

Intelligent Agents: Web-mining Agents

Probabilistic Graphical Models

Introduction

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Welcome

- Part of the module:

Intelligent Agents (CS4514-KP12)

- Consists of two lectures per week
 - First lecture per week on

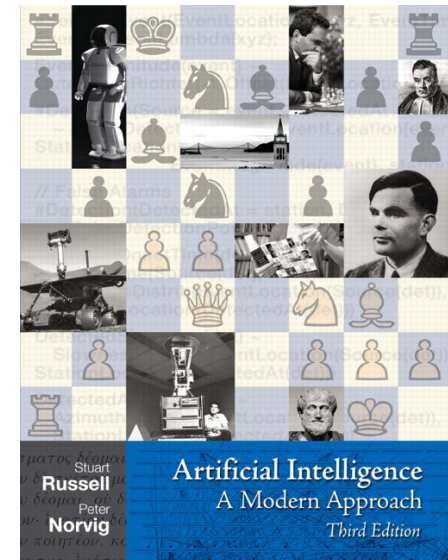
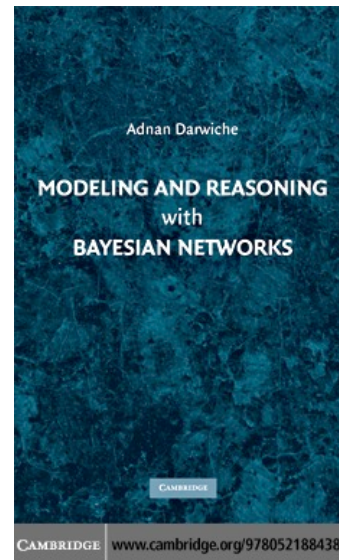
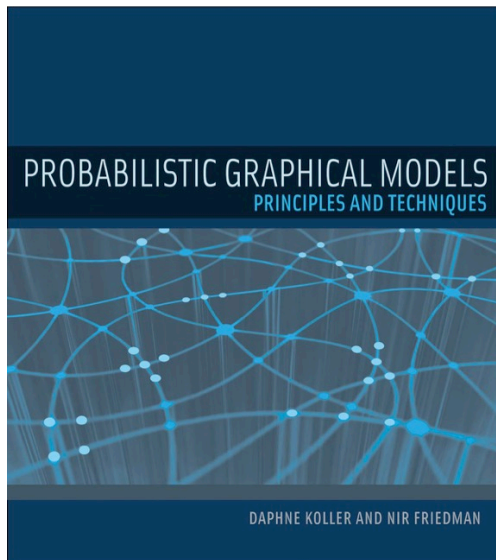
Autonomous Agents and Information Retrieval

- Second lecture per week on

Probabilistic Graphical Models

Literature: Books

- Modelling and Reasoning with Bayesian Networks
 - Adnan Darwiche
- Probabilistic Graphical Models
 - Daphne Koller, Nir Friedman
- Artificial Intelligence: A Modern Approach (3rd ed.)
 - Stuart Russell, Peter Norvig

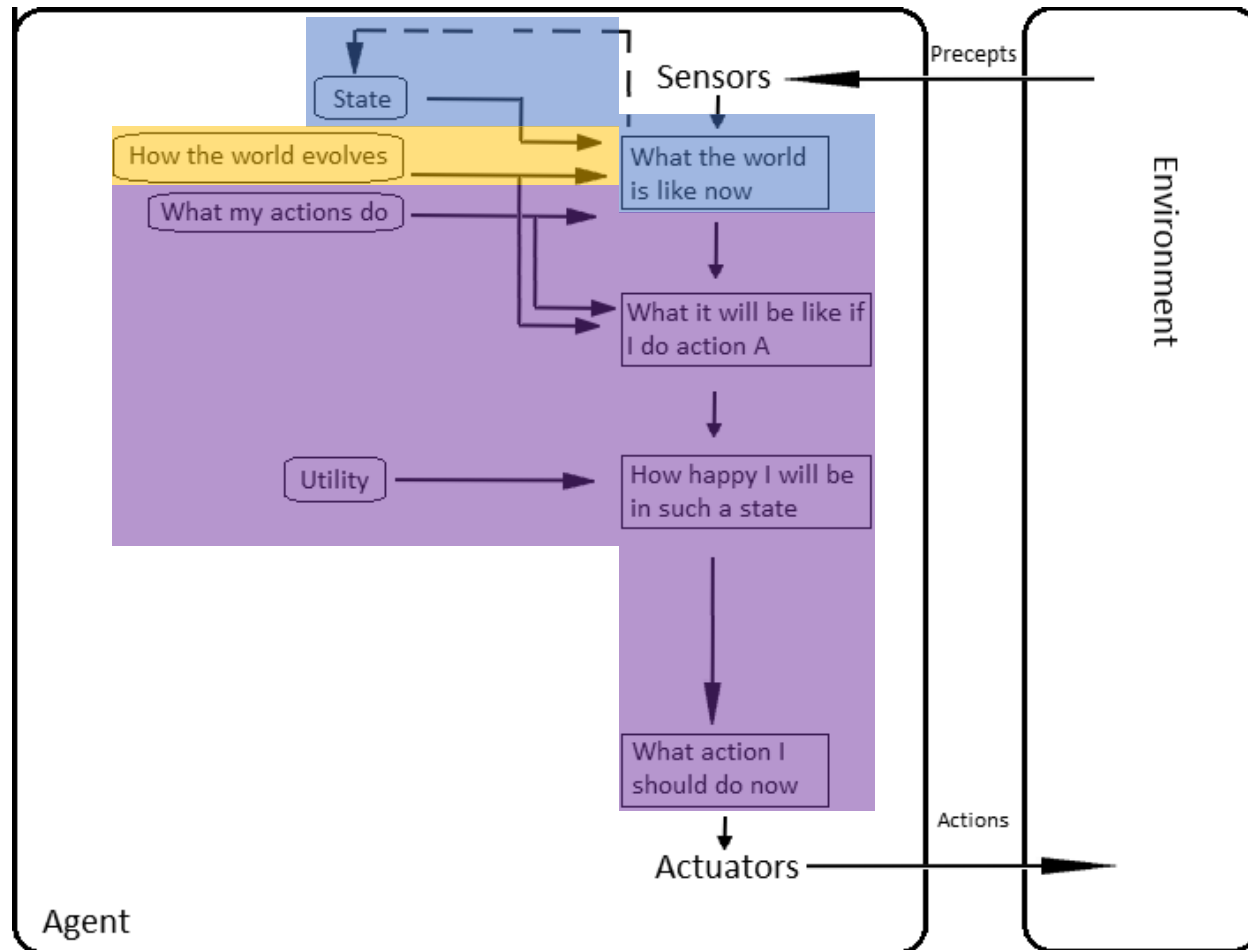


Literature: Other than Books

- Two PhD theses (especially for Sections 1-3):
 - Nima Taghipour: Lifted Probabilistic Inference by Variable Elimination. KU Leuven, 2013.
 - <https://lirias.kuleuven.be/1656026?limo=0>
 - Tanya Braun: Rescued from a Sea of Queries: Exact Inference in Probabilistic Relational Models. UZL, 2020.
 - https://www.ifis.uni-luebeck.de/~braun/Diss/Braun_diss.pdf
- Further research papers referenced in slides



Setting: Agent with Utilities



Probabilistic Graphical Models (PGMs)

1. Recap: **Propositional** modelling

- Factor model, Bayesian network, Markov network
- Semantics, inference tasks + algorithms + complexity

2. **Probabilistic relational models** (PRMs)

- Parameterised models, Markov logic networks
- Semantics, inference tasks

3. **Lifted inference**

- LVE, LJT, FOKC
- Theoretical analysis

4. **Lifted learning**

- Recap: propositional learning
- From ground to lifted models
- Direct lifted learning

5. **Approximate Inference: Sampling**

- Importance sampling
- MCMC methods

6. **Sequential models & inference**

- Dynamic PRMs
- Semantics, inference tasks + algorithms + complexity, learning

7. **Decision making**

- (Dynamic) Decision PRMs
- Semantics, inference tasks + algorithms, learning

8. **Continuous Models**

- Probabilistic soft logic: modelling, semantics, inference tasks + algorithms