Projects

9.520

2010

Projects

1. Implement and test a large-scale regularization algorithm. Papers? [L/T,CF]
2. Parameter tuning for dimensionality reduction in terms of bias-variance trade-off. [L]
3. Find a way to formalize and exploit dependence among related learning tasks (multi-output kernel learning, statistical techniques). [L]

1. Why Reproducing Kernel Hilbert Spaces are a natural set of hypothesis spaces for supervised learning? Draw ideas from embedding theorems, extension to Banach spaces having in mind sparsity based regularization.[TP, L, CF]

2. Option pricing: using modern techniques and more recent data improve on the approach of Hutchinson, J.M., A. Lo and T. Poggio. A Nonparametric Approach to Pricing and Hedging Derivative Securities Via Learning Networks, Journal of Finance, Vol. XLIX, No. 3, 851-889, 1994. [CF]

Review-type projects

1. Review: Random Projections.
2. Review: Unbalanced training set.
3. Review: Learning from non i.i.d. data.
4. Review: Regularization parameter choice.
5. Review: Learning on Graphs.
6. Review: Learning Invariances.
7. Write/edit (create account first) entries for Wikipedia (eg Regularization Networks, Radial Bases Functions, Learning Theory, RKHS, Generalization Bounds, Stability in Learning)

iPhones machine learning applications!

1. Computational biology: inferring gene regulatory networks from large genomics datasets. Could explore supervised and/or semi-supervised methods. Will probably confront variable selection problems – how to choose from amongst many candidate explanations for the data? [CF]

2. Various projects on the visual cortex model are available. These projects will typically require more time but may also lead to some paper.

3. Experiments with derived kernels. Developing existing code. Use CNS (GPU-based).