Rezaul Karim

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Research Interests

My research is in the general area of **Computer Vision** with a special focus on **Video Understanding**. My demonstrated research experience includes using multiscale spatiotemporal attention mechanism for video segmentation, distributed feedback for scene segmentation, vehicle trajectory prediction from birds-eye-view videos for autonomous driving.

Summary

- 7 years of research and development experience on various industry and academic projects

- Hands-on experience in implementing novel models for research experiments focused in a wide varieties of computer vision problems with a strong peer-reviewed publication track record

- Deep understanding of the theories behind machine learning, deep learning, CNN, transformers, spatiotemporal oriented energy networks, and computer vision algorithms

- Good understanding of latest academic computer vision papers, and the state-of-the-art algorithms for a wide variety of problems in image and video understanding tasks

- Demonstrated experience in implementing computer vision algorithms for the task of classification, object detection, semantic segmentation, video object segmentation, action recognition, and adversarial attack/defense on CNN using standard libraries (OpenCV, NumPy, SciPy, scikit-learn) and popular deep learning frameworks (PyTorch, TensorFlow, and Keras)

Skills

- **Machine Learning:** Machine Learning, Deep Learning, Convolutional Neural Network (CNN), Recurrent Neural Networks (RNN), Attention Mechanism, Transformers, Meta Learning, Domain Adaptation.

- **Computer Vision**: Classification, Object Detection, Action Recognition, Scene Segmentation, Video Object Segmentation

- **Deep Learning Framework:** PyTorch, TensorFlow, Keras

- **Programming expertise:** Python, C/C++, Java, SQL

- **Others:** Linux, Vim, Eclipse, PyCharm, Tmux, Latex

Education

York University   TORONTO, ONTARIO, CANADA
   Ph.D. in Electrical Engineering and Computer Science   *2019-Present*
   Thesis: Spatial Temporal Attention Models for Video Understanding
   Supervisor: Dr. Richard P. Wildes

University of Manitoba   WINNIPEG, MANITOBA, CANADA
   M.Sc. in Computer Science   *Graduated, 2019*
   Thesis: Feedback and Gating in Deep Neural Networks
   Supervisor: Dr. Neil D. B. Bruce

Bangladesh University of Engineering and Technology   DHAKA, BANGLADESH
   Bachelor of Science (B.Sc.) in Computer Science and Engineering   *Graduated, 2015*
   Thesis: Computer Vision Algorithms for Protein Tertiary Structure Retrieval
   Supervisor: Dr. Abul Kashem Mia

Honors & Awards

- VISTA Graduate Scholarship, York University, 2019.

- Lassonde School of Engineering Carswell Scholarship, York University, 2019.

- Lassonde Graduate Entrance Scholarship(LGES), York University, 2019.

- Manitoba Graduate Scholarship (MGS), 2017

- University of Manitoba Graduate Fellowship (UMGF), Faculty of Graduate Studies, UofM, 2017.

- International Graduate Student Entrance Scholarship (IGSES), FGS, UofM, 2017.

Publications

1. **Rezaul Karim**, He Zhao, Richard P. Wildes, and Mennatullah Siam. MED-VT: Multiscale Encoder-Decoder Video Transformer with Application to Object Segmentation. In *CVPR*, 2023 (**to appear**).

2. **Rezaul Karim**, M. A. Islam, and N. Bruce. Distributed Iterative Gating Networks for Semantic Segmentation. In *WACV*, 2020 (**Oral Presentation**).

3. **Rezaul Karim**, M. A. Islam, and N. Bruce.. Recurrent Iterative Gating Networks for Semantic Segmentation. In *WACV*, 2019 (**Oral Presentation**).

4. Arezoo Abdollahi, N. Bruce, Shahin Kamali, and **Rezaul Karim**. Lossless Image Compression Using List Update Algorithms. In *SPIRE*, 2019.

5. **Rezaul Karim***, M. A. Islam*, N. Mohammed, and N. Bruce. On the Robustness of Deep Learning Models to Universal Adversarial Attack. In *CRV*, 2018 (**Oral Presentation**).

6. Mohammad Asiful Hossain, **Rezaul Karim**, Ruppa Thulasiram, Neil D. B. Bruce, Yang Wang. Hybrid Deep Learning Model for Stock Price Prediction. In *IEEE Symposium Series on Computational Intelligence (SSCI), 2018.*

7. **Karim, Rezaul**, Mohd Momin Al Aziz, Swakkhar Shatabda, M. Sohel Rahman, Md Abul Kashem Mia, Farhana Zaman, and Salman Rakin. CoMOGrad and PHOG: From computer vision to fast and accurate protein tertiary structure retrieval. In *Nature Scientific Reports*, 2015.

Experience

Noah's Ark Laboratory, Toronto Research Center, Huawei Canada Corp. Toronto, ON, Canada
Associate Researcher, Intern *July '22 – December '22*
- Doing research on vehicle trajectory prediction.

Vision Lab, York University Toronto, ON, Canada
Graduate Research Assistant with Dr. Richard Wildes *September '19 – present*
- Unsupervised video object segmentation from unconstrained videos.
- Spatial temporal attention models for video understanding

Department of EECS, York University Toronto, ON, Canada
Teaching Assistant
- TA: EECS 3101 E, Design and Analysis of Algorithms

Computer Vision Lab University of Manitoba Winnipeg, MB, Canada
Graduate Research Assistant with Dr. Neil Bruce *September '17 – August '19*
- **Feedback and Gating:** How can information from deeper layers be routed as feedback and gated with earlier layer to generate high quality inference in challenging contexts for scene understanding tasks. [WACV'19,WACV'20]
- **Adversarial Attack/Defense:** Exploring adversarial attack generation in deep neural networks and their defense mechanisms. We focused on adversarial attack/defense in networks for image classification and segmentation tasks. [CRV'18]

Department of Computer Science, University of Manitoba Winnipeg, MB, Canada
Teaching Assistant
- TA: Programming Practices, Data Structures and Algorithms
- Grader: Introductory Computer Science, Introduction to Computer Systems, Object Orientation

Reve Systems, R&D Division Dhaka, Bangladesh
Senior Software Engineer *July '14 – Aug '17*
- Development and performance improvement of IP Telephony SoftSwitch
- Development of Telecom Billing Solutions
- Development of Network Monitoring Softwares

References

Available upon request