

Seminar on  
**Bayesian Probabilistic Networks**

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Bayesian Probabilistic Networks provide a useful tool for dealing with *uncertainty* and *complexity* of engineering problems. They were developed during the last two decades, as a decision support tool originally targeted for purposes of artificial intelligence engineering. The developments of the theory and application areas for Bayesian Probabilistic Networks have been and are still evolving rapidly. It is at present possible to utilize the techniques for almost any aspect of probabilistic modeling and decision making, ranging from inference problems, model building and data mining over to pre-posterior decision analysis.

In this seminar an introduction to the Bayesian Networks will be provided covering the algorithms and the theory behind those models. The basics of probability theory are a prerequisite.

**Who should attend?**

Graduate students, PhD. Students and post-docs interested in Bayesian networks.

**Mode**

The seminar follows closely the Book *Bayesian Networks and Decision Graphs* by Finn V. Jensen. It is anticipated that the lecturing will be performed in turn by the participants.

**Literature**

Jensen, F.V., 2001. *Bayesian Networks and Decision Graphs*, Springer.  
Pearl, Judea, 1988. *Probabilistic Reasoning in Intelligent Systems*, Morgan Kaufmann Publishers.  
Cowell, R., Dawid, A.P., Lauritzen, S. L., Spiegelhalter, D. J., 1999. *Probabilistic Networks and Expert Systems*, Springer.

**When and where?**

On

**Wednesdays**  
**17:00 – 18:00**  
**ETH Hönggerberg, HIL E36.1**

## Agenda

W	Date	Speaker	Topic
1	10.11.04		1. Causal and Bayesian Networks 1.1 Reasoning under Uncertainty 1.2 Causal Networks and d-Separation 1.3 Probability Calculus 1.4 Bayesian Networks
2	17.11.04		2. Building Models 2.1 Catching the Structure 2.2 Determining the Conditional Probabilities
3	24.11.04		2.3 Modeling Methods 2.4 Special Features
4	01.12.04		3. Learning, Adaptation and Tuning 3.1 Distance Measures 3.2 Batch Learning 3.3 Adaptation 3.4 Tuning
5	08.12.04		4. Decision Graphs 4.1 One Action 4.2 Utilities 4.3 Value of Information 4.4 Decision Trees
6	15.12.04		4.5 Decision-Theoretic Troubleshooting 4.6 Influence Diagrams
7	22.12.04		5. Belief Updating in Bayesian Networks 5.1 Introductory Examples 5.2 Graph-Theoretical Representation
	<b>Break</b>		
8	12.01.05		5.3 Triangulated Graphs and Join Trees 5.4 Propagation in junction trees
9	19.01.05		5.5 Exploiting the Information Scenario 5.6 Nontriangulated Domain Graphs 5.7 Stochastic Simulation
10	26.01.05		6. Bayesian Network Analysis Tools 6.1 IEJ trees 6.2 Joint Probabilities and A-Saturated Junction trees 6.3 Configuration of Maximal Probabilities 6.4 Axioms for Propagation in Junction trees 6.5 Data Conflict
11	02.02.05		6.6 SE Analysis 6.7 Sensitivity to Parameters
12	09.02.05		7. Algorithms for Influence Diagrams 7.1 The Chain Rule for Influence Diagrams 7.2 Strategies and Expected Utilities
13	16.02.05		7.3 Variable Elimination 7.4 Policy Networks 7.5 Value of Information 7.6 LIMIDs