

# Signal and Image Processing

## Data Mining



*The METEOR provides a training in the fundamental concepts of Machine Learning. This field is concerned with the automatic discovery of regularities in data through the use of computer algorithms. As data sources proliferate along with the computing power to process them, going straight to the data is one of the most straightforward ways to quickly gain insights and make predictions. Machine learning is gaining increasing importance in the dawn of what is now usually called the Big Data era.*

### Theory

by C. RICHARD, R. FLAMARY

The goal of machine learning is to train computers with example data or past experience to solve a given problem. Many successful applications of machine learning exist already, including systems that analyze customer behavior or predict stock prices, that train robots so that they can automatically complete complex tasks, and that extract knowledge from bioinformatics data.

This class is about the fundamental concepts of learning from data. Our intent is to detect and exploit a possible hidden structure and regularity patterns associated with the data generation mechanism. This information helps our analysis and understanding of the nature of the data, which can be used to make predictions for the future. Besides modeling the underlying structure, a direction of significant interest in machine learning is to develop efficient algorithms for designing the models and also for analysis and prediction. Machine learning is gaining importance in the dawn of what we call the Big Data era, when one has to deal with massive amounts of data which may be represented in spaces of very large dimensionality. Analyzing data

for such applications is computationally demanding and needs the algorithms to be efficient, and at the same time robust in their performance because some of these data are contaminated with large noise and also, in some cases, the data may have missing values.

Machine Learning is a first-class ticket to the most exciting careers in data analysis today. Indeed, as data sources proliferate along with the computing power to process them, going straight to the data is one of the most straightforward ways to quickly gain insights and make predictions.



### Road map

by C. RICHARD, R. FLAMARY

In order to present a unified treatment of machine learning problems and solutions, the METEOR discusses many methods from different fields, including statistics, pattern recognition, neural networks, signal processing, control and data mining. All learning algorithms are explained so that the student can move from the equations to a computer program. The METEOR covers topics as supervised and unsupervised learning, Bayesian decision theory, parametric methods, multivariate methods, multilayer perceptrons, local models, comparing classification algorithms, and reinforcement learning.

### See also

MAUCA courses FC1.6 (Signal/image processing) and FC2.2 (Statistical methods), Data Mining.

C. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.

S. Theodoridis, *Machine Learning*, Academic Press, 2015.

### Contact

☎ +33-4-92-07-63-94 (supervisor)

✉ [cedric.richard@unice.fr](mailto:cedric.richard@unice.fr)

✉ [remi.flamary@unice.fr](mailto:remi.flamary@unice.fr)