

# Avery Bojie Ma

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## Education

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### Ph.D in Computer Science

Toronto ON

University of Toronto, Vector Institute for Artificial Intelligence

Sept 2018 – Aug 2023 (expected)

- Topic: Security and adversarial robustness of learning algorithms
- Supervisors: Amir-massoud Farahmand and Richard Zemel
- Candidacy qualified: Nov, 2020
- Cumulative GPA : 3.6

### M.A.Sc. in Systems Design Engineering

Waterloo ON

University of Waterloo, Vision and Image Processing Lab

May 2016 – Aug 2018

- Supervisors: Alexander Wong and David Clausi
- Thesis: "[Computational Depth from Defocus via Active Quasi-random Pattern Projections](#)"
- Cumulative GPA : 4.0

### B.A.Sc. in Mechatronics Engineering *with Distinction, Honours, Co-op Program*

Waterloo ON

University of Waterloo

Sept 2011 – Apr 2016

- Capstone project: "[All Terrain Personal Transportation Device](#)"
- Cumulative GPA : 3.7

## Publications

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- **Avery Ma**, Nikita Dvornik, Ran Zhang, Leila Pishdad, Konstantinos G. Derpanis, Afsaneh Fazly (2022). SAGE: Saliency-Guided Mixup with Optimal Rearrangements. *BMVC'22*.
- **Avery Ma**, Aladin Virmaux, Kevin Scaman, Juwei Lu (2021). Improving Hierarchical Adversarial Robustness of Deep Neural Network. *arXiv preprint arXiv: 2102.09012*.
- **Avery Ma**, Fartash Faghri, Nicolas Papernot, Amir-massoud Farahmand (2020). SOAR: Second-Order Adversarial Regularization. *arXiv preprint arXiv: 2004.01832*.
- Plinio Morita, Adson Rocha, George Shaker, Dave Lee, Jing Wei, Brandon Fong, Anjali Thatte, Amir Karimi, Linlin Xu, **Avery Ma**, Alexander Wong, Jennifer Boger (2020). Comparative Analysis of Gait Speed Estimation Using Wideband and Narrowband Radars, Thermal Camera, and Motion Tracking Suit Technologies. *Journal of Healthcare Informatics Research*.
- **Avery Ma**, Alexander Wong, David Clausi (2018). Deep Learning-driven Depth from Defocus via Active Multispectral Quasi-random Projections with Complex Subpatterns. *CRV'18: Conference on Computer and Robot Vision*.
- **Avery Ma**, Ahmed Gawish, Mark Lamm, Alexander Wong, Paul Fieguth (2018). Real-time Spatial-based Projector Resolution Enhancement. *SID'18: Society for Information Display*.

- **Avery Ma**, Alexander Wong (2018). An Inverse Problem Approach to Computational Active Depth from Defocus. *Journal of Physics: Conference Series*.
- Xiaodan Hu, **Avery Ma**, Ahmed Gawish, Mark Lamm, Paul Fieguth (2017). Motion Detection in High Resolution Enhancement. *CVIS'17: Conference on Vision and Imaging Systems*.
- **Avery Ma**, Alexander Wong, David Clausi (2017). Depth from defocus via active multispectral quasi-random point projections using deep learning. *CVIS'17: Conference on Vision and Imaging Systems*.
- **Avery Ma**, Alexander Wong, David Clausi (2017). Depth from Defocus via Active Quasi-random Point Projections: a Deep Learning Approach. *ICIAR'17: International Conference on Image Analysis and Recognition*.
- **Avery Ma**, Alexander Wong (2017). Enhanced Depth from Defocus via Active Quasi-random Colored Point Projections. *ICIPE'17: International Conference on Inverse Problems in Engineering*.
- **Avery Ma**, Francis Li, Alexander Wong (2016). Depth from Defocus via Active Quasi-random Point Projections. *CVIS'16: Conference on Vision and Imaging Systems*.

## Patents

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- **Avery Ma**, Ahmed Gawish, Alexander Wong, Paul Fieguth, Mark Lamm (2018). Real-time spatial-based resolution enhancement using shifted superposition. Patent No.: US10009587 B1

## Research Experience

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### Research Intern

*Huawei - Noah's Ark Lab*

**Toronto ON**

*Sept 2022 – Current*

- Hosted by Yangchen Pan
- Research project on implicit regularization effect of optimization methods and its connection to out-of-distribution generalization

### Research Intern

*Samsung - Samsung AI Center*

**Toronto ON**

*May 2021 – Aug 2022*

- Hosted by Afsaneh Fazly
- Research project on data augmentation approaches for improving generalization performance of deep neural networks in the multi-modal learning setting

### Research Intern

*Huawei - Noah's Ark Lab*

**Toronto ON**

*May – Nov 2020*

- Hosted by Juwei Lu
- Research project on improving hierarchical adversarial robustness of deep neural networks

### Research Intern

*Christie Digital - Advanced Technologies Group*

**Kitchener ON**

*May 2016 – Apr 2017*

- Hosted by Mark Lamm
- Research project on multiple spatial-temporal super-resolution enhancement methods for projectors
- Funded by the NSERC-CRD grants and the OCE VIP-II grants

### Undergraduate Research Assistant

*University of Waterloo - Vision and Image Processing Lab*

**Waterloo ON**

*Jan – Apr 2015*

- Advised by Prof. Alexander Wong

- Research project on graph contraction algorithms for large scale graph computation

### Research Intern

University Health Network - Princess Margaret Hospital, Guided Therapeutics Lab

**Toronto ON**

May – Aug 2013

- Hosted by Dr. Robert Weersink
- Prototyped an integrated 3D imaging and reconstruction system using a pico projector and a rigid endoscope for intra-operative 3D registration

## Work Experience

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### Mechatronics Engineer, Co-op

Bendix Commercial Vehicle Systems - Vehicle Electronics Group

**Cleveland OH**

Sept – Dec 2015

- Developed an embedded program for a tire pressure monitoring system (TPMS)
- Programmed an automatic system configuration tool for anti-lock braking systems (ABS) in trucks

### Electrical Engineer, Co-op

Baylis Medical Company - Biomedical Engineering Group

**Mississauga ON**

Jan – Apr 2014

- Designed a thermocouple probe for temperature monitoring during minimally invasive surgery
- Hands-on circuit design experience gained from diagnosing malfunctioned radio-frequency ablation probes for spine tumor treatments

### Software Developer, Co-op

JSI Telecom - UX Team

**Ottawa ON**

Sept – Dec 2012

- Enhanced the name search algorithm that drastically improved the user experience of the software
- Self-taught C# and Windows WPF, and developed a Gomoku board game

### QA Engineer, Co-op

TeleCommunication Systems Inc. - QA Team

**Calgary AB**

Jan – Apr 2012

- Developed a series of automated tests that focus on the reliability of the software
- Implemented an automatic fault logging program that sends notifications to software developers regarding the latest bugs reported

## Honors and Achievements

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- NSERC Canada Graduate Scholarship - Doctoral (CGS-D) Sept 2018 – present
- University of Waterloo Alumni Gold Medal (Department Nomination) Sept 2018
- Ontario Graduate Scholarship May 2017 – Apr 2018
- University of Waterloo President's Graduate Scholarship May 2017 – Apr 2018
- University of Waterloo Provost Graduate Scholarship May 2016 – Apr 2017
- University of Waterloo President's Scholarship Sept 2011

## Teaching Assistantships

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### University of Toronto

- Mathematical Expression and Reasoning for Computer Science

Winter 2020

### University of Waterloo

- Introduction to Pattern Recognition
- Digital Computation: Introduction to C++ Programming

Winter 2018

Fall 2017

## Conference Presentations

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- **Avery Ma**, Nikita Dvornik, Ran Zhang, Leila Pishdad, Konstantinos G. Derpanis, Afsaneh Fazly (2022). SAGE: Saliency-Guided Mixup with Optimal Rearrangements. **Poster Presentation** at the *33rd British Machine Vision Conference*. London, UK
- **Avery Ma**, Simona Meng, Amir-massoud Farahmand (2021). Adversarial Robustness through the Lens of Fourier Analysis. **Poster Presentation** at the *Vector Research Symposium*. Vector Institute, Toronto, Ontario
- **Avery Ma**, Amir-massoud Farahmand (2019). Adversarial Robustness using Taylor Series-based Regularizer. **Poster Presentation** at the *Evolution of Deep Learning Symposium*. Vector Institute, Toronto, Ontario
- **Avery Ma**, Amir-massoud Farahmand (2018). Adversarial Robustness Through Loss regularization. **Poster Presentation** at the *Vector Research Symposium*. Vector Institute, Toronto, Ontario
- **Avery Ma**, Ahmed Gawish, Mark Lamm, Alexander Wong, Paul Fieguth (2018). Real-time Spatial-based Projector Resolution Enhancement. **Oral Presentation** at the *Society for Information Display - Display Week 2018*. Los Angeles Convention Center, Los Angeles, California
- **Avery Ma**, Alexander Wong, David Clausi (2018). Deep Learning-driven Depth from Defocus via Active Multispectral Quasi-random Projections with Complex Subpatterns. **Poster Presentation** at the *15th Conference on Computer and Robot Vision*. York University, Toronto, Ontario
- **Avery Ma**, Alexander Wong, David Clausi (2017). Depth from Defocus via Active Multispectral Quasi-random Point Projections using Deep Learning. **Oral Presentation** at the *3rd Annual Conference on Vision and Imaging Systems*. University of Waterloo, Waterloo, Ontario.
- Xiaodan Hu, **Avery Ma**, Ahmed Gawish, Mark Lamm, Paul Fieguth (2017). Motion Detection in High Resolution Enhancement. **Poster Presentation** at the *3rd Annual Conference on Vision and Imaging Systems*. University of Waterloo, Waterloo, Ontario.
- **Avery Ma**, Alexander Wong, David Clausi (2017). Depth from Defocus via Active Quasi-random Point Projections: a Deep Learning Approach. **Poster Presentation** at the *14th International Conference on Image Analysis and Recognition*. Polytechnique Montréal, Montreal, Quebec
- **Avery Ma**, Alexander Wong (2017). Enhanced Depth from Defocus via Active Quasi-random Colored Point Projections. **Oral Presentation** at the *9th International Conference on Inverse Problems in Engineering*. University of Waterloo, Waterloo, Ontario.
- **Avery Ma**, Alexander Wong, David Clausi (2016). Depth from Defocus via Active Multispectral Quasi-random Point Projections using Deep Learning. **Poster Presentation** at the *2nd Annual Conference on Vision and Imaging Systems*. University of Waterloo, Waterloo, Ontario

## Talks

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- **University of Waterloo, Vision and Image Processing Lab** **Nov 2017**  
"Real-time Spatial-based Resolution Enhancement"
- **University of Waterloo, Systems Design Engineering Graduate Seminar** **Feb 2017**  
"Depth from Defocus via Active Quasi-random Pattern Projection: A Deep Learning Approach"

- **University of Waterloo, Vision and Image Processing Lab**  
*"Depth from Defocus via Active Quasi-random Pattern Projection"*

**Oct 2016**

## **Student Mentoring**

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- Simona Meng (Undergraduate – UofT). Topic: Frequency-domain Analysis of Adversarial Robustness of Deep Neural Networks (May 2020 - Present)

## **Professional Activities and Services**

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- Computer Vision and Image Understanding (**CVIU**) (2022: 1 papers)
- Artificial Intelligence and Statistics (**AISTATS**) (2022: 4 papers)
- Graduate application assistance program for prospective students in groups underrepresented in CS, Department of Computer Science, University of Toronto (2021, 2022)
- Graduate admissions committee at the Department of Computer Science, University of Toronto (Dec 2020)