Arthur Delarue

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA 9/2016 – 6/2021
Candidate for PhD in Operations Research. GPA: 5.0/5.0
Thesis: Improving Public School Operations with Optimization and Machine Learning.
Advisor: Dimitris Bertsimas.

Massachusetts Institute of Technology, Cambridge, MA 9/2012 – 6/2016
S.B. in Physics and Mathematics. GPA: 5.0/5.0
Honors: Phi Beta Kappa, Sigma Pi Sigma.

PUBLICATIONS

1. Bus Routing Optimization Helps Boston Public Schools Design Better Policies (with D. Bertsimas, W. Eger, J. Hanlon, S. Martin). *INFORMS Journal of Applied Analytics* 50(1): 39-47 (2020).
2. Optimizing Schools' Start Time and Bus Routes (with D. Bertsimas, S. Martin). *Proceedings of the National Academy of Sciences* 116(13): 5943-5948 (2019).
3. Travel Time Estimation in the Age of Big Data (with D. Bertsimas, P. Jaillet, S. Martin). *Operations Research* 67(2): 498-515 (2019).

WORKING PAPERS

1. Reinforcement Learning with Combinatorial Actions: Application to Vehicle Routing (with R. Anderson, C. Tjandraatmadja). Submitted.
2. From Predictions to Prescriptions: a Data-Driven Response to COVID-19 (with D. Bertsimas et al.). Submitted.
3. The Price of Interpretability (with D. Bertsimas, P. Jaillet, S. Martin). Submitted.
4. Optimal Explanations of Linear Models (with D. Bertsimas, P. Jaillet, S. Martin). Preprint available on arXiv:1907.04669
5. An Integrated Approach to Machine Learning with Missing Data (with D. Bertsimas, J. Pauphilet). In preparation.
6. Fair Predictions of Individual Costs in Routing Problems (with D. Bertsimas). In preparation.
7. Optimizing Extended School Year Operations at Boston Public Schools (with D. Bertsimas). In preparation.

AWARDS AND HONORS

MIT William L Stewart, Jr. Award 2020

INFORMS Data Mining Section Best Student Paper, Finalist 2019
INFORMS Franz Edelman Laureate 2019
MIT LIDS Student Conference Best Presentation, Second Place 2019
INFORMS Doing Good With Good OR Competition, Second Place 2018
MIT ORC Best Student Paper 2018
Boston Public Schools Transportation Challenge, First Place 2017
William Asbjornsen Albert Memorial Fellowship 2016
Zeno Karl Schindler Foundation Research Grant 2014
Third prize in Latin from "Concours général des lycées" (Top-level French national contest) 2011

SELECTED MEDIA COVERAGE

How an Algorithm Made the Buses in Boston Better. *Popular Mechanics*, August 2019.

Building a Smarter (and Cheaper) School Bus System. *The 74 Million*, August 2019.

What the Boston School Bus Schedule Can Teach Us About AI. *Wired*, November 2018.

The Equity Machine. Special report in *The Boston Globe*, September 2018.

How Do You Fix a School Bus Problem? Call MIT. *The Wall Street Journal*, August 2017.

2 MIT Engineers Use Math To Plot A Path For Boston's School Buses. *WBUR*, July 2017.

INDUSTRY EXPERIENCE

Google, Cambridge, MA, *Research Intern* 6/2019 – 8/2019
- Developed a mixed-integer optimization framework to solve combinatorial optimization problems such as the capacitated vehicle routing problem using reinforcement learning.
- Conducted simulation study and presented results to the Operations Research team.

Jane Street Capital, New York, NY, *Trading Intern* 1/2015
- Analyzed arbitrage and risk hedging strategies and searched for new opportunities.
- Developed predictive models to capitalize on trends in historical data.

RESEARCH EXPERIENCE

MIT Operations Research Center, Cambridge, MA, *Research Assistant* 5/2015 - Present
- Designed innovative mixed-integer formulation and efficient heuristics for school bus routing and bell time assignment. Presented methods and results to Boston Public Schools (BPS) leaders and received top prize in both phases of BPS Transportation Challenge. Algorithm assigned all 30,000 BPS students to school bus routes for the 2017-2018 school year. Competition and results covered by local and national media including the Boston Globe and Wall Street Journal.
- Proposed new mathematical framework to quantify interpretability in machine learning.
- Developed second-order cone method to estimate network travel times using sparse observations.
- Investigating new machine learning algorithms for data with missing observations, combining statistical techniques with mixed-integer optimization insights.

MIT Kavli Institute for Astrophysics, Cambridge, MA, *Research Assistant* 1/2013 – 1/2015
- Analyzed data from the NASA Kepler mission, which aims to detect extrasolar planets and binary stars by looking for tiny dips in the brightness of a source when a planet (or companion star) transits in front of it.
- Applied modern data methods to automatically detect periodic trends in light-curve data for over 200,000 stars.

ETHZ Institute for Particle Physics, Zurich, Switzerland, ***Summer Intern*** 6/2014 – 8/2014

- Implemented modern jet reconstruction techniques to identify boosted top quarks at the Large Hadron Collider.
- Optimized top tagging algorithms using various particle physics C++ extensions and packages, such as ROOT.

Center for Free-Electron Laser Science, Hamburg, Germany, ***Summer Intern*** 6/2013 – 8/2013

- Engineered software to log data and semi-automate tests of micrometer-scale nozzles delivering biological samples into a vacuum chamber.

TEACHING EXPERIENCE

Computing in Optimization and Statistics (15.S60), MIT Sloan, ***Course Coordinator*** 1/2020

- Defined course expectations, prepared course outline and overview, coordinated a team of 11 teaching assistants, assigned session leaders.
- Responsible for developing assignments, managing enrollment, and course feedback.

Computing in Optimization and Statistics (15.S60), MIT Sloan, ***Teaching Assistant*** 1/2018, 1/2019

- Taught sessions to Sloan graduate students on using tools including the Julia language, its JuMP extension for mathematical programming, and distributed computing resources.

Software Tools for Business Analytics (15.S41), MIT Sloan, ***Teaching Assistant*** 1/2018, 1/2020

- Taught 3-hour sessions to Sloan undergraduate students on using the Julia language and its JuMP extension for basic mathematical programming.

The Analytics Edge (15.071), MIT Sloan, ***Teaching Assistant*** 1/2018 – 5/2018

- Prepared recitations, conducted office hours, developed and graded homework assignments, and supervised final projects for course aiming to introduce data analytics to Sloan MBA students.

Private Physics Tutor, Lycee Saint-Jean de Passy 12/2011 – 5/2012

- Taught 9th grade physics and chemistry. Reviewed assignments and materials for exams.

LEADERSHIP AND SERVICE

MIT Residential Education, Cambridge MA, ***Graduate Resident Advisor*** 8/2018 - Present

- Live-in mentor and support resource for 40 undergraduates. Organize weekly study breaks and monthly hall events. Completed 10-module community development training.

MIT Operations Research Center, Cambridge MA, ***REFS Member*** 1/2017 - Present

- Member of ORC REFS team (Resources for Easing Friction and Stress). Support students with issues related to research, communication, and personal matters. Completed semester-long conflict management training.

MIT Office of the Chancellor, Cambridge, MA, ***Consultant*** 6/2019 – 8/2019

- Developed and implemented mixed-integer optimization algorithm to assign all incoming first-year MIT students (Class of 2023) to dorms based on their preferences.
- Assisted student leaders to develop algorithmic in-residence rooming assignment procedures for incoming first-year students.

MIT Residential Life, Cambridge, MA, ***Residence Hall President*** 1/2015 – 1/2016

- Elected president of MIT dorm, responsible for leading internal house government and interfacing with other MIT entities. Fostered communication between administration, students and faculty.

SELECTED TALKS

The Price of Interpretability
- INFORMS Annual Meeting, Seattle, WA 2019

Driving Policy with Optimization: Optimizing Schools' Start Time and Bus Routes
- INFORMS Annual Meeting, Seattle, WA 2019
- CSBA Data as a Resource Workshop, Washington, DC 2019
- AI100 Prediction in Practice Workshop, New York City, NY 2019
- MIT LIDS Annual Student Conference, Cambridge, MA 2019
- INFORMS Annual Meeting, Phoenix, AZ 2018
- MIT ORC Fall Seminar Series, Cambridge, MA 2018
- MIT ORC Special Seminar on Operations Research for Social Good 2018

Travel Time Estimation in the Age of Big Data
- ISMP Triennial Meeting, Bordeaux, France 2018
- INFORMS Annual Meeting, Houston, TX 2017

SKILLS AND INTERESTS

Languages: French (native), German (intermediate), Spanish (intermediate), Greek (beginner).
Software: Julia, R, C++, Python, Bash, Mathematica, Matlab, SQL.
Interests: Reading, skiing, baseball.