Master Internship proposal – April to September 2013

Project: **Large-scale convex optimization for structured prediction**

Many applications of machine learning now take place in situations where both the size p of each observations and the number n of these observations are large (i.e., n~10^9, p~10^6). In this context, the running time of classical supervised learning techniques (such as the SVM or logistic regression) may become prohibitive, and current research focuses on algorithms based on simple updates after each observation is made [1].

Such an algorithm was recently proposed in [2] to optimize the learning objective for *structured* SVMs, the generalization of SVM to classification with structured labels such as sequences or graphs (called structured prediction), and which has growing applications in natural language processing, computer vision, computational biology, etc.

The goal of the internship is to extend the approach in [2] by using *weighted* sampling of the data points to potentially speed-up the optimization. **The work is at the intersection of algorithms, statistics and optimization**, and may focus primarily on any of these three aspects depending on the candidate.

Students interested in this project should contact Simon Lacoste-Julien to discuss further.

This internship may be extended to a PhD within the SIERRA team of Département d'Informatique de l'Ecole Normale Supérieure.

Pre-requisites : Machine learning classes
Convex optimization

Length: 4-6 months

Compensation: Approximately 1200 per month

Laboratory: Département d'Informatique de l'ENS - INRIA
23, avenue d'Italie, Paris 13^{e}

Contact : Simon Lacoste-Julien (simon.lacoste-julien ens.fr)
http://www.di.ens.fr/~slacoste/

[1] L. Bottou, O. Bousquet. The trade-off of large scale learning. Advances in Neural Information Processing Systems (NIPS), 2008.

[2] S. Lacoste-Julien, M. Jaggi, M. Schmidt, P. Pletscher. Block-Coordinate Frank-Wolfe Optimization for Structural SVMs. International Conference on Machine Learning (ICML), 2013. http://arxiv.org/pdf/1207.4747v4