Amine Bennouna

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Education

Massachusetts Institute of Technology 2019 – Present
Ph.D candidate in Operations Research (GPA 5.0/5) *Cambridge, MA*
- Advisor: Bart Van Parys
- Thesis: Optimal Robustness in Learning and Data-driven Decision Making

Ecole Polytechnique 2016 – 2019
Master of Science in Applied Mathematics *Paris, France*
Bachelor of Science in Mathematics and Computer Science
- Advisor: Stéphane Gaubert.

Lycée Louis-le-Grand 2014 – 2016
Classes préparatoires, Mathematics, Physics, Computer Science *Paris, France*
- Intensive undergraduate program leading to nationwide exams.
  Admitted to ENS Ulm and Ecole Polytechnique (4th).

Research Interests

Data-driven Decision-making, Machine Learning, Optimization;
Distributionally Robust Optimization, Reinforcement Learning, Statistics.

Papers

Published or under review:

[1] Certified Robust Neural Networks: Generalization and Corruption Resistance (`link`)
Amine Bennouna, Ryan Lucas & Bart Van Parys.
Accepted in ***ICML 2023***
- ⋆ *Runner-up of INFORMS 2023 Data Mining Best Paper Award (General Track)*
- ⋆ *Winner of INFORMS 2023 Workshop on Data Science Best Student Paper*

[2] Holistic Robust Data-Driven Decisions (`link`)
Amine Bennouna & Bart Van Parys.
Submitted to Management Science

[3] Learning and Decision-Making with Data: Optimal Formulations and Phase Transitions (`link`)
Amine Bennouna & Bart Van Parys.
Major Revision in ***Mathematical Programming***
- ⋆ *Winner of MIT Operations Research Center Best Student Paper 2022*

[4] Optimal Discretization in RL: Learning the Minimal Representation of a Dynamic System from Transition Data (`link`)
Amine Bennouna, Dessislava Pachamanova, Georgia Perakis & Omar Skali Lami.
Minor Revision in ***Management Science***

[5] COVID-19: Prediction, Prevalence, and the Operations of Vaccine Allocation (`link`)
Amine Bennouna, Joshua Joseph, David Nze-Ndong, Georgia Perakis, Divya Singhvi, Omar Skali Lami, Yannis Spantidakis, Leann Thayaparan, Asterios Tsiourvas.
Accepted in ***Manufacturing & Service Operations Management 2022***
- ⋆ *Finalist of INFORMS Doing Good with Good OR 2021*
- ⋆ *Honorable Mention Public Sector Operations Research Best Paper Competition 2021*
- ⋆ *INFORMS ICSS Best Conference Paper 2021*

[6] Shallow and Deep Networks are Near-Optimal Approximators of Korobov Functions (`link`)
Moïse Blanchard & Amine Bennouna.
Accepted in ***ICLR 2022***

In preparation for submission:

[7] Robust Two-Stage Optimization with Covariate Data (`link`)
Bart Van Parys & Amine Bennouna.

[8] Robust Statistics Through a Robust Optimization Lens
Gabriel Chan, Bart Van Parys & Amine Bennouna.

[9] Near Optimal Tractable Threshold Policies for Two-stage Robust Optimization Problems (`link`)
Amine Bennouna, Omar El Housni & Vineet Goyal.

⋆ *Winner of Ecole Polytechnique's 1st prize of research internship in Applied Mathematics*

Teaching Experience

Optimization Methods, MIT 15.093/6.255 Rating
Graduate (Masters, MBAn, PhDs), 180 students **6.9/7** (79 ratings)
Head teaching assistant, Fall 2021

Optimization Methods, MIT 15.093/6.255 Rating
Graduate (Masters, MBAn, PhDs), 120 students **6.5/7** (60 ratings)
Teaching assistant, Fall 2020

The Analytics Edge, MIT 15.071
Graduate (MBA), 80 students
Guest Lecturer, Fall 2023

The Advanced Analytics Edge, MIT 15.072
Graduate (MBAn), 100 students
Guest Lecturer, Fall 2023

Mathematical Olympiad, Instructor
Morocco's national team IMO training 2017-2019

Advanced Mathematics, Classes Préparatoires
Instructor and examiner for Institut Bossuet (Lycée Louis-le-Grand, Saint-Louis, Henri IV)

Research Mentorship

Mentored MIT Masters Research Assistants
Ryan Lucas (then MIT ORC PhD), Gabriel Chan, Julien Pinede.

Mentored MIT Undergraduate Research Assistants
Janice Yang (then MIT MEng RA), Lowell Hensgen (then MIT MEng RA), Albert Luo, William Zhao.

Industry Experience

Google Research Summer 2023
Part-time Student Researcher *New York, NY*

- Launched a research collaboration on learning under distribution shift.

Google Research Summer 2022
Research Intern *New York, NY*

- Designed and implemented novel learning algorithms for image classification under distribution shift.

Research Experience

Massachusetts Institute of Technology, ORC Aug 2019 – Present
Doctoral Research Assistant, advised by Prof. Bart Van Parys *Cambridge, MA*

- Research on robustness in data-driven decision-making and machine learning problems. Designed novel "optimally robust" algorithms, with applications including deep learning and portfolio optimization.
- Theoretical and computational contributions to Distributionally Robust Optimization (DRO). Building novel DRO approaches for robust machine learning.
- Introduced a novel interpretable reinforcement learning approach. Applied the approach to COVID-19 cases and deaths forecasting and later used by the CDC.

Columbia University, IEOR Summer 2019
Research Intern, advised by Prof. Vineet Goyal *New York, NY*

- Introduced novel near-optimal policies for two-stage robust optimization problems.

Ecole Polytechnique, CMAP Sep 2018 – Apr 2019
Research Assistant *Paris, France*

- Worked with Prof. Stephane Gaubert & Prof. Xavier Allamigeon on the complexity of interior point methods, with Prof. Emmanuel Gobet on simulation methods of stochastic processes, and with Prof. Igor Kortchemski on random minimal factorizations of large n-cycles.

Awards

Runner-up of INFORMS Data Mining Best Paper Award (General Track)	2023
INFORMS Workshop on Data Science Best Student Paper	2023
MIT Operations Research Center Best Student Paper Award	2022
Runner-up of INFORMS Doing Good with Good OR Student Paper Competition	2021
Honorable Mention in the Public Sector Operations Research Best Paper Competition	2021
Third Best Talk at CMU YinzOR Flash Talk Competition	2023
ICSS Best Conference Paper Award	2021
1st Prize Operations Research Center's Common Experience Deep Learning Challenge	2021
Top 2% in Kaggle Brain Tumor Classification Competition (Silver Medal)	2021
Robert B. Guenassia Award, MIT Office of Graduate Education	2021
Ecole Polytechnique 1st Prize of Research Internship in Applied Mathematics	2019
Chanoine Pierre Garand Award for Outstanding Undergraduate Pathway, Institut Bossuet	2016
Moroccan Merit Scholarship	2016
Honorable Mention in National French Physics Olympiad	2016
Honorable Mention in International Mathematical Olympiad (IMO)	2014

Service and Outreach

Reviewer: Operations Research.

Session Chair: INFORMS Annual Meeting 2023, ICCOPT 2022 Conference.

Seminar Coordinator: MIT Operations Research Center Seminar Series Spring 2023.

Initiatives: President of the Moroccan Mathematical Olympiad Society (2016-2019),
Co-organizer of the Morocco Solidarity Hackathon (AI/Optimization for mitigating natural disasters risks)

Talks

Holistic Robust Data-Driven Decisions

- INFORMS Annual Meeting Data Mining Best Paper Competition, October 2023, Phoenix AZ
- INFORMS Annual Meeting General Session, October 2023, Phoenix AZ
- CMU YinzOR Selected Flash Talk, August 2023, Pittsburgh PA
- SIAM Conference on Optimization, June 2023, Seattle WA
- Manufacturing & Services Operation Management Conference, June 2023, Montreal
- UM6P ThinkAI Hackathon Guest Speaker, May 2023, Benguerir
- MIT ORC Seminar (Best Paper Award), February 2023, Cambridge MA
- INFORMS Annual Meeting, October 2022, Indianapolis IN
- MoroccoAI Webinar Invited Speaker, October 2022, virtual
- ICCOPT, July 2022, Bethlehem PA
- MIT ORC Student Seminar, October 2022, Cambridge MA

Certified Robust Neural Networks: Bridging Generalization and Corruption Resistance

- *Upcoming:* MILA Invited Talk, 10 November 2023, Montreal
- INFORMS Workshop on Data Science, October 2023, Phoenix AZ
- ICML, July 2023, Honolulu HI/virtual

Learning and Decision-Making with Data: Optimal Formulations and Phase Transitions

- MIT ORC Student Seminar, October 2021, Cambridge MA
- INFORMS Annual Meeting, October 2021, Anaheim CA

Minimal Representation Learning: Toward more Interpretable and Efficient Offline Reinforcement Learning

- INFORMS Healthcare Conference, July 2021, virtual
- Manufacturing & Services Operation Management Conference Conference, June 2021, virtual
- MIT ORC Student Seminar, April 2021, Cambridge MA
- INFORMS Annual Meeting, November 2020, virtual

The Representation Power of Neural Networks

- ICLR, April 2022, virtual (poster session)
- MIT ORC Student Seminar, March 2021, Cambridge MA
- MIT SIAM Student Seminar, December 2020, Cambridge MA

Skills

Languages | *Fluent:* English. *Native:* French, Arabic.
Programming | *Proficient:* Python, Julia. *Prior experience:* SQL, Maple, OCaml, HTML.
Software Tools | PyTorch, TensorFlow, JuMP, Gurobi, MOSEK.

Outside Activities

Soccer, Piano, Biking, Reading, Hiking.

References

Prof. Bart Van Parys
Sloan School of Management
Massachusetts Institute of Technology
vanparys@mit.edu

Prof. Patrick Jaillet
Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology
jaillet@mit.edu

Prof. Daniel Kuhn
Risk Analytics and Optimization Chair
Swiss Federal Institute of Technology Lausanne
daniel.kuhn@epfl.ch