# Rafid Mahmood

Mechanical and Industrial Engineering
University of Toronto
Toronto, Ontario, Canada

Phone: +1 (647) 784 6242
Email: rafid.mahmood@mail.utoronto.ca
Homepage: http://rafidrm.github.io

## 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

## Publications[1]

### In Preparation

1. A. Babier, T. C. Y. Chan, A. Diamant, and **R. Mahmood***, Learning to Optimize with Hidden Constraints, 2020.

### Under Review

1. T. C. Y. Chan, A. Diamant, and **R. Mahmood***, Sampling from the Complement of a Polyhedron: An MCMC Algorithm for Data Augmentation, *under review at Operations Research Letters*, 2020.

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

2. 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, *under review at 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.

## Journal Articles

1. 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.

2. 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.

3. 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.

4. 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.

5. **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.

6. **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

## 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. Richard Chavez, Sliding Window Generative Adversarial Networks for Radiation Therapy, *Industrial Engineering 4th Year Thesis*, 2019. Co-supervised with Aaron Babier.
2. Michael Shin, Using Portfolio Theory to Optimize Selection of Daily Fantasy Basketball Contests, *Engineering Science 4th Year Thesis*, 2018. Co-supervised with Ben Potter.
3. Yusuf Shalaby, Inverse Optimization for Measuring Cancer Treatment Pathway Concordance, *Industrial Engineering 4th Year Thesis*, 2018. Co-supervised with Nasrin Youssefi.
4. 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 2019–2020
Machine Learning Expert

**Opus One Solutions**, Toronto, ON, Canada 2019
Power Systems Optimization Expert

**NHL Expansion Draft Optimizer (**`http://nhlexpansiondraft.com`**)**[2] 2017
Back-end Software Developer

**Microsemi**, San Jose, CA, USA 2011–2012
Product Engineer Intern

## Service

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

**Electrical and Computer Engineering Graduate Student Society** 2014–2015
Treasurer

**Electrical and Computer Engineering Graduate Students Symposium** 2014
Organizing Committee Member

## Personal

Languages: English (fluent), French (beginner)

Citizenship: Canadian

Last updated: August 27, 2020
`http://rafidrm.github.io`

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