Machine Learning

Course level: Master

Course instructors: Marc Sebban (Professor - UJM, Saint- Etienne ) and Amaury Habrard (Professor - UJM, Saint- Etienne)

Education period: 2nd semester

Language of instruction: English

Expected prior-knowledge: basic mathematics and statistics – convex optimization

Aim and learning outcomes:
This course gives a general introduction to Machine Learning, from algorithms to theoretical aspects in Statistical Learning Theory.

Topics to be taught (may be modified) ~20h of lectures + 20h of lab sessions.

- General introduction to Machine Learning: learning settings, curse of dimensionality, overfitting/underfitting, etc.
- Overview of Supervised Learning Theory: True risk versus empirical risk, loss functions, regularization, bias/variance trade-off, complexity measures, generalization bounds.
- Linear/Logistic/Polynomial Regression: batch/stochastic gradient descent, closed-form solution.
- Sparsity in Convex Optimization
- Support Vector Machines: large margin, primal problem, dual problem, kernelization, etc.
- Neural Networks, Deep Learning
- Theory of boosting: Ensemble methods, Adaboost, theoretical guarantees
- Non-parametric Methods (K-Nearest-Neighbors)
- Domain Adaptation
- Metric Learning

Teaching methods: Lectures and Lab sessions.

Form(s) of Assessment: written exam (50%) and project (50%)

Literature and study materials:

- Pattern Recognition and Machine Learning, M. Bishop, 2013
- On-line Machine Learning courses: https://www.coursera.org/

Additional information:
Marc Sebban and Amaury Habrard
Hubert Curien Laboratory – UMR CNRS 5516 - University Jean Monnet, Saint- Etienne
E-mail: marc.sebban@univ-st-etienne.fr and amaury.habrard@univ-st-etienne.fr