FIN-407

Machine learning in finance

Malamud Semyon

Cursus	Sem.	Type
Financial engineering minor	E	Opt.
Financial engineering	MA2, MA4	Obl.

Language of teaching	English
Credits	6
Session	Summer
Semester	Spring
Exam	Written
Workload	180h
Weeks	14
Hours	**5 weekly**
Courses	3 weekly
Exercises	2 weekly
Number of positions	

Summary

This course aims to give an introduction to the application of machine learning to finance, focusing on the problems of portfolio optimization and hedging, as well as textual analysis. A particular focus will be on deep learning and the practical details of applying deep learning models to financial

Content

1- Introduction to machine learning in finance
- Goals of machine learning
- Applications of machine learning
- Optimizaing algorithms and Inductive Biases

2- Neural Networks
- Kernel Methods and Feature Learning
- Feedforward networks
- Recurrent Neural Networks
- Transformers

3- Supervised learning
- Regression
- Portfolio Optimization
- Applications to asset pricing and forecasting

5- Introduction to Natural Language Processing
- Text representation and Embeddings
- Sentiment analysis
- Topic modelling
- Large Language Models

Keywords

Machine Learning, Deep Learning, NLP

Learning Prerequisites

Required courses

Introduction to Econometrics

Recommended courses

Introduction to finance

Important concepts to start the course

Basic linear algebra.
Basic probabilistic and statistical concepts.

Learning Outcomes

By the end of the course, the student must be able to:

- Elaborate a machine learning algorithm
- Assess / Evaluate the performance of different models
- Formulate hypotheses behind different models
- Propose optimal methods for problems seen
- Optimize techniques / algorithms used
- Construct a parsimonious model
- Implement machine learning algorithms
- Exploit information contained in data

Transversal skills

- Give feedback (critique) in an appropriate fashion.
- Demonstrate the capacity for critical thinking
- Use a work methodology appropriate to the task.

Teaching methods

Lectures and exercise sessions
Projects

Expected student activities

- Participate in lectures
- Participate in exercises sessions
- Solve the problem sets
- Work on a project
- Write a final exam

Assessment methods

0.4 *Project report + 0.2 * homework + 0.4 * Exam

Supervision

Assistants	Yes

Resources

Bibliography

Dixon M. F, Halperin I. and Bilokon P. (2020): "Machine Learning in Finance", Springer

Ressources en bibliothèque

- Machine Learning in Finance / Dixon

Moodle Link

- https://go.epfl.ch/FIN-407

Prerequisite for

- Courses using statistical dynamic models