732A96 Advanced Machine Learning

Graphical Models and Hidden Markov Models

Jose M. Peña
IDA, Linköping University, Sweden

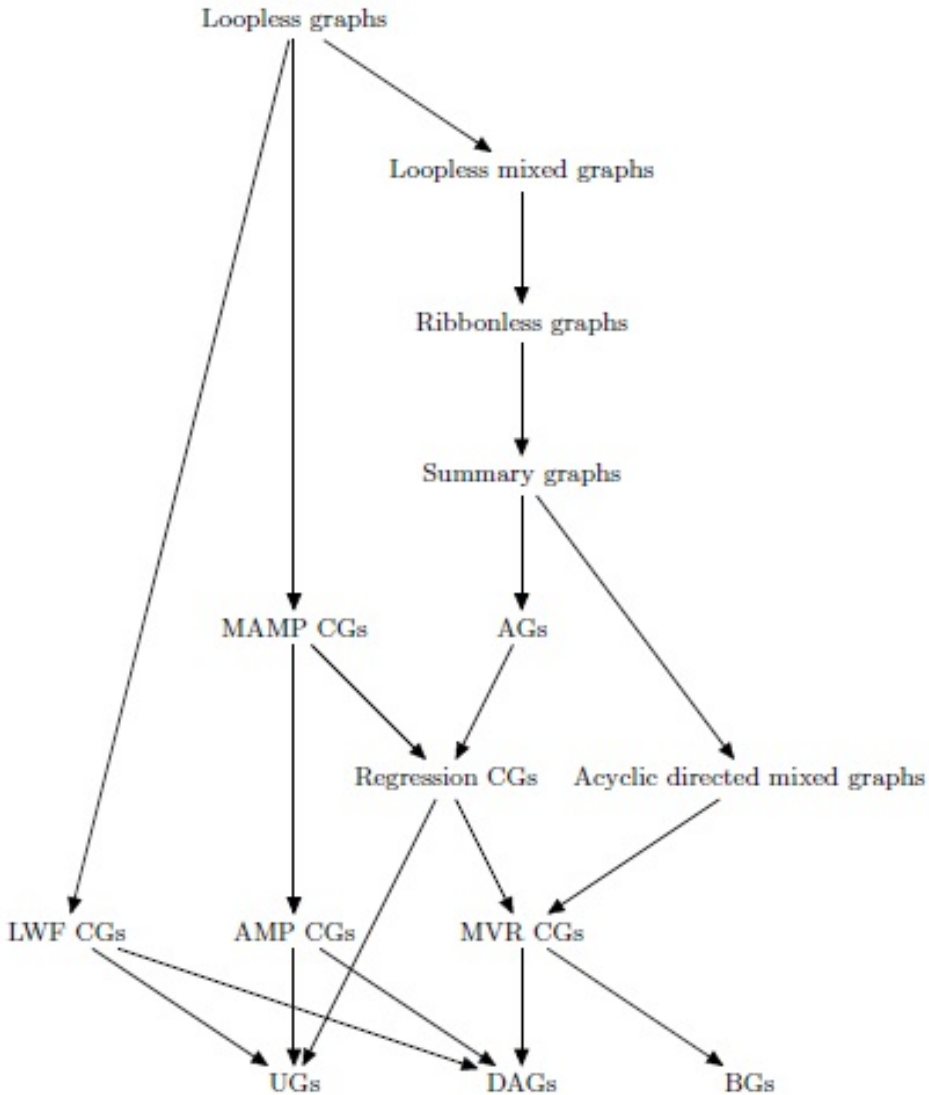
Contents

- Lecture 1
  - Causal Models
  - Bayesian Networks
  - Markov Networks
- Lecture 2
  - Probabilistic Reasoning
- Lecture 3
  - Parameter Learning
- Lecture 4
  - Structure Learning
- Lecture 5
  - Dynamic Bayesian Networks
  - Hidden Markov Models
- Lecture 6
  - Autoregressive Hidden Markov Models
  - Explicit-Duration Hidden Markov Models

Literature

- Main source
  - Bishop, C. M. *Pattern Recognition and Machine Learning*. Springer, 2006.
- Additional sources
  - Chiappa, S. Explicit-Duration Markov Switching Models. *Foundations and Trends in Machine Learning* 7, 803-886, 2014.
  - Ghahramani, Z. An Introduction to Hidden Markov Models and Bayesian Networks. *International Journal of Pattern Recognition and Artificial Intelligence* 15, 9-42, 2001.
  - Koski, T. J. T. and Noble, J .M. A Review of Bayesian Networks and Structure Learning. *Mathematica Applicanda* 40, 51-103, 2012.
  - Lauritzen, S. L. and Spiegelhalter, D. J. Local Computations with Probabilities on Graphical Structures and Their Application to Expert Systems. *Journal of the Royal Statistical Society B* 50, 157-224, 1988.
- R packages
  - bnlearn
    - Package documentation.
    - Højsgaard, S. Graphical Independence Networks with the gRain Package for R. *Journal of Statistical Software* 46, 2012.
    - Scutari, S. Learning Bayesian Networks with the bnlearn R Package. *Journal of Statistical Software* 35, 2010.
  - HMM
    - Package documentation.

Families of Graphical Models



Relevance of Graphical Models