

FIN-622

**Big Data and Machine Learning for Financial Economics**

Malamud Semyon

Cursus	Sem.	Type
Finance		Opt.
Mathematics		Obl.

Language of teaching	English
Credits	3
Session	
Exam	Written
Workload	90h
<b>Hours</b>	<b>64</b>
Courses	24
Exercises	40
<b>Number of positions</b>	

**Remark**

If you would like to attend this course, please send an email to: [edfi@epfl.ch](mailto:edfi@epfl.ch) to register

**Summary**

This class is an introduction to Machine Learning and High Dimensional Statistics in Finance. We start with purely empirical approach, focusing first on high dimensional regressions then moving to kernel methods and deep learning, and then study equilibrium models.

**Content**

This class is an introduction to Machine Learning and High Dimensional Statistics in Finance. We start with purely empirical approach, focusing first on high dimensional regressions and the ideas of over-parametrization and over-fitting. We then discuss the role of non-linearities, inductive biases, and ways to think and model non-linear structures in financial markets and economic systems.

We then move to kernel methods and deep learning, and then investigate equilibrium models in economies populated agents that are aware of the statistical complexity on the underlying systems: The fact that we do not have enough observations to make efficient inference. We show how "complexity corrections" emerge in every single statistical test and every single economic model, and that these corrections have first order effects on equilibrium dynamics. Studying such complex models requires a new form of calculus: Just like Ito calculus is necessary to study models in continuous time, this new calculus is necessary to study models with a lot of variables / shocks and lot of non-linearities. Here is list of topics we will cover:

- Understand and apply modern methods for big data models with many predictors and factors.
- Understand and apply big data models and neural networks, and the role of complexity corrections and limits to learning.
- Construct high-dimensional factor models for the cross-section of returns and economic time series and develop an efficient, theory-based way of optimally incorporating high-dimensional information into portfolio construction and economic factor analysis.
- Understand how to develop equilibrium models in the presence of statistical complexity.
- Understand the role of trading costs, price impact, and the nature of shock propagation in economic systems through the lens of machine learning

**Assessment methods**

Written Exam

**Resources****Moodle Link**

- <https://go.epfl.ch/FIN-622>