# Yassine Yaakoubi

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Citizenship: Tunisia & Canada Permanent Resident

## EDUCATION

**Polytechnique Montréal**, Canada

- *PhD in Mathematics*                                                                        2017–2020
- Thesis: Combining Artificial Intelligence and Mathematical Programming for Airline Crew Scheduling
- Supervisors: François Soumis and Simon Lacoste-Julien
- Fast-tracked from Masters to PhD program
- GPA: 4.0/4.0

**Polytechnique Montréal**, Canada and **Institut polytechnique de Grenoble**, France

- *Maîtrise (MSc equivalent) in Applied Mathematics*                                          2017–2017
- Thesis: Column Generation and Machine Learning for Airline Crew Pairing
- Supervisor: François Soumis
- Dual degree, jointly between Institut polytechnique de Grenoble and Polytechnique Montréal
- GPA: 4.0/4.0

**Institut polytechnique de Grenoble**, France

- *Engineering Diploma in Information Technology*                                             2015–2017
- Joint dual degree between Phelma (École Nationale Supérieure de Physique, Électronique et Matériaux) & Ensimag (École nationale supérieure d'informatique et de mathématiques appliquées)
- Triple Major (Discrete Optimization and Operations Research, Networks, IT security) & Double Minor
- Graduated with highest honors ("mention très bien")

## PROFESSIONAL & ACADEMIC EXPERIENCE

**IVADO Postdoctoral Fellow - McGill University**                                             2022–present
IVADO Strategic Research Funding Program
COSMO (Stochastic Mine Planning Laboratory)
Montréal, Canada

- COSMO Supervisor: Roussos Dimitrakopoulos
- IVADO PI: Erick Delage, IVADO Co-PIs: Emma Frejinger and Yossiri Adulyasak. Strategic Research Funding Program: "Integrated Machine Learning and Optimization for Decision Making under Uncertainty"
- Led IVADO grant preparation and project on "Smart Mineral Value/Supply Chains," focusing on data-driven lifelong learning stochastic optimizers for sustainable mineral resource development
- Collaborating with Elissa Strome and David Rolnick on the CIFAR (Canadian Institute for Advanced Research) landscape, symposium, and strategic initiative on AI for Energy and the Environment (AI4E&E)

**Postdoctoral Fellow - McGill University**                                                   2020–2022
COSMO
GERAD (Group for Research in Decision Analysis)
Montréal, Canada

- Supervisor: Roussos Dimitrakopoulos

- Developed self-learning meta- and hyper-heuristics for the simultaneous stochastic optimization of industrial mining complexes, combining reinforcement learning and optimization for decision making under uncertainty
- Spearheaded the development of COSMO Suite, the first state-of-the-art software for stochastic mine planning
- Assisted in the preparation and drafting of NSERC (Natural Sciences and Engineering Research Council of Canada) Discovery and CRD (Collaborative Research and Development) grant proposals
- Supervised several MSc and PhD students in their research
- Served as CIFAR's official reporter for the Pan-Canadian AI Strategy, documenting key discussions, outcomes, and facilitating collaboration among AI Chairs, researchers, and policymakers

**Research Assistant (MSc and PhD) - Polytechnique Montréal** 2017–2019
GERAD
Mila (Quebec Artificial Intelligence Institute)
Montréal, Canada

- Integrated machine learning and combinatorial optimization to develop data-driven state-of-the-art column generation-based solvers for large-scale airline crew scheduling, improving efficiency and scalability
- Developed ML-augmented warm-starting, dynamic adaptive cluster (dis)aggregation, and structure-informed solution generation techniques for robust solutions

**Research Assistant - Polytechnique Montréal** 2017
Montréal, Canada

- Supervisor: Christopher Pal
- Developed statistical tools and recurrent neural network models for analyzing global warming trends, performing temporal pattern recognition, and deepening climate change understanding
- Conducted comparative studies to assess model performance against established methods

**Research Engineer - Institut polytechnique de Grenoble** 2015-2016
G-SCOP (Laboratory of Sciences for Design, Optimization and production)
Grenoble, France

- Supervisor: Gauttier Stauffer
- Applied stochastic traveling salesman problem to golfing strategy optimization and formulated a Markov Decision Process for effective sequential decision-making
- Developed a Q-learning-based reinforcement learning algorithm and conducted computational studies for validity assessment and comparison

**Intern - General Motors** 2015
Strasbourg, France

- Optimized automatic transmissions production line and managed supply chain operations, achieving a production goal of 3000 units within the specified timeline and efficiently tracking supply-demand metrics

**Research Engineer - Institut polytechnique de Grenoble** 2014 - 2015
Grenoble Images Speech Signal and Control (GIPSA-lab)
Grenoble, France

- Supervisor: Franck Quaine
- Engineered a myoelectric interface for real-time EMG signal analysis and classification, successfully demonstrating control of a physical pilot arm via a 3D virtual arm

## SELECTED AWARDS AND DISTINCTIONS

- IVADO: Postdoctoral Research Fellowship Under the Strategic Research Funding Program 2022–present
- Deep Learning Indaba: Travel Award 2022–present

- INFORMS: Annual Meeting Travel Award                                                    2022
- ICML (International Conference on Machine Learning): Student Volunteer Award             2021
- Polytechnique Montréal: Doctoral Fellowship Award                                  2017–2019
- Grenoble INP (Institut polytechnique de Grenoble): Highest distinctions                 2017
- Polytechnique Montréal: Master's Scholarship Award                                      2017
- Explo'RA Sup: Two-time winner of the Exchange Student Mobility Scholarship         2016–2018
- Fondation Grenoble INP: Excellence Scholarship                                          2016
- Phelma – Grenoble INP: Research award                                                   2015
- ESPRIT Prépa: Awarded First-class Honours                                          2013–2014

**PRE-PRINTS**

- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (pre-print). Neural branching and diving for optimizing mining complexes under supply and demand uncertainties. *European Journal of Operational Research*.
- Ezzine, L. N., Bengio, Y., Atanane, A., Boukachab, G., Boussif, O., Mahfoud, M., **Yaakoubi, Y.**, Benabou, L., Boussioux, L., Mitra, P., Jacquillat, A., Den Hertog, D., Bennis, M, et al. (pre-print). Leveraging AI for Natural Disaster Management: Takeaways From The Moroccan Earthquake. *NeurIPS 2023*.
- Pereira, P., Courtade, E., Aloise, D., Quesnel, F., Soumis, F., & **Yaakoubi, Y.** (pre-print). Learning to branch for the crew pairing problem. *Operations Research Forum*.
- **Yaakoubi, Y.**, Soumis, F., & Lacoste-Julien, S. (pre-print). Flight-connection prediction for airline crew scheduling to construct initial clusters for OR optimizer. *Transactions on Machine Learning Research*.

**PUBLICATIONS**

- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2023). Learning to schedule heuristics for the simultaneous stochastic optimization of mining complexes. *Computers & Operations Research*, 159, 106349.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2022). A data-driven approach for the simultaneous stochastic optimization of mining complexes. *IFAC-PapersOnLine*, 55(21), 67–72.
- Tahir, A., Quesnel, F., Desaulniers, G., El Hallaoui, I., & **Yaakoubi, Y**. (2021). An improved integral column generation algorithm using machine learning for aircrew pairing. *Transportation Science*, 55(6), 1411–1429.
- **Yaakoubi, Y.**, Soumis, F., & Lacoste-Julien, S. (2020). Machine learning in airline crew pairing to construct initial clusters for dynamic constraint aggregation. *EURO Journal on Transportation and Logistics*, 9(4), 100020.
- Soumis, F., **Yaakoubi, Y.**, & Lacoste-Julien, S. (2019). Machine learning $\rightarrow$ mathematical programming for air crew scheduling. *Proceedings of the Triennial Symposium on Transportation Analysis*.

**CONFERENCE PAPERS**

**Note:** In Computer Science, conference papers are full-length, peer-reviewed, archival publications. The conferences below are highly competitive, with acceptance rates in the 15-30%.

- **Yaakoubi, Y.**, Soumis, F., & Lacoste-Julien, S. (2021). Structured convolutional kernel networks for airline crew scheduling. In *International Conference on Machine Learning*. PMLR, 139, 11626–11636.

**REFEREED WORKSHOPS & TALKS**

- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2023). Integrated Machine Learning And Optimization For The Simultaneous Stochastic Optimization Of Mining Complexes. INFORMS Annual Meeting.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2023). Diverse candidate generation for a sustainability-aware stochastic optimization of mining complexes. COSMO Technical Day.

- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2023). Context-aware neural branching & diving strategies for optimizing industrial mining complexes. CORS / Optimization Days (Optimization Days).
- **Yaakoubi, Y.**, Radi, H., & Dimitrakopoulos, R. (2022). Learning on graphs for mineral asset valuation under supply and demand uncertainty. In Graph Learning for Industrial Applications. *Proceedings of the Neural Information Processing Systems, Thirty-sixth Annual Conference Conference (NeurIPS-22)*.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2022). Learning to schedule heuristics for the simultaneous stochastic optimization of mining complexes. In W27: Machine Learning for Operations Research (ML4OR), AAAI Conference on Artificial Intelligence (AAAI-22), 1-8, AI Access Foundation.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2022). Rethinking optimizers and continual learning: A study on combining AI and OR for optimizing mining complexes under uncertainty. COSMO Technical Day.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2022). Self-learning hyper-heuristics for the optimization of industrial mining complexes. JOPT (Optimization Days).
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2021). Learn to perturb: A self-learning hyper-heuristic for the simultaneous stochastic optimization of mining complexes. Montreal AI Symposium.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2021). A self-learning hyper-heuristic method for strategic mine planning. INFORMS Annual Meeting.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2021). A self-learning tree-based approach to the simultaneous stochastic optimization of mining complexes. COSMO Technical Day.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2021). Learn on to perturb: A deep research reinforcement approach to adaptive simulated annealing for optimizing industrial mining complexes. European Conference on Operational Research (EURO).
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2021). A self-learning hyper-heuristic method for strategic mine planning. Conference of the International Federation of Operational Research Societies (IFORS).
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2020). Learn to perturb: A deep reinforcement learning approach to adaptive simulated annealing for optimizing industrial mining complexes. COSMO Technical Day.
- **Yaakoubi, Y.**, Soumis, F., & Lacoste-Julien, S. (2019). Machine learning in airline crew pairing to construct initial clusters for dynamic constraint aggregation. JOPT (Optimization Days).
- **Yaakoubi, Y.**, & Lacoste-Julien, S., Soumis, F. (2019). Structured convolutional kernel networks for airline crew scheduling. Montreal AI Symposium.
- **Yaakoubi, Y.**, Soumis, F., & Lacoste-Julien, S. (2018). Accelerating the optimization of aircrew rotations with machine learning. JOPT (Optimization Days).

## TEACHING EXPERIENCE

### Instructor, McGill University, Faculty of Engineering

- MIME 522 – Discrete Optimization and Mineral Resources: Lecturing, project supervision.   2022–present
- MIME 631 – Advanced Stochastic Optimization in Mine Planning: Lecturing, grading.   2021–present
- MIME 513 – Mine Planning Optimization Under Uncertainty: Lecturing, grading.   2020–present

## ACADEMIC SERVICE AND LEADERSHIP

- Deep Learning Indaba   2022-present
  Sponsorship committee: Raising annually 600,000 USD to strengthen machine learning in Africa
  Programme optimization and mining clusters: Spearheading the initiatives
- EDI Committee of GERAD   2022-present
  Comprehensive survey, data analysis, and strategic recommendations
- INFORMS OR/MS Today & INFORMS OR/MS Tomorrow   2021-present
  Editorial staff writer and board member

- AAAI (Association for the Advancement of Artificial Intelligence) conference        2022
  Help desk and session co-chair: Provided technical support and chaired conference sessions
- ICML (International Conference on Machine Learning)        2021
  Help desk and session co-chair: Provided technical support and chaired conference sessions
- Summer Undergraduate Research in Engineering, Poster Competition at McGill University    2021
  Student presentations and posters evaluation and follow-up mentorship
- JOPT (Optimization Days)        2018-2019
  Session organizer: Coordinated and chaired conference sessions
- DeepAlpha startup (Reinforcement learning for portfolio optimization)        2017-2019
  Provided technical assistance and guidance for portfolio optimization solutions

## PROFESSIONAL ACTIVITIES

- Mentoring and supervising **4** undergraduate students, **6** MSc, and **4** PhD students.
- Active member of Reinforcement Learning Theory Reading Group, Reinforcement Learning Sofa Meetings (Mila), Association Jeunes Science de Tunisie (AJST), Artificial Intelligence Journal Club (AIJC)

## REVIEWING EXPERIENCE

- **Journals:** INFORMS Journal on Computing (3), Resources Policy (3), Transportation science (1), Computers & Geosciences (1), International Journal of Mining Science and Technology (1).
- **Conferences:** ICML (International Conference on Machine Learning) (3), AISTATS (International Conference on Artificial Intelligence and Statistics) (3), International Conference on Computer Science and Application Engineering (3), IFAC (International Federation of Automatic Control Symposium on Control), Optimization and Automation in Mining, Mineral and Metal Processing (1).
- **Workshops:** Montreal AI Symposium (MAIS) (7).

## CERTIFICATIONS & SKILLS

- **Temporary Restrictive Permit** holder, granted by the **Ordre des ingénieurs du Québec (OIQ)** under the mutual recognition arrangement between France and Quebec. Authorized to work under supervision as "ing. PRT". Registered for the professional exam on October 21, 2023. Member number: 6063606
- Programming languages: Python, C/C++, C#, Java, R
- Software libraries: JAX, Pytorch, Tensorflow, Keras, Scikit-learn, Theano, Weka
- Languages: English (C2), French (C2), Arabic (C2), and German (B2)

## REFERENCES

1. François Soumis
   Full Professor,
   Polytechnique Montréal
   francois.soumis@gerad.ca
3. David Rolnick
   Assistant Professor
   School of Computer Science, McGill University
   CIFAR AI Chair, Mila
   Co-founder and Chair, Climate Change AI
   drolnick@cs.mcgill.ca

2. Roussos Dimitrakopoulos
   Full Professor
   Canada Research Chair (Tier I)
   Director, COSMO (Stochastic Mine Planning Laboratory)
   McGill University
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