# Optimization of Structured Mean Field Objectives

Alexandre Bouchard-Côté*   Michael I. Jordan*,†

* Computer Science Division   † Department of Statistics
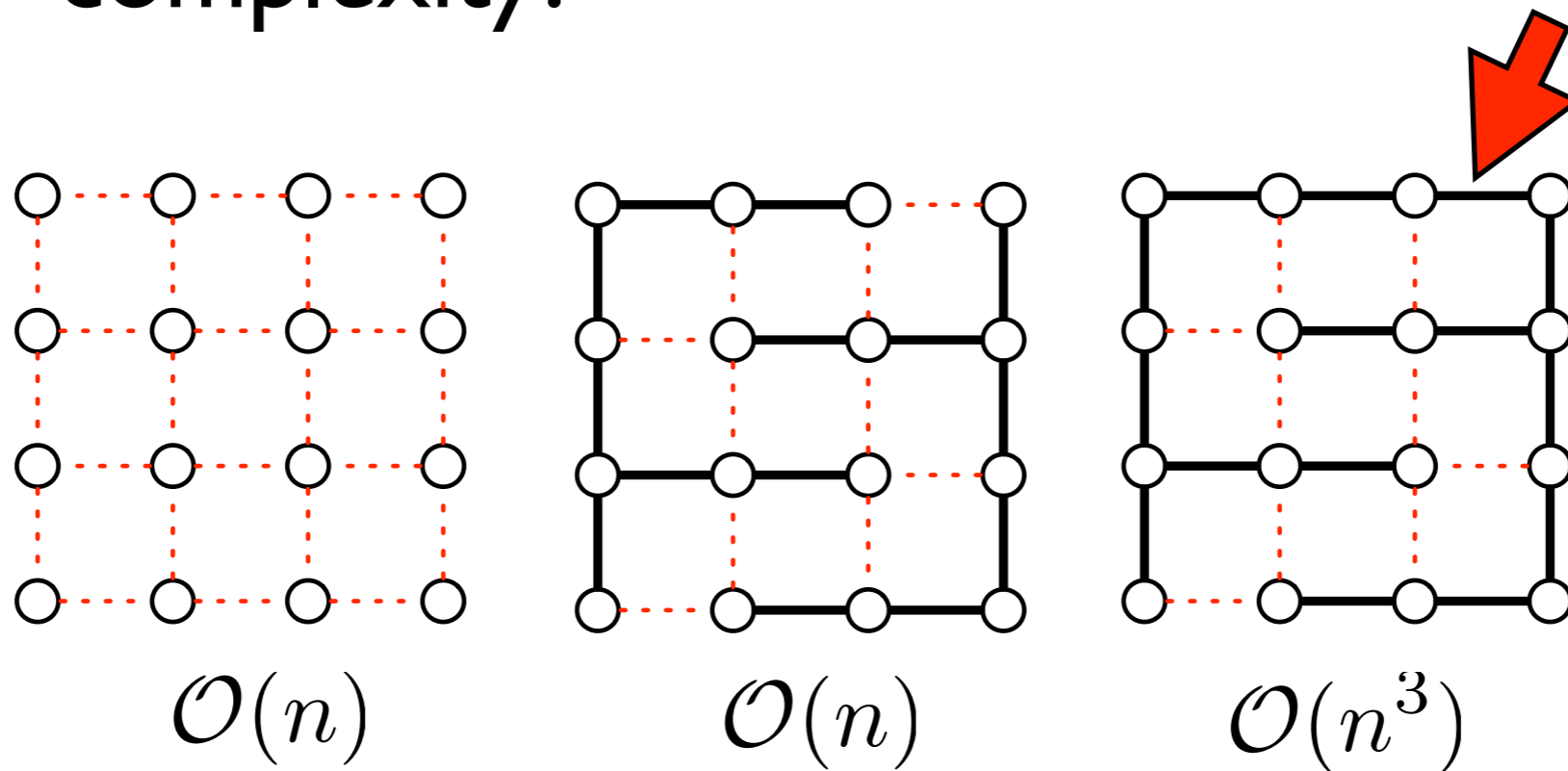University of California at Berkeley

Structured mean field

- A well-known method for doing approximate inference in intractable probabilistic models

- In Markov random fields, the approximation is usually based on an acyclic subgraph
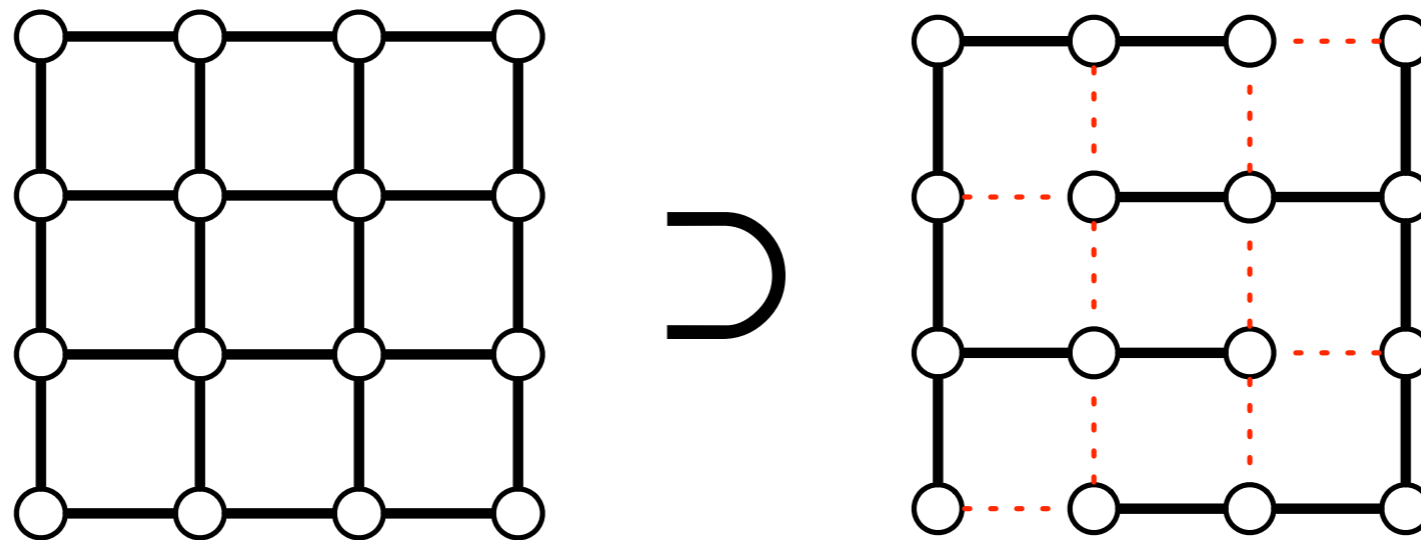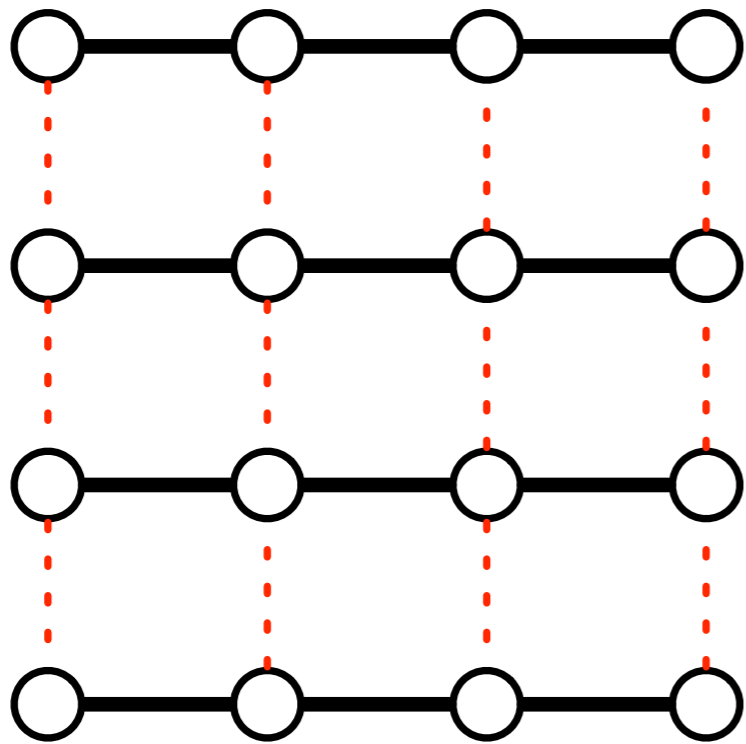
Picking a subgraph

- Using more edges increases quality

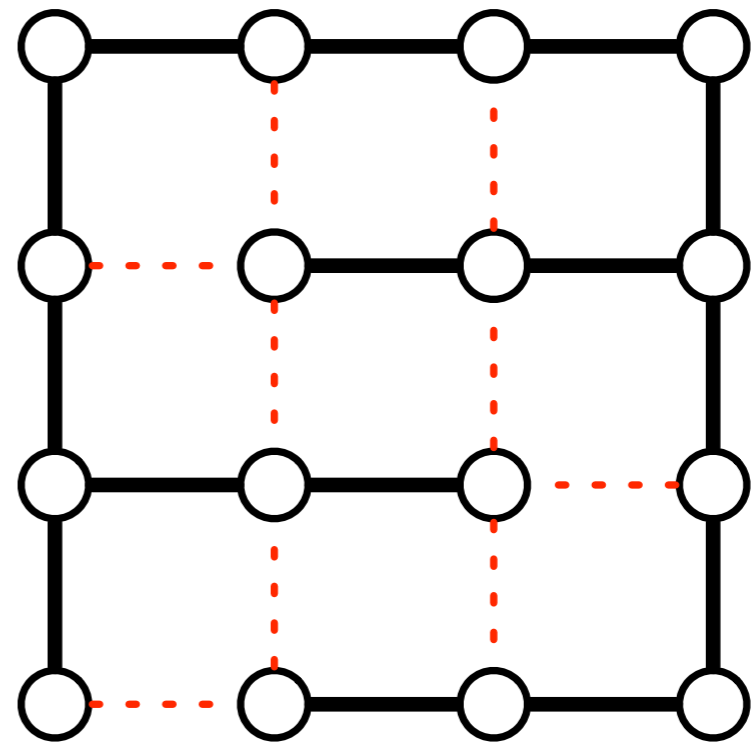- What is the impact on computational complexity?

$$\mathcal{O}(n) \qquad \mathcal{O}(n) \qquad \mathcal{O}(n^3)$$

$n = \#\text{nodes}$
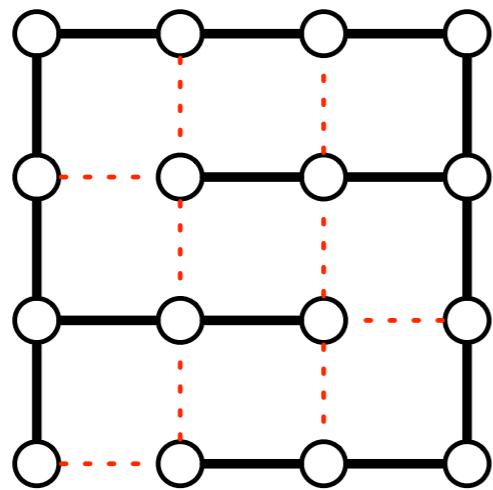
Preview of our results

v-acyclic

b-acyclic

v-acyclic

- Computationally easy

- Approximations in the literature fall into this category

- Connection with block Gibbs sampling

0.1	0.3			
0.9		0.8		
			0.4	0.9
	0.2		0.6	
	0.5	0.2		0.1

0	1			
1		1		
			0	1
	0		1	
	0	0		0

b-acyclic

- More accurate but computationally harder

- We improve on the direct method by using a technique based on *auxiliary exponential families*

$$\mathcal{O}(n^3) \rightarrow \mathcal{O}(n^2)$$