

Course Descriptions Master 2020-2021

Course Title Machine Learning
 Course Code EBC4257
 ECTS Credits 6,5
 Assessment Whole/Half Grades

Period	Start	End	Mon	Tue	Wed	Thu	Fri
5	12-4-2021	28-5-2021	X		X		

Level Advanced
 Coordinator Rui Jorge De Almeida e Santos Nogueira For more information:rj.almeida@maastrichtuniversity.nl
 Language of instruction

Goals This course provides an introduction to the fundamental methods of machine learning and statistical pattern recognition. This course will cover both theoretical foundations as well as implementation of these methods in real world finance and economic applications. In addition, this course will also help in developing skills to assess such methods critically and adapt them to suit the particularities of different problems.

Description PLEASE NOTE THAT THE INFORMATION ABOUT THE TEACHING AND ASSESSMENT METHOD(S) USED IN THIS COURSE IS WITH RESERVATION. THE INFORMATION PROVIDED HERE IS BASED ON THE COURSE SETUP PRIOR TO THE CORONAVIRUS CRISIS. AS A CONSEQUENCE OF THE CRISIS, COURSE COORDINATORS MAY BE FORCED TO CHANGE THE TEACHING AND ASSESSMENT METHODS USED. THE MOST UP-TO-DATE INFORMATION ABOUT THE TEACHING/ASSESSMENT METHOD(S) WILL BE AVAILABLE IN THE COURSE SYLLABUS. In this course we cover several machine learning algorithms. We will discuss theoretical properties of the methods, their practical implementation using a suitable programming language (e.g. Python). This course relates to several application areas where business problems are supported using systematic data analysis. Examples of applications are operations, manufacturing, supply-chain management, customer behavior modeling, marketing campaign performance, workflow procedures, finance and economic applications. Despite the wide applicability, this course will focus mostly on real world finance and economic applications. This course will offer a new perspective of data driven modelling, build upon and complement knowledge developed in econometrics and operations research courses. Possible topics include: supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, auto-encoders, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance trade-offs; Vapnik–Chervonenkis theory); reinforcement learning, text analytics (bags of words, topic modelling, entity recognition), ensemble of methods (boosting, bagging, stacking) and bio-inspired heuristics for optimization (genetic algorithms, ants and bees colony optimization).

The course will consist of lectures, in which the methods and theory are introduced, and tutorials, in which groups of students present specific papers on the subject. Students also have to write a paper for which they implement and apply the methods to economic problems.

Literature Hastie, T., R. Tibshirani and J. Friedman (2009). The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2nd Ed). Freely available at <http://statweb.stanford.edu/~tibs/ElemStatLearn/>.

Selected papers and book chapters (to be announced on the course website).

Prerequisites Students need to have solid background in probability theory, mathematical statistics, econometric methods and time series analysis, comparable to the knowledge obtained during the econometric courses of the bachelor programme Econometrics and Operations Research. In addition, students should have solid foundations with programming languages such as Python, R, Java or C#, using procedural, functions or objec-oriented paradigms.

Keywords
 Teaching methods PBL / Lecture
 Assessment methods Final Paper / Participation

Evaluation in previous academic year For the complete evaluation of this course please click <http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM>

This course belongs to the following programme / specialisation Master Econometrics and Operations Research Elective Course(s)