Thibaut Cuvelier

Address: 168 bis rue de Paris 94220, Charenton-le-Pont France
Contact: cuvelier.thibaut@gmail.com

Operational research in industrial applications
Research keywords: mathematical optimisation, network routing, data analytics

Education

2013 – 2015: **Master in Computer Science and Engineering**, university of Liège, magna cum laude (second year: summa cum laude; master's thesis: summa cum laude).

Master's thesis: *Implementing and comparing stochastic and robust programming*.
Two paradigms are often used in the optimisation literature in order to model uncertainty: **stochastic and robust programming**. However, they have seen very little **comparison**, which is the goal of this master's thesis. This work considers facility location and unit commitment. I have implemented both paradigms for each problem and conducted an **in-depth study** of the impact on the objective function and on the **robustness** of the obtained solutions.
Under the supervision of Prof. Q. Louveaux.
http://hdl.handle.net/2268/197090
Award: **best master's thesis in computer science and engineering, AIM.**

Topics: applied mathematics (discrete and numerical optimisation, machine learning, high-performance scientific computing), networks (advanced networking, information and coding theory, telecommunications), intelligent robotics.

First aid training (BEPS, Belgian Red Cross), 2015.

2010 – 2013: **Bachelor of Engineering Sciences**, university of Liège.
Topics: computer science, electronics.

2004 – 2010: secondary education at Saint-Barthélemy, Liège, magna cum laude.
Electives: mathematics, Latin, ancient Greek.
Finalist for the Belgian round of the **Olympics of Informatics** (2010).

Online courses

- Deep learning specialisation, Andrew Ng, Coursera, March 2018 (overall score: 100%)
  https://www.coursera.org/account/accomplishments/specialization/SVP835XDYLHA

Research experience

Since October 2017: **doctoral researcher** at Orange Labs and CentraleSupélec
Keywords: mathematical optimisation, network routing, machine learning.

Machine learning algorithms are often based on optimisation techniques, but do not always take the most of them. For example, combinatorial bandit algorithms tend to have exponential complexity, even with polynomial-time combinatorial problems (matching, shortest path, etc.): with better understanding of optimisation, I was able to reduce this complexity to polynomial. Conversely, machine learning can bring significant advance in optimisation, such as to have a better choice of columns to generate in decomposition schemes or to choose the best algorithm to solve a given instance of a complex problem.

Under the supervision of Zwi Altman, Éric Gourdin (Orange Labs) and Richard Combes (CentraleSupélec).

January 2016-September 2017: **research engineer** at the University of Liège, working on the InduStore project (http://www.industore-project.be/).
Keywords: mathematical optimisation, data analytics.

Industry may take advantage of the **increasing electricity price volatility**, by organising its production around price forecasts, and provide flexibility services to the grid. Moreover, respecting the well-being of the workforce is a requirement in this context, albeit often disregarded. My **responsibilities** are to develop, apply, and evaluate mathematical **optimisation models** of plant operations, including HR concerns. The result of this work is available as open source software: https://github.com/dourouc05/IndustrialProcessFlexibilisation.jl

Trainings: IPCO 2016 summer school (Prof. Michel Goemans, Dr. Nicolas Stier, and Prof. Juan Pablo Vielma), algorithmic convex optimisation course (Prof. François Glineur and Prof. Yurii Nesterov).

Project in partnership with N-SIDE (project coordinator), UCL (ICTEAM and CRECIS), and ICEDD.

July-August 2014: **internship** at N-SIDE (Louvain-la-Neuve, Belgium), on the ENERTOP project.
Keywords: mathematical optimisation.

The context is the **optimisation of electricity production** in a complex plant in order to minimise the total energy costs, mostly using cogeneration, using a mathematical optimisation model. My **responsibilities** were to investigate specific issues to make the solutions more **robust to uncertain events**, such as failures, and to analyse different ways of handling the electricity price uncertainty inside the model. Most of my source code has been deployed in production at the end of my internship.

Under the supervision of Prof. Bertrand Cornélusse (N-SIDE, now ULg).

Communication experience

Journal articles

- *Comparison Between Robust and Stochastic Optimisation for Long-term Reservoir Operations Under Uncertainty*, T. Cuvelier, A. Archambeau, B. Dewals, Q. Louveaux
  Water Resources Management, vol. 32, no. 5, pp. 1599–1614, March 2018
  http://hdl.handle.net/2268/219394

Workshop papers

- *NETPerfTrace — Predicting Internet Path Dynamics and Performance with Machine Learning*, S. Wassermann, P. Casas, T. Cuvelier, B. Donnet
  ACM SIGCOMM Workshop on Big Data Analytics and Machine Learning for Data Communication (Big-DAMA), Los Angeles (USA), August 2017
  http://hdl.handle.net/2268/211667

Abstracts

- *Retour d'expérience sur Julia pour la recherche et l'enseignement en recherche opérationnelle*, T. Cuvelier
  Congrès de la Société française de recherche opérationnelle et d'aide à la décision (ROADEF) 2018, February 2018
  http://hdl.handle.net/2268/220267
- *Optimising workforce and energy costs by exploiting production flexibility*, T. Cuvelier and Q. Louveaux
  21st Conference of the International Federation of Operational Research Societies (IFORS), Québec (Canada), July 2017
  http://hdl.handle.net/2268/207330
- *Modelling the industrial flexibility from the electricity consumption and HR points of view*, T. Cuvelier and Q. Louveaux
  22nd Belgian Mathematical Optimization Workshop, COMEX (combinatorial optimisation: metaheuristics and exact methods), La Roche-en-Ardenne (Belgium), April 2017
  http://hdl.handle.net/2268/209469
- *Optimisation and uncertainty: comparing stochastic and robust programming*, T. Cuvelier
  30th Annual Conference of the Belgian Operational Research Society (ORBEL), Louvain-la-Neuve (Belgium), January 2016
  http://hdl.handle.net/2268/197081

Posters

- *Characterising Industrial Sites' Flexibility with Reservoir Models*, T. Cuvelier
  DS3 Data Science Summer School (École Polytechnique), Paris (France), August 2017
  http://hdl.handle.net/2268/212703

Books

- *Créer des applications graphiques en Python avec PyQt5*, published by D-BookeR, March 2017. T. Cuvelier, P. Denis.
  ISBN-13: 978-2-8227-0518-9.
- *Créer des applications avec Qt 5 – les essentiels*, published by D-BookeR, November 2013. G. Belz, T. Cuvelier, I. Diallo, L. du Verdier, V. Meyer, F. Renault.
  ISBN-13: 978-2-8227-0108-2.
- *Web sémantique : méthodes et outils pour le Web de données*, published by Pearson, May 2012. Translated by T. Cuvelier, J. Plu, A. Seilles.
  Original title: *Linked Data: Evolving the Web into a Global Data Space*, T. Health and C. Bizier.
  ISBN-13: 978-2-7440-2519-8.

Talks

- *Voyage incertain : découvrir l'optimisation stochastique et robuste,* Orange Labs (internal)
  http://hdl.handle.net/2268/219824
- *A Journey through Julia*, May 2017, IEEE Student Branch Liège
  http://hdl.handle.net/2268/210211
- *A Journey through Julia*, November 2016, Geeks anonymes (Liège)
  http://hdl.handle.net/2268/203491

Open-source contributions

- Several contributions to Julia packages: TimeSeries.jl, Distributions.jl, Nemo.jl, Hungarian.jl, SimpleWeightedGraphs.jl
- Contribution to the translation into French of Qt Creator
- Contributions to PHP libraries: GeSHi, Silex, winzouCacheBundle

Service to the community

Session co-chair at IFORS 2017.

Reviewer for the WiOpt 2018 conference.

Work experience

August 2015: development of a real-time car-sharing prototype application for the **ULg**. Technologies: Python, Django.
Under the supervision of Prof. Bertrand Cornélusse (ULg).

July 2015: translation into English of a numerical analysis textbook (2nd year students).

2011–2017: officer for the ULg **IEEE Student Branch**. Event organisation, website maintenance, poster design.

2009–now: section manager for **Developpez.com**. Team management, website maintenance, application development.

2008–now: author, translator, and proofreader for **Developpez.com**. Communication, popularisation. http://tcuvelier.developpez.com/

Pedagogical experience

Spring 2017: project supervision for the **intelligent robotics** course, with contributions to an open syllabus (TRS: https://github.com/ULgRobotics/trs).
Lecturers: Prof. Bernard Boigelot, Philippe Latour, Antoine Lejeune, Dr. Raphaël Marée, Prof. Marc Van Droogenbroeck, Prof. Louis Wehenkel.

Winter 2016: exercise sessions and project supervision for the **discrete optimisation** course, with the design of a complete exercise book.
Lecturer: Prof. Quentin Louveaux.

Spring 2016: project supervision for the **intelligent robotics** course.
Lecturer: Dr. Renaud Detry.

Spring 2015: student instructor for the **numerical analysis project** (1st year students).
Lecturer: Prof. Quentin Louveaux.

Open course material

Discrete optimisation: development of an exercise book with solutions and source code examples, available at https://github.com/dourouc05/OptimisationTeachingKit.

Intelligent robotics: contributions to TRS (https://github.com/ULgRobotics/trs), including updates of the webpages and video making.

Formal training

Several courses at the *Institut de Formation et de Recherche en Enseignement Supérieur* (IFRES, ULg):

- Design multimedia material for face-to-face teaching
- Competency-based approach
- Motivate my students
- Introduction to evaluation: principles and quality criteria
- Customising teaching by taking into account students' characteristics
- Triple concordance between objectives, methods, and evaluation
- Organising practical lessons in science and applied science courses
- Introduction to the Blackboard Learn platform
- Using Blackboard Learn to create tests
- Evaluate and regulate one's teaching activities

Language skills

French	Mother tongue
English	Cambridge FCE (B2 level) in 2010. Full-English master
German	B1-level training from 2014 to 2017

IT skills

Programming

Programming languages	Julia, Python, C++, Scala, Java, PHP, C
Data analytics	scikit-learn
Mathematical modelling	JuMP (Julia), AMPL
Optimisation solvers	Gurobi, CPLEX (MILP); Couenne (global nonlinear)
Query languages	SQL, SPARQL
Development environments	Juno (Julia), PyCharm (Python), Mathematica, MATLAB, IntelliJ IDEA (Java), CLion (C++)
Graphical user interfaces	Qt 5 (especially Qt Quick), PyQt

Office software

Office	Microsoft Word, Microsoft Excel, LyX (LaTeX)
Technical documentation	oXygen XML Author, DocBook
Drawing	Microsoft Visio, Adobe Photoshop, Adobe Illustrator

Personality

Detail-minded, results-driven, autonomous, energised by challenges.

Sports: climbing (since 2002, both indoor and outdoor, including competitions), walking.

Hobbies: reading novels (thrillers); listening to music (progressive rock, electronica); active contribution to the *Revue des Ingénieurs* at the ULg (satiric play; 2013, 2016).