

# Outline

## **Graphical Models & Belief Propagation**

- Pairwise Markov random fields
- Variational methods & loopy BP

## **Binary Markov Random Fields**

- Attractive pairwise interactions
- Loop series expansion of the partition function

## **Bounds & the Bethe Approximation**

- Conditions under which BP provides bounds
- Empirical comparison to mean field bounds