MD GOLAM SARWAR MURSHED

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EDUCATION

Clarkson University, Potsdam, New York   **May 2023 (expected)**

- **Doctor of Philosophy (Ongoing)**, Department of Electrical and Computer Engineering
- Dissertation: Efficient Deep Learning in resource-constrained settings

Clarkson University, New York   **Aug 2018 - Aug 2020**

- **Master of Science**, Department of Electrical Engineering
- Research Topic: Machine Learning at the network edge

Chittagong University of Engineering & Technology, Chittagong, Bangladesh   **Mar 2009 - Sep 2013**

- **Bachelor of Sciences (Honours)**, Department of Computer Science & Engineering
- Thesis: Web-page Classification through Text Summarization.

BOOK CHAPTERS

1. M. G. Sarwar Murshed, James J. Carroll, Nazar Khan, and Faraz Hussain, "Efficient deployment of deep learning models on autonomous robots in the ROS environment", Springer, Advances in Intelligent Systems and Computing, 2022, https://doi.org/10.1007/978-981-16-3357-7_9.

2. Edward Verenich, M. G. Sarwar Murshed, Nazar Khan, Alvaro Velasquez, and Faraz Hussain, "Mitigating the Class Overlap Problem in Discriminative Localization: COVID-19 and Pneumonia Case Study", Springer, Explainable AI Within the Digital Transformation and Cyber-Physical Systems, 08 May 2021, https://doi.org/10.1007/978-3-030-76409-8_7.

JOURNALS AND CONFERENCES

Google Scholar statistics total of **230** citations as of March 1st, 2023.

1. M.G. Sarwar Murshed, Keivan Bahmani, Stephanie Schuckers, Faraz Hussain, "Deep Age-Invariant Fingerprint Segmentation System", arXiv, 2023, https://arxiv.org/abs/2303.03341.

2. M. G. Sarwar Murshed, S. M. Safayet. Hossain, Aksel Seitllari, Kibria K. Roman, "A vision-based system for road crack detection using hybrid deep learning architecture", ASCE International Conference on Transportation & Development, 2023.

3. M. G. Sarwar Murshed, R. Kline, K. Bahmani, F. Hussain, and S. Schuckers, "Deep Slap Fingerprint Segmentation for Juveniles and Adults", 2021 IEEE International Conference on Consumer Electronics-Asia (ICCE-Asia), 2021, pp. 1-4, https://doi.org/10.1109/ICCE-Asia53811.2021.9641980.

4. M. G. Sarwar Murshed, C. Murphy, D. Hou, N. Khan, G. Ananthanarayanan, and F. Hussain, "Machine Learning at the Network Edge: A Survey", ACM Computing Surveys, vol. 54, no. 8, Oct. 2021. https://doi.org/10.1145/3469029.

5. M. G. Sarwar Murshed, J. J. Carroll, N. Khan, and F. Hussain, "Resource-aware On-device Deep Learning for Supermarket Hazard Detection", 2020 19th IEEE International Conference on Machine Learning and Applications (ICMLA), 2020, pp. 871-876, https://doi.org/10.1109/ICMLA51294.2020.00142.

6. B. Zhang, M. G. S. Murshed, F. Hussain, and R. Ewetz, "Fast Resilient-Aware Data Layout Organization for Resistive Computing Systems", 2020 IEEE Computer Society Annual Symposium on VLSI (ISVLSI), 2020, pp. 72-77, https://doi.org/10.1109/ISVLSI49217.2020.00023.

7. E. Verenich, A. Velasquez, M.G. Sarwar Murshed, F. Hussain, "FlexServe: Deployment of PyTorch Models as Flexible REST Endpoints", 2020 USENIX Conference on Operational Machine Learning (OpML 2020), https://www.usenix.org/conference/opml20/presentation/verenich

8. M.G. Sarwar Murshed, E. Verenich, C. Gende, J. J. Carroll, N. Khan, and F. Hussain, "Hazard Detection in Supermarkets using Deep Learning on the Edge", 3rd USENIX Workshop on Hot Topics in Edge Computing (HotEdge 2020) [poster]

9. E. Verenich, A. Velasquez, M.G. Sarwar Murshed, and F. Hussain, "The Utility of Feature Reuse: Transfer Learning in Data-Starved Regimes", https://arxiv.org/abs/2003.04117

RESEARCH INTERESTS

- Machine Learning, Deep Learning, Biometrics, Edge computing, Cybersecurity, Network Security, Natural Language Processing

RESEARCH EXPERIENCE

Robust Contactless Fingerprint Processing Tool   **Spring 2022 - Present**

Developed deep learning-based object segmentation models capable of detecting contactless fingerprints. Developed a new large-scale dataset of contactless slap fingerprints. Evaluated and quantified the performance of the proposed fingerprint segmentation algorithms using Verifinger SDK.

Road health assessment using deep learning   **Spring 2022 - Present**

Developed deep learning-based image analysis models capable of detecting, classifying, quantifying, and segmenting cracked regions in real-world road images. A two-stage hybrid deep learning architecture is used in this project. The first stage is responsible for detecting and classifying road cracks and the second stage measures the cracks and segments them.

Detection of Over-Rotated Biometric Images and Incorrect
Labeling of Fingerprints   **Fall 2021 - Present**

Developed deep learning-based object segmentation models capable of detecting and segmenting over-rotated objects, such as fingerprints, humans, and cars. Mitigated the negative effects of over-rotation fingerprints on the performance of different commercial fingerprint matcher such as the Verifinger matcher.

Robust biometrics recognition and template security with multiple modalities   **Fall 2021 - Present**

Improved the performance of fingerprint recognition algorithms and developed evaluation test harness for assessing template security software

Fingerprint Segmentation for Juveniles and Adults   **Fall 2020 - Summer 2021**

Developed new fingerprint segmentation models capable of effectively processing both adult and juvenile fingerprints using deep learning. Improve the performance of a deep-learning-based fingerprint segmentation system by solving object over-rotation problems.

Fingerprint Template Security   **Fall 2020 - Spring 2021**

Developed a test harness for assessing a template security scheme. Evaluated a fingerprint recognition system, developed by a well-known technology company, using a large database of fingerprints and improved up to 20% recognition accuracy.

Software for Marty Robot.   **Fall 2019 - Spring 2020**

Developed test harness for testing the Marty OS (ROS-based). Evaluated the current performance of the OS (Robot operating system), improved localization problem, and proposed a deep learning-based grocery hazard recognition system.

Samsung SHealth and Iotivity project   **Fall 2013 - Spring 2018**

Improved a machine learning technique (K-means) to categorize apps for user recommendations. Designed and developed the Device to Device (D2D) communication, cloud communication, and security test system of the IoTivity framework. Designed, and implemented the build system in an IoTivity test project.

PROFESSIONAL EXPERIENCE

Lead Engineer   **September 2013 - July 2018**
Samsung R&D Institute, Bangladesh
Project: IoTivity (www.IoTivity.org - An open Linux Foundation Project for the Internet of Things)

- Designed and developed different APIs and build systems for the IoTivity framework

- Evaluated the performance of Device to Device (D2D) Communication, Cloud Communication, and Security system of the IoTivity project

- Designed and developed background API for IoT automatic test software, different web application, and robot automation test cases

- Developed test app (C++, Java) based on IoTivity device communication and security protocol

- Designed and implemented auto code coverage framework for quality assurance of IoTivity project

- Designed and implemented memory leak tools for the IoTivity project

- Developed APIs for the Samsung SHealth project

Research Collaborator   **Fall 2020 - Present**
Verizon wireless

- Developing deep learning-based biometrics recognition and template protection systems for multiple modalities including face, finger, and iris.

- Deploying Fully Homomorphic Encryption (FHE) on biometric template protection systems

TEACHING EXPERIENCE

- Fall 2019: Teaching Assistant for EE 262: Introduction to Object-Oriented Programming and Software Design at Clarkson University

- Spring 2019: Teaching Assistant for EE 260/360: Embedded Systems/Microprocessors at Clarkson University

- Fall 2018: Teaching Assistant for EE 262: Introduction to Object-Oriented Programming and Software Design at Clarkson University

INTERNSHIP EXPERIENCE

Badger Technologies
July 2020- August 2020
Working Area: Deep learning on autonomous robots in the ROS environment.

Semicon PVT. LTD
January 2013-February 2013
Working Area: Mobile App Development, IT system Management.

ACADEMIC SERVICES AND APPOINTMENTS

- Reviewer of AI Conferences and Journals: Journal of Network and Computer Applications(JNCA) 2022, IEEE International conference on web services(ICWS) 2022, Joint International Conference on Data Science & Management of data (CODS-COMAD) 2021, IEEE SERVICES 2021
- Graduate researcher at Center for Identification Technology Research - CITeR
- Collaborating: Verizon wireless and Badger Technologies as a research assistance

RESEARCH GRANTS

I contributed to writing proposals in response to a variety of funding opportunities.
Current Research

1. **Robust Contactless Fingerprint Processing Tool**
   - PI Name: Faraz Hussain, Daqing Hou
   - Name of Funding Organization: CITeR
   - Date: 15 May 2022
   - Period of Grant Award: 1 Year
   - Title of Project: Robust Contactless Fingerprint Processing Tool
   - Role on Project: Wrote the proposal, developed software to complete the preliminary experiments and generated preliminary results, and will complete all milestones proposed in the proposal through collaboration with PIs.

2. **Fingerprint image segmentation using deep learning**
   - PI Name: Faraz Hussain, Stephanie Schuckers
   - Name of Funding Organization: CITeR
   - Date: 15 January 2021
   - Period of Grant Award: 2 Years
   - Title of Project: Fingerprint Segmentation for Juveniles and Adults
   - Role on Project: Wrote the proposal, developed software to complete the preliminary experiments and generated preliminary results through collaboration with another student, and will complete all milestones proposed in the proposal by collaborating with PIs and students.

Completed Research

1. **Fingerprint template security**
   - PI Name: Stephanie Schuckers, Faraz Hussain, Mahesh Banavar, Chen Liu
   - Name of Funding Organization: Verizon wireless
   - Date: 15 May 2020
   - Period of Grant Award: 2 Year
   - Title of Project: Fingerprint Template Security: Enabling Cloud-Based Biometric Solutions through High Performance, Secure Matching

- Role on Project: Wrote the proposal, completed all milestones proposed in the proposal through collaboration with PIs, and helped to write an extension of the proposal.

2. **Evaluate and test Robot Operating System (ROS) of the Marty Robot**

   - PI Name: Faraz Hussain, James Carroll
   - Name of Funding Organization: Badger Technologies
   - Date: 1 March 2020
   - Period of Grant Award: 1 Year
   - Title of Project: Evaluate and test the performance of ROS-based OS system for the Marty Robot
   - Role on Project: Developed software to complete the preliminary experiments and generated preliminary results, and completed all milestones set for this project through collaboration with PIs and students.

SOFTWARE SKILL HIGHLIGHTS

- **Languages:** Python, C, C++, JAVA, UNIX shell scripting
- **AI frameworks:** TensorFlow, PyTorch, Keras, Detectron2
- **Cloud platform:** AWS
- **Version Control System:** Git
- **Project Management:** JIRA, Agile Project Management system
- **Build Automation Tools:** SCons, Gradle, Maven, Ant

AWARDS AND HONORS

Professional

- Achieved Advanced Level in Software Capability Test arranged by Samsung Electronics Co Ltd.
- Achieved top 20% annual performance evaluation grade in 2 consecutive years 2014 & 2015 at Samsung Electronics Co Ltd

Academic

- University Merit Scholarship: Each year of Undergraduate Level, Chittagong University of Engineering and Technology, 2009-2013, Bangladesh

Programming

- Samsung internal programming contest- got an advanced level
- Inter-university programming contest(Chittagong Zone) - runner up
- Inter department programming contest (CUET) – runner up

LEADERSHIP AND VOLUNTARY ACTIVITIES

- Lead Engineer, Samsung R&D Institute of Bangladesh, IoTivty Group
- President, Bangladeshi Students' Association at Clarkson University

LANGUAGE SKILL

English (Full professional proficiency), Bengali (Native)

REFERENCE

Faraz Hussain
Assistant Professor
Electrical & Computer Engineering
Email: fhussain@clarkson.edu