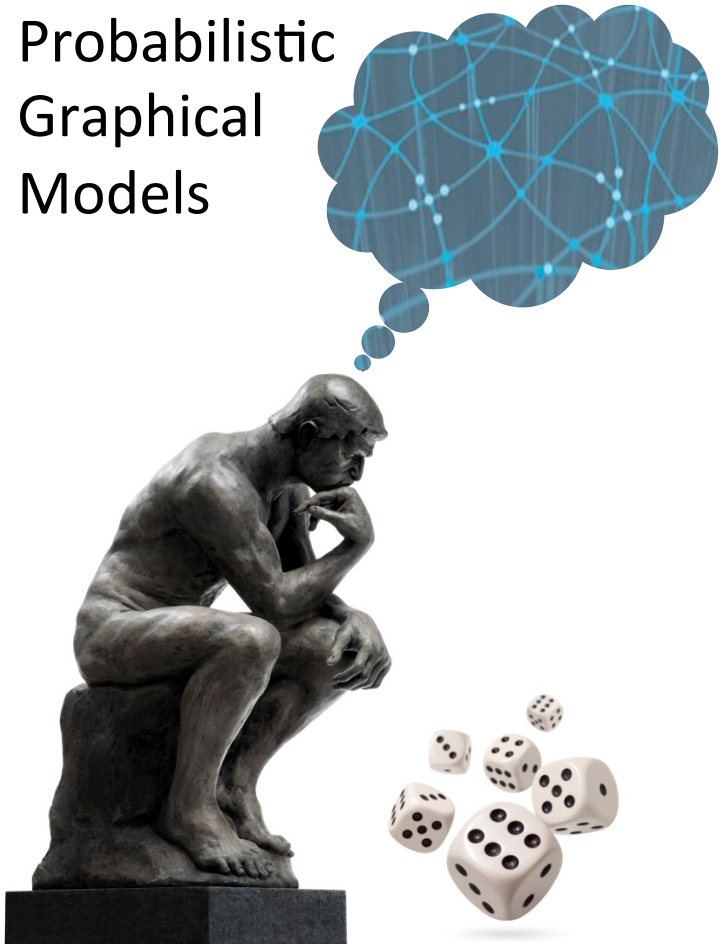
Probabilistic Graphical Models



Representation

Wrapup

Knowledge Engineering

Important Distinctions

- Template based versus specific
- Directed versus undirected
- Generative versus discriminative

- Hybrids are also common

Important Distinctions

Template-based

image segmentation

small number of variable types

features are most predictive

Specific

medical diagnosis

fault diagnosis

large number of "unique" variables

Important Distinctions

Generative

task shifts

(easier to train in certain regimes)

Discriminative

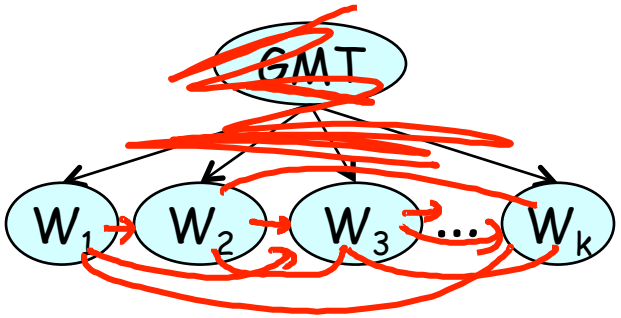
particular prediction task

richly expressive features (avoid dealing w. correlations)

⇒ high performance

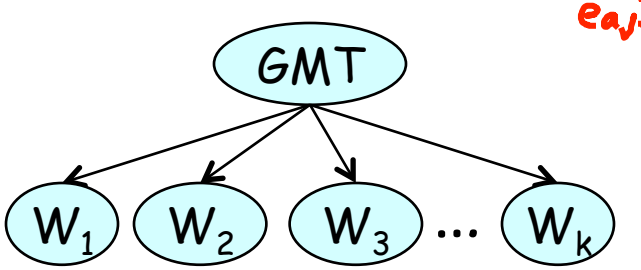
Variable Types

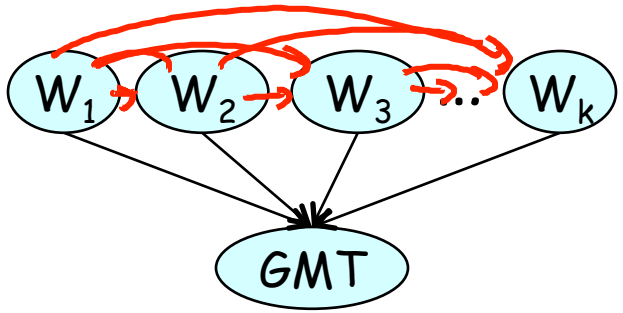
- Target
- Observed
  - Including complex, constructed features
- Latent



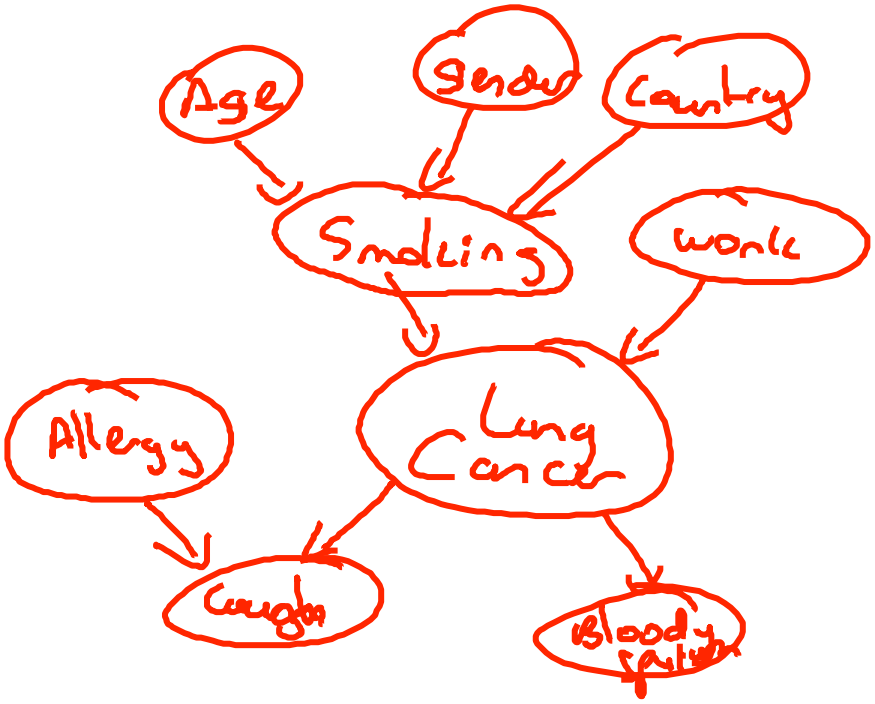
Structure

- Causal versus non-causal ordering





Extending the Conversation



Parameters: Values

- What matters:
  - Zeros
  - Orders of magnitude $\frac{1}{10}$ vs $\frac{1}{100}$
  - Relative values
- Structured CPDs

Parameters: Local Structure

- Table CPDs are the exception

	Context-specific	Aggregating
Discrete	tree CPDs	Sigmoid noisy OR
Continuous	regression tree (thresholds) CLG	Linear Gaussian

Iterative Refinement

- Model testing
- Sensitivity analysis for parameters
- Error analysis
  - Add features
  - Add dependencies