Centre of Digital Management and Technology Innovation

Complexity that leads to simplicity

Course Assets

2020

Contents

Course outline: Machine Learning

This course will develop basic knowledge and techniques in the various aspects of Machine Learning, Artificial Intelligence, neural networks and deep learning. It will cover the theory behind it paired with practical examples and will walk students through hands-on applications. The course will also include business applications. Students will understand what it takes to integrate and implement machine learning in business and its applications in different fields.

Part 1: Fundamentals

- What is Machine Learning
- Brief History of Machine Learning
- What has changed in recent years
- Some underlying Math
- Supervised Learning Concepts
- Unsupervised Learning Concepts
- Combining Supervised and Unsupervised
- Neural Nets

Part 2: Hands-on Sessions

- Machine Learning Cases
- Model Usage
- Case Studies: Sonnet Insurance, Lemonade Insurance
- Artificial Intelligence for Mortgage Adjudication

Course outline: Deep Learning

This course deals with the development and application of modern neural networks. Deep learning algorithms extract layered high-level representations of data in a way that maximizes performance on a given task. Deep learning is behind many recent advances in AI, including face recognition, Siri's speech recognition, Facebook's tag suggestions and self-driving cars.

The course will be focused on applied deep learning, and will prepare students for a research role in machine learning. It will cover an introductory level of multivariable calculus and linear algebra required for the underlying theory of neural networks, and focus on studying different neural network architectures. Those will include MLPs, convolutional neural networks, RNNs / LSTMs, Transformers, and a brief overview deep reinforcement learning. The course will include hands on programming in PyTorch and how these networks are applied in practical use cases in the industry, with a focus on natural language processing.

Contents

Introduction to Deep Learning. Motivation and high-level introduction. Creating a simple neural network from scratch.

The multilayer perceptron (MLP): architecture, tuning, applications and example. Autoencoders.

Convolutional Neural Networks (CNNs): architecture, tuning, applications and example. Use cases & case studies.

RNNs and Attention. Recurrent Neural Networks (RNNs): architecture, tuning, applications and example. Attention: intuition & types, the transformer model and the BERT model. Use cases & case studies.

Transfer Learning & Applications: other deep learning applications, transfer learning and Deep learning projects / applications: training data, building and tuning algorithms and deployment & refinement.

Recap, Applications & Case StudiesRecap: machine learning "toolbox", how to choose the best approaching two case studies / extended exercises, covering: problem statement, data profiling / exploration, feature engineering, model building and deployment & business considerations. Machine learning teams & business processes / best practices.

Final Project Hackathon: team of 3-4 students will brainstorm, research & lay the high-level plan for their final projects, with assistance from guest machine learning SMEs. Mini-hackathon to set up final project: use case definition, approach, data availability & exploration and deployment & business considerations.

Course outline: Artificial Intelligence

The course aims to develop a variety of topics in AI by covering the theory behind it paired with practical examples. It will walk students through hands-on AI applications using Python as the main programming language and getting students familiar with code depositories such as PyTorch, Github or TensorFlow. The course will also cover the intersection of AI with machine learning and data science, following the business aspects in-depth and walk students through what it takes to integrate AI environments in a business end-to-end, from idea and business case to implementation and deployment.

Contents

- The multilayer perceptron (MLP)
  - Architecture, Tuning, Applications, Example
- Autoencoders
- Convolutional Neural Networks (CNNs)
  - Architecture, Tuning, Applications, Example
  - Use cases & case studies
- Recurrent Neural Networks (RNNs / LSTMs)
- Transformers
- AI and cloud servers
- Natural language processing (NLP)
- Expert Systems: Definition: differences with machine learning . Success of Machine Learning. Applications of Expert systems in AI: design, medical domain, monitoring systems, finance, speech synthesizer systems.etc. Limitations of Expert Systems.

Course outline: Introduction to Quantitative Analysis

In this course, students will gain an understanding of the mathematics and statistics that are used in the business world, with special focus on portfolio management, risk management and corporate finance. The course aims to combine the mathematical and statistical theory with examples where these concepts are used in one of the earlier mentioned areas. Students will be able to use the refreshed and/or acquired mathematical skills in other quantitative classes. Topics covered include statistics, probability and random variable concepts and time valuation of money.

Contents

Statistics

- Introduction
- Frequency distributions
- Mean and variance of a sample
- Correlation theory and possible introduction in linear regression
- Introduction in probability

Probability and random variable concepts

- Probability concepts
- Random variables
- Probability density function - Cumulative density function
- Expected value and variance for random variables
- Conditional expectations
- Distribution examples: Uniform and normal distribution
- Law of large numbers

Time value of money, functions, and measures of change

- Interest rates: Compounding
- Present value and future value
- Cost of carry and forwards/Futures

Course outline: Data Science

This course covers basic techniques of data science for data sets in finite and infinite dimensions.

Contents

- History and Fundamentals. History of Machine Learning, review of linear algebra, statistics and calculus and setting up your data science environment.
- Introduction to Data science. Supervised & unsupervised learning. High level introduction to key algorithms. Data exploration and exploratory data analysis (EDA). Data manipulation / feature engineering and reliance on historical data & bias.
- Probability and statistics
  - Univariate probability and distribution functions; examples
  - Multivariate probability and distribution functions: examples
  - Copulas
- Applications: PageRank of websites
- Exploratory Data Analysis
- Model Formulation
- Goodness of Fit Testing
- Standard and Non-standard Statistical Analysis
- Linear and non- linear Regression
- Analysis of Variance
- Time-series Analysis
- Infinite dimensional data sets:
  - Harmonic analysis of data sets
  - Wavelets
  - Applications: image compression, face recognition
- Data Encryption

Course outline: Introduction to Financial Markets

This course offers an introduction to the financial markets that provides the foundation needed for the study of finance. Learn the differences between stocks, bonds, commodities, futures, derivatives, options, and currencies. Topics include the risks in each financial asset, how markets are related, fundamental versus technical analysis, in a background of current market conditions. The student will explore financial news, market movements, and asked to do projects that reinforce learning.

Fundamentals

Equity Options

- Valuing Forwards
- Options trading strategies
- Option price boundaries
- Put Call parity
- Dynamic hedging
- Binomial pricing
- The Greeks
- Black and Scholes

Bonds

- Duration and other fixed income risk measures
- Definition of swaps and description of the market
- Day count convention
- Eurodollar futures
- Forward rates
- Bootstrapping
- Valuing swaps
- Efficient market model

Portfolio theory: Risk and return

- Correlation, regression and portfolio management

- The efficient frontier
- The security market line, alpha and beta risk
- How to build a well-diversified portfolio

Course outline: BlockChains

This course provides an introduction to the fundamental Blockchain concepts exploring a range of stakeholder perspectives, governance and implementation challenges as the race to adopt begins. First, students from all backgrounds will acquire the knowledge of the core concepts of Blockchain to later be prepared for more advanced and in depth courses. Students will be able to differentiate between Blockchain and Cryptocurrencies and understand the merits of using a Blockchain versus a traditional database. Using case studies, students will acquire the knowledge to implement Blockchain technology in their organizations and businesses.

Contents

Blockchain Basics

- How to leverage blockchain networks
- Core features of blockchain
- What is Trust?
- Consensus Algorithms

Public & Private Chains

Industry Evolution

- Main tools and applications popular in the industry (layer 2s etc, stablecoins)
- Blockchain communities & conflicts
- ICOs & Price of Cryptos

Regulatory Impact

- Legal
- Policy

Financial Services

- Cross Border work & Trade Rules
- User identities & efficiencies

Supply Chain: Tracking of goods & audit cycle

Entertainment: Contract management and entity

Commodity Trading: Use of blockchain in asset trading and verification

Course outline: Practical Mathematical Modelling

From landing a man on the moon, to better predicting financial markets, to winning elections, to eradicating smallpox, an argument can be made that nearly all of mankind's most significant contemporary achievements and advances have been realized thanks to the mathematical modelling behind each endeavour.

We will motivate the characterization of mathematical modelling as the discipline which combines expertise with creativity via mathematical formalism. To advocate for this characterization, this course will survey a number of mathematical models developed which are of practical interest. The breadth of applications and types of models surveyed will teach you how to create your own models, and derive unexpected findings from your models.

All necessary mathematics will be developed in parallel with the models, as will any necessary background in each application.

Part 1: Fundamentals

- What is Mathematical Modelling
- Brief History of Mathematical Modelling
- What has changed in recent years
- Game Theory, Statistics, Calculus, & Analysis
- Physical Systems: Biology, Physics, Astronomy, Chemistry, & Pharmacology
- Social Systems: Finance, Politics, Sociology, Economics, Psychology, &
- Model Extraction Techniques using Big & Small Data

Part 2: Hands-on Sessions

- The Steps of Building a Model: Research => Prototype => Experiment
- Model Usage: Simulations & Visualizations

Course outline: Cyber Security

This course deals with the basic concepts behind modern cybersecurity theory and basic techniques for optimizing security on personal computers and small networks.

Contents

Definition of the different types of security from a computer systems perspective: CyberSecurity, email security and physical security

Practices: passwords, firewalls, account controls, file privacy, etc.

Dealing with user account on computer networks

Encryption fundamentals

File backup techniques

Describe computer log entries to identify potential security issues

Differentiate between various security threats and computer attacks

Techniques to provide basic protection of a small computer and/or small networks

Incident response techniques: regulation and implementation

Specific situations:

- wireless networks
- could services

Course outline: Communication and business skills

This course will cover a number of principles and techniques for an efficient communication practice. The focus will include verbal and non-verbal techniques, drawing from concrete examples. Topics discussed include opening and closing considerations, the use of the pause and word selection, the efficient use of questions, presence and physical communication elements. This course will present the basic concepts of behavioural science to develop a framework of principles on which notions are based.

The course will use considerable audio-visual material.

Part 1: Fundamentals

- Communication skills fundamentals
  - Verbal skills, basic 80/20 rules
  - Non-verbal skills
- Thinking fast, thinking slow
  - “Words, music, dance”
  - Logical vs. intuitive thinking
- Leadership fundamentals

Part 2: Hands-on Sessions

- Short individual presentations, followed by comments and critique
- Group sessions to experience group dynamics

Course outline: Business Intelligence

Part 1: Theory

- What is BI, why BI is important now, what is BI work flow.
- How banks and other industries use them with examples
- Understand data architecture
- What is advanced analytics, what are the challenges to display them in BI tools.
- Introduction to EasyMorph software, a data preparation and automation (ETL) tool without coding expertise, only need to drag/drop icons. With in-app real-time demonstration. (Students can download the free version of software on the spot within 2 mins)
- Introduction to major BI service providers in the market, and their differences: major BI tools, with in-app real-time navigation within BI tools including drag/drop data source files, set up visualizations, define dimensions and measurements
- Basic rules of choosing visualizations, explaining different types of visualizations and analysis. What are the best ways to present multi-dimensional datasets, how to keep your data dynamic, why color is important, in-app real-time demonstration with examples, showing both of user perspective and developer perspective
- Geographic analysis (most trending one recently)
- Introduction to Advanced Analytics with Qlik and R Integration, without coding experiences, how to do analysis in forecasting area and clustering area.

Part 2: Hands-on Session:

- Register Qlik account and download Qlik free desktop version
- Download EasyMorph, download datasets, create first visualizations
- Create filters, KPI, pie chart, pivot table, line chart, scatter plots, heat maps
- Make dynamic colors to make analytics meaningful
- Install R-studio, make first service call (optional)
- Advanced Analytics with R (optional)

Course outline: Academic English

This course utilizes the same breakdown components as any English exam, which are reading, writing, listening, and speaking, with special emphasis on listening and speaking. More specifically, this course will provide students with a scientific or engineering background an opportunity to meet the language facility requirements to prepare for any language test as well as build the confidence needed to excel in a western academic environment.

We will read several major works of literature and examine how these texts relate to cultural ideas and practices associated with their country of origin. This will help students focus, polish, and deepen their writing as well as their presentation skills. This is a project-based learning environment to fully integrate a communal opportunity for all students equally, to help each other and work together to dominate the speaking and listening of the English language.

Objectives:

1) Produce complex and well-developed pieces of writing
2) Build students' academic speaking, listening, reading, and writing skills
3) Interact in an academic setting with confidence
4) Develop communication skills necessary for academic success
5) Demonstrate knowledge of university culture;
6) Develop strategies for delivering technical information such as engineering topics to non-technical readers;
7) Students will gain experience in thinking critically about the relationship of an array of topics, while perfecting all other skills;
8) As a Foundations course, this course is designed to help students develop foundational academic skills for university-level studies. We will therefore focus on improving the following: reading comprehension, writing clear, logical and persuasive academic prose; participating constructively and collaboratively in discussion and debate. Other skills to be developed include: time-management; note-taking on readings and lectures; preparation of essays; planning for exams; dealing with academic culture.

Course outline: Linear Algebra

Introduction to vector spaces and its application to geometry.

Matrices, trace and determinant

Diagonalization of a quadratic form.

Eigenvalues and Eigenvectors.

Dimension reduction.

Scalar products and orthogonal projections.

Course outline: Advanced Calculus

Differential calculus: norms and continuity.

Derivatives.

Lagrange multipliers.

Critical points.

The Taylor formula.

Improper Integration

Fourier transform and Green' formula.

Course outline: Probability

Probability spaces.

Conditional and unconditional probability.

Expectation and variance.

Probability distributions

Particular emphasis on the one-dimensional , bi-dimensional and multidimensional Gaussian distribution.

Study of marginalization and factor analysis.

Special understanding of the Central Limit Theorem.

Course outline: Statistics

We study the time series characteristics, determining the model that best describes the structure of observed data. We explain the multivariate time series, the interaction and the forecast of the future values of the series. This course offers the introduction to the ARMA and ARIMA models. The ARMA model is a merge between autoregressive (AR) and moving average (MA) models; aims at predicting future values of the time series. The ARIMA models are generalized ARMA models that eliminate the non-stationarity of the observed data in the time series.

Content

- Time series
- ARMA Processes
- Stochastic Processes: Probabilistic Methods and Mathematical Models of Randomness for Assets

Course outline: Stochastic Processes I

One main difficulty when trying to model financial markets using mathematical tools is the uncertainty these markets present. The high amount of components influencing these markets, in addition to the personal preferences of investors and managers, make the behaviour of financial markets very random. To cover the random behaviour of financial markets and the elements in them, we use stochastic processes. Discrete and continuous stochastic processes are introduced, highlighting the most popular ones: random walks, Poisson processes and the Weiner process. Properties of these processes as well as the methods to work with them are taught.

Course outline: Differential Equations

Differential equations and Black-Sholes .

Finding solutions to an initial value problem and to boundary problems.

Course outline: Monte Carlo Algorithms

Depending on the complexity of the model, analytical solutions of the problem might not exist and therefore, one has to rely on numerical methods. The Computer Science section introduces numerical methods that help solving problems in mathematical finance when a closed-form solution does not exist.

Monte Carlo method are algorithms based on repeated random simulation to get numerical results of a problem with probabilistic interpretation.

Course outline: Optimization

Optimization techniques seek the optimal results of a giving problem by the maximization and minimization of some financial problem.

Course outline: Economics

The Macroeconomics section studies how the aggregated economy behaves according to inflation, price levels, interest rates and other economics factors. Econometrics is the unified study of economic models, statistics and economic data. This first module offer an introduction to econometrics theory and applied econometrics.

Course outline: Ethics and Standards in Portfolio Management

Standards of Practice and ethical and professional standards for presenting investment performance in the context of portfolio management. Corporate Governance.

Course outline: Basic Finance, the Value of Money

This introductory course describes how market regulations work to protect market integrity, to enforce rules, mitigate risks and prevent damage to the market participants. These financial participants are corporations that make investments decisions to maximize shareholders value, money markets for high liquidity institutions and very short maturity period, bond markets where participants can issue new debt, the stock market where shares of publicly held companies are issued and traded.

Content:

- Corporate Finance
- History of Financial Markets and Insurance
- Market Regulations
- Money Markets
- Bond Markets
- Stock Markets
- Trading Strategies
- Properties of Equities and Fixed Income
- Financial derivatives
- Options and Futures

Course outline: Discrete-Time Stochastic Processes

This course introduces the fundamental concepts that are needed in basic and advanced financial activities. After a successful implementation of this course students will posses the knowledge of basic Income Securities and the notion of arbitrage. Furthermore, they will get a deep learning about Interest Rates and Forward Contracts.

Content:

- Introduction to Basic Income Securities
- No arbitrage
- Interest Rates and Fixed Income Products
- Floating Rate Bonds and Term Structure of Interest Rates
- Forward Contracts

Course outline: Introduction to Derivatives

Derivatives are financial products of high relevance in the financial sector; they have become – from academic and practical standpoint-- one of the most important tools of modern finance. In addition, the derivatives market is much bigger than the stock market when measured in terms of underlying assets. This course introduces the theoretical and practical aspects of Swaps, Futures, and Options. In addition, students are trained to properly apply these financial components: The 1-Period Binomial Model, Options Pricing in the 1-period Binomial Model, and Option Pricing in the Multi-period Binomial Model.

Content:

- Swaps
- Futures
- Options
- The 1-Period Binomial Model
- Options Pricing in the 1-period Binomial Model
- Option Pricing in the Multi-period Binomial Model
    - Introduction
    - Collaterized Mortgage Obligations

Course outline: Stochastic Calculus II

After the successful completion of this course, students will be able to define Brownian motion/ Wiener processes and apply calculations involving them, work with stochastic processes such as Continuous and Discrete Time Poisson and Compound Poisson Processes, understand the basics of stochastic integration, apply Itô's formula, understand the principles of stochastic differential equations, apply Feynman-Kac and Martin–Girsanov Theorems, work with stopping/hitting times and analyze their distributions, define Martingales and apply basic calculations involving them. In addition, students are introduced to the theory of the Black—Scholes model, crucial in financial option pricing. Furthermore, students also will develo the skills in modelling financial phenomena using stochastic models.

Content

- Conditional Expectation
- Continuous and Discrete Time
- Poisson and Compound Poisson Processes
- Brownian Motion/ Wiener Processes
- Markov Chain
- Stopping/Hitting time s and their distributions
- Stochastic Integrals
- Ito’s Lemma
- Solution to Stochastic Differential Equations
- Feynman-Kac, Martin–Girsanov Theorems
- Martingales
- Black-Sholes Theorem

Course outline: Portfolio Management

Portfolio management is the art and science of balancing the risk against the performance. Portfolio managers must possess a wide knowledge on theoretical and practical aspects of most existent components on financial markets and, due to the continuous non-stop movement of these markets, the skills to make fast decision. Students who successfully complete this course will be capable of measuring risk and returns of financial portfolios and be able to compute the Efficient Frontier, Alphas and Betas. Furthermore, they will be trained in Optimizing Portfolios, analyzing Portfolio Performance.

Content

- Measuring Risk And Return
- The Efficient Frontier
- Optimizing your Portfolio
- Portfolio Performance
- Alphas and Betas

Course outline: Risk Regulation and Basel III

The existence of uncertainty, human preferences, the wish of maximizing profit and the continuous activity of financial markets among other features, implies the existence of different sources of risk. The study and deep comprehension of these risks is essential to avoid economical downturns. In addition, the good understanding of regulatory frameworks is of high relevance to avoid financial catastrophes. This course describes the necessary concepts to help measuring the risk sources and the need of protecting from them.

Content

- Evolution of Basel
- Market Risk
- Measuring Risk
- VaR and Stressed VaR
- Expected Shortfall and Liquidity Horizons
- Correlation
- Extreme Value Theory

Course outline: Linear Regression Models

The existence of dependence structures in a variety of components in the financial markets, i.e. dependent lifetimes of companies in a credit portfolio, dependent multivariate stochastic models, dependent losses on insurance portfolio, requires statistical tools that provides relations between dependent components. This course aims at introducing the students to the Theory and Practice of Regression Analysis.

Content.

- Theory and Practice of Regression Analysis
- Simple and Multiple Regression
- Testing, Estimation and Confidence Procedures
- Modeling, Regression diagnostics and plots
- Polynomial Regression
- Least Squares

Course outline: Numerical Methods I

The complexity of financial markets --consequence of continuous non-stop activity, dependence between different financial components, the influence of human preferences etc.—imply practical challenges that are not solvable by close-form analytical expressions. Therefore, one has to rely on numerical methods. A good comprehension of numerical methods is as important as a robust knowledge on theoretical aspects. This course is designed with the purpose of educating students in numerical methods applied to financial problems.

Content

- Basic Numerical Methods
- Variation Inequalities And Free Boundary Problems
- Solving Stochastic Differential Equations
- Random Number Generator
- Monte Carlo Techniques for evaluating Path-integrals
- Numerical Techniques for the Evaluation of American Options
- Path-dependent and Barrier Options

Course outline: Valuation of Equity Index Options

Equity index options are financial instruments that give the holder the right, but not the obligation, to buy or sell the value of an underlying equity index. These financial products are used to make profit from general index level movements as well as to diversify a portfolio when an investor is unwilling to invest directly in the index's underlying stocks. Furthermore, index options can also be used in multiple ways to hedge specific risks in a portfolio. Their high practical usage makes these options of high relevance in the financial sector. This course aims at introducing the theoretical and practical aspects of these instruments.

Content

- Equity and Options Markets
- Numerical Valuation of Equity Index Options
- Calibration of Option Pricing
- Simulation for European and American Options
- Indices
- Merton Jump-Diffusion Model
- Python implementation

Course outline: Time Series Modelling

Time Series Analysis has several aims like the discovery of the phenomena, the modeling, reaching conclusions, assessment of predictability, description of variability, classification description of relationship, inference, conformity of theory of data, measurement of constants and comparative analysis. Among specific methods are spectrum analysis, smoothing, inversion, likelihood, Kalman-Buey, clustering, dimensionality reduction, contingency, analysis of variance, least squares and simulation.

We study some problems like the measurement of errors and heterogeneous data modeled by the ARMA, ARCH and GARCH processes.

Content

- Modeling and Inference for Random Processes
- ARMA
- ARCH
- GARCH and Non-linear Models
- Parameter Estimation
- Prediction and Filtering

Course outline: Non-linear Option Pricing

This course looks at several market terms like the Utility Maximation, the term structure of Interest Rates, transaction costs and Illiquid Markets. The main problem is the Option Pricing in complete and incomplete markets. Some techniques are developed to help with this task: Calibrating local volatility of arbitrary multifactor stochastic volatility models to market smiles, the Credit Valuation when there is a possibilility of default and the Replication of a portfolio under Delta and Gamma constraints.

Content

- Pricing Options in Complete and Incomplete Markets
- Utility Maximization
- Term Structure of Interest Rates
- Calibration of Models to Market Smiles
- Credit Valuation
- Transaction Costs
- Iliquid Markets
- Replication under Delta and Gamma Constraints

Course outline: Stochastic Calculus III

This course continues advancing the stochastic calculus I with the development of the Markowitz Mean-Variance Portfolio Theory, the Capital Asset Pricing Model and the Interest Rate models. Multivariate Linear Regression, Bootstrap, the Principal Component analysis and Copula techniques are thoroughly investigated.

Factor models include Fixed Income Securities, Credit Risk, and Value at Risk for several multivariate distributions.

Content

- Markowitz Mean-Variance Portfolio Theory
- Capital Asset Pricing Model
- Multivariate Linear Regression
- Factor Model
- Financial Time Series Models
- Bootstrap
- Fixed Income Securities and Credit Risk
- Value at Risk
- Multivariate Distributions
- Copula
- Interest Rate Models
- Principal Component Analysis

Course outline: Risk Management

This course goes beyond "Risk Regulation and Basel III "in level 2 and studies how Value at Risk can be calculated (Historical, Parametric and Monte Carlo) IN the same way other risks are calculated like the credit exposures and CVA.

How the financial crisis affect the importance of Risk Management and the regulatory Practices that are required will finalize this course.

Content

- Value-at-Risk (VaR, Parametric VaR, Historical VaR, MonteCarlo VaR)
- PFE
- EE
- Credit Exposures and CVA
- Regulatory Practices, Financial Crises

Course outline: Martingale Theory

This course is divided in discrete and continuous martingales. The discrete case extends the binomial model and finds the conditional and unconditional expectation.

In the continuous case the Greeks: Delta, Gamma, Theta, Vega, Rho and the high order Greeks are described. The fundamental asset pricing formula is deduced and the Black Sholes formula for calls and puts American Options and early exercise is found. Similarly, we find the Black's formula for options and futures.

Content

- Binomial Model Extended
- Sample Space, Filtration, Models
- Conditional and Unconditional Expectation
- The Greeks: Delta, Gamma, Theta, Vega, Rho
- High-order Greeks
- The Fundamental asset pricing Formula
- The Black Sholes Formula for Calls, Puts
- American Options and Early Exercise
- Black's Formula for options, Futures

Course outline: Data Analysis

Further techniques studies within the model formulation in data analysis in Level 3 are goodness of fit testing, standard and non-standard statistical analysis, non-linear regression and analysis of variance.

We also introduce Python for Data Science, Excel/VBA, Bloomberg Pro, B-Pipe, BLPAPI, Charting and Technical Analysis.

Some important cases in data analysis are the Thompson-Reuters, the TRTH and Eikon, the Data Stream and the Distributed Ledger Technologies

Complex Event Processing as a mean to understand Esper and Java with Eclipse for CEP.

Content

- Exploratory Data Analysis
- Model Formulation
- Goodness of Fit Testing
- Standard and Non-standard Statistical Analysis
- Linear and non- linear Regression
- Analysis of Variance
- Time-series Analysis

Course outline: Numerical Methods II

This course details several numerical methods that are important in finance. Some of them are: the Implicit Finite-Difference Methods, the Crank-Nicolson, the Douglas Schemes, the Richardson Extrapolation, the Explicit Finite-Difference for 2 Factors Models and the ADI and Hopscotch Methods.

Content

- Implicit Finite-Difference Methods
- Crank-Nicolson
- Douglas Schemes
- Richardson Extrapolation