

Rafid Mahmood

Mechanical and Industrial Engineering
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Employment

NVIDIA

AI Resident Researcher

2020–2021

Education

University of Toronto, Mechanical and Industrial Engineering

Ph.D Industrial Engineering (Operations Research)

2015–2020

Vector Institute for Artificial Intelligence Postgraduate Affiliate

2019–2020

Thesis: Learning to Solve Optimization Problems with Hidden Components: Applications in Automated Treatment Planning

Adviser: Professor Timothy C. Y. Chan

University of Toronto, Electrical and Computer Engineering

M.A.Sc. Electrical Engineering

2013–2015

Thesis: Rank Metric Convolution Codes with Applications in Network Streaming

Adviser: Professor Ashish Khisti

Honors B.A.Sc. Electrical Engineering

2008–2013

Publications¹

In Preparation

1. A. Babier*, B. Zhang, **R. Mahmood**, K. Moore, T. Purdie, A. McNiven, and T. C. Y. Chan, OpenKBP: The Open-access Knowledge-Based Planning Grand Challenge, 2020.
2. R. K. Wong*, M. A. Pitino, **R. Mahmood**, I. Y. Zhu, D. Stone, S. Unger, D. L. O'Connor, and T. C. Y. Chan, Assessment of Machine Learning Regression Models to Predict Protein and Fat Content in Human Donor Milk using Maternal-Infant and Donation Specific Variables, 2020.
3. A. Babier, T. C. Y. Chan, A. Diamant, and **R. Mahmood***, Learning to Optimize with Hidden Constraints, 2020.

¹Articles for operations research journals use alphabetical author ordering. The primary author is starred.

Journal Articles

1. A. Babier, T. C. Y. Chan, T. Lee, **R. Mahmood***, and D. Terekhov, An Ensemble Learning Framework for Model Fitting and Evaluation in Inverse Linear Optimization, *forthcoming in INFORMS Journal on Optimization*, 2019.
 - **Honorable Mention at CORS 2018 Best Student Paper Competition: Open Category.**
 - Preliminary version at the 2019 Canadian Healthcare Optimization Workshop.
 - Previously titled Multiple Observations and Goodness of Fit in Generalized Inverse Optimization.
2. T. C. Y. Chan, A. Diamant, and **R. Mahmood***, Sampling from the Complement of a Polyhedron: An MCMC Algorithm for Data Augmentation, *Operations Research Letters*, 48 (6), 744–751, 2020.
3. M. J. Crowson*, A. Hamour, **R. Mahmood**, A. Babier, V. Lin, D. Tucci, and T. C. Y. Chan, AutoAudio: Deep Learning for Automatic Audiogram Interpretation, *Journal of Medical Systems*, 44 (163), 2020.
4. A. Babier*, **R. Mahmood**, A. McNiven, A. Diamant, and T. C. Y. Chan, The Importance of Evaluating the Complete Knowledge-Based Planning Pipeline, *Physica Medica: European Journal of Medical Physics*, 72, 73–79, 2020.
 - Preliminary version at the 2019 International Conference on the Use of Computers in Radiotherapy.
5. M. J. Crowson*, P. Dixon, **R. Mahmood**, J. W. Lee, D. Shipp, T. Le, V. Lin, J. Chen, and T. C. Y. Chan, Predicting Post-Operative Cochlear Implant Performance Using Supervised Machine Learning, *Otology & Neurotology*, 41 (8), 1013–1023, 2020.
6. A. Babier*, **R. Mahmood**, A. McNiven, A. Diamant, and T. C. Y. Chan, Knowledge-based Automated Treatment Planning with Three-dimensional Generative Adversarial Networks, *Medical Physics*, 47, 297–306, 2019.
 - Preliminary version at the 2018 NeurIPS Workshop on Machine Learning for Health.
7. **R. Mahmood***, A. Badr, and A. Khisti, Streaming Codes for Multiplicative-Matrix Channels with Burst Rank Loss, *IEEE Transactions on Information Theory*, 64 (7), 5296–5311, 2018.
 - Preliminary version at the 2016 International Symposium on Information Theory.
8. **R. Mahmood***, A. Badr, and A. Khisti, Convolutional Codes with Maximum Column Sum Rank for Network Streaming, *IEEE Transactions on Information Theory*, 62 (6), 3039–3052, 2016.
 - Preliminary version at the 2015 International Symposium on Information Theory.

Conference Proceedings

1. A. Babier*, **R. Mahmood***, A. McNiven, A. Diamant, and T. C. Y. Chan, Automated Treatment Planning in Radiation Therapy with 3-D Generative Adversarial Networks, *NeurIPS Workshop on Machine Learning for Health*, 2018.
2. **R. Mahmood***, A. Babier, A. McNiven, A. Diamant, and T. C. Y. Chan, Automated Treatment Planning in Radiation Therapy with Generative Adversarial Networks, *Machine Learning for Healthcare*, Proceedings of Machine Learning Research 85, 484–499, 2018.
 – Won Runners’ Up at CORS 2019 HCOR Student Presentation Competition.
3. **R. Mahmood***, A. Badr, and A. Khisti, Low Delay Network Streaming Under Burst Losses, *IEEE International Symposium on Information Theory*, 2898–2902, 2016.
4. **R. Mahmood***, A. Badr, and A. Khisti, Convolutional Codes with Maximum Column Sum Rank for Network Streaming, *IEEE International Symposium on Information Theory*, 2271–2275, 2015.
5. A. Badr*, **R. Mahmood**, and A. Khisti, Embedded MDS Codes for Multicast Streaming, *IEEE International Symposium on Information Theory*, 2276–2280, 2015.

Clinical Abstracts

1. A. Babier*, **R. Mahmood**, A. McNiven, A. Diamant, and T. C. Y. Chan, The Importance of Evaluating the Complete Knowledge-based Automated Planning Pipeline, *International Conference on the Use of Computers in Radiotherapy*, 2019.
2. A. Babier*, **R. Mahmood**, A. McNiven, and T. C. Y. Chan, An Optimization Method for Knowledge-based Automated Planning that Leverages Ensemble Dose Predictions, *American Association of Physicists in Medicine*, 2019.
3. A. Babier*, **R. Mahmood**, A. McNiven, and T. C. Y. Chan, Comparing Deep Learning Architectures for Knowledge-Based Automated Planning, *American Association of Physicists in Medicine*, 2019.

Presentations

Learning to Optimize with Hidden Constraints

(Scheduled) INFORMS Annual Meeting, Washington, DC, USA	2020
AOIS Seminar, Alberta School of Business, Edmonton, AB, Canada	2020
NVIDIA AI Research Seminar, Toronto, ON, Canada	2020
IE Department Seminar, University of Pittsburgh, Pittsburgh, PA, USA	2020
INFORMS Annual Meeting, Seattle, WA, USA	2019
CORS Annual Conference, Saskatoon, SK, Canada	2019
GERAD Seminar, Université de Montréal, Montréal, QC, Canada	2019

An Ensemble Learning Framework for Model Fitting and Evaluation in Inverse Linear Optimization

INFORMS Health Care, Boston, MA, USA	2019
CORS Annual Conference, Saskatoon, SK, Canada	2019
CORS Annual Conference, Halifax, NS, Canada	2018
INFORMS Annual Meeting, Houston, TX, USA	2017
CORS Annual Conference, Quebec City, QC, Canada	2017
INFORMS Annual Meeting, Nashville, TN, USA	2016

Automated Treatment Planning in Radiation Therapy with Generative Adversarial Networks

CORS Annual Conference, Saskatoon, SK, Canada	2019
MLHC Conference, Palo Alto, CA, USA	2018

Convolutional Codes with Maximum Column Sum Rank for Network Streaming

IEEE ISIT, Hong Kong, HK, China	2015
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Teaching Assistantship

MIE 465: Analytics in Action	2017–2019
Responsible for curriculum development in 2017.	
MIE 1620: Linear Programming and Network Flows	2018
MIE 258: Engineering Economics and Accounting	2016–2017
ECE 363: Communication Systems	2015

Students Supervised

1. Rachel Wong, Machine Learning Regression Models to Predict Protein and Fat Content in Human Donor Milk using Maternal-Infant and Domation Specific Variables, *Masters of Applied Science Thesis*, 2020. Co-supervised with Ian Yihang Zhu.
2. Richard Chavez, Sliding Window Generative Adversarial Networks for Radiation Therapy, *Industrial Engineering 4th Year Thesis*, 2019. Co-supervised with Aaron Babier.
3. Michael Shin, Using Portfolio Theory to Optimize Selection of Daily Fantasy Basketball Contests, *Engineering Science 4th Year Thesis*, 2018. Co-supervised with Ben Potter.
4. Yusuf Shalaby, Inverse Optimization for Measuring Cancer Treatment Pathway Concorance, *Industrial Engineering 4th Year Thesis*, 2018. Co-supervised with Nasrin Youssefi.
5. Palmira Pereira, Netflix Prize Problem Using Inverse Optimization, *Masters of Engineering Thesis*, 2017.

Awards

1. University of Toronto Doctoral Completion Award, 2019–2020 (\$8 000).
2. Runners' Up, Health Care Operations Research Student Presentation Competition, CORS Annual Conference, 2019.
3. Postgraduate Affiliate Award, Vector Institute for Artificial Intelligence, 2019 (\$12 000).
4. Honourable Mention, Student Paper Competition: Open Category, CORS Annual Conference, 2018 (\$100).
5. Postgraduate Doctoral Scholarship, NSERC, 2017 (\$42 000).
6. First Place, Waterfront International Ltd. Quantathon, 2016 (\$7 500).

Other Professional Experience

OpenKBP Grand Challenge , American Association of Physicists in Medicine Machine Learning Expert	2019–2020
Opus One Solutions , Toronto, ON, Canada Power Systems Optimization Expert	2019
NHL Expansion Draft Optimizer (http://nhlexpansiondraft.com) ² Back-end Software Developer	2017
Microsemi , San Jose, CA, USA Product Engineer Intern	2011–2012

Service

Referee for European Journal of Operations Research, IEEE ISIT (2017), NeurIPS ML4H Workshop (2019, 2020), ACM CHIL (2020), and NeurIPS (2020).

Electrical and Computer Engineering Graduate Student Society Treasurer	2014–2015
Electrical and Computer Engineering Graduate Students Symposium Organizing Committee Member	2014

²This project received media coverage from *The Toronto Star* and others.

Personal

Languages: English (fluent), French (beginner)

Citizenship: Canadian

Last updated: October 14, 2020

<http://rafidrm.github.io>