Keshara Weerasinghe

cjh9fw@virginia.edu | Website | LinkedIn | GitHub

Research Interests

Computer Vision	**Egocentric Activity Recognition**	**Human Activity Recognition**
Multimodal Learning	**Cognitive Assistance**	**Augmented Reality**
Dependable AI Systems	**Embedded Systems**	**Deep Learning**

Education

University of Virginia Aug. 2022 – Present
PhD in Computer Engineering **GPA 3.86/4.00** *Charlottesville, Virginia*

University of Peradeniya Nov. 2016 – September 2021
BSc in Computer Engineering **GPA 3.70/4.00** *Peradeniya, Sri Lanka*

Publications

- **Weerasinghe, K.**, Ge, X., Heick, T., Wijayasingha, L.N., Cortez, A., Satpathy, A., Stankovic, J., and Alemzadeh, H. (2026). EgoEMS: A High-Fidelity Multimodal Egocentric Dataset for Cognitive Assistance in Emergency Medical Services. To appear in *Proceedings of the 40th **AAAI Conference on Artificial Intelligence (AAAI-26)***, AI for Social Impact Track. arXiv:2511.09894.

- **Weerasinghe, K.**, Janapati, S., Ge, X., Kim, S., Iyer, S., Stankovic, J. A., & Alemzadeh, H. (2024). Real-Time Multimodal Cognitive Assistant for Emergency Medical Services. **IoTDI 2024** Acceptance Rate 36.7%

- **Weerasinghe, K.**, Roodabeh, S. H. R., Hutchinson, K., & Alemzadeh, H. (2024). Multimodal Transformers for Real-Time Surgical Activity Prediction. **ICRA 2024** Acceptance Rate 44.8%

- Rahman, M. A., **Weerasinghe, K**., Wijayasingha, L., Alemzadeh, H., Williams, R. D., & Stankovic, J. (2023, May). Senseems-towards a hand activity recognition and monitoring system for emergency medical services. In Proceedings of the 22nd International Conference on Information Processing in Sensor Networks (pp. 310-311). 10.1145/3583120.3589823

- **Weerasinghe, K. T. B.**, Tennakoon, S. C., Kularatne, K. N. U., Nawinne, I., Ragel, R., & Jayakody, H. (2021, August). Using Near-Infrared Spectroscopy for Vein Visualization. In 2021 10th International Conference on Information and Automation for Sustainability (ICIAfS) (pp. 363-368). IEEE.10.1109/ICIAfS52090.2021.9606126

Experience

Graduate Research Assistant Aug 2022 – Present
Department of Electrical and Computer Engineering, University of Virginia *Charlottesville, Virginia, USA*

- Developing a context-aware cognitive assistance system for emergency medical services using **augmented reality**, incorporating machine learning for human activity recognition with multimodal data, optimized for real-time performance on resource-constrained devices.
- Development of open-source unified software–hardware data collection system to capture egocentric perspectives and multimodal data of EMS responder activities during simulated emergencies.
- Designing a safety engine for robot-assisted surgeries by leveraging machine learning to recognize and predict surgical activities for improved operational reliability.
- Curation of open-source multimodal datasets for the improvement of cognitive assistance for emergency medical services, enhancing the safety of robot-assisted surgery, in collaboration with public safety officials, EMS responders, surgeons and medical students.

Graduate Teaching Assistant Aug 2023 – Present
Department of Electrical and Computer Engineering, University of Virginia *Charlottesville, Virginia, USA*

- Assisting graduate-level courses including Advanced Embedded Systems, providing project guidance, technical support, and academic support to enhance student learning.

Instructor / Teaching Assistant

Department of Computer Engineering, Faculty of Engineering, UOP

September 2021 – July 2022

Peradeniya, Sri Lanka

- Assisted in developing course projects and conducting lab sessions for subjects such as Computer Architecture, Computer Communication Networks, and Image Processing.
- Provided one-on-one support to students, ensuring a comprehensive understanding of complex topics.

Voluntary Research Assistant

Department of Computer Engineering, Faculty of Engineering, UOP

September 2021 – July 2022

Peradeniya, Sri Lanka

- Developed an anomaly detection system for injection molding using computer vision, enabling real-time safety monitoring in industrial automation.

Trainee Software Engineer

99x Technology

March 2021 – September 2021

Colombo, Sri Lanka

- Implemented a dynamic internationalization and localization framework for an Angular application.
- Integrated MSAL (Microsoft Authentication Library) with B2C authentication support for Angular application.
- Developed localization management API using .NET core web API.
- Integrated Microsoft App Insights to Angular application for advanced analytics and performance monitoring.
- Integrated static code analysis tool (SonarQube) and automated testing with azure pipeline management.
- Built and deployed angular custom libraries to a private registry using Azure Artifacts.
- Integrated Atlassian status page API for the in-house status management portal.

Voluntary Teaching Assistant - Programming Methodology

Department of Computer Engineering, Faculty of Engineering, University of Peradeniya

April 2020 - June 2020

Peradeniya, Sri Lanka

- Instructed and guided the 2nd year undergraduates through the programming fundamentals, analyzing complex problems, using C language

Mentoring

- **Voluntary Undergraduate Research Mentor**
  Consistently mentoring UVA undergraduate research interns since 2022, guiding over six students in learning research methodologies, exploring new technologies, and achieving project goals while helping with capstone projects.

- **Voluntary Mentor** for the Charlottesville High School Senior Capstone project, initiated by the Link Lab at the University of Virginia. Mentored a group of students throughout the Fall semester, providing guidance on technical questions, design philosophies, and support with manufacturing and presentations.

- **Voluntary Mentor and Teacher** for Arduino programming, assisting junior high school students in learning the basics of electronics and coding.

Services

- **Voluntary Project – In Development**
  Initiating a community-focused service project aimed at enhancing pre-operative planning and surgical education at UVA Hospital using advanced 3D printing techniques (e.g., Stereolithography). Currently in the proposal and funding stage, in collaboration with Cardiothoracic surgeons. Passionate about bringing this initiative to fruition with my extensive background in 3D printing technology.

- **External Reviewer** for ICCPS 2025, IEEE S&P 2025, and ICRA 2025.

- **Voluntary Projects** during the Covid-19 epidemic, including designing and manufacturing face shields and distributing them to hospitals and first responders across Sri Lanka during my 3rd year as an undergraduate.

- **Developer** of a free ICU monitoring system for Covid-19 patients, distributed to hospitals in Sri Lanka that lacked remote ICU monitoring software.

Awards

- **AAAI Student Scholarship & Volunteer Program** - Travel grant awarded for the paper titled EgoEMS: A High-Fidelity Multimodal Egocentric Dataset for Cognitive Assistance in Emergency Medical Services. AAAI 2026

- **Poster Winner in UVA AI/ML Resource Fair** - Awarded for the research titled CognitiveEMS: Real-Time Multimodal Cognitive Assistant for Emergency Medical Services, at the Artificial Intelligence and Machine Learning Resource Fair at University of Virginia 2025.

- **2nd Place in ECE Student Research Poster Session** - awarded for the research titled CognitiveEMS: Multimodal Cognitive Assistance for EMS Using Augmented Reality at the Edge, at the Electrical and Computer Engineering Students Research Poster Contest at University of Virginia 2024.

- **Best Research Article** - awarded for the paper titled Near-IR Spectroscopy for Vein Visualization, at the Engineering Students Project Symposium and Conference of University of Peradeniya 2021.

- **Best Product/Project University Category SLASSCOM Ingenuity Awards 2021**
  Won the above award under central province for the Realtime Covid-19 ICU Patient Monitoring System which was implemented in 2020 April.

- **ACES Hackathon 2019 Winner under 'Agriculture' Category**

- **ACES Hackathon 2018 - 3rd place under embedded and network systems.**

Paper, Poster Presentations & Live Demonstrations

- **Live Demonstration of Cognitive Assistant for EMS** - at the Shenandoah Valley EMS Expo in Charlottesville 2025. This outreach helped us connect with more public safety agencies and supporting us collect more data enhancing the quality of our dataset. This enabled us to connect with Charlottesville Albermarle Rescue Squad, Virgnia Beach EMS Agencies and more.

- **Live demonstrations, poster sessions, and flash talk presentations on the Cognitive Assistant for EMS** at Link Lab Open House events (2022–present), engaging a broad audience including faculty, students, and external collaborators.

- **Live Demonstration of Cognitive Assistant for EMS** - at the 5x5 Public Safety and Innovation Summit in Chicago 2024.

- **Live Demonstration of Cognitive Assistant for EMS** - at the 5x5 Public Safety and Innovation Summit in San Diego 2023.

- **Paper Presentation** - *Real-Time Multimodal Cognitive Assistant for Emergency Medical Services* - CPS Week 2024 Hong Kong.

- **Poster Presentation** - *Real-Time Multimodal Cognitive Assistant for Emergency Medical Services* - UVA Link Lab Open House & Industry Reception 2024.

- **Poster Presentation** - *Real-Time Multimodal Cognitive Assistant for Emergency Medical Services* - UVA ECE Poster Contest 2024.

- **Flash Talk** - *Cognitive Assistance for Emergency Medical Services & Safe Robot Assisted Surgery* - UVA Link Lab Research Day 2023.

Teaching

- **CS6501: Real-time Embedded Systems** Graduate TA: Spring 25
- **CS6501: Real-time Embedded Systems** Graduate TA: Spring 24
- **CO224: Computer Architecture** Volunteer TA
- **CO323: Computer Communication Networks** Volunteer TA
- **CO328: Software Engineering** Volunteer TA for
- **CO326: Computer Systems Engineering: Industrial Networks** Volunteer TA
- **Programming Methodology** Volunteer TA

Open-source Data Collection System for Emergency Medical Services — Ongoing Research 2024
C++, Python, Android, Arduino, Tkinter, Azure Kinect SDK, Open3D, GoPro SDK
- Engineered a multimodal data collection system for EMS responders to capture simulated emergency scenarios using a non-invasive, automated setup. The system records egocentric and exocentric video, hand movements, speech data, and rich annotations.
- This first-of-its-kind dataset addresses a critical gap in EMS research and serves as a foundational resource for advancing context-aware cognitive assistance technologies.
- Utilizing devices such as GoPros, Azure Kinect cameras, Smartwatches and Arduinos to collect multimodal data.

Open-source Data Collection System for Robot-Assisted Surgeries — Ongoing Research 2024
C++, Python, Android, Arduino, django
- Developed a unified software and hardware platform for recording surgical robot video, surgeon hand, and foot movements synchronously.
- Utilizing devices such as BlackMagic SDI recorders, TrakStar electromagnetic location tracking devices, and SDKs.

Context-Aware Augmented Reality for Cognitive Assistance in EMS — Ongoing Research 2022
Machine Learning, Image Processing, Android, C++, Python, PyTorch, CUDA, NVIDIA Jetson
- Developing a context-aware AR cognitive assistant system for cooperative situational awareness in medical emergencies.
- CognitiveEMS integrates AR smart glasses and smartwatch devices with data analytics for real-time context inference based on multimodal sensor data (audio, video, hand motion) to provide just-in-time context-dependent feedback to responders.
- Video-based action recognition model optimized for resource-constrained devices

Using Near-IR Spectroscopy for Vein Visualization — Final Year Research Project 2021
Python, NIR Spectroscopy, Image Processing, OpenCV, Javascript, C++, CAD/CAM
- Implementing a cost-effective and efficient method to detect veins and provide a real-time vein visualization using Near-infrared illumination and image processing techniques.
- Designing an illumination system that favors a variety of skin types, with more weight on darker shades of skin, as the difficulty in vein visualization on darker skins is not taken into consideration in existing devices.

COVID-19 Real-time ICU Patient Monitoring System — Covid Voluntary Project 2021
Go, HL7 Protocol, VLANs, NodeJS, Nuxt, Javascript, Cisco IOS, PostgreSQL
- Designed, Developed & Implemented a Real-time Remote ICU Patient Vital Monitoring System within 3 days which connects to all ICU Patient Vital Monitors retrieving patient vitals and displays real-time to the health personnel, giving them the ability to monitor any amount of patients in a central location without physically visiting them, thus reducing the risk of exposure.
- Implemented at Peradeniya Teaching Hospital Covid Ward and Kandy General Hospital Covid ICU.

Face Shield Project — Covid Innovative Humane Engineering 2020 March
CAD, CAM, CNC Machining, Laser Cutting
- Designed a Re-Usable Face Shield and started production at a time of crisis when the country went into full lock-down due to the Covid-19 pandemic, and the health sector did not have a sufficient amount of PPE (Personal Protective Equipment) due to no imports and halted in-house production.
- With the support from the Faculty of Engineering, I could produce and distribute more than 10000 Face shields to the entire country (Hospitals and all health personnel, Police, First Responders, etc.)

Health-Watch — Embedded Systems Group Project 2019
NodeJS, Vue, MongoDB, MQTT, Javascript, C++, ESP8266 SoC, PCB
- Designed and developed a wearable for patients, elderly to monitor basic vitals and giving the ability to remotely monitor them via a mobile app or a web app.
- **My Contribution:** PCB Design and Manufacturing, Watch Firmware Design and Development, MQTT Integration, CAD/CAM 3D Design and Manufcaturing of the watch

HappyPet - Smart Pet Feeder — Group Project 2017

MQTT, MySQL, Atmega Microcontrollers, ESP8266 WiFi SOC, Swift (iOS Development) Javascript, C++

- Implemented a smart pet feeding machine that gives food and water to indoor pets according to a predefined schedule or request via the mobile application by the user.
- **My Contribution:** iOS Mobile Application, System Design

TECHNICAL SKILLS

Languages: C, C++,C#, Java, JavaScript,Typescript, Python, GoLang
Frameworks: .NET, Angular, Springboot, ReactJS, NodeJS, Vue, Nuxt, Bootstrap, OAuth, HTML/CSS
Machine Learning Libraries: PyTorch
Continuous Integration: Microsoft Azure, Azure DevOps, Netlify, Github Actions, AWS, Heroku.
Database Systems: MYSQL, MongoDB, PostgresSQL.
Embedded Systems: Atmel Microcontrollers, ESP8266 Wi-Fi SOC, PCB Designing and Manufacturing, CAD/CAM Technologies, 3D Printing, CNC Manufacturing, CO2 Laser Manufacturing.

REFERENCES

- **Prof. Homa Alemzadeh**
  Professor in Electrical and Computer Engineering
  Department of Electrical and Computer Engineering, School of Engineering and Applied Science,
  University of Virginia.
  ha4d@virginia.edu

- **Prof. John Stankovic**
  BP America Professor Emeritus, Director of the Link Lab, Emeritus
  Department of Computer Science, School of Engineering & Applied Science, University of Virginia.
  stankovic@cs.virginia.edu

- **Prof. Roshan Ragel**
  Professor in Computer Engineering
  Department of Computer Engineering, Faculty of Engineering, University of Peradeniya.
  roshanr@eng.pdn.ac.lk

- **Dr. Asitha Bandaranayake**
  PhD (Cincinnati), BSc.Eng. (Hons)(Peradeniya)
  Department of Computer Engineering, Faculty of Engineering, University of Peradeniya.
  asithab@eng.pdn.ac.lk