

Machine learning

Course title - Intitulé du cours	Machine Learning/Apprentissage automatique
Level / Semester - Niveau / semestre	M2 / S1
School - Composante	Toulouse School of Economics/ Ecole d'Economie de Toulouse
Teacher - Enseignant responsable	Thierry MAGNAC
Lecture Hours - Volume Horaire CM	15
TA Hours - Volume horaire TD	0
TP Hours - Volume horaire TP	6
Course Language - Langue du cours	English/Anglais
TA and/or TP Language - Langue des TD et/ou TP	English/Anglais

Teaching staff contacts – Coordonnées de l'équipe pédagogique :

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Course Objectives – Objectifs du cours :

The main goal of the course is to familiarize students with machine learning methods for quantitative and qualitative prediction (regression and classification). Both supervised and non-supervised methods will be studied.

Content of the course: Overview, Lasso and Ridge Regression, Trees, Random forests and Boosting, Neural Networks, Support-Vector Machines, Principal Component Analysis.

Content of the tutorial sessions: computer classes in which empirical applications are worked out using R.

Prerequisites – Pré requis:

Econometrics of the linear model and discrete variables.

Grading system – Modalités d'évaluation:

Assessment:

- 50% Empirical or Simulation home exam
- 50% Oral presentation

+ Bonus for participation in classes

Bibliography/references – Bibliographie/références :

- Susan Athey and Guido Imbens, Machine Learning Methods Economists should know about, Working paper, 019.
- James, G., D. Witten, T. Hastie, and R. Tibshirani, An Introduction to Statistical Learning, Springer, 2013.
- Efron, B. and T. Hastie, Computer Age Statistical Inference, Cambridge University Press, 2016
- Hastie, T., R. Tibshirani, and J. Friedman, The Elements of Statistical Learning, Springer, 2016
- Chernozhukov, V., Hansen, C., Kallus, N., Spindler, M., & Syrgkanis, V., 2024. Applied causal inference powered by ML and AI. arXiv preprint arXiv:2403.02467.

Session planning – Planification des séances

Distance learning can be provided when necessary by implementing, for example: / En cas de nécessité, un enseignement à distance sera assuré en mobilisant:

- Interactive virtual classrooms / Classe en ligne interactive
- MCQ tests and other online exercises and assignments / QCM et exercices en ligne

- Remote (online) tutorials (classes) / TP/TD à distance