Machine learning for finance

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**Remarque**
MA3 only

**Summary**
The objective of this course is to introduce machine learning techniques for financial applications such as derivatives pricing, model calibration, portfolio allocation and hedging, investment decision, and risk-management. The course focuses on neural network models with Tensorflow and Keras.

**Content**

**Machine Learning**
- Introduction to machine learning
- Neural network models and deep learning
- Reinforcement learning
- Natural language processing

**Applications**
- Predictive analytics
- Model pricing and calibration
- Scenario generation and stress-testing
- Anomaly detection
- Time series modeling
- Portfolio allocation and hedging
- Textual analysis

**Keywords**

Machine learning, data analytics, financial derivatives, risk-management, portfolio strategy, textual analysis

**Learning Prerequisites**

**Recommended courses**
- Introduction to finance
• Econometrics
• Derivatives
• Advanced derivatives
• Investments

Important concepts to start the course
• Programming knowledge of R or Python required
• Basic Probability and Statistics knowledge
• Some knowledge of finance and financial derivatives

Learning Outcomes
By the end of the course, the student must be able to:
• Describe the principal types of machine learning algorithms
• Implement quality code in Tensorflow
• Assess / Evaluate an algorithm performance
• Identify what methods to use for a given financial problem
• Optimize the evaluation of standard pricing and calibration methods
• Solve numerically complex dynamic control problems in finance
• Construct flexible models for financial predictions and stress-testing
• Investigate textual data with algorithms

Transversal skills
• Plan and carry out activities in a way which makes optimal use of available time and other resources.
• Use a work methodology appropriate to the task.
• Evaluate one’s own performance in the team, receive and respond appropriately to feedback.

Teaching methods
Lectures and programming sessions

Assessment methods
• 100% group project

Supervision
Office hours  No
Assistants  No
Forum  Yes
Others  Sykpe call