

Course projects

Fall 2012

Part of your evaluation in the course is based on the course project. You have broad scope to choose the topic of your course project, but *with the caveat that it makes non-trivial use of some subset of the {models, methods, algorithms} covered in the class/book*, or extensions of the techniques presented in class/book.

Types of projects

There are various types of projects, including:

- applications project: choose an interesting data set or application, experiment with different models or estimators from the course
- survey project: choose an interesting area (e.g., clustering algorithms), read and survey a range of competing techniques, implement them on synthetic data sets to gain some intuition.
- methodology project: develop and implement a new algorithm for a particular goal. If theoretically inclined, prove something about convergence properties and so on.

Examples

In past semesters, students have worked on a very wide range of projects. A brief selection of examples include:

- study of taxi-driver routing in San Francisco using graphical models
- classification of computer keyboard strokes from microphone recording using hidden Markov models
- face recognition using logistic regression, support vector machines and kernel methods
- study of the Lasserre and Sherali-Adams hierarchies for MAP estimation in graphical models
- learning of graphical model structure in social network data: applications to voting records and Facebook
- study of the “loopy” sum-product algorithm: how does it work for graphs with cycles?
- sum-product decoding for error-control coding: study of power consumption versus convergence speed
- Markov chain Monte Carlo and variational methods: comparison and relations

Presentation of projects

Your presentation of the project will consist of two parts:

- an informal poster presentation on Monday, December 10th. This gives you a chance to both describe what you have done to us (Martin, Andre and Hongwei), and also to the rest of the class. It is also a nice opportunity for you to see the interesting things that your classmates have been doing for their projects.
- a technical write-up of roughly 10 pages in length. A typical organization would be:
 - an introduction: description of the problem, motivation for studying it, related scientific or engineering background
 - past/related work: what techniques have been used to date? What has been successful or not? What are limitations of current methods?
 - models/algorithms: what models did you use? what were the main computational and statistical problems? what algorithms did you apply or consider?
 - results: what types of results did you obtain? How did different methods/models compare? What was the running time of your algorithms for different problems?
 - conclusion: what did you learn? What are some open questions that your work raised? What would you do if you had more time to spend on the project?