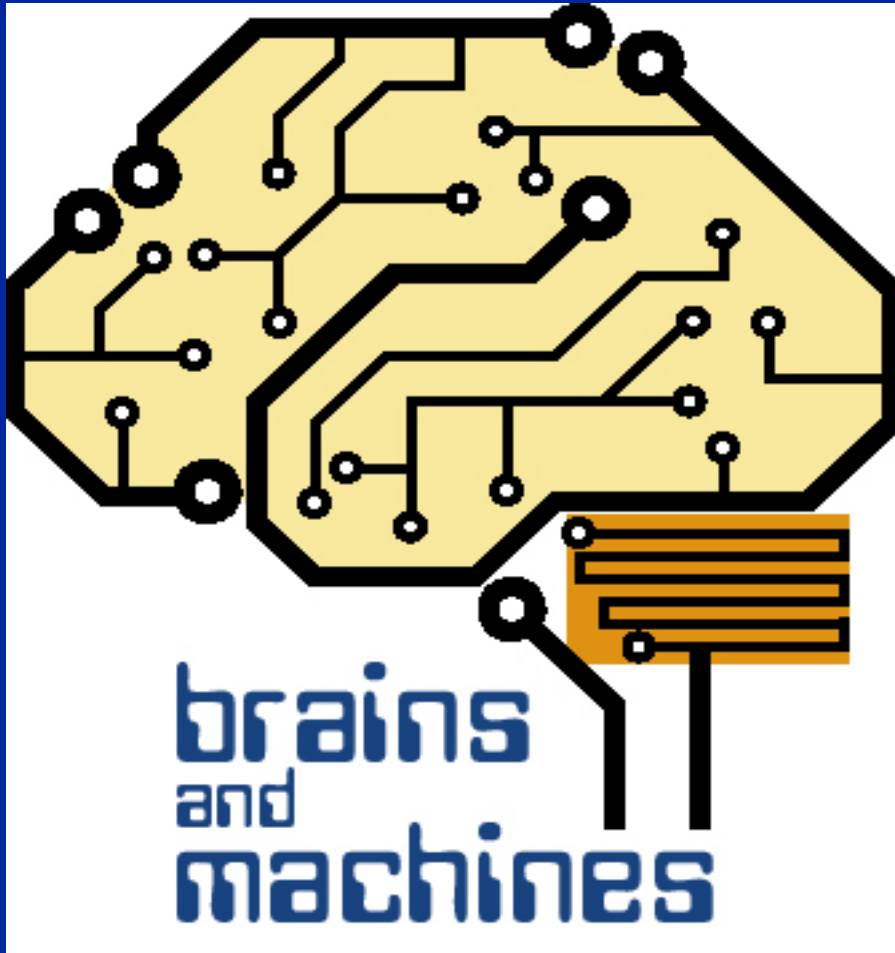


9.520

Statistical Learning Theory and Applications

Sayan Mukherjee and Ryan Rifkin
and Alex Rakhlin + tomaso poggio

Learning: Brains and Machines

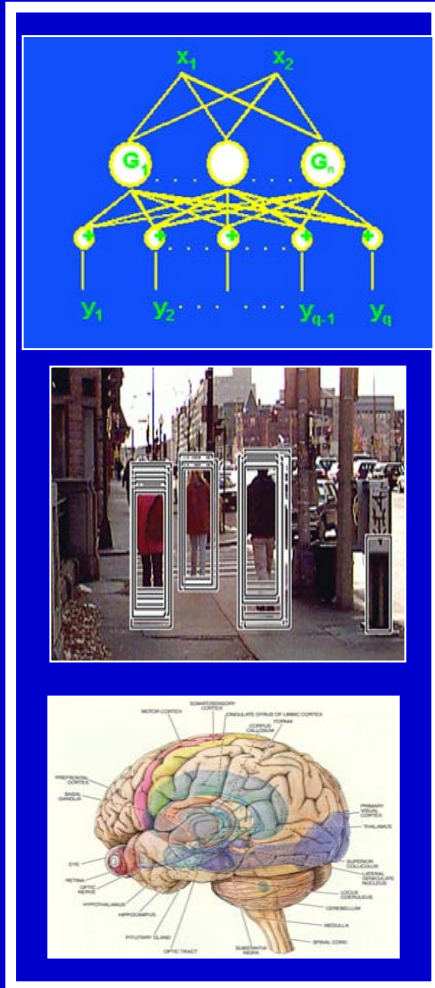


Learning is the gateway to understanding the brain and to making intelligent machines.

Problem of learning:
a focus for

- modern math
- computer algorithms
- neuroscience

Multidisciplinary Approach to Learning



Learning theory
+ algorithms

$$\min_{f \in H} \left[\frac{1}{\ell} \sum_{i=1}^{\ell} V(y_i, f(x_i)) + \mu \|f\|_K^2 \right]$$

$$f(x) = \sum_{i=1}^{\ell} c_i K(\mathbf{x}_i, \mathbf{x})$$

ENGINEERING
APPLICATIONS

- Information extraction (text, Web...)
- Computer vision and graphics
- Man-machine interfaces
- Bioinformatics (DNA arrays)
- Artificial Markets (society of learning agents)

Computational
Neuroscience:
models+experiments

Learning to recognize objects in visual cortex

Class

Rules of the game: problem sets (2 + 1 in MatLab)
final project (min = review; max = j. paper)
grading
participation!
mathcamps?

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Some of the previous years projects

1. Hypothesis Testing with Small Sets (tp and Dradulov)
2. Feature Selection for SVMs: Theory and Experiments (Sayan)
3. Reusing the Test Set: Dataminining Bounds (Sayan)
4. Large-Scale Nonlinear Least Square Regularization (Rif)

The rest of the class will overview math and applications of learning as developed in the course (with some short neuroscience considerations)

- o The problem of supervised learning: “real” math behind it
- o Examples of in-house engineering applications
- o Learning and the brain