

TP 2: THE PARAMETER-SERVER ARCHITECTURE

Othmane Marfoq, Angelo Rodio

March 14, 2022

Introduction

The purpose of this session is to implement and run distributed gradient descent using the parameter-server architecture [2].

Algorithm 1: Distributed Subgradient Descent

```
1 for iterations  $t = 0, \dots, T$  do
2   server broadcasts  $w^{t-1}$  to the clients;
3   for client  $r = 1, \dots, m$  in parallel over  $m$  clients do
4     load a part of training data  $\{y_{i_k}, x_{i_k}\}_{k=1}^{n_r}$  ;
5      $g_r^{(t)} \leftarrow \sum_{k=1}^{n_r} \partial l(x_{i_k}, y_{i_k}, w_r^{(t)})$  ;
6     push  $g_r^{(t)}$  to server ;
7   end
8    $g^{(t)} \leftarrow \sum_{r=1}^m g_r^{(t)}$  ;
9    $w^{(t+1)} \leftarrow w^{(t)} - \eta g^{(t)}$  ;
10 end
```

Tasks

- First, clone / download the code corresponding to this session from [the class repository](#). If you have already cloned the project previously, just do "git pull".
- In this session, we will consider MNIST [1] dataset as example. We prepared a script that splits this dataset across clients (data/generate_data.py). Run this script in order to download and split the dataset.
- In models.py, we implemented a linear model. In the same way, try to implement a deep network with two convolution and two dense layers.
- Complete Server class in server.py
- Complete Client class in client.py
- Complete the function main in main.py by precising the model, criterion, metric and device
- reserve resources using oar sub.
- run the code using `python -m torch.launch.distributed`

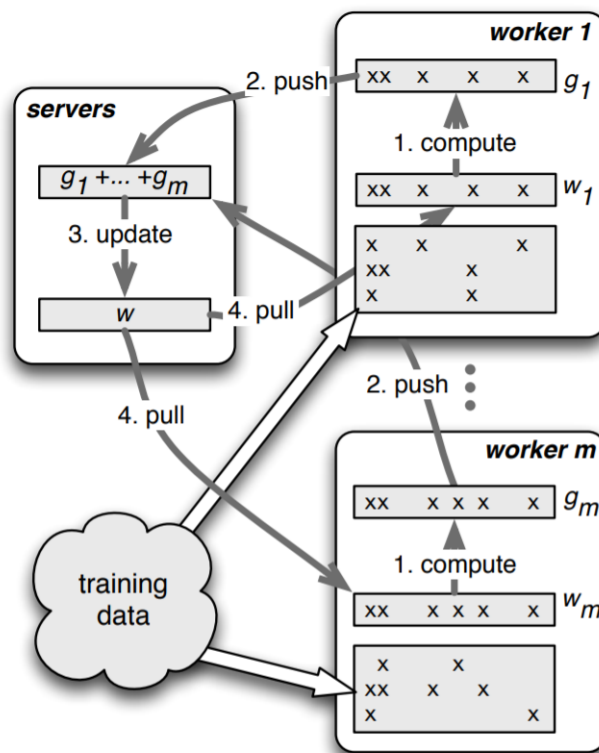


Figure 1: Steps required in performing distributed subgradient descent [2]

References

- [1] Yann LeCun and Corinna Cortes. "MNIST handwritten digit database". In: (2010). URL: <http://yann.lecun.com/exdb/mnist/>.
- [2] Mu Li. "Scaling Distributed Machine Learning with the Parameter Server". In: *Proceedings of the 2014 International Conference on Big Data Science and Computing*. BigDataScience '14. Beijing, China: Association for Computing Machinery, 2014. ISBN: 9781450328913. DOI: 10.1145/2640087.2644155. URL: <https://doi.org/10.1145/2640087.2644155>.