

Projects

9.520

2009

- 1 Implement and test a large-scale regularization algorithms. [L/T]
- 2 Understand the role of unlabelled data in semi-supervised learning, for example by testing semi-supervised learning algorithms in a non transductive setting. [L]
- 3 Study regularization techniques when a noise model for the input data is given. [J]
- 4 Understand model selection for dimensionality reduction in terms of bias-variance trade-off. [L]
- 5 Connection between boosting and compressed sensing. Ensemble methods and sparsity.
- 6 Empirical comparison between sparsity based regularization and RLS.[L]
- 7 Find a way to formalize and exploit dependence among related learning tasks. [J]

- 1 Learning the kernel: recent developments [L].
- 2 Computational comparison of algorithms for sparsity based regularization. [L]
- 3 Comparison of Ivanov and Tikhonov regularization: stability and approximation properties. [TP, L, SR]
- 4 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]
- 5 Discuss ideas for algorithms based on maximizing stability of the algorithm at the predicted point and minimizing empirical error. [TP]
- 6 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. 

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 Invariances.
- 6 NEW: write entries for Wikipedia (eg Regularization Networks, Radial Bases Functions, Learning Theory, RKHS, Generalization Bounds, Stability in Learning)

Computational Neuroscience-type projects

- 1 Various projects on the visual cortex model are available. These projects will typically require more time but also lead to some paper.
- 2 Experiments with derived kernels.