Machine learning, big data and quantitative spatial analysis

Level: 2nd year of Master - Master 2
Curriculum: Data Science and Innovation Management - Political Engineering
Semester: 1st semesterHours: 12 hours of lectures, including hands-on practice
Lecturer: Jean-Philippe PEYRACHE
Contact: jean.philippe.peyrache@univ-st-etienne.fr

Course objective:
The aims of the course are to provide students with the essential understanding of the field of Macine Learning, and to familiarize them with different families of algorithms. The course will then focus on supervised learning in classification tasks, in order to develop the theoretical framework and the difficulties that can limit the success of these approaches.

Course outline:
Introduction to Machine Learning: principle, use cases and different approaches
The question of data: differences in distribution, difficulties and dimensionalitySupervised learning: theoretical framework and basic algorithms
Decision trees and random forests (ensemblistic methods)
Linear models and introduction to deep learning

Skills developed:
Students will develop the following skills at the end of the course:
- General understanding of Machine Learning issues, their usefulness and limitations
- Knowledge of the theoretical framework of supervised learning
- Knowledge of the strengths and weaknesses of different classification algorithms in a supervised learning framework, and ability to implement them on datasets.

Evaluation method:
Report on a practical implementation of several algorithms on selected problems.

Prerequisites (to be mentioned only if applicable):
Basic knowledge of the Python language and a working environment using Python and the Scikit-learn library.

Bibliography / reference:
On learning theory
Vladimir Vapnik. Statistical learning theory. Wiley, 1998.
- Leslie G. Valiant. A Theory of the Learnable. Commun. ACM, vol. 27, no. 11, pages 1134-1142, 1984.
- Antoine Cornuéjols & Laurent Miclet. Artificial learning: concepts and algorithms. 2010

About the Scikit-Learn Python library:
- https://scikit-learn.org/stable/index.html