# Keshara Weerasinghe

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## Education

**University of Virginia** Aug. 2022 – Present
*PhD in Computer Engineering* ***GPA 3.81/4.00*** *Charlottesville, Virginia*

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

## Publications

- **Weerasinghe, K.**, Janapati, S., Ge, X., Kim, S., Iyer, S., Stankovic, J. A., & Alemzadeh, H. (2024). Real-Time Multimodal Cognitive Assistant for Emergency Medical Services. 10.1109/IoTDI61053.2024.00012
- **Weerasinghe, K.**, Roodabeh, S. H. R., Hutchinson, K., & Alemzadeh, H. (2024). Multimodal Transformers for Real-Time Surgical Activity Prediction. 10.1109/ICRA57147.2024.10611048
- 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.
- Designing a safety engine for robot-assisted surgeries by leveraging machine learning to recognize and predict surgical activities for improved operational reliability.

**Instructor / Teaching Assistant** September 2021 – July 2022
*Department of Computer Engineering, Faculty of Engineering, UOP* *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** September 2021 – July 2022
*Department of Computer Engineering, Faculty of Engineering, UOP* *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** March 2021 – September 2021
*99x Technology* *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** April 2020 - June 2020

*Department of Computer Engineering, Faculty of Engineering, University of Peradeniya* *Peradeniya, Sri Lanka*

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

## Projects

**Data Collection System for Emergency Medical Services — 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.

**Data Collection System for Robot-Assisted Surgeries — Ongoing Research** 2024

*C++, Python, Android, Arduino, Tkinter, Azure Kinect SDK, Open3D, GoPro SDK*

- Developed a unified software and hardware platform for recording egocentric and exocentric videos of EMS responders treating patients in simulation.
- Utilizing devices such as GoPros, Azure Kinect cameras, Smartwatches and Arduinos to collect multimodal data.

**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.)

**Pera-Ride - Eco Friendly Smart Bicycle Sharing System — Group Project** 2020

*NodeJS, Nuxt, MongoDB, Atmega Microcontrollers, MQTT, Bluetooth, Javascript, C++*

- A complete platform for Bicycle Sharing System designed for the University of Peradeniya giving the ability for the students and staff to travel using a bicycle within the university.
- **My Contribution:** System Design, Back-end design and development, Embedded System Design and Development, Database Integration, UI Design

**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

**IIOT based Automated Bottle Filling System — Group Project** 2020

*NodeRed, KEP-Server, OPC-UA, SCADA, Atmega Microcontrollers, ESP8266 WiFi SOC, Javascript, C++*

- An automated bottle filling machine with an IIOT based SCADA controlling platform using Industry Standard Communication Protocols (OPC-UA) to control and monitor the system.
- **My Contribution:** Hardware  Electronics Design, Embedded System Design, and Development

**WiFi PABX — Group Project** 2018

*Java, Android-Studio, MySQL, Asterisk, SIP*

- Developed a mobile application through which those who are in the same Local Area Network can communicate with each other through the SIP server.
- **My Contribution:** Server Design and Development, Asterisk, and DB Integration.

**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.

## Teaching

- **Graduate TA: Sp25** for CS6501: Real-time Embedded Systems
- **Graduate TA: Sp24** for CS6501: Real-time Embedded Systems
- **Volunteer TA** for CO224: Computer Architecture
- **Volunteer TA** for CO323: Computer Communication Networks
- **Volunteer TA** for CO328: Software Engineering
- **Volunteer TA** for CO326: Computer Systems Engineering: Industrial Networks
- **Casual TA** for Programming Methodology

## Achievements

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

## Services

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

## 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.
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- **Prof. Roshan Ragel**
  Professor in Computer Engineering
  Department of Computer Engineering, Faculty of Engineering, University of Peradeniya.
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- **Dr. Asitha Bandaranayake**
  PhD (Cincinnati), BSc.Eng. (Hons)(Peradeniya)
  Department of Computer Engineering, Faculty of Engineering, University of Peradeniya.
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