Jungseok Hong

CONTACT INFORMATION

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RESEARCH INTERESTS

Perception for Mobile Robots, Field Robots, and Underwater Robots; Localization; Mapping; Generative Models; Machine learning; and Computer Vision.

EDUCATION

University of Minnesota, Minneapolis, MN, USA.

Ph.D., Computer Science and Engineering, Expected May 2023

- Advisor: Professor Junaed Sattar
- Area of Study: Field Robotics, Underwater Robotics, Generative models (GAN, VAE), Object Detection, and AUV Localization.

University of Central Florida, Orlando, FL, USA.

M.Sc. Electrical Engineering, August 2017

- Thesis Title: *A Multiagent Q-learning-based Restoration Algorithm for Resilient Distribution System Operation.*
- Advisor: Professor Wei Sun
- Area of Study: Power System Restoration, Microgrid, Power System Protection.
- GPA 4.00

South Dakota State University, Brookings, SD, USA.

B.Sc. Electrical Engineering, *Summa Cum Laude*, May 2015.

- Senior Design Title: *Design of Relay-based Protection Scheme for Wind Farm Generator Installations.*
- Advisor: Professor Wei Sun
- Minor in Mathematics.
- Fundamentals of Engineering Certificate.
- GPA 3.96

Sung Kyun Kwan University, Seoul, Korea.

B.Sc. Electrical Engineering, August 2015.

- Dual Degree with South Dakota State University.

RESEARCH EXPERIENCE

University of Minnesota, Minneapolis, MN, USA.

Interactive Robotics and Vision Lab, Department of Computer Science and Engineering

September 2017 –

- Advisor: Professor Junaed Sattar
- Developing zero-shot object detection algorithms for generalized object detection.
- Developed a low-cost AUV, LoCO, as one of main developers.
- Developed a robotic system to navigate and detect marine litter using instance segmentation.

- Developed a diver face recognition system which can be trained on no-mask face images.
- Developed an approach using a generative model (VAE) to generate synthetic images to improve object detection performance.
- Developed localization algorithms for AUVs using Bayesian filter-based methods.
- Developed underwater debris detection algorithms for AUVs using CNN-based object detection algorithms.

University of Central Florida, Orlando, FL, USA.

Power Systems Lab, Department of Electrical Engineering and Computer Science

August 2015 to August 2017

- Advisor: Professor Wei Sun
- Developed power system restoration strategy using multi-agent system, reinforcement learning, and genetic algorithms to optimize the strategy.
- Developed power system testbed consisting of a real-time digital simulator (OPAL-RT), relay, PMU, and high voltage amplifier.
- Other responsibilities included reviewing and editing manuscripts.

South Dakota State University, Brookings, SD, USA.

Microgrid Lab, Department of Electrical Engineering and Computer Science

May 2014 to August 2015

- Advisor: Professor Wei Sun
- Developed the project Communication-Assisted Protection Strategy using IEC 61850 GOOSE messaging and presented an alternative way to handle the messaging data to devices.
- Developed power system protection testbed using a real-time digital simulator and relay.
- Advised summer undergraduate research for power system testbed development.

Image Processing Lab, Department of Electrical Engineering and Computer Science

August 2013 to April 2014

- Advisor: Professor Dennis Helder
- Developed the methodology for estimating the image quality of Landsat 8 using Matlab.
- Analyzed satellite image data and developed the algorithm for evaluating the quality of each image.

Computer Engineering Lab, Department of Electrical Engineering and Computer Science

August 2013 to April 2014

- Advisor: Professor Wei Wang
- Developed the firmware for vehicle head up display using Arduino and LED.
- Designed the hardware setting to connect a mobile device to LED circuit.

Work Experience

Samsung AI Center, New York, NY, USA.

Research Intern **February 2022– September 2022**

- Advisor: Prof. Volkan Isler
- Developed Gaussian process-based semantic mapping algorithm for grasping tasks and submitted a paper in the 2023 ICRA.

- Developed self-supervised visual servoing algorithms for grasping tasks and published a paper in the 2022 IROS.

Sentera, Minneapolis, MN, USA.

Deep Learning Research Intern **May 2020 – August 2020**

- Developed a weed recognition pipeline using image segmentation and classification.

Publications

[J3] Hong, J., Fulton, M., and Sattar, J. Towards Robotic Detection of Marine Litter. Under review at the IEEE Robotics & Automation Magazine (IEEE RAM).

[J2] Islam, J.;Hong, J.;Sattar, J. "Person Following by Autonomous Robots: A Categorical Overview" The International Journal of Robotics Research (IJRR). 2019, 38(14), 15811618.

[J1] Wenny, B.;Helder, D.;Hong, J.;Leigh, L.; Thome, K.;Reuter, D. "Pre- and Post-Launch Spatial Quality of the Landsat 8 Thermal Infrared Sensor" Remote Sensing. 2015, 7(2), 1962-1980.

[C8] Huh, J.;Hong, J.; Garg, S.;Park, HS;Isler, V. "Self-supervised Wide Baseline Visual Servoing via 3D Equivariance" Accepted for publication in the 2022 International Conference on Intelligent Robots and Systems (IROS).

[C7] Fulton, M.*;Hong, J.*; Islam J.;Sattar, J. "Using Monocular Vision and Human Body Priors for AUVs to Autonomously Approach Divers" Proceedings of the IEEE International Conference on Robotics and Automation (ICRA). In Press. Philadelphia, PA, USA. *The authors contributed equally to this work.

[C6] Yuan, J.;Hong, J.;Sattar, J.;Isler, V. "ROW-SLAM: Under-Canopy Cornfield Semantic SLAM" Proceedings of the IEEE International Conference on Robotics and Automation (ICRA). In Press. Philadelphia, PA, USA.

[C5] Hong, J.;de Langis, K.;Wyeth, C.;Walaszek, C.;Sattar, J. "Semantically-Aware Strategies for Stereo-Visual Robotic Obstacle Avoidance" Proceedings of the IEEE International Conference on Robotics and Automation (ICRA) 2021. In Press. Xian, China (Virtual).

[C4] Edge, C.;Enan, S.;Fulton, M.;Hong, J.;Mo, J.;Barthelemy, K.;Bashaw, H.;Kallevig, B.;Knutson, C.;Orpen, K.;Sattar, J. "Design and Experiments with LoCO AUV: A Low Cost Open-Source Autonomous Underwater Vehicle" Proceedings of the International Conference on Intelligent Robots and Systems (IROS) 2020. In Press. Las Vegas, NV, USA (Virtual). *The authors in alphabetical order.

[C3] Edge, C.;Enan, S.;Fulton, M.;Hong, J.;Sattar, J. "Power-On-and-Go Capabilities for a Low-Cost Modular Autonomous Underwater Vehicle" Robotics: Science and Systems (RSS) 2020 Workshop on Power On and Go Robots. Virtual RSS. *The authors in alphabetical order.

[C2] Hong, J.;Fulton, M.;Sattar, J. "A Generative Approach Towards Improved Robotic Detection of Marine Litter" Proceedings of the IEEE International Conference on Robotics and Automation (ICRA) 2020. In Press. Paris, France.

[C1] Fulton, M.*;Hong, J.*; Islam J.;Sattar, J. "Robotic Detection of Marine Litter Using Deep Visual Detection Models" Proceedings of the IEEE International Conference on Robotics and Automation (ICRA) 2019. In Press. Montreal, QC, Canada. *The authors contributed equally to this work.

[P3] Hong, J.;Buckmiller, J.;Metzger, B.;Sun, W. "Development of a Cyber-Physical Testbed for Relay Protection Scheme", 2015 PES General Meeting Conference, Denver, CO.

[P2] Hong, J.;Buckmiller, J.;Metzger, B.;Sun, W. "Design of Relay-based Protection Scheme for Wind Farm Generator Installations", 2015 Center for Power System Studies, Rapid City, SD.

[P1] Hong, J.;Sun, W. "Communication-Assisted Protection Strategy using IEC 61850 GOOSE messaging", 2014 NAPS, Pullman, WA.

Awards

[A8] Received 2nd place award at the 21st Korean Computer Scientists and Engineers Association in America (KOCSEA) Technical Symposium, University of Nevada, Las Vegas, November 6-7, 2021

[A7] UMII MnDRIVE Graduate Assistantship, University of Minnesota MnDrive, $50,000. Awarded in recognition of academic record and potential for future research productivity in Robotics, 2019.

[A6] Power System Protection Scholarship, Schweitzer Engineering Lab. (SEL), $4,000. Awarded in recognition of outstanding academic and personal achievements, 2015.

[A5] Received 2nd place among 15 teams from South Dakota State Engineering Expo, $500. Project title:"Design of Relay-based Protection Scheme for Wind Farm Generator Installations", 2015.

[A4] BENNETT Fellowship, South Dakota State University, $3,000. First international student recipient. Awarded to one student annually in recognition of outstanding academic and personal achievements, 2014.

[A3] Dean's Honor List, South Dakota State University, 2013-2015.

[A2] Dean's Honor List, Sung Kyun Kwan Unviersity, 2012.

[A1] Samsung Full Scholarship, Sung Kyun Kwan University, $40,000. Awarded in recognition of outstanding Korean SAT score and high school GPA, 2007-2015.

Released Datasets

[D2] Hong, J.;Fulton, M.;Sattar, J. "TrashCan 1.0 An Instance-Segmentation Labeled Dataset of Trash Observations" Data Repository for U of M, July 2020. (Downloaded 25,113 times as of September 29th 2022) [url: https://conservancy.umn.edu/handle/11299/214865]

[D1] Fulton, M.;Hong, J.;Sattar, J. Trash-ICRA19: A Bounding Box Labeled Dataset of Underwater Trash Data Repository for U of M, July 2020. (Downloaded 6,963 times as of September 29th 2022) [url: https://conservancy.umn.edu/handle/11299/214366]

Course Projects

[C5] Action Recognition (Machine Learning Course): Implemented a deep learning-based action recognition framework to detect abnormal activities by using Tensorflow and Pytorch with UCF101 dataset.

[C4] Acoustic localization for Autonomous Underwater Vehicles (Field Robotics Course): Developed the localization method which does not depend on either existing bathymetry data or costly sensors by utilizing acoustic frequency information.

[C3] Visual Odometry Using a Stereo Camera (Computer Vision Course): Implemented the steps of visual odometry including feature extraction, feature matching, triangulation of landmarks, pose estimation using 3D-2D correspondences with KITTI dataset.

[C2] Depth-Based Monte Carlo Localization (Robotics II Course): Developed an application of Monte-Carlo Localization (MCL) methods, utilizing depth information from pressure and sonar sensors to localize AUV with given bathymetric data.

[C1] Underwater Trash Detection Project (Robotics I Course): Developed deep learning models for the detection of marine debris and consider the exploration and summarization algorithms necessary to apply this visual trash recognition to the automated creation of trash cleanup plans.

Professional Service Activities

[P3] Program Committee Member: CRV (2021)

[P2] Reviewer: ICRA (2019–2023), IROS (2019–2022), CRV(2019–2021)

[P1] Student Representative on the Faculty Hiring Committee, Department of Computer Science and Engineering, University of Minneosta, 2020-2021

Mentoring Activities

[M5] Ben Withey (CS undergrad), Summer 2021, Unseen Object Detection

[M4] Kevin Orpen (ME undergrad), 2019-2021, Associate Design Engineer at Collins Aerospace

[M3] Chris Morse (CS undergrad), 2019-2020, PhD Student at the University of Virginia

[M2] Cole Wyeth (CS undergrad), 2019-2020

[M1] Julian Lagman (CS undergrad), 2018-2019, Software Engineer at Medtronic

Professional Memberships

[P3] IEEE Eta Kappa Nu (HKN), the honor society of IEEE 2014–

[P2] Tau Beta Pi (TBP), national engineering honor society 2014–

[P1] Institute of Electrical and Electronics Engineers (IEEE), 2013–

Technical Activities

[T2] Self Driving Car Club, University of Minnesota, 2017-2019

[T1] Robotics Club, Sung Kyun Kwan University, 2011-2012.

Leadership Activities

[L5] Computer Science Graduate Student Association (CSGSA) Vice President, University of Minnesota 2019-2020

[L4] Minnesota Korean Graduate Student Association (MKGSA) Vice President, University of Minnesota 2018-2020

[L3] Habitat for Humanity Fundraising Chair, University of Central Florida 2015-2016.

[L2] IEEE HKN Vice President, South Dakota State University 2014-2015.

[L1] Korean Student Association(KSA) President, South Dakota State University 2013-2015.

Teaching Experience

University of Minnesota, Minneapolis, MN, USA.

Teaching Assistant, Department of Computer Science and Engineering

Fall 2017 –

- Teaching assistant to Professor Rui Kuang, CSCI5521, Introduction to Machine Learning. Spring 2019.
- Teaching assistant to Professor Junaed Sattar, CSCI5551, Robotics I. Fall 2018.
- Teaching assistant to Professor Yousef Saad, CSCI2033, Linear Algebra. Spring 2018.
- Teaching assistant to Lecturer Chris Dovolis, CSCI2021, Computer Architecture. Fall 2017.

University of Central Florida, Orlando, FL, USA.

Teaching Assistant, Department of Electrical Engineering and Computer Science

Spring 2017

- Teaching assistant to Lecturer Azza Fahim, EEL3004, Electrical Network. Spring 2017.
- Teaching assistant to Professor Aman Behal, EEL3004, Electrical Network. Spring 2017.

Technical Skills – Software

Programming: Python, TensorFlow, PyTorch, ROS, Assembly, Git.

Matlab experience: power systems and control systems design using Simulink. Satellite image processing.

Matlab toolboxes: power systems, image processing, statistics, control systems.

Technical Skills – Hardware

Robotic Hardware: Hardware, operations and programming experience with the Aqua amphibious robot platforms.

Hardware, operations and programming experience with the TurtleBot, Kinova Gen3, and Panda Arm robots.

Hardware, operations experience with the OPAL-RT real-time digital simulator, a testbed development experience with power protection relays.

Outreach

[O8] University of Minnesota. "How to Thrive as a PhD Student" Panelist, Intro to Research in CS (CSCI 8001, Instructor: Prof. Lana Yarosh). September 2022.

[O7] University of Minnesota. Graduate Student Panelist, Graduate School Information Sessions for international students. March 2020.

[O6] University of Minnesota. MnDrive Scholar, Teaching Tech Camp for middle school students. May 2019 to August 2019.

[O5] University of Minnesota. Student Representative, Organizing and operating prospective students visiting day. March 2019.

[O4] University of Minnesota. CSE Ph.D. student representative, Presenting CSE program and research at the CSE career fair. September 2018.

[O3] University of Minnesota. MnDrive Scholar, Teaching Tech Camp for middle school students. May 2018 to August 2018.

[O2] University of Minnesota. MnDrive Scholar, Presenting Tech Camp at the Minnesota State Fair. August 2018.

[O1] University of Minnesota. Student Representative, Organizing and operating prospective students visiting day. March 2018.