Md Jahidul Islam

Ph. D. Candidate (ABD) in Computer Science
Minnesota Robotics Institute (MnRI)
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About Me

I am an avid practitioner of artificial intelligence with a passion for robot vision and deep learning. I also explore challenging problems in the domains of applied machine learning and 3D computer vision.

Domain Knowledge

Robot Vision
- Visual attention modeling
- Visual tracking & servoing
- Autonomous following

Deep Visual Perception
- Object detection & segmentation
- Image enhancement/restoration
- Image super-resolution

Applied Machine Vision
- Design of computationally light detection/classification models
- Low-powered meta-learning

Education

Ph.D. in Computer Science — Fall 2015 - Today
University of Minnesota (UMN), Twin Cities
Ongoing Ph.D. research work focuses on the design and development of robust perception modules for visually-guided underwater robots. More at: `https://xahidbuffon.github.io/projects.html`.
Dissertation: "Machine Vision for Improved Human-Robot Cooperation in Adverse Underwater Conditions"
Advised by: Prof. Junaed Sattar
Major courses: Field Robotics; 3D Computer Vision; Advanced Machine Learning; Matrix Theory; Non-linear Optimization; Artificial Intelligence II; Sensing/Estimation in Robotics; Probability and Stochastic Processes.

M.Sc. / B.Sc. in Computer Science & Engineering — Spring 2012-15 / Fall 2007-12
Bangladesh University of Engineering and Technology (BUET)
Worked on designing a smart dynamic spectrum access (DSA) technique for cognitive radio networks (CRNs) by integrating the benefits of bio-inspired algorithms and stochastic processes.
Thesis: "Intelligent DSA by Exploiting a Synergy between Genetic Algorithm and Local Search"
Advised by: Prof. Md. Monirul Islam and Prof. A. B. M. Alim Al Islam
Major courses: Structured Programming Languages; Linear Algebra; Machine Learning; Artificial Intelligence; Neural Networks; Microprocessors; Wireless Networks; Concrete Mathematics; Differential Equations.

Academic Enrollments

Graduate Research Assistant — Fall 2020/18, Summer 2020/17
Interactive Robotics and Vision Lab (IRVLab)
Primary role involves working on sponsored research projects and assisting in the robotic field trials.

Graduate Teaching Assistant — Spring 2018, Fall 2017/16
Dept. of CSE, University of Minnesota (UMN), Twin Cities
Was involved in preparing/grading tests; also held office-hours and conducted occasional lectures.
Courses: Introduction to Intelligent Robotic Systems; Introduction to C/C++ Programming.

Assistant Professor and Lecturer — May 2012 - August 2015
Dept. of CSE, United International University (UIU), Dhaka
Major courses: Artificial Intelligence; Structured Programming Languages; Algorithms; Numerical Methods; Microprocessors and Microcontrollers; Data Communications; Electronic Devices and Circuits.

Industry Experiences

2019 Summer Internship, R&D
Qualcomm Technologies, Inc.
Santa Clara, CA, USA.
Worked with the Glance team on design/customization of various vision-based models for faster processing and better portability on ultra-low powered systems.

2018 Summer Internship, R&D
Corporate Research Systems Lab, 3M.
Maplewood, MN, USA
Worked with the AI group (Orthodontics team) on visual and corpus data analysis, and also building multiple features of a virtual assistant app.

Skill Sets

Programming Languages
- Python, C++/C
- Java, MATLAB, Unix Shell

Deep NN Libraries
- TensorFlow 1.14+ (Keras 2.2.0+)
- PyTorch 1.5.1+

Embedded AI devices
- Nvidia Jetson Xavier, TX2, Nano
- Google Coral Edge TPU

Operating Systems
- Linux (Ubuntu), Windows

Vision Tool-kits
- OpenCV 3.0, ROS (Kinetic/Melodic)

Robotic platforms
- AQUA 8, TurtleBot 2, OpenROV

Research Highlights and Publications

Saliency-guided Visual Attention Modeling (SVAM) [In review at IEEE T-RO]

Designed a holistic deep visual model: SVAM-Net, which integrates bottom-up and top-down learning within an efficient end-to-end architecture to facilitate fast saliency estimation by visually-guided robots.

`https://arxiv.org/pdf/2011.06252.pdf` `https://github.com/xahidbuffon/SVAM-Net`

Simultaneous Enhancement and Super-Resolution (SESR) [Published in RSS 2020]

Introduced the SESR problem and developed a robust solution: Deep SESR, a residual-in-residual network model that can learn to restore perceptual image qualities for up to 4x higher spatial resolution.

`http://www.roboticsproceedings.org/rss16/p018.pdf` `https://github.com/xahidbuffon/Deep_SESR`

Fast Underwater Image Enhancement (FUnIE) [Published in RA-L 2020]

Designed a generative adversarial network model: FUnIE-GAN, which provides state-of-the-art performance for perceptual image enhancement and offers real-time inference on single-board embedded devices.

`https://ieeexplore.ieee.org/document/9001231` `https://github.com/xahidbuffon/FUnIE-GAN`

Semantic Segmentation of Underwater Imagery (SUIM) [To appear at IROS 2020]

Presented the first large-scale dataset for semantic segmentation of underwater imagery, performed comprehensive benchmark evaluation of state-of-the-art approaches for general-purpose robotic applications.

`https://arxiv.org/pdf/2004.01241.pdf` `https://github.com/xahidbuffon/SUIM`

Autonomous Person Following [Published in IJRR 2019 and RA-L 2018]

Developed and benchmarked various visual servoing modules for autonomous person-following by ground, underwater, and aerial robots. In particular, developed a robust diver-following module by addressing the inherent challenges of underwater human-robot cooperative missions.

https://journals.sagepub.com/doi/10.1177/0278364919881683 https://ieeexplore.ieee.org/document/8543168

Robot-to-robot Relative Pose from Human Body-Pose (R2R-OpenPose) [In review at AuRo]

Proposed a method to estimate the 3D relative poses of pairs of communicating robots by using human pose (OpenPose)-based key-points as geometric correspondences. https://arxiv.org/pdf/1903.00820.pdf

Selected Awards

2019-20	Doctoral Dissertation Fellowship (DDF), Dept. of CSE, University of Minnesota.
2019	RAS travel grant for ICRA 2019 in Montreal, Canada.
2017	IEEE/RSJ travel grant for IROS 2017 in Vancouver, Canada.
2015-16	ADC graduate fellowship, Digital Technology Center (DTC), University of Minnesota.
2012-13	Runner-up. International Robotics Challenge (IRC) grand finale, Techfest, IIT-Bombay, India.
2012	Champion. Bangladesh regional of IRC, IEEE student branch, BUET, Bangladesh.

Community and Volunteering Work

Member / Student Member
- IEEE, IEEE RAS, TinyML, 3D-VR
- Self-Driving Car Club, UMN
- Grad Student Panel, UMN

Conference & Journal Reviewer
- ICRA 2016-20, IROS 2016-20,
- ICCV 2019, CRV 2018-20
- IEEE Transactions, RA-L, Elsevier

Volunteer / Activist
- Clean Energy and Climate
- One-Taka-Meal Project
- Oceanic Preservation Society

Extracurricular Activities

Math / Puzzle Nerd
- Keen explorer of century-old math problems and puzzles

Cricket Player
- Semi-professional cricketer, played in major leagues of MN, CA, and TX

Travel Photographer
- Self-taught photographer, like to travel and capture memories

References are available on request. For more information, please visit: `https://xahidbuffon.github.io/`.