

Who Should Attend?

This workshop series is specially designed to provide insight into the discipline of optimisation for a wide range of individuals such as OR professionals & financial quantitative analysts, risk analysts, consultants, DSS application developers, and academics. Everyone can benefit from a clear presentation of optimisation and how it is applied to solve business problems.

OR Professionals: This workshop series will help you to get up-to-date on the latest methodologies and receive exposure to the wide range of technologies and software now available in the field of optimisation.

Quantitative Analysts / Risk Analysts: These workshop series gives you an overview of the wide range of the technologies available allowing you to define and conceptualise your business problem in terms of an optimisation problem.

Software Developers/IT: This workshop series provides instruction on how to embed optimisation models into software applications. It will also give you all the necessary information and techniques in order to understand optimisation modelling and data modelling integration.

Academics and Students: Take advantage of our special academic prices to view optimisation from a business perspective, as well as receive hands-on experience with leading optimisation software.

Optimisation Series:

Business Application of Optimisation, Stochastic Programming & Portfolio Planning

Workshops:

Introduction to Optimisation and its Applications: Linear & Integer Programming: embedded DSS using scripting and com objects
2 - 3 November 2009

Decision Making under Uncertainty: Stochastic Programming
4 - 5 November 2009

Financial Planning using Integer Quadratic Programming
6 November 2009

www.carisma.brunel.ac.uk

CARISMA Speakers:

Gautam Mitra, John Beasley
Cormac Lucas, Diana Roman
Christian Valente, Leela Mitra,
Viktar Zverovich, Katharina Schwaiger

Invited Speakers:

Csaba Fabian
(*Eötvös Loránd University*)
Achim Koberstein
(*University of Paderborn*)



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Benefits

At the end of the workshop, the participants will be able to develop their own optimisation models, link them to data sources and solve the models using state-of-the-art commercial solvers.

Participants will also acquire a good knowledge on how to embed optimisation models into applications.

By attending this workshop you will be able to:

- ⇒ Build your own optimisation applications.
- ⇒ Identify the best use of optimisation techniques and how to deploy them for your purposes.
- ⇒ Gain an insightful and realistic view on the use of optimisation for business applications.
- ⇒ Prepare and consolidate data from disparate sources for optimisation applications.
- ⇒ Identify solving and fine-tuning requirements in your optimisation applications.

Software Used

The workshop is designed to give the participants hands-on experience with industrial optimisation tools, including:

- ⇒ AMPL/AMPL Studio
- ⇒ AMPL COM Object by Optirisk Systems
- ⇒ FortMP Solver from Optirisk Systems
- ⇒ FortSP Solver from Optirisk Systems
- ⇒ CPLEX Solver from ILOG
- ⇒ Microsoft Excel and Access
- ⇒ SPlnE (Stochastic Programming Integrated Environment)

Introduction to Optimisation and its Applications: Linear & Integer Programming - Embedded DSS using scripting and COM Objects.

■ 2 - 3 November 2009

Background

Optimisation technologies have become key tools in making important business decisions that increase competitive advantage. Optimisation, through the use of advanced mathematics and computer science techniques, is used to assist organisations with solving their complex business problems in areas such as manufacturing, distribution, finance and scheduling. The success of optimisation projects depends on many different factors such as which modelling tools are used, integration with corporate data and the selection of the most efficient solution algorithms available for the problem. The purpose of this optimisation workshop is to provide participants with an insightful overview and give step-by-step instructions for successfully building optimisation applications.

In this workshop, our instructors, who all have years of experience in this field, will take you through all the steps of an optimisation project using powerful optimisation tools such as AMPL Modelling System, CPLEX and FortMP. The purpose of the workshop is to show how optimisation models, relational data and optimisation algorithms can be brought together in one cohesive business application.

This workshop is an advanced course designed to allow individuals with various levels of optimisation knowledge to attend. Some previous exposure to optimisation is helpful.

Overview

Day One

On day one we introduce optimisation modelling using an algebraic modelling system and help delegates develop an understanding of how to formulate real-world optimisation models.

Introduction to Optimisation Modelling and Solving

- ⇒ Fundamental modelling techniques and model development
- ⇒ Formulating models with the AMPL Modelling System
- ⇒ Solving models with CPLEX and FortMP
- ⇒ Optimisation algorithms LP/MIP
- ⇒ Fine tuning of optimisation applications for performance
- ⇒ Model validations and sensitivity analysis
- ⇒ Common modelling mistakes and how to avoid them.

Data Modelling for Optimisation

- ⇒ Connection to databases and spreadsheets
- ⇒ Connecting to data over the Internet
- ⇒ Advanced data modelling techniques
- ⇒ Sparse data vs. dense data
- ⇒ Hints and tips for managing your data
- ⇒ Common data problems and how to avoid them

Optimisation Applications Showcase used throughout the workshop:

- ⇒ Production Planning
- ⇒ Distribution
- ⇒ Blending
- ⇒ Assignment
- ⇒ Scheduling
- ⇒ Portfolio Management

Day Two

On day two we cover advanced modelling concepts such as highly sparse large-scale models and how to formulate models with integer variables and logical constraints. We also guide participants to learn the tools and methods used for embedding optimisation into business applications including Excel and Access from Microsoft Office.

Advanced Optimisation Modelling

- ⇒ Special model formulations
- ⇒ Integer/binary variables
- ⇒ Logical constraints
- ⇒ Advanced indexing techniques for sparse data
- ⇒ Data instantiation techniques
- ⇒ Scalability for large optimisation models
- ⇒ Developing solution heuristics using a script language

Deploying Optimisation into Applications

- ⇒ Choosing the right tools and methods for embedding optimisation applications
- ⇒ Accessing AMPL-COM object functionalities from MS Excel and .NET framework

Decision Making Under Uncertainty: Stochastic Programming Workshop

■ 4 - 5 November 2009

Background

There are two key aspects in developing successful business plans for the near or far future: the need to make an optimum decision today in order to ensure that your goals and targets will be met, and to be prepared for the uncertain future. Stochastic programming models are designed to capture both these aspects in a unique way, thus optimally allocating resources, while taking into consideration the alternative scenarios of how the future unfolds. The result is an optimal, or near optimal plan of action that is hedged against the vagaries of the future. Stochastic programming is at the forefront of making decisions for the uncertain world of tomorrow. After three decades of research in the theory and application of stochastic programming, today, it is the first choice for analysts in portfolio selection, asset allocation, supply chain planning, energy systems planning, and agricultural planning among others. We also introduce robust optimisation and illustrate how risk can be modelled and constraints used to control (conditional value at risk (CVaR)). This workshop is designed for those who wish to deploy stochastic programming successfully, but have little or no experience in the development of stochastic programming applications. Our course is most comprehensive and covers the latest developments in the field, with plenty of hands-on examples which help you develop stochastic programming applications for your sector, be it financial, supply chain, agriculture or energy systems planning. If you want to make optimal plans for an uncertain future, this is definitely the course for you. The course also introduces the delegates to a state of the art software SPiNE, for developing and investigating stochastic programming applications.

Course Requirements

The workshop is focused around two streams of applications: Financial modelling and Supply Chain Planning applications. An understanding of Linear and Integer programming is necessary to obtain the most from this course.

Financial Planning using Integer Quadratic Programming

■ 6 November 2009

Background

Financial Planning problems are eminently suited for analysis using the efficient risk & return frontier. These models are successfully processed as quadratic programs. Rather belatedly quadratic programs in the form of mean-variance analysis have become the tool of choice when it comes to financial planning, be it portfolio selection, asset liability management models, or index tracking. Further, integer quadratic optimisation is one of the most valuable extensions that make the portfolio selection realistic and applicable by introducing threshold values, numbers to be chosen, and transaction costs. This special one-day course is designed to successfully demonstrate and transfer the skills needed for developing integer quadratic programming models as applied in financial planning. The conceptual and practical aspects of the course have been carefully chosen and prepared to ensure that you have the opportunity to cover integer programming both in theory and in practice, without being overwhelmed by inconsequential details in either optimisation or financial planning. The course is focused tightly around financial planning applications such as portfolio selection.

Overview

Introduction to Integer Quadratic programming and financial planning - the portfolio selection model - asset allocation - constructing the covariance matrix - modelling and interpretation of risk - index tracking - risk and return models - robust portfolio optimisation model - discrete constraints - threshold & cardinality constraints - transaction roundlots - portfolio rebalancing models - duration constraints.

