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?