

CS 6140 Machine Learning

Northeastern University, Fall 2018

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Course Syllabus

Tuesday, Friday 9:50 am - 11:30 am Behrakis Health Sciences Cntr 320

Description Machine learning is at the heart of many advances and new applications in science and technology: from self-driving cars, machine translation, speech recognition, recommender systems, to understanding the human genome. This course provides a broad introduction to machine learning, data mining, and statistical pattern recognition. The course will focus not only on the theoretical underpinnings of learning techniques, but also on the practical know-how needed to effectively apply these techniques to new problems. The course will also draw from numerous case studies and applications, so that students also learn how to apply learning algorithms to computer vision, text processing, medical informatics, audio, database mining, and other areas.

- 28 lectures
- 4 homeworks: ($10\% \times 4$)
- 1 Kaggle mini-project (20%)
- 1 final project (40%)

Schedule

Administrative

- Fri., Sep. 7 administrative and basics (linear algebra, calculus)

Supervised Learning

- Tue., Sep. 11 linear regression, bias-variance trade-off
- Fri., Sep. 14 logistic regression, naive Bayes, perceptron
- Tue., Sep. 18 support vector machine, learning theory
- Fri., Sep. 21 ML practice: over-fitting, regularization, feature selection
- Tue., Sep. 25 decision trees, bagging, random forests
- Fri., Sep. 28 boosting, ensemble learning

Deep Learning

- Tue., Oct. 2 deep learning basics

- Fri., Oct. 5 neural network architectures
- Tue., Oct. 9 recent applications of deep learning
- Fri., Oct. 12 ML practice: optimization techniques, dropout regularization, adversarial examples

Mid-term week: no class

- Tue., Oct. 16 mid-term week
- Fri., Oct. 19 mid-term week

Unsupervised Learning

- Tue., Oct. 23 clustering, k-means, PCA
- Fri., Oct. 26 matrix and tensor factorization
- Tue., Oct. 30 latent variable models, Expectation-Maximization
- Fri., Nov. 2 topic models, hidden Markov models
- Tue., Nov. 6 Gaussian processes, kernel methods
- Fri., Nov. 9 ML practice: loss function, evaluation metrics
- Tue., Nov. 13 deep generative models
- Fri., Nov. 16 Generative Adversarial Networks (GANs)

Reinforcement Learning

- Tue., Nov. 20 MDP, Bellman equation
- Fri., Nov. 23 value iteration and policy iteration
- Tue., Nov. 27 optimal control, LQR, LQG
- Fri., Nov. 30 value function approximation, Q-learning
- Tue., Dec. 4 deep reinforcement learning, applications

Final Evaluation

- Fri., Dec. 7 Kaggle competition presentation
- Tue., Dec. 11 project poster day
- Fri., Dec. 14 final write up due

Mini-project

Final project