Guillaume **Dalle**

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Postdoctoral researcher

Education

PhD in applied mathematics — *2019 - 2022*
École des Ponts ParisTech — *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*

Professional Experience

Postdoctoral researcher — *2023 - present*
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

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

Publications & preprints

[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. Zdeborová, “Analysis of Bootstrap and Subsampling in High-dimensional Regularized Regression”, no. arXiv:2402.13622. arXiv, Feb. 2024.

[3] G. Dalle, L. Baty, L. Bouvier, and A. Parmentier, “Learning with Combinatorial Optimization Layers: A Probabilistic Approach”, no. arXiv: 2207.13513. arXiv, Dec. 2022. doi: 10.48550/arXiv.2207.13513.

[4] G. Dalle, “Machine Learning and Combinatorial Optimization Algorithms, with Applications to Railway Planning”, 2022.

[5] G. Dalle and Y. de Castro, “Minimax Estimation of Partially-Observed Vector AutoRegressions”, no. arXiv:2106.09327. arXiv, May 2022. doi: 10.48550/arXiv.2106.09327.

[6] P. Stephan and G. Dalle, “Method for Determining a Soiling Speed of a Photovoltaic Generation Unit”, Jun. 2020

Talks

Conferences

2024 (accepted)

- 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)
- JPOC: *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 des Ponts ParisTech: *Understanding railway delay propagation through latent variable models* (abstract)

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*
- Oleg Fafurin (2023): *Graph algorithms in Julia*

Student advisor *2019 - 2022*

École des Ponts ParisTech *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

Peer review

- Journals: Journal of Open Source Software, Transportation Research
- Conferences: JuliaCon (2021-2024), NeurIPS (2023), ICML (2023)

Awards

2023 **PhD award for mathematics in industry**, AMIES
2021 **Prix Pasquet for the best 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