Initial weight: [-5.0 ~ -4.0, -2.0 ~ -1.0, -6.0 ~ -5.0, -0.5 ~ 0.5, 6.0 ~ 7.0, -8.0 ~ -7.0], [3.0 ~ 4.0, 3.0 ~ 4.0, 3.0 ~ 4.0]
  - Learning rate: 0.9 ~ 1.0

We should use mean value for **avoiding cherry picking**. In this result, **final result is mean value of 100 times.**

	Results in Task #1	**Results in Task #2**	**Results in Task #3**
Accuracy(with train set)[%]	82.635[%]	81.520[%]	94.723[%]
Accuracy(with test set)[%]	81.70[%]	82.440[%]	95.600[%]
Train time[sec]	0.06120[s]	0.18793s	0.24350s
Inference(test) time[sec]	0.00002[s]	0.00006[s]	0.00007[s]

5. Enlightenment

Simple neural network's accuracy is lower oscillated than 2-layered neural network's accuracy. However, unless proper setting of initial values, 2-layered neural network's accuracy is much lower than simple one's. As neural network's layer is deeper, initial values is exponentially increased. So we can figure out the importance of setting initial values in proper way.