Kulathunga Arachchige Avandra Sahan Hemachandra

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Research Interests

My research interests align with **Computer Vision**, **Robot Perception**, and **Machine Learning in Robotics**.

Education

University of Moratuwa, Sri Lanka **CGPA**: 3.98/4.20 (3.90 in 4.00 scale) Oct 2016 - Jul 2021
B.Sc.(Honours) in Electronic and Telecommunication Engineering (First Class) Dean's List: All semesters

Nalanda College, Colombo, Sri Lanka Graduated Sep 2015
GCE Advanced Level Examination Ranked **7th** in the country with a **z-score of 3.0014**
(University entrance examination taken by high school students (32393 in physical sciences) in Sri Lanka)
Combined Mathematics : A Physics : A Chemistry : A General English : A

Related Undergraduate Modules

Autonomous Systems (A+)	Robot Design and Competition (A+)	Robotics (A)	Machine Vision (A+)
Final Year Project (A+)	Fluid Mechanics (A+)	Research project (A+)	Mechanics (A+)
Linear Algebra (A+)	Applied Statistics (A+)	Graph Theory (A+)	Calculus (A+)

Publications

[1] Sahan Hemachandra, Ranga Rodrigo, and Chamira Edussooriya, "Fast and Accurate Light Field Saliency Detection through Deep Encoding", Signal Processing : Image Communication, Volume 110, January 2023. [PDF]

[2] Oshada Jayasinghe, Sahan Hemachandra, Damith Anhettigama, Shenali Kariyawasam, Ranga Rodrigo, and Peshala Jayasekara, "CeyMo: See More on Roads - A Novel Benchmark Dataset for Road Marking Detection", IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) 2022. [PDF]

[3] Oshada Jayasinghe, Sahan Hemachandra, Damith Anhettigama, Shenali Kariyawasam, Ranga Rodrigo, and Peshala Jayasekara, "Towards Real-time Traffic Sign and Traffic Light Detection on Embedded Systems", 2022 IEEE Intelligent Vehicles Symposium (IV), 2022. [PDF]

[4] Oshada Jayasinghe, Damith Anhettigama, Sahan Hemachandra, Shenali Kariyawasam, Ranga Rodrigo, and Peshala Jayasekara, "SwiftLane: Towards Fast and Efficient Lane Detection", accepted to International Conference on Machine Learning and Applications (ICMLA) 2021. [PDF]

Research Projects

Road Sign, Traffic Light and Static Object Detection for Self-Driving (Jan 2020 - Jul 2021)
Undergraduate Thesis Project: University of Moratuwa, Sri Lanka
Advisors : Dr. Peshala Jayasekara and Dr. Ranga Rodrigo

Awarded *Research Project of the Year* at NBQSA National ICT Awards 2022

- Developed traffic sign, traffic light, lane and road marking detection algorithms suitable for chaotic and unstructured road scenarios in Sri Lanka.
- Created the first large datasets for traffic sign, traffic light, and road marking detection for Sri Lanka, containing unique challenges in a developing country with scenarios covering traffic, rain, dazzle light, and normal conditions.
- Developed a row-wise classification-based lane marking detection algorithm which outperforms state-of-the-art in terms of speed with comparable and better F_1 values.
- Optimized the end-system for real-time performance in Nvidia-Jetson Xavier with ROS.

Light Field Saliency Detetion (Jan 2020 - Jul 2021)
Individual Research Project : University of Moratuwa, Sri Lanka
Advisors : Dr. Ranga Rodrigo and Dr. Chamira Edussooriya

- Experimented on methods to reduce the high computational power requirement of deep-learning based light field saliency detection algorithms.
- Developed a fast light field saliency detection algorithm with low computational complexity by leveraging on RGB saliency detectors, demonstrating state-of-the-art in terms of speed with comparable F_β values.

Awards and Honours

Research Project of the Year - NBQSA National ICT Awards 2022
- National Best Quality Software Awards by British Computer Society, Sri Lanka Section.
- Jointly awarded by British Computer Society and IEEE Computer Society Sri Lanka Sections.

Bronze Award for Tertiary Student Projects (Technology) - NBQSA National ICT Awards 2022
- National Best Quality Software Awards by British Computer Society, Sri Lanka Section.
- Represented Sri Lanka in Asia Pacific ICT Alliance (APICTA) Awards 2022 in Islamabad, Pakistan.

Dean's List in All Semesters - University of Moratuwa, Sri Lanka 2021
- For achieving an outstanding GPA higher than 3.8 in all the semesters.

Country 6th in IEEEXtreme 14.0 - IEEE Computer Society 2020
- 24h long world-wide competitive programming challenge, annually organized by IEEE Computer Society.

Country 6th in MoraXtreme 5.0 - University of Moratuwa, Sri Lanka 2020
- 12h long country-wide competitive programming challenge, annually organized in University of Moratuwa.

Finalists, Sri Lanka Robotics Challenge (SLRC) 2018 - University of Moratuwa, Sri Lanka 2018
- An undergraduate robot competition organized by the E-Club, University of Moratuwa.

Finalists, Xbotix Robotics Competition 2018 - University of Ruhuna, Sri Lanka 2018
- An undergraduate robot competition organized by the University of Ruhuna.

Professor Padmajeeva Ganepola Challenge Trophy - Nalanda College, Sri Lanka 2016
- For achieving the best results of the school in G.C.E. Advanced Level examination 2015.

Mahapola Merit Scholarship 2016
- For outstanding performance in GCE Advanced Level Examination 2015 (7th out of 32393 students).

SLIC Merit Scholarship 2016
- For outstanding performance in GCE Advanced Level Examination 2015 (7th out of 32393 students).

Dialog Merit Scholarship 2016.
- For outstanding performance in GCE Advanced Level Examination 2015 (7th out of 32393 students).

Best Student of Physical Science Stream from 2013 to 2015 - Nalanda College, Sri Lanka 2014/2015
- For achieving the highest average grade in the school from 2013 to 2015.

Gold Medalist and Ranked 4th in Sri Lanka - Sri Lanka Physics Olympiad (SLPhO), Sri Lanka 2015.
- National qualification exam to choose representatives for AphO and IPhO 2016.

Runners Up - All Island Chemistry Quiz- Institute of Chemistry Ceylon 2015.
- Annual national chemistry competition for high school students in Sri Lanka.

Distinction in Sri Lanka Mathematics Competition- Sri Lanka Olympiad Mathematics Foundation 2014.
- National qualification exam to choose representatives for IMO 2014.

Professional Experience

Software Engineer (May 2022 - present)

WSO2 Lanka (Pvt) Ltd., Sri Lanka, branch of WSO2 LLC, Santa Clara, CA
- Development of Ballerina standard libraries (io, time, xslt, and java-arrays).
- Development of CLI tools and Google Sheets Support for Ballerina Persist library (An ORM library).
- Ballerina and ERP system integration.

Data Engineer (Jun 2021 - May 2022)

Axiata Digital Labs (Pvt) Ltd., Sri Lanka, technology hub of Axiata Group Berhad, Malaysia
- Developed recommendation systems for IPTV.
- Developed deep learning based face biometric tools for masked face recognition.
- Developed CCTV surveillance tools for identifying unauthorized entries.
- Developed cloud based computer vision APIs for identification documents (ID, Driving License, and Passport) verification in online banking applications.

Trainee Associate Electronic Engineer (Jun 2019 - Dec 2019)

Zone24x7 (Pvt) Ltd., Sri Lanka, branch of Zone24x7 Inc. San Jose, Calfornia

- Developed image processing and deep-learning based tools for CCTV surveillance at ATM boxes and face biometric system for self-checkout machines.
- Deployed and benchmarked deep-learning models in Nvidia Jetson and Android devices with optimizations.

Visiting Instructor

University of Moratuwa, Sri Lanka (Mar 2019 - Jun 2019)

- Assisted the lab sessions for the module EN-2532 Robot Design and Competition.

Selected Undergraduate Projects

Mobile and Stationary Robots for Sri Lanka Robotics Challenge (SLRC) 2018 (Nov 2018 - Jan 2019)

Group Project

- Developed two collaborating robotic platforms to complete the tasks in the arena.
  - Mobile robot with line following (continuous and dashed lines), grid solving, coin collecting, and coin sorting (based on colour) capabilities.
  - Stationary robot with a 2 DoF mechanical arm to carry out the necessary supporting tasks required to clear the path of the mobile robot.
- Qualified for the final round obtaining the second place of the first round.

Mobile Robot for Xbotix 2018 Robotics Competition (Oct 2018 - Nov 2018)

Group Project

- Developed a robotic platform with line and wall following, grid solving, object detection, and colour detection capabilities with a mechanical gripper to carry out the tasks in the arena.
- Qualified for the final round.

Application Specific Processor for Image Downsampling with an UART Transciever (Jan 2019 - Jun 2019)

Group Project

- Designed an application specific processor with a custom ISA for processing RGB images using DE2-115 development board.
- Final processor could downsample an image by an integer factor up to 15 using Gaussian and average filtering and it could apply any linear separable filter to images.
- UART transceiver, developed using Verilog was used as the communication medium between the processor and the PC.

Localization based on BLE Beacon Strengths (Jan 2020 - Feb 2020)

Group Project

- Developed a system for the localization based on BLE beacon strengths using ESP-32 devices.
- MQTT publish-subscribe network protocol was used for the data-pipeline.
- Used Random Forest classifier to accurately predict the location.

Design of M-fold Interpolator (Feb 2021 - Mar 2021)

Individual Project

- Designed a M-fold up-sampler with the anti-imaging filter to satisfy the given set of specifications.
- Kaiser window method was used for the FIR filter design and it was implemented efficiently using polyphase decomposition of the filter to reduce the computational complexity.

Coin Collecting and Bridge Unfolding Robot (Oct 2018 - Nov 2018)

Group Project

- Developed a robotic platform with line and wall following, grid solving, and coin collecting capabilities with a 1 DoF arm to carry out the tasks in the arena.

More details can be found in https://sahanhe.github.io/projects/

Skills

Programming Languages:	Python, Java, Ballerina, MATLAB, C
Libraries:	Tensorflow, PyTorch, Flask, TensorRT
Software & Tools:	LaTeX, SOLIDWORKS, Altium, Git
Hardware:	Nvidia Jetson, STM32, Arduino

MOOCS

Fundamentals of Reinforcement Learning	(University of Alberta, Coursera)
Sample-based Learning Methods	(University of Alberta, Coursera)
Deep Learning Specialization	(Deepleaning.ai)
Build Better Generative Adversarial Networks	(Deepleaning.ai)
Build Basic Generative Adversarial Networks	(Deepleaning.ai)
Machine Learning	(Stanford University, Coursera)
Introduction to TensorFlow for Artificial Intelligence,Machine Learning, and Deep Learning	(Deepleaning.ai)
Networking Essentials	(Cisco Networking Academy)

Leadership & Outreach

Leadership

IEEE IES Student Branch Chapter of University of Moratuwa, Sri Lanka (Sep 2020 - Aug 2021)
Treasurer

IEEE Sri Lanka Section SPS Chapter, Sri Lanka (Oct 2021 – Present)
Industry Coordinator

Workshops

Certificate Course: Embedded Machine Learning for Edge Computing (Sep - Nov, 2022)
Course Instructor Course

Beginners' Workshop of Pi-Mora, University of Moratuwa (Aug 2021)
Workshop Instructor

Workshop on Light Fields Processing, IEEE EMBS ISC 2021 (Feb 2021)
Workshop Instructor. Webpage

Introduction to Robotics Workshop Series, Nalanda College, Colombo (Aug 2018 – Jun 2019)
Organizer and Workshop Instructor

References

- Dr. Ranga Rodrigo,
  Head of the Department,
  Department of Electronic and Telecommunication Engineering, University of Moratuwa, Sri Lanka.
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- Dr. Peshala Jayasekara,
  Senior Lecturer,
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  Telephone : +94 11 264 0051/3318
  Homepage: https://ent.uom.lk/team/dr-peshala-jayasekara/

- Dr. Chamira U. S. Edussooriya,
  Senior Lecturer,
  Department of Electronic and Telecommunication Engineering, University of Moratuwa, Sri Lanka.
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  Telephone : +94 11 264 0051/3316
  Homepage: https://ent.uom.lk/team/dr-chamira-u-s-edussooriya/