Probabilistic Graphical Models

Course code: MLC_PGM

This course is intended for people interested in Bayesian networks and probabilistic programming. At the beginning of the course, the theoretical part will lead to a practical example of topic modeling using Latent Dirichlet Allocation and its non-parametric extension, including hyperparameter estimation. By completing this course, the participants should be able to design and implement their own simple Bayesian networks for various problems.

Who is the course for

This course is intended for people interested in Bayesian networks and probabilistic programming.

Required skills

- basic knowledge of programing in Python
- high school level of mathematics

Course outline

- Bayesian networks
- Model representation
- Generative vs. discriminative models
- Statistical inference in Bayesian networks
- Variational inference
- Sampling
- Rejection sampling
- Markov Chain Monte Carlo
- Metropolis-Hastings sampling
- Gibbs sampling
- Probability distributions
- Binomial and multinomial distributions
- Beta and Dirichlet distributions
- Gamma distribution
- Probabilistic programming languages
- Practical example with topic modeling
- Latent Semantic Analysis
- Probabilistic Latent Semantic Analysis
- Latent Dirichlet Allocation
- Non-Parametric topic modelling
- Dirichlet process
- Chinese restaurant process and Stick breaking process
- Non-parametric LDA
- Hyperparameter estimation