Guillaume **Derval**

PhD in Computer Science and Engineering · Postdoctoral researcher at ULiège, Belgium

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Research interests

Modeling languages for Combinatorial Optimization (Mixed-Integer) Linear Programming (LP/MILP) Constraint Programming (CP)	• Parametric & robust optimization & sensitivity analysis • Preprocessing & symbolic modeling • Automated result analysis • Parallelization & distribution • Interaction between solving technologies (CP, MILP, SAT, CFNs) • Specialized constraint propagators
Software engineering	• Modeling language compilers and interpreters
Energy systems	• Large energy system models
Computer science and mathematics education	• Automated feedback and grading • Competitive programming

Education

PhD in Computer Science and Engineering [Teaching/Research assistant] *2016-2021* *UCLouvain*
Thesis: "Finding Maximum Submatrices" Supervisor: Pr. Pierre Schaus

Master in Computer Science and Engineering [AI & Data science/Applied mathematics] *2014-2016* *UCLouvain*
Master's thesis: "Parallelization of constraint programming using embarrassingly parallel search" Magna cum laude

Bachelor in Engineering *2011-2014* *UCLouvain*

Professional experience

SCK-CEN SMR Chair holder [Postdoctoral researcher] *ULiège*
Integration of Small Modular (nuclear) Reactors (SMR) in the Belgian Energy Landscape *2024-now*

- Development of tools and models to assess the possible integration of SMRs in Belgium.
- **Focus on the extension of the GBOML (Graph-Based Optimization Modeling Language) language and the Ora platform to manage uncertainty and robustness considerations.**
- Lead researcher on the project for ULiège.
- Co-supervision of a team of 4 PhD students.
- Grant writing (Horizon Europe, InterReg, PDR, ETF, …)

Invited Researcher *CRIL, University of Artois, FR*
Heuristics & models in CP / Aperiodic tilings *Jan-Mar 2025*

- At the CRIL laboratory of Pr. Christophe Lecoutre
- Work on CP modeling of aperiodic tiling & heuristics, submitted at AAAI.

Postdoctoral researcher *ULiège*
IntegCER project (Funded by the Walloon Region, BE) *2022-2024*

- Industrial project in collaboration with ENGIE, RESA and Haulogy, on the integration of Renewable Energy Communities in Wallonia. The aim of the project is to create the necessary tools and models for the planning of investments and the operational management of such a community, both on an economic level (billing) and a technical level (operations of production and storage means).
- **Development of GBOML (Graph-Based Optimization Modeling Language).**
- Lead researcher on the project for ULiège.
- Co-supervision of a team of 4 PhD students.
- Grant writing (Horizon Europe, InterReg, PDR, …)

Invited lecturer *UCLouvain*
LINFO1103 - Introduction to Algorithms *2022-2023 and 2023-2024*

- Course from the Louvain School of Engineering (EPL), mainly intended for first-year students in computer science.
- Introduction to basic concepts of algorithms and data structures, complexity.

- The course is attended by students from various backgrounds, mostly future computer science bachelors, but also future bachelors in mathematics, biology, architecture, business engineering, and future masters in linguistics. 293 students took the course in 2022-2023, 255 in 2023-2024.

Invited lecturer *UCLouvain*
LINFO1121 - Algorithms and Data Structures *2020-2021*

- Course from the Louvain School of Engineering, mainly intended for third-year students of civil engineering and computer science bachelor's degrees.
- The course was attended by 224 students.

Research Assistant *UCLouvain*
Thesis 'Finding Maximum Submatrices' *2016-2021*

- Finding submatrices with maximum sum; a problem related to biomedical research (DNA micro-arrays).
- Development of new Constraint Programming methods.

Teaching experience

Lecturer	2022-2024	**LINFO1103**	Introduction to algorithms (FR)	*EPL, UCLouvain*
	2020-2021	**LINFO1121**	Data structures and algorithms (FR)	*EPL, UCLouvain*
Teaching assistant	2023-2024	**ELEC0080-1**	Energy networks (EN)	*FSA, ULiège*
	2021-2022	**INFO0902**	Data structures and algorithms (FR)	*FSA, ULiège*
	2016-2020	**LINFO1121**	Data structures and algorithms (FR)	*EPL, UCLouvain*
	2017-2020	**LINFO2365**	Constraint Programming (EN)	*EPL, UCLouvain*
	2019-2020	**LEPL1402**	Computer Science 2 (FR)	*EPL, UCLouvain*
	2016-2019	**LINFO2132**	Languages and translators (EN)	*EPL, UCLouvain*
	2017-2018	**LINFO1113**	Numerical algorithms (FR)	*EPL, UCLouvain*

Projects/grants awarded

2023	**FNRS PDR** on sensitivity analysis	*1 PhD student / 4 years*
2024	**EPSx tender** from the FPS Economy in Belgium, to develop the Ora software	*3 FTEs / 1 year*
2025	**PiSTEM**, funded by the Energy Transition Fund	*2 PhD students + 0.5 FTE / 3 years*

Awards

2017	**Distinguished Student Paper Award**, for the article "Improved filtering for the bin-packing with cardinality constraint"	*CP Conference 2017*
2016	**ORBEL-Wolsey Award 2016**, Best open-source contribution of the year in Operations Research, for OscaR-Modeling	*ORBEL 2016*

Publications

I strongly emphasize the repeatability of experiments and results. My scientific output (software, results, …) is free and open-source, and the necessary files for replicating the experiments are available on GitHub or Zenodo.

Published (Peer-reviewed journals, conferences and workshops)

Integration of offshore energy into national energy system: a case study on Belgium
Jocelyn Mbenoun, Guillaume Derval, Ghislain Detienne, Thierry Deschuyteneer, Juan Vazquez, Damien Ersnt
Applied Energy, 2025

GBOML: a structure-exploiting optimization modelling language in Python
Bardhyl Miftari, Mathias Berger, Guillaume Derval, Quentin Louveaux, Damien Ernst
Optimization Methods and Software, 2024

A unified definition of hosting capacity, applications and review
Amina Benzerga, Alireza Bahmanyar, Guillaume Derval, Damien Ernst
IEEE Access, 2024

Optimal control of renewable energy communities with controllable assets
Samy Aittahar, Miguel Manuel de Villena, Guillaume Derval, Michael Castronovo, Ioannis Boukas, Quentin Gemine, Damien Ernst
Frontiers in Energy Research, 2023

A review of the Constraint Programming MOOC on EdX
Augustin Delecluse, Guillaume Derval, Laurent Michel, Pierre Schaus, Pascal Van Hentenryck
Workshop on Teaching Constraint Programming, WTCP 2023, 2023

Symbolism for modelling, reformulations, and parallelism: MaxiCP-Modelling
Guillaume Derval, Damien Ernst
The 22nd workshop on Constraint Modelling and Reformulation, ModRef 2023, 2023

Maximal-Sum submatrix search using a hybrid contraint programming/linear programming approach
Guillaume Derval, Pierre Schaus
European Journal of Operational Research, 2022

Optimal Decoding of Hidden Markov Models With Consistency Constraints
Alexandre Dubray, Guillaume Derval, Siegfried Nijssen, Pierre Schaus
International Conference on Discovery Science, 2022

Mining constrained regions of interest: An optimization approach
Alexandre Dubray, Guillaume Derval, Siegfried Nijssen, Pierre Schaus
International Conference on Discovery Science, 2020

Nowcasting COVID-19 hospitalizations using Google Trends and LSTM
Guillaume Derval, Vincent François-Lavet, Pierre Schaus
AI 4 Social Good workshop 2020, 2020

The maximum weighted submatrix coverage problem: A CP approach
Guillaume Derval, Vincent Branders, Pierre Dupont, Pierre Schaus
International conference on integration of constraint programming, artificial intelligence, and operations research (CPAIOR 2019), 2019

An aggregate learning approach for interpretable semi-supervised population prediction and disaggregation using ancillary data
Guillaume Derval, Frédéric Docquier, Pierre Schaus
Joint European Conference on Machine Learning and Knowledge Discovery in Databases (ECML-PKDD 2019), 2019

Mining a maximum weighted set of disjoint submatrices
Vincent Branders, Guillaume Derval, Pierre Schaus, Pierre Dupont
International Conference on Discovery Science, 2019

Improved filtering for the bin-packing with cardinality constraint
Guillaume Derval, Jean-Charles Régin, Pierre Schaus
Constraints, 2018

Embarassingly Parallel Search Reengineered
Guillaume Derval, Pierre Schaus, Jean-Charles Régin
Doctoral Program of the 22nd International Conference on Principles and Practice of Constraint Programming (CP 2016), 2016

Automatic grading of programming exercises in a MOOC using the INGInious platform
Guillaume Derval, Anthony Gego, Pierre Reinbold, Benjamin Frantzen, Peter Van Roy
European Stakeholder Summit on experiences and best practices in and around MOOCs (EMOOCS'15), 2015

Under review (Peer-reviewed journals, conferences and workshops)

Sensitivity analysis for linear changes of the constraint matrix of a (mixed-integer) linear program
Bardhyl Miftari, Quentin Louveaux, Damien Ernst, Guillaume Derval
Open Journal of Mathematical Optimization, 2025

Efficient LP warmstarting for linear modifications of the constraint matrix
Guillaume Derval, Bardhyl Miftari, Damien Ernst, Quentin Louveaux
SIAM Journal on Optimization, 2025

Optimal Control of Renewable Energy Communities subject to Network Peak Fees with Model Predictive Control and Reinforcement Learning Algorithms
Samy Aittahar, Adrien Bolland, Guillaume Derval, Damien Ernst
IEEE Access, 2025

Distributed e-Fuel Hubs (DEFH): A Case Study of a Belgian Fischer-Tropsh liquids Hub
Samy Mokeddem, Bardhyl Miftari, Guillaume Derval, Damien Ernst
Applied Energy, 2025

Lead-cooled fast reactor SMR integration: An off-grid study case based on a real-life demand
Antoine Larbanois, Bardhyl Miftari, Antoine Mouchamps, Ayyildiz Kerem Enesb, Vincent Schryvers, Guillaume Derval, Damien Ernst
Energy Conversion and Management: X, 2025

Aperiodic tilings: a CP journey
Guillaume Derval, Christophe Lecoutre
AAAI Conference on Artificial Intelligence 2026, 2025

Soon to be submitted (Peer-reviewed journals, conferences and workshops)

ICLF: An Immersive Code Learning Framework based on Git for Teaching and Evaluating Student Programming Projects
Pierre Schaus, Augustin Delecluse, Guillaume Derval
TDB, 2025

The MaxiCP constraint programming solver
Augustin Delecluse, Guillaume Derval, Pierre Schaus
TDB, 2025

Presentations without proceedings (at scientific conferences and workshops)

Sensitivity analysis for linear changes of the constraint matrix of a linear program
Bardhyl Miftari, Guillaume Derval, Quentin Louveaux, Damien Ernst
European Conference on Operational Research (EURO 2024), 2024

Parametric upper and lower bounds of linear variations of a linear problem's LHS
Bardhyl Miftari, Guillaume Derval, Quentin Louveaux, Damien Ernst
Annual Conference of the Belgian Operational Research Society (ORBEL 38), 2024

Efficient exact recomputation of linear modifications of the constraints matrix in Linear Programming
Guillaume Derval, Bardhyl Miftari, Quentin Louveaux, Damien Ernst
European Conference on Operational Research (EURO 2024), 2024

Tutorial:"An Introduction To Sizing And Operations of Energy Systems with GBOML"
Bardhyl Miftari, Guillaume Derval, Damien Ernst
2nd International workshop on" Open Source Modeling and Simulation of Energy Systems" OSMSES 2023, 2023

Exploiting structure in MILP: a modeler's perspective
Bardhyl Miftari, Mathias Berger, Guillaume Derval, Damien Ernst
SIAM OP23, 2023

GBOML: A modelling tool for structured MILPs
Bardhyl Miftari, Guillaume Derval, Mathias Berger, Damien Ernst
Conference of the International Federation of Operational Research Societies (IFORS 2023), 2023

Presentations outside the academic context

Les communautés d'énergie renouvelables et le partage d'énergie
Guillaume Derval
Conférence Liège Créative 22/02/24, 2024

Optimal Sizing and Operations Of Energy Systems Using GBOML (Course)
Bardhyl Miftari, Guillaume Derval, Damien Ernst
One-day course at ULiège, 2023

Sizing and Operations of Energy Systems Using GBOML
Bardhyl Miftari, Guillaume Derval, Damien Ernst
Company meetings @ULiège, 2023

Hydrogen as the basis of Remote Renewable Energy Hubs
Victor Dachet, Bardhyl Miftari, Guillaume Derval, Damien Ernst
Club Industrie-Université 22/09/23, 2023

Le partage d'énergie en copropriété
Guillaume Derval
Université d'été Climactes 2023, 2023

Contributions to open source scientific tools

GBOML: A Structure-Exploiting Optimization Modelling Language in Python
Bardhyl Miftari, Mathias Berger, Guillaume Derval, Damien Ernst

MaxiCP, a Constraint Programming solver in Java
MaxiCP Team

OscaR: Scala in OR
OscaR Team

Contributions to open source teaching tools

MiniCP
MiniCP Team

JavaGrading
Guillaume Derval, Augustin Delecluse

INGInious
Guillaume Derval, Anthony Gégo, Pierre Reinbold, Other contributors

Community work

Program Committee Memberships:

ECAI	European Conference on Artificial Intelligence	*2025*
LION	Learning and Intelligent OptimizatioN Conference	*2025*
ECML-PKDD	European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases	*2022, 2023, 2024, 2025*

AAAI	Conference on Artificial Intelligence	*2021, 2023, 2025*
CP	International Conference on Principles and Practice of Constraint Programming	*2022, 2023, 2024*
CPAIOR	International Conference on the Integration of Constraint Programming, Artificial Intelligence, and Operations Research	*2022, 2023, 2024*
JFPC	Journées Francophones de la Programmation par Contrainte	*2022, 2025*

Regular reviewer for the journals:

INFORMS	Journal of Computing
EJOR	European Journal of Operational Research
CP	Constraint Programming journal