Libelle english

MATHÉMATIQUES ET INGÉNIERIE DU RISQUE

MATHEMATICS AND RISK ANALYSIS

Lecturers: Marie-Christophette BLANCHET

| Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The third year specialization « Applied mathematics and risk engineering » is devoted to mathematical modeling and numerical simulation of problems arising in engineering.Students study a wide range of stochastic and deterministic methods concerning ordinary and partial differential equa-tions, optimization problems, discrete and time-continuous stochastic processes, statistics., together with the associated numerical methods.Opportunity is given to the best students to complete their formation with a master degree in one of the three following fields : applied mathematics, fInance / insurance, biomathematics / biostatistics.

Keywords :

Programme

Learning outcomes

- Up to date mathematical technics
- Tools for scientific monitoring
- Necessary background for an applied mathematics PhD

Independent study

Objectifs :

Méhodes :

Core texts

Assessment

ADVANCED TOOLS FOR LEARNING : WHEN CONVEXITY MEETS SPARSITY

PRACTICAL MATHEMATICS

Lecturers: Céline HARTWEG-HELBERT, Yohann DE CASTRO

| Lecturers : 15.0 | TC : 15.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : AN

Objectives

Sparsity and convexity are ubiquitous notions in Machine Learning and Statistics. In this course, we study the mathematical foundations of some powerful methods based on convex relaxation: L1-regularisation techniques in Statistics and Signal Processing; Nuclear Norm minimization in Matrix Completion. These approaches turned to be Semi-Definite representable (SDP) and hence tractable in practice. The theoretical part of the course will focus on the guarantees of these algorithms under the sparsity assumption. The practical part of this course will present the standard solvers of these learning problems.

Keywords : L1-regularization; Matrix Completion; Semi-Definite Programming; Proximal methods;

Programme

Learning outcomes

Independent study

Objectifs :

Méhodes :

Core texts

Christophe Giraud, *INTRODUCTION TO HIGH-DIMENSIONAL STATISTICS*, Chapman and Hall/CRC
Martin J. Wainwright *HIGH-DIMENSIONAL STATISTICS: A NON-ASYMPTOTIC VIEWPOINT*, Cambridge University Press
Simon Foucart and Holger Rauhut*A MATHEMATICAL INTRODUCTION TO COMPRESSIVE SENSING*

Assessment

INTRODUCTION AUX MATHÉMATIQUES FINANCIÈRES

INTRODUCTION TO MATHEMATICAL FINANCE

Lecturers: Marie-Christophette BLANCHET, Elisabeth MIRONESCU

| Lecturers : 14.0 | TC : 4.0 | PW : 0.0 | Autonomy : 0.0 | Study : 12.0 | Project : 0.0 | Language : FR

Objectives

This course presents in detail the classical models used in mathematical finance in discret and continuous times. It includes three sessions of numerical implementation. It is based on the Stochastics Processes course (MOD) given during the first part of the year.

Keywords : Mathematical finance, Cox-Ross-Rubinstein model, Black-Scholes model, stochastic calculus, pricing and hedging options.

Programme

Cox-Ross- Rubinstein model
Black-Scholes model and some extensions

Learning outcomes

Independent study

Objectifs :

Méhodes :

Core texts

Damien Lamberton et Bernard Lapeyre, *INTRODUCTION AU CALCUL STOCHASTIQUE APPLIQUÉ À LA FINANCE*, Ellipses, 1997
Peter Tannkov et Nizar Touzi *CALCUL STOCHASTIQUE ET FINANCE (EN ANGLAIS)*, http://www.cmap.polytechnique.fr/~touzi/Poly-MAP552.pdf, 2018
Damien Lamberton and Bernard Lapeyre*INTRODUCTION TO STOCHASTIC CALCULUS APPLIED TO FINANCE.* , Chapman and Hall 2nd Edition, 2008

Assessment

3 practical work sessions
1 written exam

PROBLÈMES INVERSES ET IMAGERIE

INTRODUCTION TO INVERSE PROBLEMS

Lecturers: Abdel-Malek ZINE, Laurent SEPPECHER

| Lecturers : 20.0 | TC : 2.0 | PW : 0.0 | Autonomy : 0.0 | Study : 8.0 | Project : 0.0 | Language : FR

Objectives

Keywords :

Programme

Learning outcomes

Independent study

Objectifs :

Méhodes :

Core texts

Assessment

PROJET IM

PROJET IM

Lecturers: **Marie-Christophette BLANCHET**

| Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 8 | Project : 50 | Language : FR

Objectives

Through this project, students will identify mathematical problems/ barriers, propose solutions and implement them. They will also improve their communication skills to present the results (in written and oral forms).

Keywords : Modelization, Analysis, Simulations.

Programme

Learning outcomes

- Build a model
- Analyzis of a determnistic or random model
- Use of an appropriated software to perform simulation

Independent study

Objectifs : rite a report, build a presentation.

Méhodes : Group Work, pair work.

Core texts

Assessment

Report and defense