Uday Kamal

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CONTACT

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SUMMARY

6 years of experience in developing and applying Deep Learning (CNNs, Transformers) methods to solve diverse computer vision and robotics research problems.

EDUCATION

Georgia Institute of Technology Atlanta, GA
PhD in Electrical and Computer Engineering (ML) Jan. 2021 – Apr. 2025
Advisor: Saibal Mukhopadhyay

Georgia Institute of Technology Atlanta, GA
MS in Electrical and Computer Engineering Jan. 2021 – Dec 2022

Bangladesh University of Engineering & Technology Bangladesh
BS in Electrical and Electronics Engineering Feb. 2015 – Apr 2019

RELEVANT EXPERIENCE

Memory-Augmented Transformer for Event-based Object Recognition

- Developed a novel spatiotemporal representation learning framework that combines external memory mechanism with Attention for streaming event-based perception.
- Designed a learnable memory read-and-write mechanism with sliding window attention that enables highly efficient processing of event-based sequences.
- Achieved 30000x computation gain compared to the state-of-the-art methods with no loss in accuracy on event-based object recognition datasets.
- Demonstrated persistent memory on long horizon sequential classification and robustness across input transformation.

Hierarchical Learning with Adaptive Update for Event-based Dense Perception

- Developed a hierarchical, multi-stage memory-enhanced Transformer encoder architecture with an adaptive update rate for efficient event-based dense perception.
- Proposed a global context-based association between two contiguous memory levels to efficiently process recurrent updates.
- Achieved significant (50%) reduction in latency while maintaining competitive performance on different event-based dense perception tasks (e.g. object detection, semantic segmentation and depth estimation).

Reinforcement Learning with Event-Based Perception

- Developed a novel perception module for long-horizon sequential decision-making tasks with adaptive action-taking frequencies.
- Designed an integrated, event-by-event reinforcement learning framework for end-to-end policy learning conditioned on optimal event-based representations for autonomous navigation and obstacle avoidance.
- Developed a recurrent action gating mechanism to execute actions at an adaptive frequency, reducing compute cost and improving sample efficiency.

Adaptive 3D Object Detection with Hierarchical Matryoshka Learning

- Developed an adaptive hierarchical framework for efficient 3D object detection from LIDAR point cloud data, leveraging Matryoshka Representation Learning to enable multi-scale feature extraction and dynamic model selection.
- Incorporated a surrogate loss prediction module to dynamically rank model backbones, ensuring optimal computation with minimal performance degradation.
- Proposed a novel feature gating mechanism to dynamically select the most relevant feature subsets, significantly reducing computational costs by 41.4% with only a 2.44% drop in accuracy.

SELECT PUBLICATIONS

[6] M. S. Mohammad, **U. Kamal**, S. Mukhopadhyay. Adaptive-Cloud: Dynamic Computation Control for 3D Object Detection From LIDAR Point Clouds Using Matryoshka Representation Learning. ***IEEE RA-L 2025.***

[5] **U. Kamal**, S. Mukhopadhyay. Memory-Augmented Representation for Efficient Event-based Visuomotor Policy Learning with Adaptive Perception and Control. ***WACV 2026.***

[4] **U. Kamal**, S. Mukhopadhyay. Efficient Learning of Event-based Dense Representation using Hierarchical Memories with Adaptive Update. ***ECCV 2024.***

[3] M. Lee, **U. Kamal**, S. Mukhopadhyay. Learning Collective Dynamics of Multi-Agent Systems using Event-based Vision. ***L4DC 2025.***

[2] **U. Kamal**, S. Dash, S. Mukhopadhyay. Associative Memory Augmented Asynchronous Spatiotemporal Representation Learning for Event-based Perception. ***ICLR 2023 (Notable-25%).***

[1] **U. Kamal**, T. I. Tonmoy, S. Das, Md. K. Hasan. Automatic Traffic Sign Detection and Recognition Using SegU-Net and a Modified Tversky Loss Function with L1-Constraint. ***IEEE T-ITS 2017.***

WORK EXPERIENCE

***Applied Scientist II,* Amazon Robotics, Boston, MA** May 2025 - Current

Applied science full-time position with the Robotic Manipulation Group under Dr. Kapil Katyal. Developing foundation VLA models using score-based generative learning followed by RL-based post-training to solve some of the most challenging industry-scale robotics problems including warehouse items pick and place, motion planning and continuous learning.

EXPERIENCE

***Applied Scientist Intern,* Amazon Robotics, Boston, MA** Aug - Dec 2023
Applied science internship with the Robotic Manipulation Group under Dr. Chaitanya Mitash and Dr. Jeroen Van Baar. Led research project on novel 3D-scene graph augmented semantic scene understanding algorithm to predict pick outcome for target object under heavily cluttered environments with warehouse scale robots. Also collaborated with fellow intern on diffusion-based visuo-motor policy learning integrated with 3D perception for scooping from cluttered bins with real robots.

***Research Engineer,* Brain Station 23 Limited, Bangladesh** Aug - Dec 2020
Research engineer with the intelligent biomedical imaging research group under Dr. Taufiq Hasan. Led research project on novel anatomy-aware spatial attention and leveraged generative data-augmentation (using Cycle-GAN architecture) in a semi-supervised learning setting to tackle imperfect and scarce data annotation.

***Research Associate,* Neural Semiconductor, Bangladesh** Jun 2019 - May 2020
Research associate with the advanced hardware acceleration and digital design group under Dr. A.B.M. Harun-ur Rashid. Led the project on developing an end-to-end HLS-based FPGA hardware accelerator compiler that supports several building blocks inlcuding pooling, convolution and linear layers for accelerated inference of quantized deep CNN architectures (VGG16, and TinyYOLO) and prototyped them on real FPGA board (Xilinx Ultra96)

SKILLS

Programming *Proficient*: Python, MATLAB, Bash; *Familiar*: C++
Learning PyTorch, Jax
Robotics/HW Airsim, Open AI Gym, Locobot, Xilinx Vivado, HLS

AWARDS & GRANTS

Silver medal in Kaggle APTOS Blindness Detection Challenge	2019
2nd place in IEEE SPS Video and Image Processing Cup	2018
Travel grant for International Conference in Image Processing (ICIP)	2018
1st place in IEEE SPS Video and Image Processing Cup	2017
Travel grant for International Conference in Image Processing (ICIP)	2017
Undergraduate Deans Award	2016
Government Scholarship for academic excellence in Higher Secondary College	2011

MENTORING

Mir Sayeed Mohammad (PhD ECE, Gatech), Partha Ghosh (BS EEE, BUET, now PhD BME, U of IOWA), Shahed Ahmed (BS EEE, BUET, now PhD ECE, Purdue)

OUTREACH

Web Administrator, Georgia Tech Bangladeshi Student Association 2022 – 2023
Developed and maintained the official website of BSAGT.

Treasurer, Georgia Tech Bangladeshi Student Association (BSAGT) 2023 - 2024
Responsible for handling all financial and budgeting activities for a group of more than 70 members.