

Machine Learning

Catalog description:

We define **Machine Learning** as a set of methods that can automatically detect patterns in data, and then uses the uncovered patterns to predict future data, or to perform other kinds of decision making under uncertainty (such as planned how to collect more data!)

The *Visual C# programming language* will also be introduced. Two lecture hours per week.

Objectives:

- Be able to formulate machine learning problems corresponding to different applications.
- Understand a range of machine learning algorithms along with their strengths and weaknesses.
- Understand the basic theory underlying machine learning.
- Be able to apply machine learning algorithms to solve problems of moderate complexity.
- Be able to read current research papers and understand the issues raised by current research.

Topics:

This course provides a broad introduction to machine learning and data mining. Topics include:

- Supervised learning (discriminative /generative learning, neural networks, support vector machines);
- Unsupervised learning (clustering, dimensionality reduction);
- Learning theory (bias/variance tradeoffs; VC theory; large margins);
- Ensemble learning (bagging, boosting).
- Sequential learning problems and algorithms.
- Lectures will discuss general issues in these topics and well-established algorithms, both from a computational aspect (how to compute the answer) and a statistical aspect (how to ensure that future predictions are accurate).

*Periodic written homework assignments will be given, including reports on assigned reading in books and journals. **Oral presentations** on selected topics may also be required, and **Project***

***Evaluation methods:** (Midterm exams, assignments, project, and obligation)*

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