Probabilistic Graphical Models

Inference

Summary

Inference Methods and Evaluation

MAP vs Marginals

Marginals

- Less fragile
- Confidence in answers
- Supports decision making

MAP

- Coherent joint assignment
- More tractable model classes
- Some theoretical guarantees

Approximate inference

- Errors are often attenuated

- Ability to gauge whether algorithm is working

Algorithms for Marginals

- Exact inference

  fits in memory $\Rightarrow$ exact inference

- Loopy message passing

- Sampling methods

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Algorithms for MAP

- Exact inference   *low treewidth*
  associative models

- Optimization methods:
  - exact or approximate   *(dual decomposition)*

- Search-based methods (including sampling)
  hill-climbing   *mcmc*

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Factors in Approximate Inference

- Connectivity structure

- Strength of influence

- Opposing influences

- Multiple peaks in likelihood

message passing

convergence
accuracy

coupling between
variables

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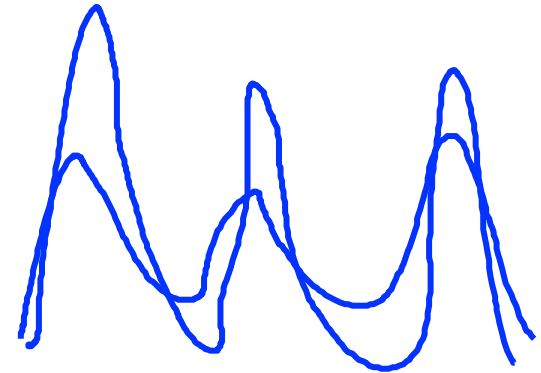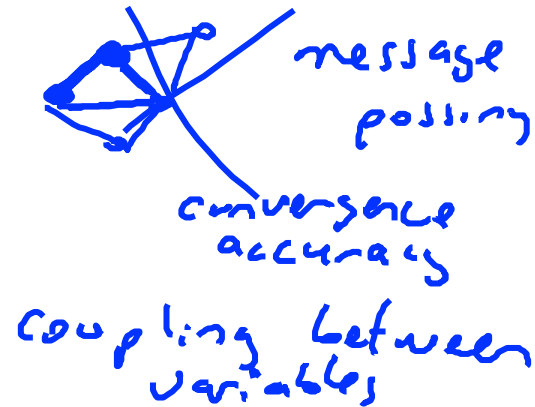
So, now what?

- Identify "problem regions" in network
- Try to make inference in these regions more exact
  - Larger clusters in cluster graph
  - Proposal moves over multiple variables
  - Larger "slave" in dual decomposition

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