Guillaume **Dalle**

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Researcher in applied mathematics

Professional Experience

Researcher — *2025 - present*
École Nationale des Ponts et Chaussées — *Champs-sur-Marne, France*

- Applied mathematics for transportation systems

Postdoctoral researcher — *2023 - 2024*
École polytechnique fédérale de Lausanne — *Lausanne, Switzerland*

- Theoretical study of graph neural networks

Research intern — *2018*
Électricité de France R&D — *Chatou, France*

- Markovian models for soiling estimation & cleaning optimization in solar power plants

Software development intern — *2017*
Foris AI — *Santiago, Chile*

- Linear Programming & local search for university timetabling

Education

PhD in applied mathematics — *2019 - 2022*
École Nationale des Ponts et Chaussées — *Champs-sur-Marne, France*

- Thesis: *Machine Learning and Combinatorial Optimization Algorithms, with Applications to Railway Planning*

Master of Science in applied mathematics — *2018 - 2019*
École Normale Supérieure Paris-Saclay — *Cachan, France*

- Coursework in machine learning and optimization
- Thesis: *Delay propagation on suburban railway networks*

Engineering degree — *2015 - 2018*
École polytechnique — *Palaiseau, France*

- Coursework in applied mathematics, computer science and humanities

Scientific preparatory classes — *2013 - 2015*
Lycée Louis-le-Grand — *Paris, France*

- Coursework in mathematics and physics

Bilingual French-German high school — *2010 - 2013*
Lycée Jeanne d'Arc — *Clermont-Ferrand, France*

Publications

[1] L. Bouvier, G. Dalle, A. Parmentier, and T. Vidal, "Solving a Continent-Scale Inventory Routing Problem at Renault," *Transportation Science*, Oct. 2023, doi: 10.1287/trsc.2022.0342.

[2] L. Clarté, A. Vandenbroucque, G. Dalle, B. Loureiro, F. Krzakala, and L. Zdeborova, "Analysis of Bootstrap and Subsampling in High-dimensional Regularized Regression," in *The 40th Conference on Uncertainty in Artificial Intelligence*, Jun. 2024. [Online]. Available: https://openreview.net/forum?id=yZaXk3OxVS

[3] G. Dalle, "HiddenMarkovModels.jl: generic, fast and reliable state space modeling," *Journal of Open Source Software*, vol. 9, no. 96, p. 6436, Apr. 2024, doi: 10.21105/joss.06436.

[4] G. Dalle, L. Baty, L. Bouvier, and A. Parmentier, "Learning with Combinatorial Optimization Layers: a Probabilistic Approach." [Online]. Available: http://arxiv.org/abs/2207.13513

[5] G. Dalle, "Machine learning and combinatorial optimization algorithms, with applications to railway planning," 2022. [Online]. Available: https://pastel.hal.science/tel-04053322

[6] G. Dalle and Y. de Castro, "Minimax Estimation of Partially-Observed Vector AutoRegressions." [Online]. Available: http://arxiv.org/abs/2106.09327

[7] G. Dalle and P. Thiran, "Optimal performance of Graph Convolutional Networks on the Contextual Stochastic Block Model," in *The Third Learning on Graphs Conference*, Nov. 2024. [Online]. Available: https://openreview.net/forum?id=NJrOLuM2Ro

[8] A. Hill and G. Dalle, "Sparser, Better, Faster, Stronger: Efficient Automatic Differentiation for Sparse Jacobians and Hessians." [Online]. Available: http://arxiv.org/abs/2501.17737

[9] P. Stephan and G. Dalle, "Method for determining a soiling speed of a photovoltaic generation unit," Jun. 2020 [Online]. Available: https://patents.google.com/patent/WO2020115431A1/en

Talks

Conferences

2024

- PyData Global: *Automatic differentiation: a tale of two languages* (abstract)
- JuliaCon: *Gradients for everyone: a quick guide to autodiff in Julia* (abstract)
- JuliaCon: *Fast and generic Hidden Markov Models* (abstract)
- JuliaCon: *Interfaces.jl: base and package interface tests for your objects* (abstract)

2023

- Workshop "Exploring synergies: Machine Learning Meets Physics & Optimization": *Every solution, everywhere, all at once: turning optimization solvers into probability distributions* (abstract)
- Journées Polyèdres et Optimisation Combinatoire: *What is the gradient of a Linear Program? Automatic differentiation on a polytope*
- Julia and Optimization Days: *Graphs in Julia - on the edge of glory* (slides)
- Julia and Optimization Days: *Writing fast Julia code* (slides)

2022

- JuliaCon: *InferOpt.jl: combinatorial optimization in ML pipelines* (recording)
- JuliaCon: *ImplicitDifferentiation.jl: differentiating implicit functions* (recording)
- Journées SMAI-MODE: *Recherche d'itinéraires dans un réseau ferroviaire : apprendre à mieux optimiser* (abstract)
- ROADEF: *Learning to Solve Stochastic Multi-Agent Path Finding* (abstract)

2020

- ROADEF: *Delay propagation on a suburban railway network* (abstract)

2019

- PGMO Days: *Delay propagation on a suburban railway network* (abstract)

Invitations & seminars

2024

- Institut de Mathématiques de Bourgogne: *Deep learning meets combinatorial optimization - a tale of missing gradients* (abstract)

2023

- Swiss Data Science Center: *Every solution, everywhere, all at once: turning optimization solvers into probability distributions*

2022

- MIT CSAIL: *Learning with Combinatorial Optimization Layers: A Probabilistic Approach*

2021

- Institut de Recherche Mathématique de Rennes: *Pourquoi les trains sont-ils toujours en retard?* (abstract)
- École Nationale des Ponts et Chaussées: *Understanding railway delay propagation through latent variable models* (abstract)

Teaching

Teaching assistant
2023 - present

École polytechnique fédérale de Lausanne — *Lausanne, Switzerland*

- Statistical physics for optimization & learning (course page)
- Modèles stochastiques pour les communications (course page)

Teaching assistant & guest lecturer
2022 - 2023

Massachusetts Institute of Technology — *Cambridge (MA), United States*

- Julia - solving real-world problems with computation (course page)

Teaching assistant & lecturer
2019 - 2022

École des Ponts ParisTech — *Champs-sur-Marne, France*

- Introduction to optimization
- Operations research (course page)
- Design of optimization challenges on:
  - facility location with Air Liquide
  - train shunting with SNCF
  - inventory routing with Renault

Civic service
2015

Lycée Jean-Baptiste Corot — *Savigny-sur-Orge, France*

- Scientific courses and mentoring for struggling high school and undergraduate students

Mentoring

Student advisor
2023 - present

École polytechnique fédérale de Lausanne — *Lausanne, Switzerland*

- Chun-Tso Tsai (2023): *Multi-Agent Pathfinding with Mixed-Integer Linear Programming and Lagrange Relaxation*
- Various group and individual projects:
  - graph community detection (2023)
  - Flatland challenge (2024)
  - parallel graph algorithms (2024)

Student advisor
2019 - 2022

École Nationale des Ponts et Chaussées — *Champs-sur-Marne, France*

- Louis Bouvier (2021): *Large Neighborhood Search and Structured Prediction for the Inventory Routing Problem*
- Various group projects:
  - train shunting (2020)
  - multimodal transit routing (2020)
  - pathfinding in historical maps (2022)
  - optimized dorm room assignment (2022)

Community service

Reviewer
ongoing

SCIENTIFIC PUBLISHING

- Journals: Transactions on Machine Learning Research, Journal of Open Source Software, Transportation Science, Transportation Research
- Conferences: JuliaCon (2021-2024), NeurIPS (2023), ICML (2023), Learning on Graphs (2024)

Conference organizer
2025

ROADEF

Head of the scientific programme for ROADEF 2025, the largest French conference in operations research (>500 participants)

PhD representative
2021

ÉCOLE DES PONTS

Representative for PhD students at my university. Advocated for student well-being during Covid lockdowns.

Awards

2023 **PhD award for mathematics in industry**, AMIES
2021 **Prix Pasquet for an outstanding engineering student**, École des Ponts ParisTech
2015 **1st place in the nationwide entrance exam**, École polytechnique

Skills

Languages English | French | German | Spanish
Programming Julia | Python | Git(Hub) | LaTeX
Personal Interests Music | Songwriting | Board games | Bouldering