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Graphical Models to Infer Cellular Networks

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In this lecture I will talk about conditional independence and Gaussian graphical models Lauritzen (1996), Bayesian networks and scoring metrics to learn networks from data Heckerman et al. (1995). Building on these theortical basics I will describe applications of Graphical models in computational biology Wille et al. (2004); Friedman (2004), discuss and compare recent results and approaches.

Many more references can be found in the collection (Markowetz, 2005).

References:

[1] **N. Friedman.** *Inferring cellular networks using probabilistic graphical models.* Science, **303**(2004), 799-805.
URL http://www.sciencemag.org/cgi/content/abstract/303/5659/799.

[2] **D. Heckerman, D. Geiger, and D. M. Chickering.** *Learning Bayesian networks: The combination of knowledge and statistical data.* Machine Learning, **20**(1995), 197-243. URL http://dx.doi.org/10.1023/A:1022623210503.

[3] **S. L. Lauritzen.** *Graphical Models.* Clarendon Press, Oxford, 1996.

[4] **F. Markowetz.** *A bibliography on learning causal networks of gene interactions,* 2005. URL http: //www.molgen.mpg.de/ markowet/docs/network-bib.pdf.

[5] **A. Wille, Ph. Zimmermann, E. Vranova, A. Fürholz, O. Laule, S. Bleuler, L. Hennig, A. Prelic, P. V. Rohr, L. Thiele, E. Zitzler, W. Gruissem, and P. Bühlmann.** *Sparse graphical Gaussian modeling of the isoprenoid gene network in Arabidopsis thaliana.* Genome Biol, **5**(2004). URL http://dx.doi.org/10.1186/gb-2004-5-11-r92.