Performance Analysis of Stochastic Descent Algorithms

Research Context  Many engineering applications (wireless telecommunications) require to solve optimization problems involving a certain degree of randomness. One of the most successful class of descent algorithms for handling machine learning problems are stochastic gradient descent (SGD) methods [3]. In the case of optimizing a strongly convex sum of smooth functions over large finite sets, SGD variants with linear convergence rates have been recently proposed [4]. For non-smooth problems, mirror descent (MD) algorithms [1] are stochastic gradient algorithms working in the dual space. Their efficiency estimates are less dependent in the problem dimension, which makes them suitable to handle large scale optimization problems.

Goals  The aim of this internship is two-fold:

1. At first, we plan to do numerical comparison of average performance obtained while optimizing strongly convex functions with SGD/MD algorithms. These numerical results will be obtained through implementation of a practical software package.

2. Furthermore, we propose to analyse the average-case complexity of SGD and MD algorithms. An application of interest is to estimate the efficiency of the MD like algorithm described in [2].

Working Context  The internship will be co-advised by Victor Magron (CNRS Verimag) and Bruno Gaujal (INRIA Mescal/CNRS Lig, Grenoble). The Master student will be hosted by the Verimag laboratory, near Grenoble in the French Alps. The Grenoble area, in addition to the surrounding skiable mountains, features one of Europe’s largest concentrations of academic/industrial research and development with a lot of students and a relatively-cosmopolite atmosphere. You can easily reach Lyon (1 hour), Geneva (1.5 hours), Torino (2 hours), Paris (3 hours by train) and Barcelona (6 hours).

Required Skills  Motivated candidates should hold a Bachelor degree and have a solid background in either convex optimization, computer science. Good programming skills are also required. The candidates are kindly asked to send an e-mail with “Master candidate” in the title, a CV and motivation letter to victor.magron@imag.fr and bruno.gaujal@inria.fr Knowledge of French is advantageous but does not constitute a pre-requisite.

Suitable for MSCI/STAT/DS/MI students

A related PhD topic can be foreseen

References


