UCLouvain

# llsms2138

*2023*

# Big data in finance

| 5.00 credits | 30.0 h | Q2 |
|---|---|---|

| | |
|---|---|
| Teacher(s) | Lassance Nathan ; |
| Language : | English |
| Place of the course | Louvain-la-Neuve |
| Prerequisites | • This course is reserved for students with a bachelor's degree in business engineering ("ingénieur de gestion"), who have the proper background in probability, statistics, econometrics and finance.<br>Students with equivalent quantitative method skills who wish to enroll in this course should refer to the following courses as the assumed prerequisites:<br>• LINGE1113 Probabilités<br>• LINGE1114 Mathématiques: analyse<br>• LINGE1121 Mathématiques: algèbre et calcul matriciel<br>• LINGE1214 Statistiques approfondies<br>• LINGE1222 Analyse statistique multivariée (very relevant)<br>• LINGE1221 Econométrie<br>• LINGE1315 Finance<br><br>LLSMS2013 Investments (very relevant) |
| Main themes | The course will cover important developments in the fields of statistical learning, machine learning and big data. These interrelated fields provide statistical models to learn structure from high-dimensional data and make accurate predictions.<br>**<u>The course is divided in four sections:</u>**<br><br>1. Robust linear regression<br>2. Principal and independent component analysis<br>3. Bayesian estimation<br>4. Ensemble learning<br>For each section, we will see state-of-the-art applications in portfolio selection (investment strategies), based on recent scientific papers. The students will see why portfolio theory, covered in the Q1 course LLSMS2013 "Investments", leads to disappointing investment performance in practice when it is naively applied, and how the methods seen in the course help to make portfolio theory work in practice. |
| Learning outcomes | **At the end of this learning unit, the student is able to :**<br><br>***By the end of the course, the student will have mainly developed the following elements of the « référenciel de compétence » of the Louvain School of Management.***<br>**<u>From the lectures</u>:**<br>2. Maîtriser des savoirs,<br>1 3. Appliquer une démarche scientifique.<br>**<u>From the group assignment</u> :**<br>6. Travailler en équipe et en exercer le leadership,<br>7. Gérer un projet,<br>8. Communiquer. |
| Evaluation methods | Final exam in session + group assignment |
| Teaching methods | Lectures + group assignment |
| Content | This course covers theoretical and practical concepts related to:<br><br>1. Robust linear regression:<br>Reminder on linear regression, bias-variance tradeoff, subset selection and cross-validation, shrinkage methods, the case of big data, refresher on portfolio theory, two portfolio-selection papers as application<br><br>1. Principal and independent component analysis:<br>PCA, choosing the number of factors, sparse PCA, Stein's estimator, ICA, FastICA algorithm, two portfolio-selection papers as application<br><br>1. Bayesian estimation: |

| | |
|---|---|
| | Bayesian versus maximum-likelihood estimation, conjugate priors, bayesian interpretation of robust linear regression and portfolio selection, one portfolio-selection paper as application |
| Faculty or entity in charge | CLSM |

## Programmes containing this learning unit (UE)

| Program title | Acronym | Credits | Prerequisite | Learning outcomes |
|---|---|---|---|---|
| Master [120] in Actuarial Science | ACTU2M | 5 | | |
| Master [120] : Business Engineering | INGE2M | 5 | | |
| Master [120] : Business Engineering | INGM2M | 5 | | |