Course Descriptions None 2023-2024

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

Period

Period	Start	End	Mon	Tue	Wed	Thu	Fri
5	15-4-2024	7-6-2024	X			X	

Level	Advanced
Coordinator	Rui Jorge De Almeida e Santos Nogueira For more information:rj.almeida@maastrichtuniversity.nl
Language of instruction	English
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	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 Business Research - No specialisation	Year 2 Methodology Elective(s)
Master Business Research - Operations Research	Elective Course(s)
Master Econometrics and Operations Research	E&OR Electives
Master Economic and Financial Research - Econometrics	Elective Course(s)
Master Economic and Financial Research - No specialisation	Elective Course(s)