# Machine learning for finance

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<table>
<thead>
<tr>
<th>Cursus</th>
<th>Sem.</th>
<th>Type</th>
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<tbody>
<tr>
<td>Ing. finance</td>
<td>MA1, MA3</td>
<td>Opt.</td>
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<table>
<thead>
<tr>
<th>Language</th>
<th>English</th>
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<tbody>
<tr>
<td>Credits</td>
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<tr>
<td>Session</td>
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<td>Semester</td>
<td>Fall</td>
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<td>Exam</td>
<td>Written</td>
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<tr>
<td>Weeks</td>
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<tr>
<td>Hours</td>
<td>2 weekly</td>
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<tr>
<td>Lecture</td>
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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
• 10% class participation
• 90% group project

Supervision
Office hours  No
Assistants    No
Forum         Yes
Others        Sykpe call