Graphical Models Wrap-Up

Machine Learning
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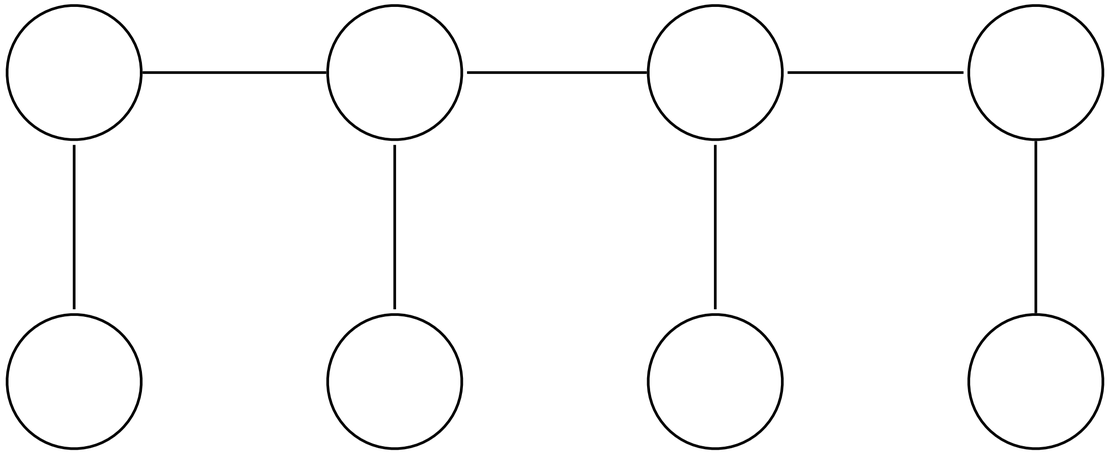
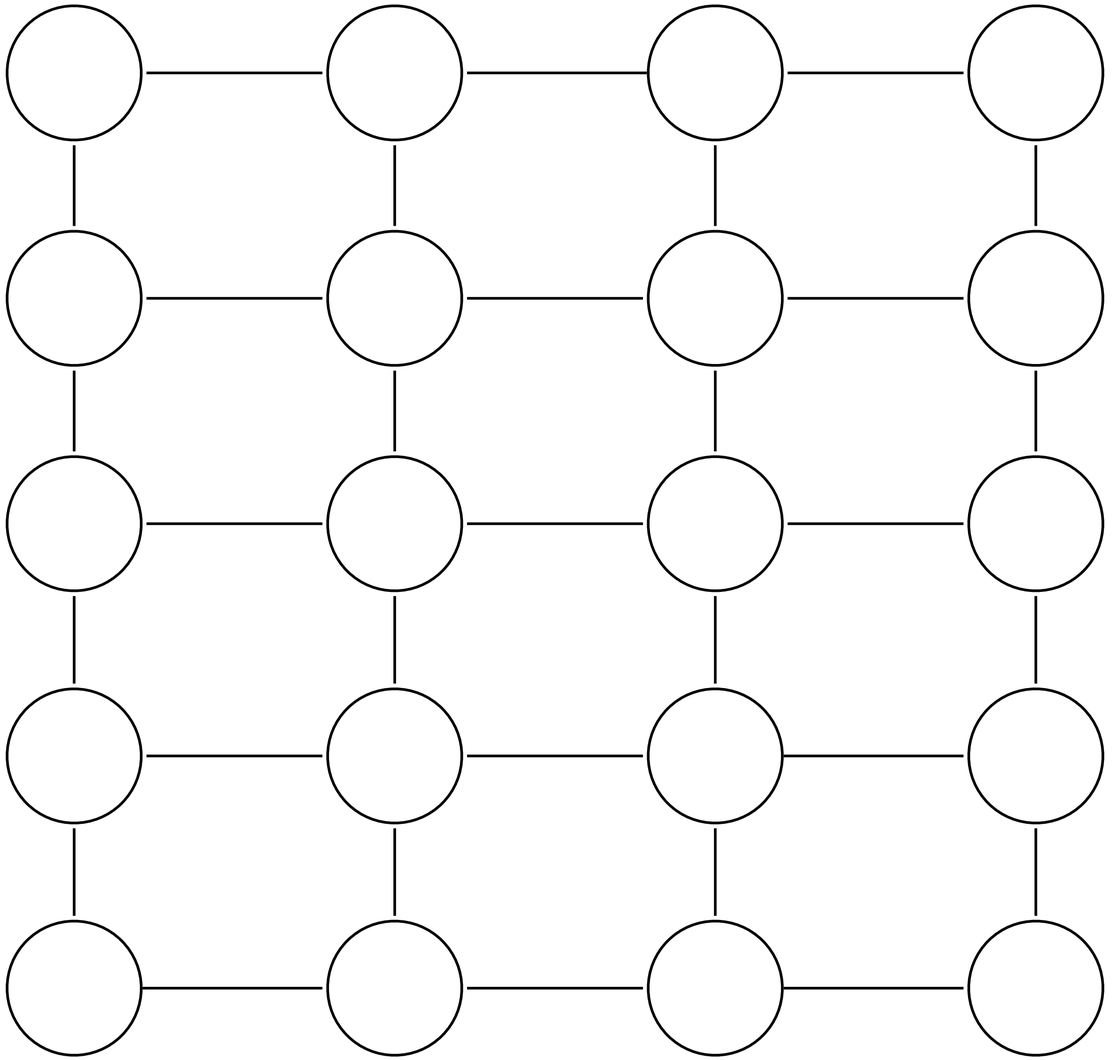
Why Graphical Models?

A modular language for describing probability distributions



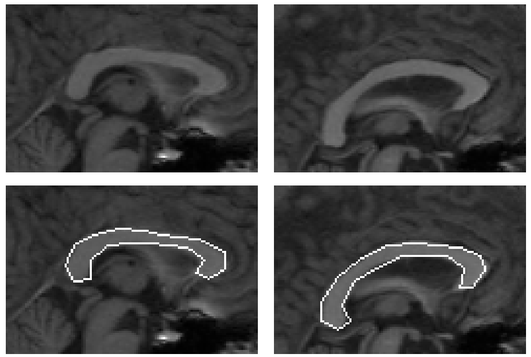
Why Graphical Models?



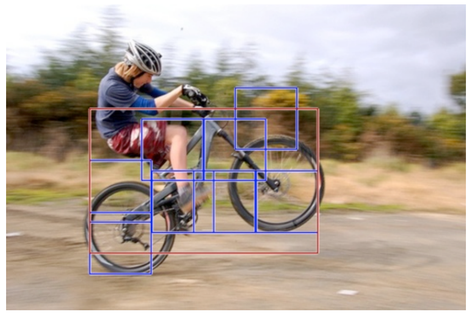
Vision Problems

Low-level vision ⟷ High-level vision

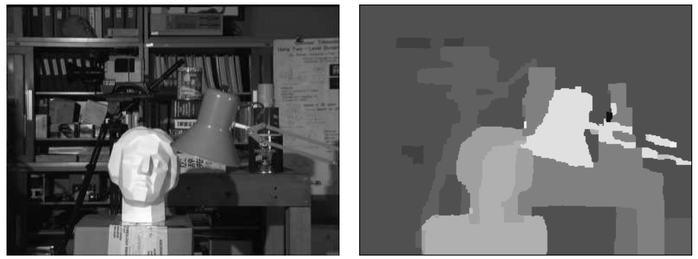
Restoration



Segmentation

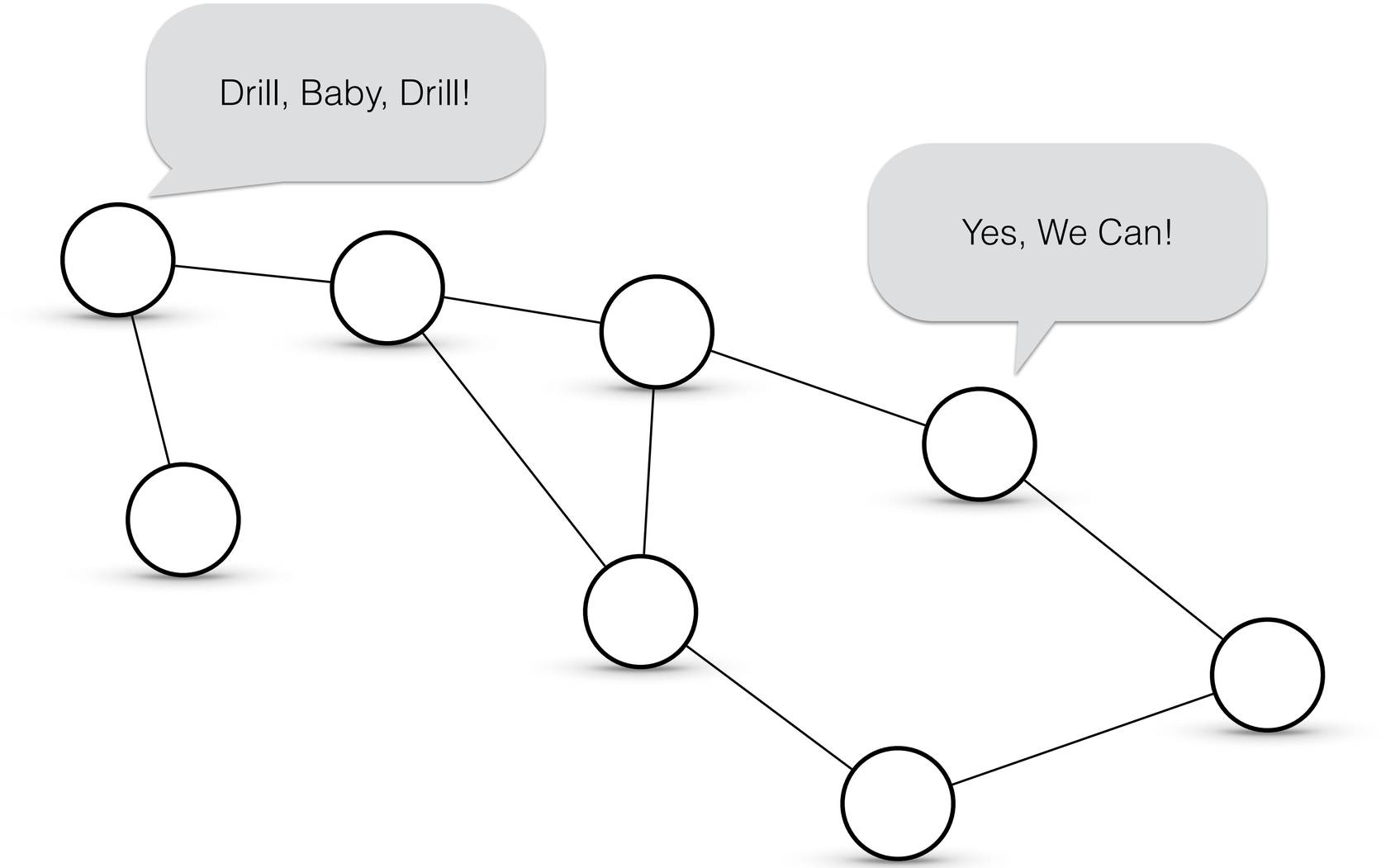


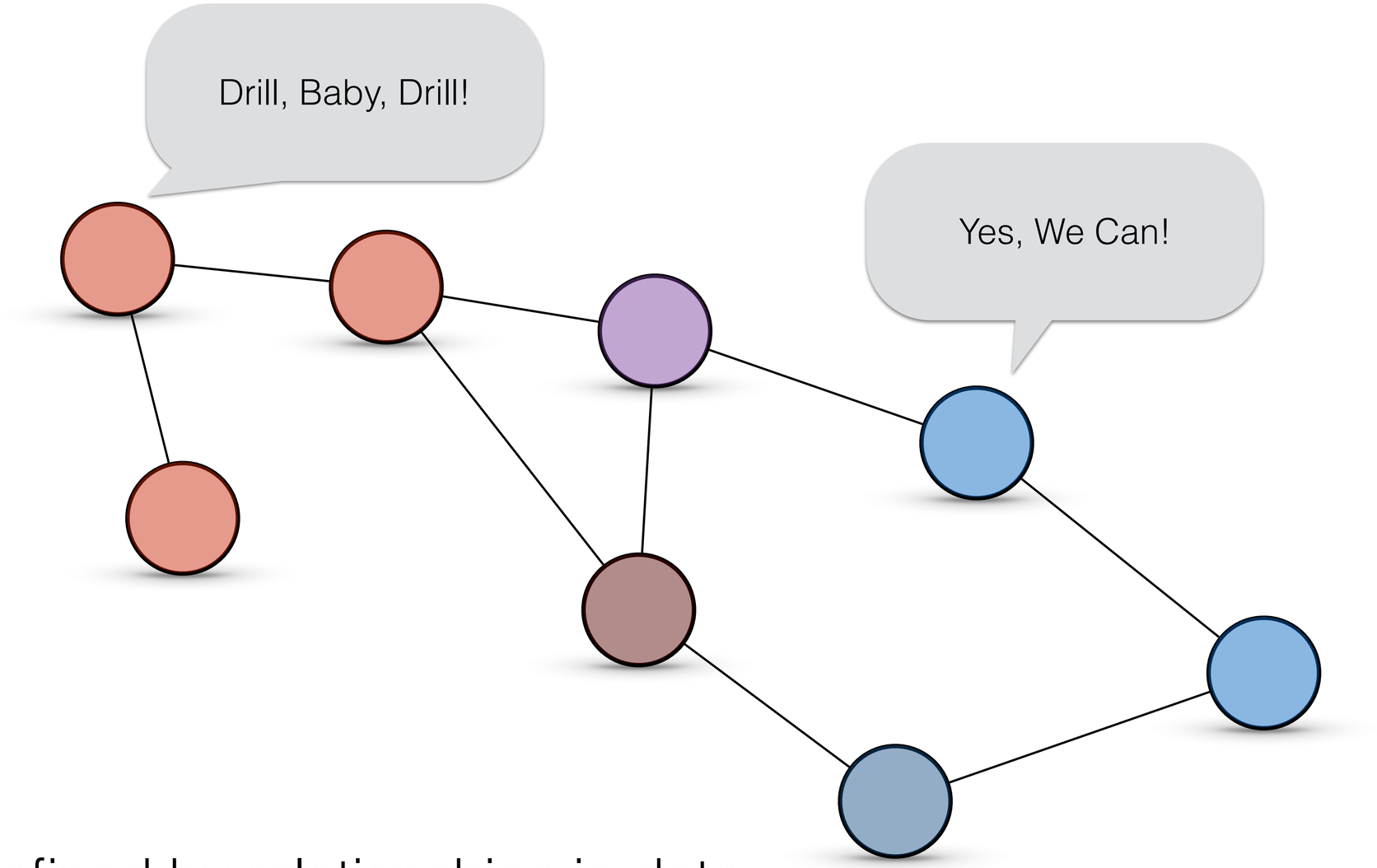
Recognition



Depth estimation

slide from Pedro Felzenszwalb's UAI tutorial on Graphical Models for Computer Vision
http://cs.brown.edu/~pff/talks/UAI-pff.pdf
http://videolectures.net/uai2012_felzenszwalb_computer_vision/


Drill, Baby, Drill!
Yes, We Can!



dependencies defined by relationships in data

Promises of Graphical Models

- General-purpose, declarative representation of distributions
- Improve models and algorithms independently
- Analysis of algorithms using graph theory
  - general domain-agnostic analyses

Challenges

- Graphical model language too rich, too general
  - Inference and learning are NP-Hard in general
- Lots of open questions about quality of approximation algorithms
  - small pockets of known families of models and algorithms that admit guaranteed approximations (or bounds)