# Yassine Yaakoubi

1515 Ste. Catherine St. W., EV-4.111 ◇ Montréal, QC H3G 2W1 ◇ Canada

E-mail: Yassine.Yaakoubi@concordia.ca, Yassine.Yaakoubi@mcgill.ca ◇ Web: Yaakoubi.github.io ◇ Phone: (+1) 514-549-9127


## RESEARCH AREAS

Probabilistic Machine Learning, Reinforcement Learning, Large-Scale Combinatorial Optimization, Decomposition Methods, Stochastic Programming and Processes, Supply/Value Chains, Transportation Systems, Crew Scheduling.

## EDUCATION

**McGill University,** Canada 2022–2024

- *Post-doctorate*
- Integrated Machine Learning and Optimization for Decision Making under Uncertainty
- Supervisors: Roussos Dimitrakopoulos, Erick Delage, Yossiri Adulyasak, and Emma Frejinger

**McGill University,** Canada 2020–2022

- Post-doctorate
- Stochastic Mine Planning
- Supervisor: Roussos Dimitrakopoulos

**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* 2014–2017
- 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

**Tenure-Track Assistant Professor, Concordia University** 2024–present
Montréal, Canada

- Gina Cody School of Engineering and Computer Science
- Department of Mechanical, Industrial & Aerospace Engineering (MIAE)

**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
- AI-for-Climate Grand Challenge landscape assessment, with Climate Change AI (David Rolnick, Priya L Donti, Lynn Kaack), in collaboration with and supported by the Bezos Earth Fund, to identify pitfalls and establish recommendations
- Collaboration with CIFAR (Canadian Institute for Advanced Research) for a landscape, symposium, and strategic initiative on AI for Energy and the Environment (AI4E&E)

**Team lead - Grand Challenge Initiatives in AI for Climate & Nature** 2023–2024
United States of America

- Climate Change AI and Bezos Earth Fund
- Collaboration with Climate Change AI (David Rolnick, Priya L Donti, Lynn Kaack) and the Bezos Earth Fund, lead a landscape assessment of the AI for Climate Grand Challenge to identify pitfalls and make recommendations.
- Climate Change AI is one of the world's most prominent non-profits in AI for climate and nature. Our collaboration, in partnership with and supported by the Bezos Earth Fund, resulted in a 15+ author white paper that launched a $100M Grand Challenge. I served as program manager and team leader for this collaboration.

**Program Manager** 2022–2023
Canadian Institute for Advanced Research

- Led a landscape assessment, 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

**CIFAR's official reporter for the Pan-Canadian AI Strategy** 2022
Canadian Institute for Advanced 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 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 for 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

- **INFORMS** - 1,500 $ 2022
  Annual Meeting Travel Award (related to my work as editor of OR/MS Tomorrow.)
- **Deep Learning Indaba** - 4,000 $ 2022-present
  *Deep Learning Indaba - Travel Award*
- **IVADO** - 70,000 $ 2022–present
  *Postdoctoral Research Fellowship Under the IVADO Strategic Research Funding Program*
- **International Conference on Machine Learning** 2021
  *Student Volunteer Award*
- **COSMO Consortium** - 200,000 $ 2020–present
  *COSMO Consortium Fellowship*
- **École Polytechnique de Montréal** - 50,000 $ 2018–2020
  *Doctoral Fellowship Award*
- **Institut polytechnique de Grenoble** 2018
  *Graduated with highest honors from Grenoble Institute of Technology.*
- **Explo'RA Sup** - 5,000 $ 2018
  *Mobility grant for joint dual diploma between Grenoble Institute of Technology and Polytechnique Montréal.*
- **Polytechnique Montréal** - 10,000 $ 2017
  *Master's Scholarship Award*
- **Fondation Grenoble INP** - 2,500 $ 2016
  *Excellence Scholarship*
- **Phelma – Grenoble INP** - 1,000 $ 2015
  *Research award*

## RESEARCH FUNDING HISTORY

### Awarded and/or Completed

1. **Faculty Research Start-up Funds** 2024-present
   *Principal Investigator*
   *Grant amount : 75,000 CAD*
   *Funding Sources: Concordia University*

2. **Strengthening African Machine Learning and Artificial Intelligence through Deep Learning Indaba** 2024-present
   *Co-investigator*
   *Grant amount : 400,000 CAD*
   *Funding Sources: International Development Research Centre (IDRC)*
   *Co-investigators: Emily Muller; Shakir Mohamed*

3. **Deep Learning Indaba** 2024-present
   *Principal Investigator*
   *Grant amount: 100,000 USD*
   *Funding Sources: Bill and Melinda Gates Foundation*
   *Co-investigator: Shakir Mohamed*

4. **IVADO Scientist in Residence Program - Intelligent CapEx Optimization for Sustainable Mining** 2024-present
   *Co-investigator*
   *Grant amount: 10,000 CAD*
   *Funding Sources: Scale AI, IVADO*
   *Principal Investigator: Matheus Faria*
   *Co-investigators: Abdallah Jarray, Luiz Silva, Renaud Senecal*

5. **Integrated Machine Learning and Optimization for Decision Making under Uncertainty** 2022-2024
   *Fellowship Co-investigator*
   *Grant amount: 70,000 CAD*
   *Funding Sources: IVADO, Strategic Research Funding Program*
   *Principal Investigator: Roussos Dimitrakopoulos*

6. **École Polytechnique de Montréal** 2017-2020
   *Scholarship amount: 60,000 CAD*
   *Funding Sources: École Polytechnique de Montréal*

### Under Review

1. **Google Academic Research Program, Grant** 2024
   *Co-applicant*
   *Grant amount: 20,000 CAD*
   *Funding Source: Google*
   *Co-applicant: Amal Rannen-Triki*

2. **Deep Learning Indaba, Grant** 2024
   *Principal Applicant*
   *Grant amount: 25,000 USD*
   *Funding Source: Schmidt Sciences*

## PRE-PRINTS

- Yaakoubi, Y; Dimitrakopoulos, R. (Under Review). Distributionally Robust Warm-Starting for Mineral Supply/Value Chains. INFORMS Journal on Computing.
- Del Castillo, F; Yaakoubi, Y; Dimitrakopoulos, R. (Under Review). Stochastic Optimization of Mining Complexes Integrating Capital Investments and Operational Alternatives. Optimization and Engineering.
- Pereira, P., Courtade, E., Aloise, D., Quesnel, F., Soumis, F., & **Yaakoubi, Y.** (pre-print). Learning to branch for the crew pairing problem. *Transportation Research Part E*.
- **Yaakoubi, Y.**, Soumis, F., & Lacoste-Julien, S. Flight-connection prediction for airline crew scheduling to construct initial clusters for OR optimizer. arXiv preprint arXiv:2009.12501.

## JOURNAL PUBLICATIONS

- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2024). Decision-focused neural adaptive search and diving for optimizing mining complexes. *European Journal of Operational Research*.
- **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. (2021). Structured convolutional kernel networks for airline crew scheduling. *International Conference on Machine Learning*. PMLR, 139, 11626–11636.
- **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*.

## CONFERENCES, REFEREED WORKSHOPS & TALKS

- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2024). Machine Learning for Distributionally Robust Warm-Starting in Mineral Supply/Value Chains. International Symposium on Mathematical Programming.
- **Yaakoubi, Y.**, & Dimitrakopoulos, R. (2024). Distributionally Robust Warm-Starting for Mineral Supply/Value Chains. Optimization Days.
- 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, El Housni, O., et al. (pre-print). Leveraging AI for Natural Disaster Management: Takeaways From The Moroccan Earthquake. *NeurIPS 2023 Workshop on Artificial Intelligence for Humanitarian Assistance and Disaster Response*.
- **Yaakoubi, Y.** (2023). Optimization and Learning for Mineral Value Chains. Industrial presentation. Imperial Oil (ExxonMobil).
- **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.**, de Carvalho, J. P., & Cutler, J. (2023). Context-Aware Smart Solvers for Optimizing Supply/Value Chains. GERAD-IVADO Contextual Optimization Workshop.

- **Yaakoubi, Y.**, Radi, H., & Dimitrakopoulos, R. (2022). Learning on graphs for mineral asset valuation under supply and demand uncertainty. *NeurIPS-22 Workshop on Graph Learning for Industrial Applications: Finance, Crime Detection, Medicine and Social Media*.
- **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). 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

**Tenure-Track Assistant Professor, Concordia University, Gina Cody School of Engineering**

- INDU 6161 - Design & Operations of Supply Chain Networks. 2024–present
- Technical elective course – Applied Industrial Engineering Analytics. 2024–present

**Instructor, McGill University, Faculty of Engineering**

- MIME 522 – Discrete Optimization and Mineral Resources: Lecturing, project supervision. 2022–2024
- MIME 631 – Advanced Stochastic Optimization in Mine Planning: Lecturing, grading. 2021–2024
- MIME 513 – Mine Planning Optimization Under Uncertainty: Lecturing, grading. 2020–2024

## ACADEMIC SERVICE AND LEADERSHIP

- Deep Learning Indaba 2024-present
  Steering Committee Member and Sponsorship Chair
  Deep Learning Indaba is an educational charity, whose mission is to strengthen African AI
  Annualy: 200+ travel grants, 400+ accommodation scholarships, and 20+ innovation grants.
  Raised $1.5 million CAD to strengthen machine learning and artificial intelligence.
- Deep Learning Indaba 2022-2023
  Sponsorship committee member: Raising annually $600{,}000+$ USD to strengthen machine learning in Africa
  Spearheading the Indaba initiatives on Optimization and Mining

- 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

## STUDENTS (CO-)SUPERVISED

### Bachelor's

1. **Logan Labossiere**, McGill University 2023–present
   *Thesis/Project Title:* Decentralized Smart Mining Complexes: Balancing Short-Term Efficiency with Long-Term Targets Using Multi-Agent Reinforcement Learning
   *Present Position:* Bachelor's student, McGill University

### Master's

1. **Hager Radi**, University of Alberta 2022–2023
   *Thesis/Project Title:* Learning on Graphs for Mineral Asset Valuation Under Supply and Demand Uncertainty
   *Present Position:* Applied research scientist, Mila
2. **Cristina Tessa Penadillo Palomino**, McGill University 2022–2023
   *Thesis/Project Title:* Underground mining: stope layout, production scheduling and access network
   *Present Position:* Mining Engineer, Newmont
3. **Pierre Pereira**, Polytechnique de Montreal 2021–2022
   *Thesis/Project Title:* Learning to branch for the crew pairing problem
   *Present Position:* R&D Engineer, JoliBrain
4. **Emeric Courtade**, Polytechnique de Montrea 2021–2022
   *Thesis/Project Title:* Learning to branch for the crew pairing problem
   *Present Position:* Data Scientist, CMA CGM
5. **Philippe Racette**, Polytechnique de Montrea 2017–2018
   *Thesis/Project Title:* Machine Learning for Airline Crew Rostering
   *Present Position:* PhD student, Polytechnique de Montreal

### Doctorate

1. **Adil Tahir**, Polytechnique de Montrea 2019–2020
   *Thesis/Project Title:* An improved integral column generation algorithm using machine learning for aircrew pairing
   *Present Position:* Assistant Professor, Mohammedia Faculty of Science and Technology

## REVIEWING EXPERIENCE

- **Journals:** INFORMS Journal on Computing (3), Resources Policy (3), Transportation science (1), Computers & Geosciences (1), International Journal of Mining Science, Technology (1) and Deep Learning Indaba.
- **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, Metal Processing (1) and JOPT (Optimization Days).
- **Workshops:** Montreal AI Symposium (MAIS) (7).

## CERTIFICATIONS & SKILLS

- **Temporary Restrictive Permit** holder, granted by the **Order of Engineers of Quebec** under the mutual recognition arrangement between France and Quebec. Authorized to work under supervision as "ing. PRT". Successfully completed 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)

## INTELLECTUAL PROPERTY

**Intellectual Property Patent & License Inventor**

**Simultaneous Stochastic Optimization of Mining Complexes for Strategic Planning**

The first stochastic mine planning software in the market, developed in collaboration with (and commercialized to) a consortium of mining companies that collectively represent 75% of the world's mining activity.

## REFERENCES

1. François Soumis
   Full Professor
   Polytechnique Montréal
   francois.soumis@gerad.ca
2. Roussos Dimitrakopoulos
   Full Professor
   Canada Research Chair (Tier I)
   Director, COSMO (Stochastic Mine Planning Laboratory)
   McGill University
   roussos.dimitrakopoulos@mcgill.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