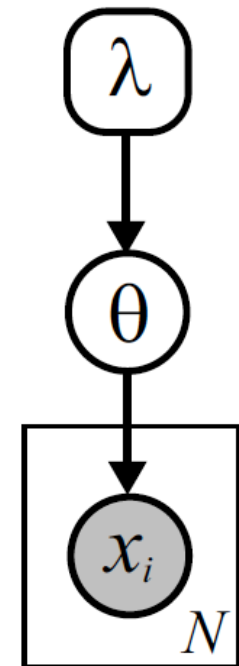
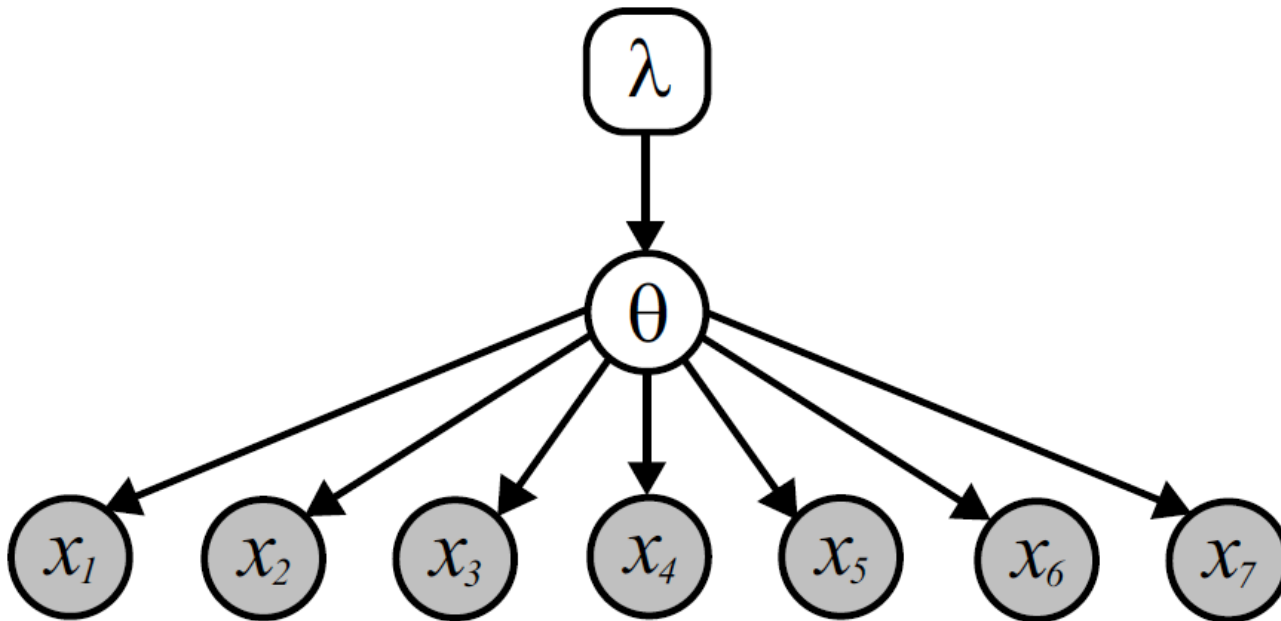


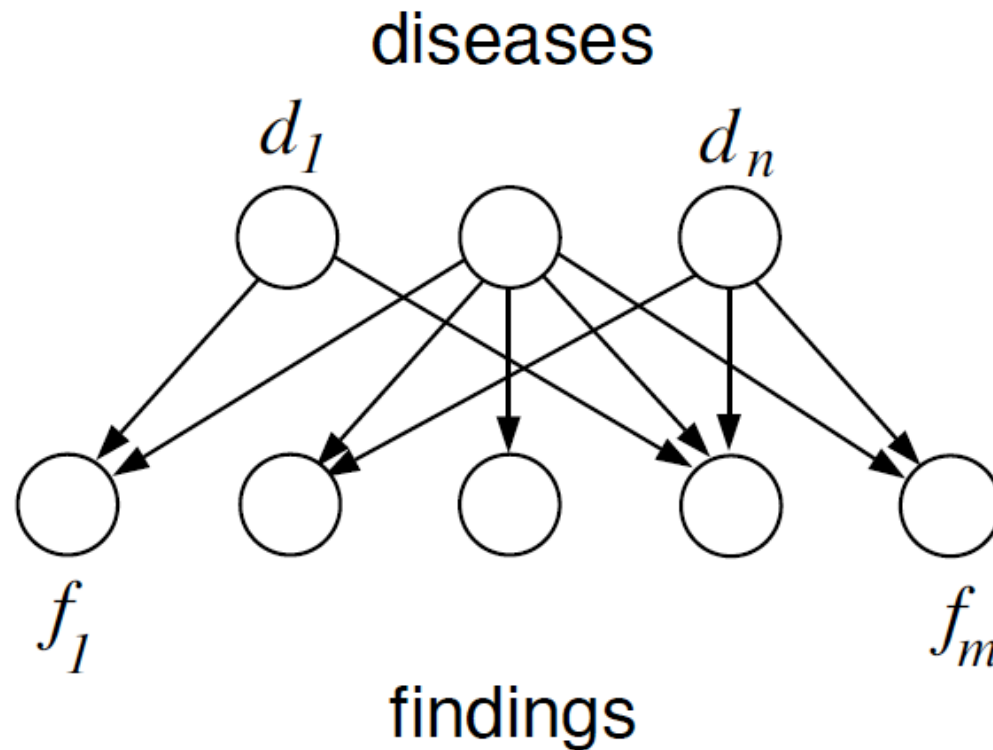
Learning and Inference in Probabilistic Graphical Models

Popular Directed Graphical Models
Feb. 3, 2010

Naïve Bayes Model

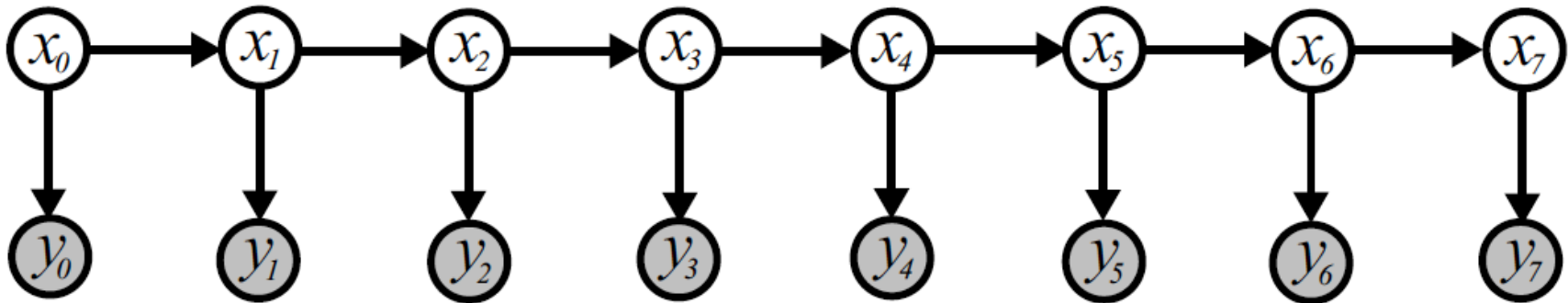


Medical Diagnosis

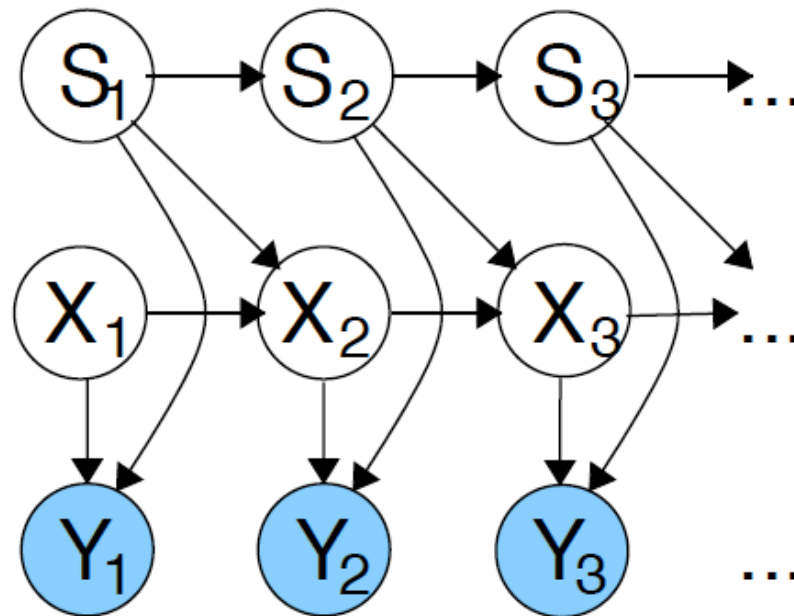


Parameterization: Noisy-OR, logistic regression, generalized linear models...

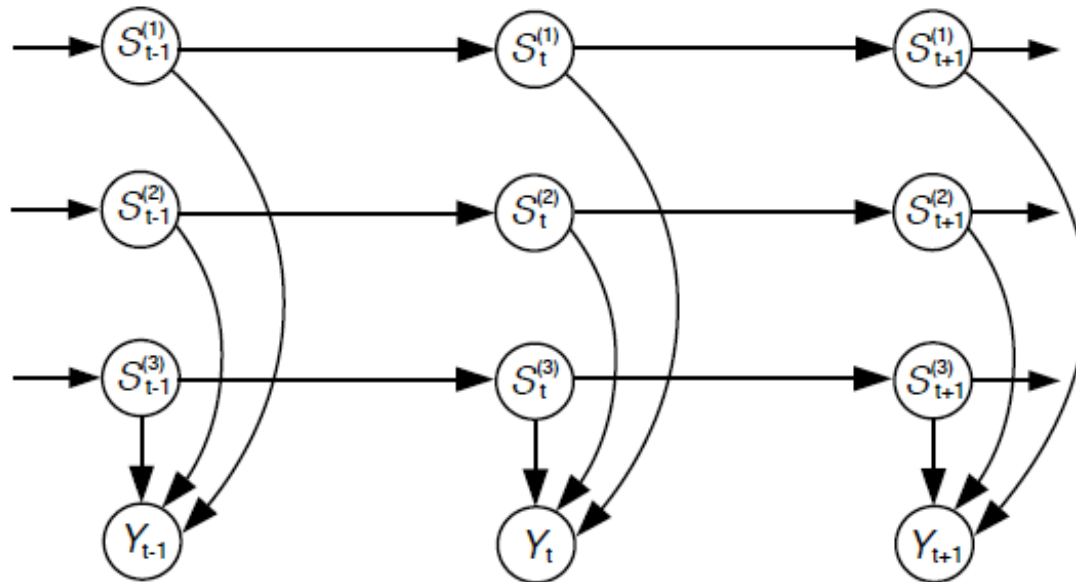
Hidden Markov Model (& linear dynamical system)



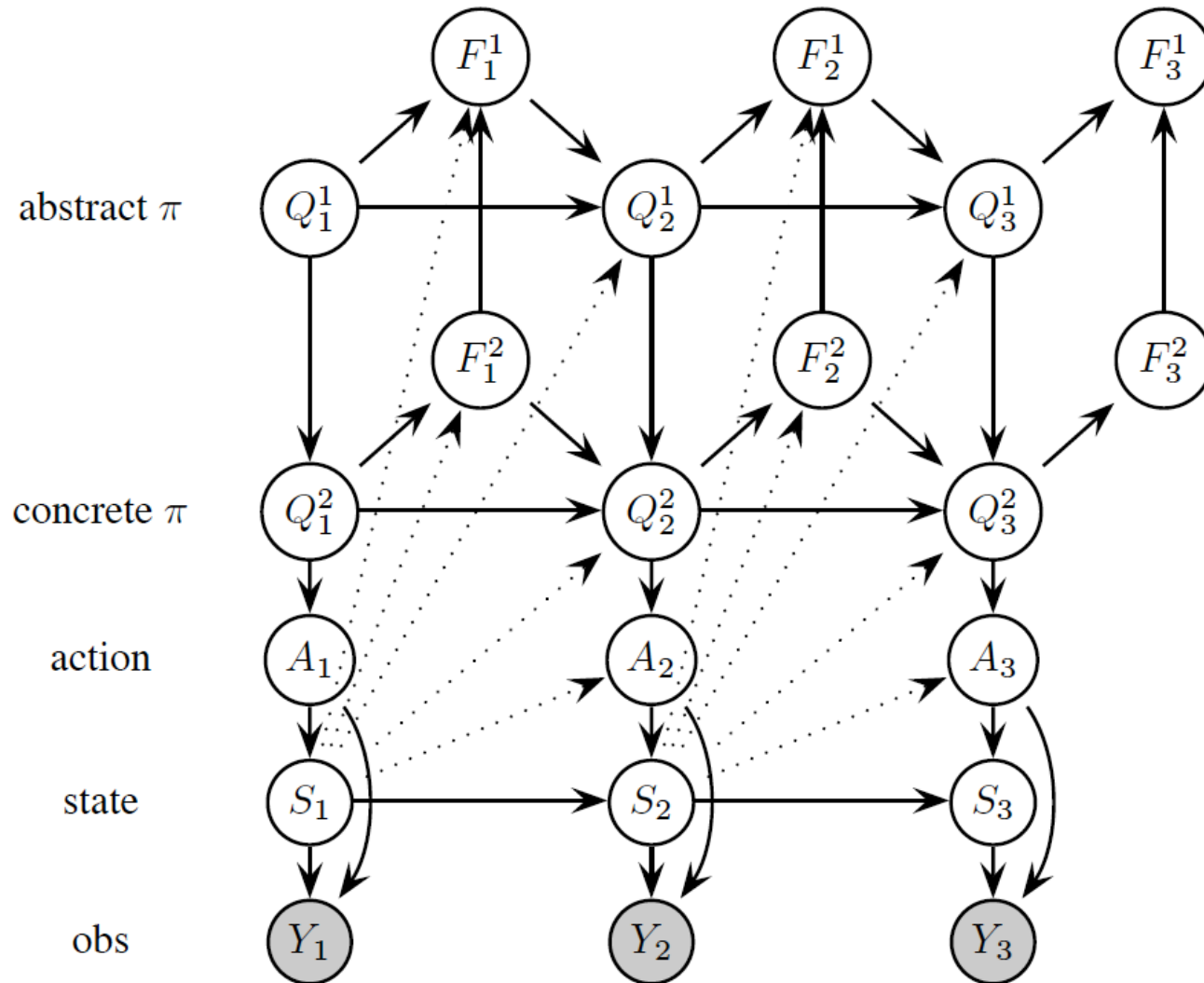
Switching Linear Dynamical System



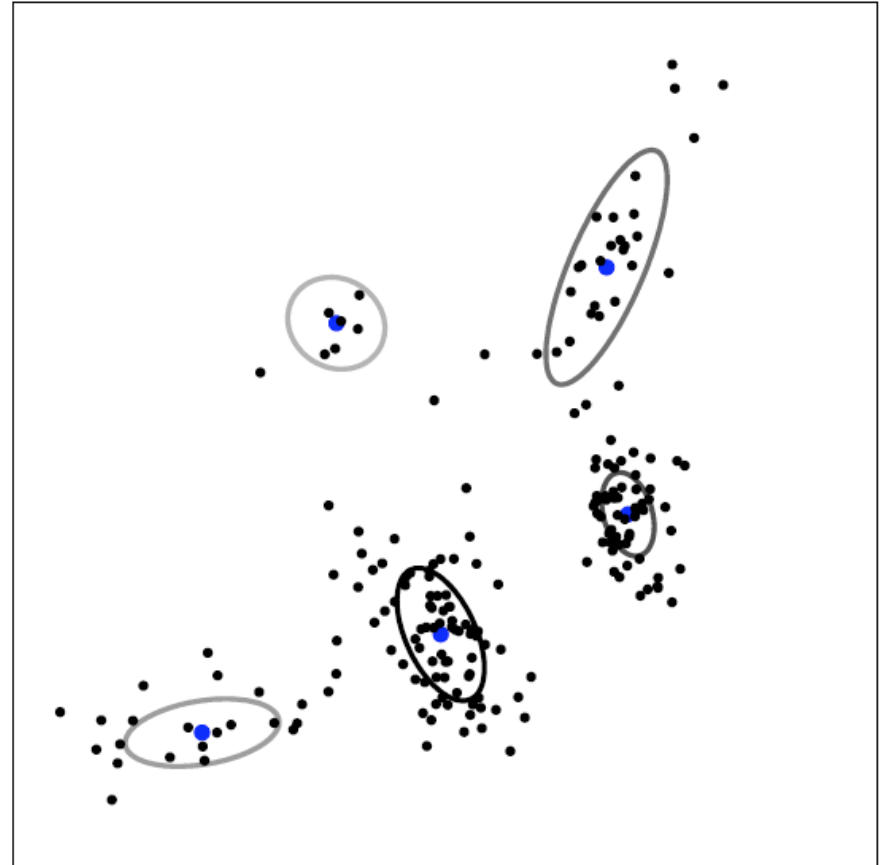
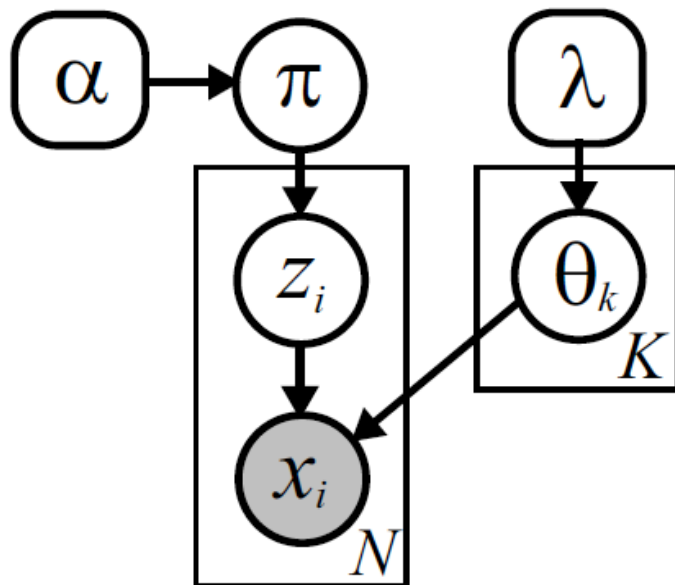
Factorial HMM



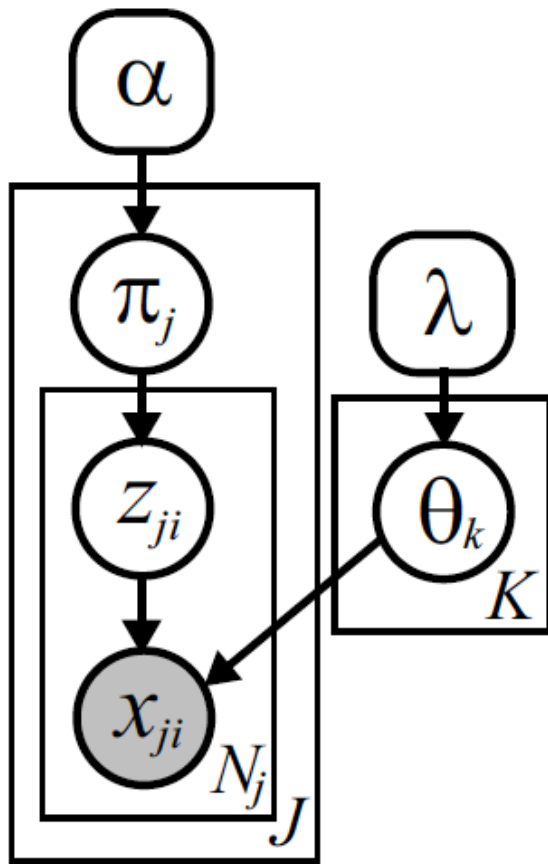
Dynamic Bayesian Networks



Mixture Models



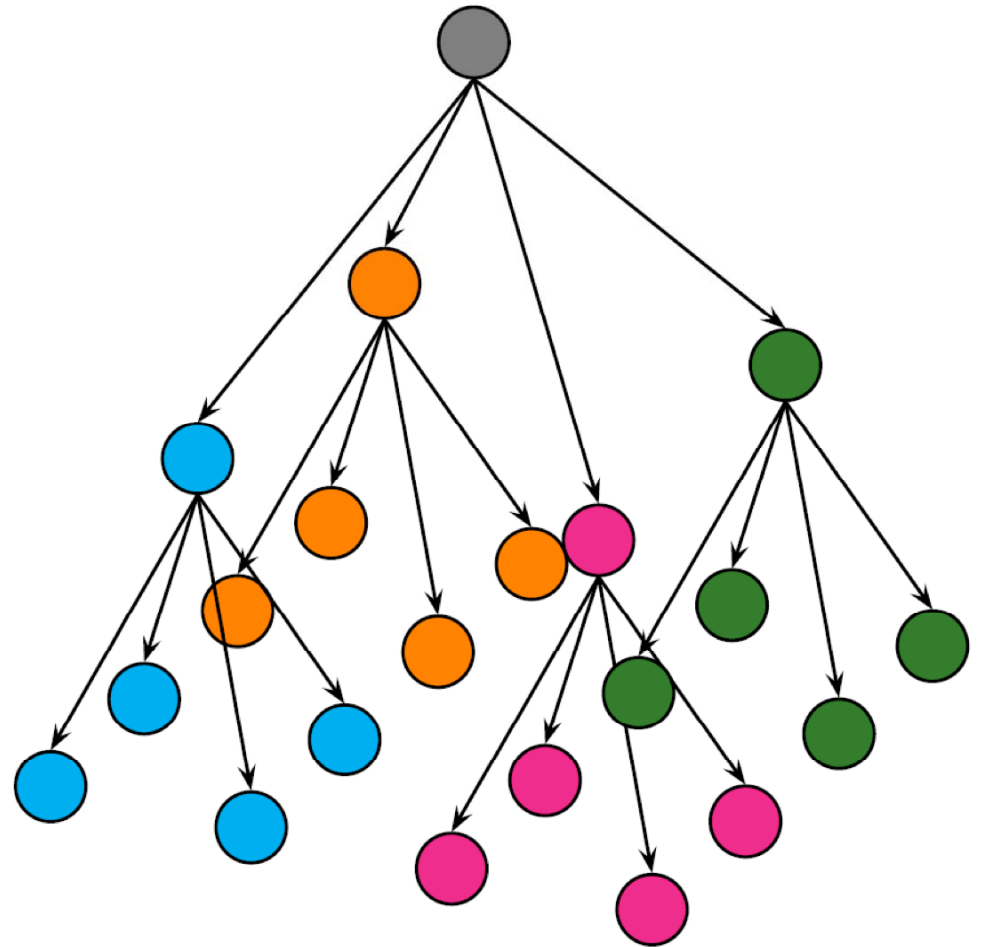
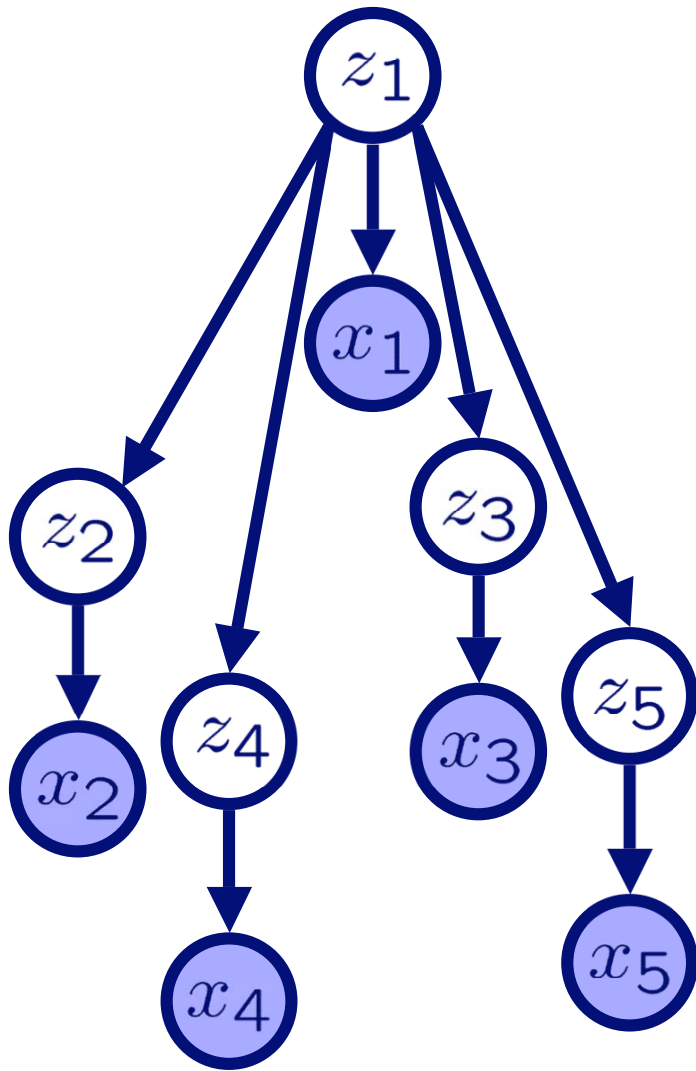
Admixture or Topic Models (Latent Dirichlet Allocation)



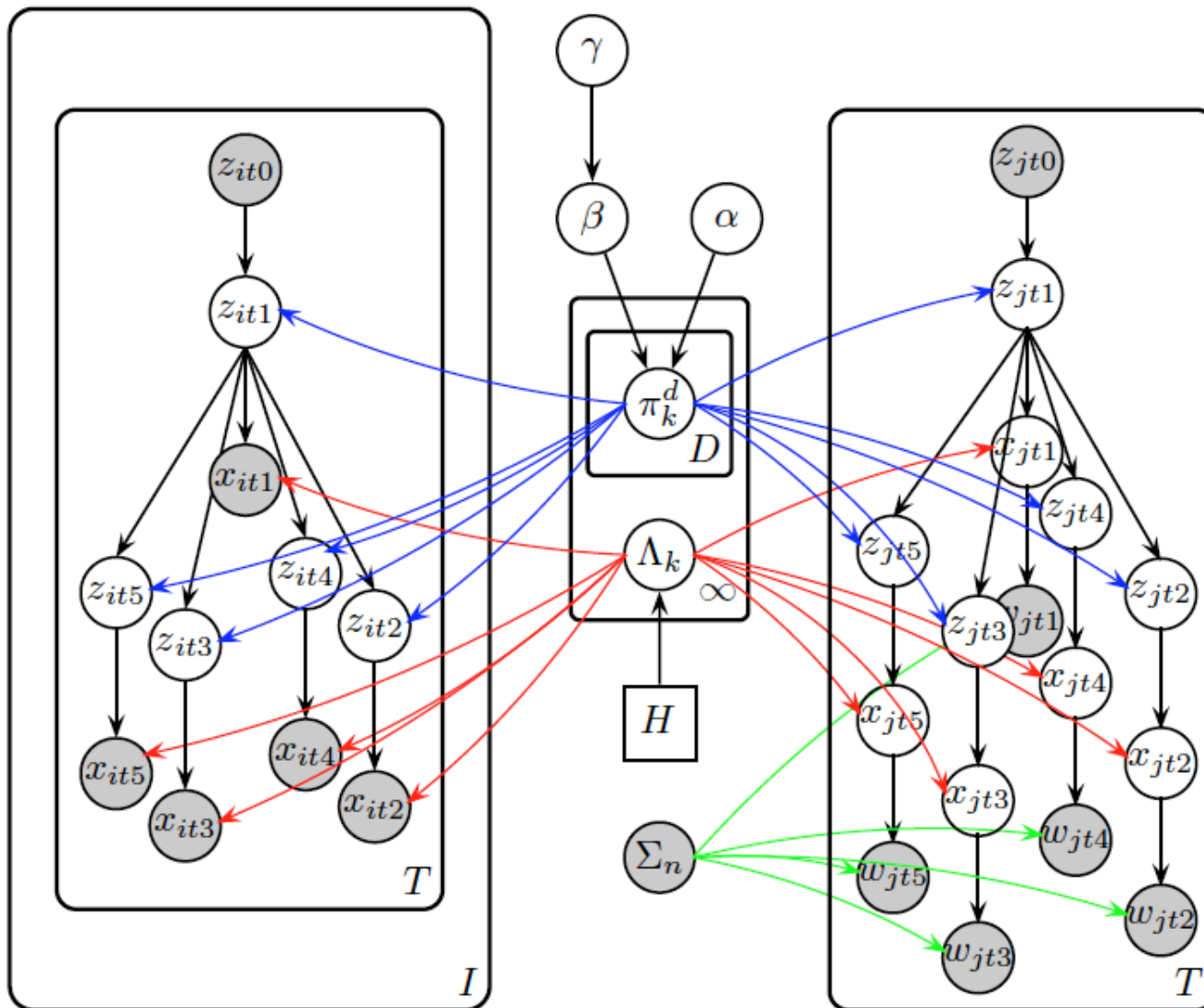
A matrix equation illustrating the relationship between word probabilities. On the left is a gray rectangle representing the word probability matrix $Pr[word | doc]$, with height W and width J . This is equal to the product of two matrices: a vertical rectangle representing $Pr[word | topic]$ with height W and width K , and a horizontal rectangle representing $Pr[topic | doc]$ with height K and width J . The multiplication is indicated by an asterisk $*$.

$$Pr[word | doc] = Pr[word | topic] * Pr[topic | doc]$$

Multiscale Modeling



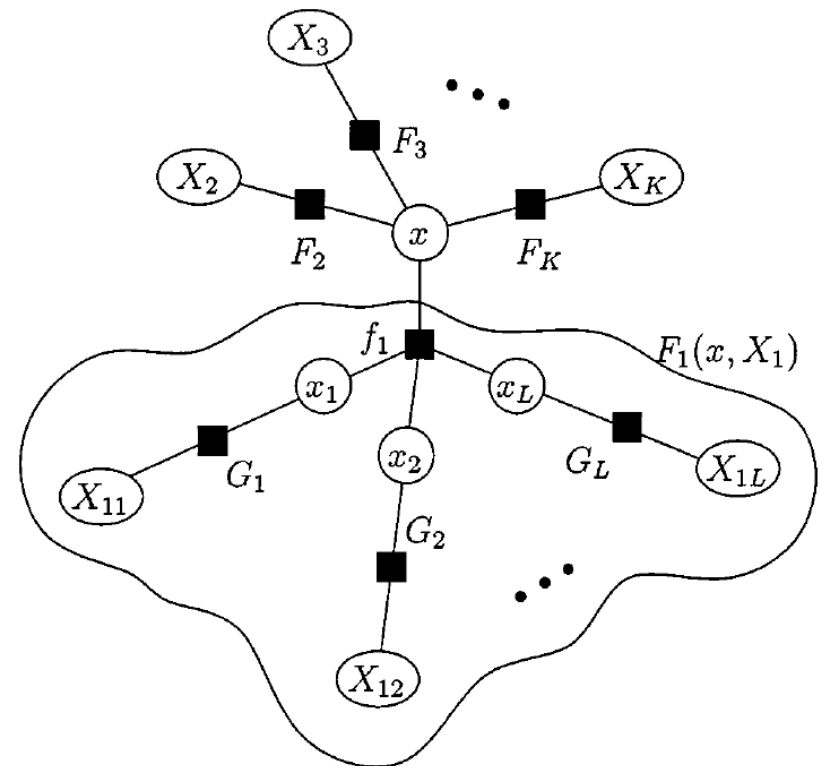
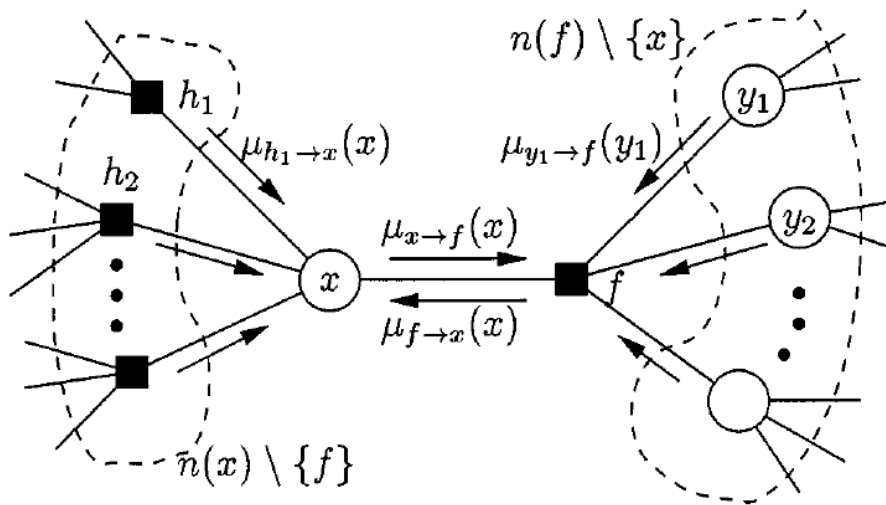
Multiscale Transfer Denoising



2/10: First Reading

Factor Graphs and the Sum-Product Algorithm

Frank R. Kschischang, *Senior Member, IEEE*, Brendan J. Frey, *Member, IEEE*, and Hans-Andrea Loeliger, *Member, IEEE*

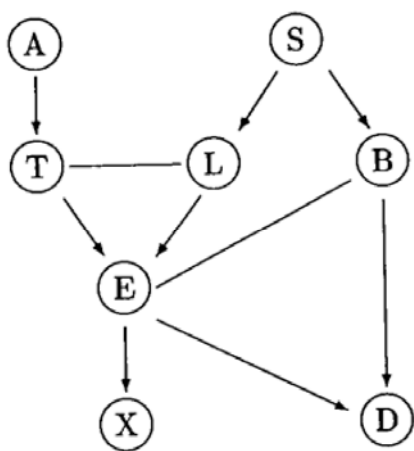


2/10: Second Reading

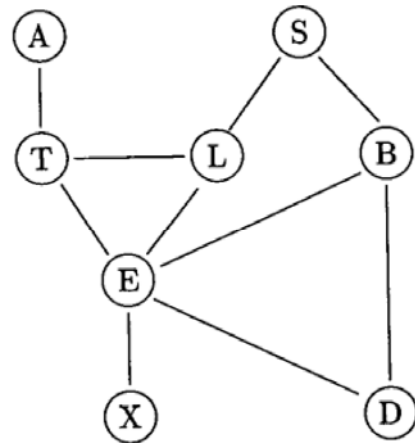
INTRODUCTION TO INFERENCE FOR BAYESIAN NETWORKS

ADVANCED INFERENCE IN BAYESIAN NETWORKS

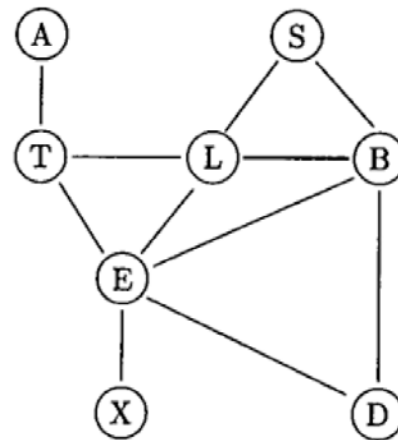
ROBERT COWELL
City University, London.



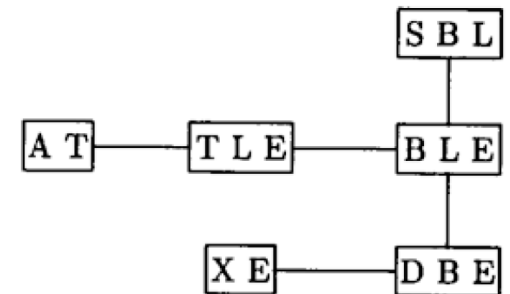
*Directed
Graphical
Model*



*Undirected
Graphical
Model*



*Triangulated
Graph*



*Junction
Tree*