Avery Bojie Ma

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Education

Ph.D in Computer Science **Toronto ON**
University of Toronto, Vector Institute for Artificial Intelligence *Sept 2018 – Apr 2024 (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

- **Avery Ma**, Amir-massoud Farahmand,Yangchen Pan, Philip Torr, Jindong Gu (2023). Improving Adversarial Transferability via Model Alignment. *Under review.*
- Jindong Gu, Xiaojun Jia, Pau de Jorge, Wenqian Yu, Xinwei Liu, **Avery Ma**, Yuan Xun, Anjun Hu, Ashkan Khakzar, Zhijiang Li, Xiaochun Cao, Philip Torr (2023). A Survey on Transferability of Adversarial Examples Across Deep Neural Networks. *Under review.*
- **Avery Ma**, Yangchen Pan, Amir-massoud Farahmand (2023). Understanding the robustness difference between stochastic gradient descent and adaptive gradient methods. *TMLR (Featured Certification).*
- **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

- **Avery Ma**, Nikita Dvornik, Ran Zhang, Konstantinos Derpanis, Afsaneh Fazly (2023). SAGE: Saliency-Guided Mixup with Optimal Re-arrangements for Efficient Data Augmentation. Patent pending
- **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

Research Intern **Toronto ON**
Huawei - Noah's Ark Lab *Sept 2022 – Dec 2022*

- Hosted by Yangchen Pan
- Implicit regularization effect of optimization methods and its connection to out-of-distribution generalization

Research Intern **Toronto ON**
Samsung - Samsung AI Center *May 2021 – Aug 2022*

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

Research Intern **Toronto ON**
Huawei - Noah's Ark Lab *May – Nov 2020*

- Hosted by Juwei Lu
- Improving hierarchical adversarial robustness of deep neural networks

Research Intern **Kitchener ON**
Christie Digital - Advanced Technologies Group *May 2016 – Apr 2017*
- Hosted by Mark Lamm
- Multiple spatial-temporal super-resolution enhancement methods for projectors
- Funded by the NSERC-CRD grants and the OCE VIP-II grants

Undergraduate Research Assistant **Waterloo ON**
University of Waterloo - Vision and Image Processing Lab *Jan – Apr 2015*
- Advised by Prof. Alexander Wong
- Graph contraction algorithms for large scale graph computation

Research Intern **Toronto ON**
University Health Network - Princess Margaret Hospital, Guided Therapeutics Lab *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

Mechatronics Engineer, Co-op **Cleveland OH**
Bendix Commercial Vehicle Systems - Vehicle Electronics Group *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 **Mississauga ON**
Baylis Medical Company - Biomedical Engineering Group *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 **Ottawa ON**
JSI Telecom - UX Team *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 **Calgary AB**
TeleCommunication Systems Inc. - QA Team *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 Awards

- NeurIPS'23 Top Reviewer *Dec 2023*
- University of Toronto Doctoral Completion Award *Jan 2023 – Apr 2023*
- NSERC Canada Graduate Scholarship - Doctoral (CGS-D) *Sept 2018 – Dec 2022*

- 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

University of Toronto

- Mathematical Expression and Reasoning for Computer Science *Winter 2020*

University of Waterloo

- Introduction to Pattern Recognition *Winter 2018*
- Digital Computation: Introduction to C++ Programming *Fall 2017*
- Advanced Engineering Math 2: Numerical Methods for ODEs *Spring 2016*

Conference Presentations

- **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 Rsearch 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

- **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** **Oct 2016**
  "Depth from Defocus via Active Quasi-random Pattern Projection"

Student Mentoring

- Simona Meng (Undergraduate – UofT). Topic: Frequency-domain Analysis of Adversarial Robustness of Deep Neural Networks (May 2020 - May 2021)

Professional Activities and Services

- International Conference on Learning Representations (**ICLR**) (2023: 2 papers)
- Conference on Neural Information Processing Systems (**NeurIPS**) (2023: 6 papers)
- International Conference on Machine Learning (**ICML**) (2023: 3 papers)
- 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)