EP3260: Machine Learning Over Networks
Computer Assignment 3
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Computer Assignment 3 - Training a neural network

Consider optimization problem

$$\underset{\mathbf{W}_1,\mathbf{W}_2,\mathbf{w}_3}{\text{minimize}} \ \frac{1}{N}\sum_{i\in[N]} \|\mathbf{w}_3\mathbf{s}(\mathbf{W}_2\mathbf{s}(\mathbf{W}_1\mathbf{x}_i) - \mathbf{y}_i\|_2^2,$$

where $\mathbf{s}(\mathbf{x}) = 1/(1+\exp(-\mathbf{x}))$. You may add your choice of regularizer. Using the "Individual household electric power consumption" and "Greenhouse Gas Observing Network" datasets, address the following questions:

(a) Try to solve this optimization task with proper choices of size of decision variables (matrix $\mathbf{W}_1$, matrix $\mathbf{W}_2$, and vector $\mathbf{w}_3$) using GD, perturbed GD, SGD, SVRG, and block coordinate descent. For the SGD method, you may use the mini-batch version.

(b) Compare these solvers in terms complexity of hyper-parameter tunning, convergence time, convergence rate (in terms of # outer-loop iterations), and memory requirement