机器学习

Machine Learning

## Instructor

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## Course description

课程主要介绍高级机器学习的理论和相关算法；课程内容涵盖经典机器学习方法的回顾、概率图生成模型和概率图判别模型，以机器学习模型的理论分析和算法的应用验证为基础，重点讲述以下内容： （1）课程简介（Course Introduction）； （2）基础知识回顾（Basic ML algorithms review）； （3）支持向量机（Support Vector Machines）； （4）概率话题模型（Probabilistic topic model）； （5）马尔科夫随机场（Markov Random Fields）； （6）非参贝叶斯模型（Non-Parametric Bayesian Learning）； （7）深度学习（Deep Learning）； （8）前沿讲座。 课程要求设计并实现一个高级学习算法，并在验证平台上进行验证。

The course introduces the advanced theory of machine learning and its related algorithms. The course will first review the state-of-the-art machine learning algorithms and the course's content mainly consists of probabilistic generative learning and probabilistic discriminative learning. (1) Course Introduction; (2) Basic ML algorithms review; (3) Support Vector Machines; (4) Probabilistic topic model; (5) Markov Random Fields; (6) Non-Parametric Bayesian Learning; (7) Deep Learning; (8) Future trend.

## Prerequisites

Probabilistics (e.g., likelihood, conditional probability, posterior probability, Bayes).

## Weekly Schedule

| Time | Teaching focus |
|---|---|
| Week 1 | Course Introduction; (3hr) |
| Week 2 | Basic ML algorithms review; (6hr)<br>Invited talk (3hr) |
| Week 3 | Support Vector Machines; (6hr) |
| Week 4 | Probabilistic topic model; (6hr)<br>Invited talk (3hr) |
| Week 5 | Markov Random Fields; (6hr) |
| Week 6 | Non-Parametric Bayesian Learning; (6hr) |
| Week 7 | Deep Learning; (6hr) |

| Time | Teaching focus |
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| Week 8 | Future trend. (3hr) |

## Reference textbook:

Christopher M. Bishop. Pattern Recognition and Machine Learning, Springer, 2007. • Daphne Koller and Nir Friedman. Probabilistic Graphical Models. MIT Press, 2009 • Michael I. Jordan. An Introduction to Probabilistic Graphical Models. University of California, Berkeley. June 30, 2003. • Trevor Hastie, Robert Tibshirani, Jerome Friedman. Elements of Statistical Learning. Springer, 2003.