9.520 in 2012

Statistical Learning Theory and Applications

Class Times:
Monday and Wednesday 10:30-12:00
Units: 3-0-9 H,G
Location:
46-5193
Instructors:
T. Poggio, L. Rosasco, C. Ciliberto, G. Evangelopoulos and C. Frogner

Office Hours:
Friday 1-2 pm in 46-5156, CBCL lounge (by appointment)

Email Contact :
9.520@mit.edu

Project: posting/editing article on Wikipedia (in 10 days (oct 28) title and abstract)

- http://en.wikipedia.org/wiki/Computational_learning_theory: to be edited (add historical perspective etc.)
- http://en.wikipedia.org/wiki/Reproducing_kernel_Hilbert_space: is ok but could be improved on the learning side add link to representer theorem
- http://en.wikipedia.org/wiki/Stability_(learning_theory) : can be expanded (to online learning, to more details...)
- http://en.wikipedia.org/wiki/Radial_basis_function_networkshould be rewritten or edited (see references in Poggio-Girosi, 1989)
- http://en.wikipedia.org/wiki/Vapnik–Chervonenkis_theory: should be improved with links to stability
- http://en.wikipedia.org/wiki/Radial_basis_function_network to be improved (see Poggio-Girosi, 1989, 1992)
- http://en.wikipedia.org/wiki/Statistical_learning_theory: is OK but could be extended (definitions of target function, sample and approximation error etc see class; historical perspective on learning)
- http://en.wikipedia.org/wiki/Loss_function: Loss functions and target functions
- http://en.wikipedia.org/wiki/Early_stopping: Early stopping and regularization
- http://en.wikipedia.org/wiki/Principal_component_regression: Principal components regression
- Spectral filtering regularization: Not Existent
- ....

Research Projects

Projects 2013

-- Learning to rank papers/grants: replacing review panels (T. Poggio)

-- Simulations of associative memories for object recognition and connections with compressed sensing: bounds on # items stored, noiseless coding, sparseness (T. Poggio)

-- The surprising usefulness of sloppy arithmetic: study of bits and their tradeoff in hierarchical architectures (T. Poggio)

-- Dimensionality reduction and manifold learning: kernel PCA, ISOMAP and all that. (L. Rosasco)

-- One class vs Binary classification schemes (L. Rosasco)

-- Implement and test least square algorithms in GURLS (A. Tacchetti)

-- Minimum Norm Estimates with l1 and l2 regularization for MEG Source Localization (Leyla Isik)

Minimum Norm Estimates with l1 and l2 regularization for MEG Source Localization

(Leyla Isik)

MEG is a non-invasive neuroimaging technique that employs a helmet of sensors to measure the weak magnetic fields induced by many synchronous neurons firing. Mapping this (~300 dimensional) sensor level activity, to the underlying neural sources (~1500 dimensional) driving it, however, is an ill-posed problem. This project will involve comparing two popular methods for constraining this source localization problem - l1 and l2 regularization - on MEG visual data.