Option Mathématiques et Décision

Modules Spécifiques Option Mathématiques et Décision

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, flnance / 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



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 RauhutA MATHEMATICAL INTRODUCTION TO COMPRESSIVE SENSING



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



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

Filière Aide à la Décision pour l'Entreprise



SIMULATION DE DÉCISIONS OPÉRATIONNELLES

PROCESS SIMULATION

Lecturers: Sylvie MIRA , Emmanuel BOUTLEUX | Lecturers : 12.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 32.0 | Project : 0.0 | Language : FR

Objectives

The main objective is to model information flows within an organization (production system, logistics platform, administration, communication network, ...). Whether designing or analyzing an organization, the evaluation phase is an unavoidable step. Indeed, before making often heavy investments, it is imperative to ensure that the solutions envisaged meet the objectives. This course provides training on both the principles and tools of mathematical analysis and simulation tools for the specification, modeling and evaluation of information flows.

This course will focus on practical applications of Petri nets modeling and event simulation software such as

Keywords : Information flows analysis, operationnal simulation and optimisation





FINANCE ET MARCHÉS

BUSINESS GAME

Lecturers: Sylvie MIRA | Lecturers : 12.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 24.0 | Project : 0.0 | Language : FR

Objectives

The course aims to bring deep insights of commercial and financial key performance indicators and competencies to design decision support tools for financial and commercial strategy

Keywords : key performance indicators, customer relationship management, corporate strategy

Programme

Corporate financeCommercial strategy

Learning	
outcomes	

- Be able to design key performance indicators (KPI)
- Be able to understand KPI to plan actions

Independent study

Objectifs : Group work on KPI for corporate decision making

Méhodes : Case studies

Core texts

Assessment

Case studies



PILOTAGE ET MANAGEMENT

DECISION SUPPORT SYSTEMS

 Lecturers:
 Sylvie MIRA

 | Lecturers : 16.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The course aims to place the students in a situation of decision-making in a company by working on their cognitive process and to give them the keys to designing and implementing management systems.

Keywords : Cognitive process, risks, management

Programme

- Cognitiv process
- Risk / decision anaysis
- Management and dashboard

• Understand cognitive process a • Design a financial dashboard • Assess financial impact of strat	activated in decision making egic decision
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Independent study Objectifs : Work group to understand analysed processes

Méhodes : Case studies

Core texts

SELMER, C., CONCEVOIR LE TABLEAU DE BORD, DUNOD, 2015

Assessment

Case studies



PROJET ADE

PROJECT

 Lecturers:
 Sylvie MIRA

 | Lecturers : 0.0 | TC : 50.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

Keywords :

Programme

Customised program to each project

earning outcomes	 Be able Be able Be able Be able 	e to analyse an company's issue e to collect relevant data from technical aspects, markets and context e to implement a prospectiv anaysis e to communicate clear and justified solutions
ndependent study	Objectifs :	Be able to bring within 3 monts a solution to a company's issue
	Méhodes :	Group work
Core texts		