Md Amirul Islam

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Work Experience

Huawei Noah's Ark Lab — Toronto, Canada
Senior Researcher — *Feb '22 – present*

- **Generative AI:** Designing and developing lightweight diffusion models tailored for edge devices (text-to-image generation, text-to-video generation, image inpainting, video editing, knowledge distillation, parameter efficient fine-tuning).
- **Multi-modal Learning:** Developed AI systems capable of learning shared concepts across diverse data modalities (multi-modal representation learning, audio-visual sound separation, segmenting audible objects).
- **3D Human Gaze Estimation:** Developed and implemented cutting-edge deep learning models for highly accurate 3D gaze estimation from facial images (domain adaptation and generalization, self-supervised learning).
- **Large Language Models (LLMs):** Conducted comprehensive research and investigation into the applications and capabilities of large language models (efficient fine-tuning, prompt engineering, multimodal text generation).

Education

Ryerson University — Toronto, Canada
Ph.D. in Computer Science — *Sep 2017 – Jan 2022*

- Thesis: Understanding various human-centric properties of current AI models beyond their accuracy such as explainability, interpretability, generalization, fairness and bias.
- Advisors: Dr. Neil Bruce & Dr. Kosta Derpanis
- Governor General Gold Medal for outstanding dissertation and academic excellence

University of Manitoba — Winnipeg, Canada
M.Sc. in Computer Science — *Sep 2015 – Jun 2017*

- Advisors: Dr. Yang Wang & Dr. Neil Bruce

Publications & Preprints

1. **M. A. Islam**, S. Nabavi, I. Kezele, Y. Wang, Y. Yu and J. Tang. Visually Guided Audio Source Separation with Meta Consistency Learning. In *IEEE/CVF Winter Conference on Applications of Computer Vision* (***WACV***) 2024 (**Oral Presentation**).
2. **M. A. Islam**, M. Kowal, S. Jia, K. G. Derpanis, and N. Bruce. Position, Padding and Predictions: A Deeper Look at Position Information in CNNs. *International Journal on Computer Vision* (***IJCV***) 2024.
3. **M. A. Islam**, M. Kowal, K. G. Derpanis, and N. Bruce. SegMix: Co-occurrence Driven Mixup for Semantic Segmentation and Adversarial Robustness. *International Journal on Computer Vision* (***IJCV***) 2023.
4. **M. A. Islam**, M. Kowal, P. Esser, B. Ommer, K. G. Derpanis, and N. Bruce. Maximizing Mutual Shape Information. In *British Machine Vision Conference* (***BMVC***), 2022.
5. M. Kowal, M. Siam, **M. A. Islam**, N. Bruce, R. Wildes and K. G. Derpanis. A Deeper Dive Into What Deep Spatiotemporal Networks Encode: Quantifying Static vs. Dynamic Information. In *IEEE Conference on Computer Vision and Pattern Recognition* (***CVPR***), 2022.
6. **M. A. Islam**, M. Kowal, S. Jia, K. G. Derpanis, and N. Bruce. Global Pooling, More than Meets the Eye: Position Information is Encoded Channel-Wise in CNNs. In *IEEE International Conference on Computer Vision* (***ICCV***), 2021.
7. **M. A. Islam**, M. Kowal, S. Jia, K. G. Derpanis, and N. Bruce. Simpler Does It: Generating Semantic Labels with Objectness Guidance. In *British Machine Vision Conference* (***BMVC***), 2021.
8. **M. A. Islam**, M. Kowal, P. Esser, S. Jia, B. Ommer, K. G. Derpanis, and N. Bruce. Shape or Texture: Understanding Discriminative Features in CNNs. In *International Conference on Learning Representations* (***ICLR***), 2021.

9. S. Aich, J. Vianney, **M. A. Islam**, M. Kaur, and B. Liu. Bidirectional Attention Network for Monocular Depth Estimation. In *IEEE International Conference on Robotics and Automation* (***ICRA***), 2021 .

10. Z. A. Nazi, F. R. Mashrur, **M. A. Islam**, and S. Saha. Fibro-CoSANet: Pulmonary Fibrosis Prognosis Prediction using a Convolutional Self Attention Network. ***Physics in Biology and Medicine***, 2021.

11. **M. A. Islam**, M. Kowal, K. G. Derpanis, and N. Bruce. Feature Binding with Category-Dependant MixUp for Semantic Segmentation and Adversarial Robustness. In *British Machine Vision Conference* (***BMVC***), 2020 (**Oral Presentation, Selected one of the Best Papers**).

12. **M. A. Islam**, Sen Jia, and N. Bruce. How much Position Information Do Convolutional Neural Networks Encode?. In *International Conference on Learning Representations* (***ICLR***), 2020 (**Spotlight Presentation**).

13. Rezaul Karim, **M. A. Islam**, and N. Bruce. Distributed Iterative Gating Networks for Semantic Segmentation. In *IEEE Winter Conference on Applications of Computer Vision* (***WACV***), 2020.

14. M. Kalash*, **M. A. Islam***, and N. Bruce. Relative Saliency and Ranking: Models, Metrics, Data and Benchmarks. *IEEE Transaction on Pattern Analysis and Machine Intelligence* (***TPAMI***), 2019.

15. Rezaul Karim, **M. A. Islam**, and N. Bruce. Recurrent Iterative Gating Networks for Semantic Segmentation. In *IEEE Winter Conference on Applications of Computer Vision* (***WACV***), 2019.

16. **M. A. Islam**, M. Kalash, and N. Bruce. Semantics Meet Saliency: Exploring Domain Affinity and Models for Dual-Task Prediction. In *British Machine Vision Conference* (***BMVC***), 2018.

17. **M. A. Islam**, M. Kalash, and N. Bruce. Revisiting Salient Object Detection: Simultaneous Detection, Ranking, and Subitizing of Multiple Salient Objects. In *IEEE Conference on Computer Vision and Pattern Recognition* (***CVPR***), 2018 (**Oral Presentation**).

18. **M. A. Islam**, M. Rochan, S. Naha, N. Bruce, and Y. Wang. Gated Feedback Refinement Network for Coarse-to-Fine Dense Semantic Image Labeling. arXiv Preprint, 2018.

19. Rezaul Karim*, **M. A. Islam***, N. Mohammed, and N. Bruce. On the Robustness of Deep Learning Models to Universal Adversarial Attack. In *IEEE Canadian Conference on Computer and Robot Vision* (***CRV***), 2018 (**Oral Presentation**).

20. **M. A. Islam**, M. Rochan, N. Bruce, and Y. Wang. Gated Feedback Refinement Network for Dense Image Labeling. *IEEE Conference on Computer Vision and Pattern Recognition* (***CVPR***)), *2017.*

21. **M. A. Islam**, M. Kalash, M. Rochan, N. Bruce, and Y. Wang. Salient Object Detection using a Context-Aware Refinement Network. *British Machine Vision Conference* (***BMVC***), 2017.

22. **M. A. Islam**, S. Naha, M. Rochan, N. Bruce, and Y. Wang. Label Refinement Network for Coarse-to-Fine Semantic Segmentation. arXiv preprint, 2017.

23. **M. A. Islam**, N. Bruce, and Y. Wang. Dense Image Labeling Using Deep Convolutional Neural Networks. *IEEE Canadian Conference on Computer and Robot Vision* (***CRV***), 2016. (**Oral Presentation**)

Under Review

1. M. Kowal, M. Siam, **M. A. Islam**, N. Bruce, R. Wildes and K. G. Derpanis. Quantifying and Learning Static vs. Dynamic Information in Deep Spatiotemporal Networks. Under review in *IEEE Transaction on Pattern Analysis and Machine Intelligence* (***TPAMI***), 2023.

Patents

1. Islam et al. (2023). Audio Visual Sound Source Separation using Meta Learning. U.S. Patent.

Research Experience

Ryerson Computer Vision Lab — Toronto, Canada
Graduate Research Assistant — *May '18 – present*

- **Responsible AI:** Understanding various human-centric properties of current AI models beyond their accuracy such as explainability, interpretability, robustness, fairness and bias. [IJCV 2023, BMVC 2022, CVPR 2022, ICCV 2021, ICLR 2021, arXiv 2021, BMVC 2020, ICLR 2020]
- **Feedback and Gating:** How can information be gated, selected and routed through deep neural networks? [WACV 2019, WACV 2020]
- **Weakly/Semi Supervised Learning:** Developed weakly/semi supervised approaches for semantic segmentation. [BMVC 2021]

Huawei Noah's Ark Lab — Toronto, Canada
Research Intern — *June '20 – Sep '20*

- **Video Object Segmentation:** Implemented a weakly supervised method to segment objects of interest from videos.

Huawei Noah's Ark Lab — Toronto, Canada
Research Intern — *May '19 – Oct '19*

- **Visual Perception for Autonomous Driving:** Implemented a uncertainty aware feedback network for 3D object detection from point clouds.
- **Monocular Depth Estimation for Autonomous Driving:** Collaborated with a multidisciplinary team of researchers and engineers to develop a bidirectional attention mechanism for estimating depth from a single image. [ICRA 2021]

University of Manitoba, Computer Vision Lab — Winnipeg, Canada
Graduate Research Assistant with Dr. Yang Wang & Dr. Neil Bruce — *Sep '15 – Apr '18*

- **Relative Saliency and Ranking Salient Objects:** Generalize the problem of salient object detection to salient object ranking and introduced a novel method for saliency ranking. [CVPR'18, BMVC'18, TPAMI'19]
- **Visual Scene Understanding:** Developed end-to-end deep learning models for visual scene understanding problems (e.g., semantic segmentation, semantic object part parsing, salient object detection/segmentation)? [arXiv'18, CVPR'17, BMVC'17, arXiv'17, CRV'16]

Skills

- **Deep Learning Frameworks:** PyTorch, Caffe, Tensorflow2.0.
- **Languages:** Python, MATLAB, C++ **Others:** Docker, Linux, Vim, VSCode, Eclipse, tmux, Latex

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Honors & Awards

- The Governor General Gold Medal, Governor General of Canada, 2022.
- Vector Institute Postgraduate Affiliate/Fellowship Award, Vector Institute for AI, Toronto, 2021-2022.
- Outstanding Reviewer, CVPR 2021.
- Ryerson Graduate Development Award, Ryerson University, 2020-2021.
- Outstanding Reviewer, ECCV 2020.
- Ontario Graduate Scholarship (OGS), Ryerson University, 2019-2021.
- Vector Institute Postgraduate Affiliate/Fellowship Award, Vector Institute for AI, Toronto, 2019-2021.
- Ryerson Graduate Fellowship (RGF), Ryerson University, 2018-2021.
- Ryerson Entrance Scholarship (Domestic level tuition), Ryerson University, 2018-2021.
- University of Manitoba Graduate Fellowship (UMGF), University of Manitoba, 2018-2021.
- Computer Science Entrance Awards, University of Manitoba, 2017 - 2021.
- International Graduate Student Scholarship (IGSS), University of Manitoba, 2017-2018.
- Faculty of Science Graduate Studentship Scholarship, University of Manitoba, 2015 - 2017.
- International Graduate Student Entrance Scholarship (IGSES), FGS, UofM, 2015 - 2016.

Academic Service

- **Conference Reviewer:** BMVC 2022, ECCV 2022, ICCV2021, CVPR 2021, NeurIPS 2020, ECCV 2020, WACV 2020, CVPR 2019, WACV 2019
- **Journal Reviewer:** IEEE Transaction on Pattern Analysis and Machine Intelligence (TPAMI), Computer Vision and Image Understanding (CVIU), Nature Scientific Reports.

References

- Dr. Neil Bruce, Assoc. Prof., Dept. of Computer Science, University of Guelph; brucen@uoguelph.ca
- Dr. Konstantinos Derpanis, Assoc. Prof., Dept. of Electrical Engineering and Computer Science, York University; kosta@yorku.ca
- Dr. Yang Wang, Assoc. Prof., Dept. of Computer Science and Software Engineering, Concordia University; yang.wang@@concordia.ca