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# K.A. AVANDRA SAHAN HEMACHANDRA

sahanhemachandra@gmail.com | +94 71 593 7300 | [LinkedIn](#) | [GitHub](#) | [Google Scholar](#)

No 147, Hangawatte Road, Banduragoda, 11244, Western Province, Sri Lanka.

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## RESEARCH INTERESTS

My research interests generally align with **Robotics**, **Autonomous Systems**, **Machine Learning**, and **Resource Constrained Environments**. Specifically, I am interested in conducting research in **Multi-Robot Collaboration** and **Machine Learning for Field Robotics**, particularly in **Control**, **Navigation**, **Path Planning**, and **Perception with Constrained Computational and Sensing Capabilities**.

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## EDUCATION

|   |                                      |                            |
|---|--------------------------------------|----------------------------|
| <b>University of Moratuwa, Sri Lanka</b>                    | <b>CGPA: 3.98/4.20</b> (First Class) | Oct 2016 - Jul 2021        |
| B.Sc.(Hons) in Electronic and Telecommunication Engineering |                                      | Dean's List: All semesters |

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|--|--|
| <b>Nalanda College, Colombo, Sri Lanka</b>   | Graduated Dec 2015   |
| GCE Advanced Level Examination   | <b>7<sup>th</sup></b> in the country with a <b>z-score of 3.0014</b> |
| (University entrance examination taken by high school students (~35000) annually in Sri Lanka) |  |
| Combined Mathematics : A   | Physics : A  |
| Chemistry : A  | General English : A  |

|                                |                      |
|--------------------------------|----------------------|
| GCE Ordinary Level Examination | 9A passes - Dec 2012 |
|--------------------------------|----------------------|

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## RELATED UNDERGRADUATE MODULES

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

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## PUBLICATIONS

- [1] Sahan Hemachandra, Ranga Rodrigo, and Chamira Edussooriya, "Fast and Accurate Light Field Saliency Detection through Deep Encoding", Signal Processing : Image Communication Journal, Under Review.
- [2] Oshada Jayasinghe, Sahan Hemachandra, Damith Anhetigama, Shenali Kariyawasam, Ranga Rodrigo, and Peshala Jayasekara, "CeyMo: See More on Roads - A Novel Benchmark Dataset for Road Marking Detection", accepted to Winter Conference on Applications of Computer Vision (WACV), Waikoloa, HI, USA, January 4 - 8, 2022. [\[PDF\]](#)
- [3] Oshada Jayasinghe, Damith Anhetigama, 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), Pasadena, CA, USA, December 13 - 16, 2021. [\[PDF\]](#)

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## RESEARCH PROJECTS

|  |                       |
|--|-----------------------|
| <b>Road Sign, Traffic Light and Static Object Detection for Self-Driving</b> | (Jan 2020 - Jul 2021) |
| Final Year Project : University of Moratuwa, Sri Lanka                       |                       |
| Advisors : Dr. Peshala Jayasekara  |                       |

- 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 in Sri Lanka, containing unstructured and challenging 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.

|   |                        |
|---|------------------------|
| <b>Light Field Saliency Detetion</b>                            | (Jan 2020 - June 2021) |
| Individual Research Project : University of Moratuwa, Sri Lanka |                        |
| Advisors : Dr. Ranga Rodrigo and Dr. Chamira Edussuriya         |                        |

- Experimented on methods to reduce the high computational power requirement of deep-learning based light field saliency detection algorithms.
- Developed fast and accurate light field saliency detection algorithm with low computational complexity, leveraging on RGB saliency detectors.
- Demonstrated state-of-the-art performance compared to light field saliency detection models in terms of speed with comparable and better  $F_\beta$  values.

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## AWARDS AND HONOURS

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|   |           |
|---|-----------|
| <b>Dean's List in All Semesters</b> - University of Moratuwa, Sri Lanka<br>- For achieving an outstanding GPA higher than 3.8 in all the semesters.   | 2021      |
| <b>World 106<sup>th</sup> and Country 6<sup>th</sup> in IEEEExtreme 14.0</b> - IEEE Computer Society<br>- 24h long world-wide competitive programming challenge, annually organized by IEEE Computer Society. | 2020      |
| <b>Country 6<sup>th</sup> in MoraXtreme 5.0</b> - University of Moratuwa, Sri Lanka<br>- 12h long country-wide competitive programming challenge, annually organized in University of Moratuwa.               | 2020      |
| <b>Finalists, Sri Lanka Robotics Challenge (SLRC) 2018</b> - University of Moratuwa, Sri Lanka<br>- A national robot competition organized by the E-Club, University of Moratuwa.                             | 2018      |
| <b>Finalists, Xbotix Robotics Competition 2018</b> - University of Ruhuna, Sri Lanka<br>- A national robot competition organized by the University of Ruhuna.   | 2018      |
| <b>Professor Padmajeewa Ganepola Challenge Trophy</b> - Nalanda College, Sri Lanka<br>- For achieving the best results of the school in G.C.E. Advanced Level examination 2015.                               | 2016      |
| <b>Dr. Sarath D. Gunapala Challenge Trophy</b> - Nalanda College, Sri Lanka<br>- For achieving the best results of the school in G.C.E. Advanced Level examination 2015 in science stream.                    | 2016      |
| <b>Mahapola Merit Scholarship</b><br>- For outstanding performance in GCE Advanced Level Examination 2015 (7th out of 35000 students).  | 2016      |
| <b>SLIC Merit Scholarship</b><br>- For outstanding performance in GCE Advanced Level Examination 2015 (7th out of 35000 students).  | 2016      |
| <b>Dialog Merit Scholarship</b><br>- For outstanding performance in GCE Advanced Level Examination 2015 (7th out of 35000 students).  | 2016.     |
| <b>Best student of Physical Science Stream from 2013 to 2015</b> - Nalanda College, Sri Lanka<br>- For achieving the highest average grade in the school from 2013 to 2015.                                   | 2014/2015 |
| <b>Gold Medalist and Ranked 4<sup>th</sup> in Sri Lanka</b> - Sri Lanka Physics Olympiad (SLPhO), Sri Lanka<br>- National qualification exam to choose representatives for AphO and IPhO 2016.                | 2015.     |
| <b>Runners Up - All Island Chemistry Quiz</b> - Institute of Chemistry Ceylon<br>- Annual national chemistry competition for high school students in Sri Lanka.   | 2015.     |
| <b>Distinction in Sri Lanka Mathematics Competition</b> - Sri Lanka Olympiad Mathematics Foundation<br>- National qualification exam to choose representatives for IMO 2014.                                  | 2014.     |

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## PROFESSIONAL EXPERIENCE

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|---|-----------------------|
| <b>Data Engineer</b><br>Axiata Digital Labs (Pvt) Ltd., Sri Lanka, technology hub of Axiata Group Berhad, Malaysia<br><ul style="list-style-type: none"><li>• Developing deep learning based face biometric tools for masked face recognition.</li><li>• Developing recommendation systems for IPTV.</li><li>• Developed CCTV surveillance tools for identifying unauthorized entries.</li><li>• Developed cloud based computer vision APIs for identification documents (ID, Driving License, and Passport) verification in online banking applications.</li></ul> | (Jun 2021 - Present)  |
| <b>Trainee Associate Electronic Engineer</b><br>Zone24x7 (Pvt) Ltd., Sri Lanka, branch of Zone24x7 Inc. San Jose, California<br><ul style="list-style-type: none"><li>• Developed image processing and deep-learning based tools for CCTV surveillance at ATM boxes and face biometric system for self-checkout machines.</li><li>• Deployed and benchmarked deep-learning models in Nvidia Jetson and Android devices with optimizations.</li></ul>  | (Jun 2019 - Dec 2019) |
| <b>Visiting Instructor</b><br>University of Moratuwa, Sri Lanka<br><ul style="list-style-type: none"><li>• Assisted the lab sessions for the module EN-2532 Robot Design and Competition</li></ul>  | (Mar 2019 - Jun 2019) |

**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 as 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.

**Motion Sensing Lighting System** (Jan 2019 - Jun 2019)

*Group Project*

- Developed a motion sensing lighting system following Cambridge EDC-Inclusive Design Toolkit.
- OrCAD and SOLIDWORKS based PCB and enclosure designs were used to develop the final prototype.

**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.

**Analog Function Generator** (Feb 2018 - Jul 2018)

*Group Project*

- Developed a function generator device using analog circuits to generate given waveforms (sine, sawtooth, square, and triangular).
- Final device had the capability to produce the waveforms in the range 13-22800 Hz, with 0-20V amplitude and it was able to provide a current up to 0.2 A.

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## SKILLS

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|-------------------------------|---|
| <b>Programming Languages:</b> | Python, MATLAB, Verilog, C, Java (novice) |
| <b>Libraries:</b>             | Tensorflow, PyTorch, Flask, TensorRT      |
| <b>Software &amp; Tools:</b>  | LaTeX, SOLIDWORKS, Altium, AWS            |
| <b>Hardware:</b>              | Nvidia Jetson, STM32, Altera DE2, Arduino |

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## MOOCS

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|   |                            |
|---|----------------------------|
| Deep Learning Specialization - Andrew Ng  | (Deeplearning.ai)          |
| Build Better Generative Adversarial Networks - Sharon Zhou                                  | (Deeplearning.ai)          |
| Build Basic Generative Adversarial Networks - Sharon Zhou                                   | (Deeplearning.ai)          |
| Machine Learning - Andrew Ng  | (Stanford University)      |
| Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning | (Deeplearning.ai)          |
| Networking Essentials   | (Cisco Networking Academy) |

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## LEADERSHIP & SERVICES

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### Leadership

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| <b>IEEE IES Student Branch Chapter of University of Moratuwa, Sri Lanka</b>  | (Sep 2020 - Aug 2021) |
| Treasurer  |                       |
| Served as the founding treasurer of IEEE IES student branch chapter of University of Moratuwa with the aim of developing the electronic knowledge  |                       |
| <b>IEEE Sri Lanka Section SPS Chapter, Sri Lanka</b>   | (Oct 2021 – Present)  |
| Industry Coordinator   |                       |
| Serving as a founding committee member of IEEE Sri Lanka Section Signal Processing Society Chapter, with the aim of providing guidance to the university students in the field of signal processing. |                       |

### Workshops

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|---|-----------------------|
| <b>Workshop Instructor: Workshop on Light Fields Processing, IEEE EMBS ISC 2021</b>   | (Feb 2021)            |
| Worked as an instructor in the workshop <i>Light Fields Processing using Low-Complexity Signal Processing Algorithms and Deep Learning</i> organized as a part of IEEE EMBS International Student Conference(ISC) 2021. <a href="#">Webpage</a> |                       |
| <b>Instructor: Robotics Workshop Series, Nalanda College, Colombo</b>   | (Aug 2018 – Jun 2019) |
| Initiated the robotics seminar and workshop program, collaborating with Robotics Society and engineering alumnus of Nalanda college, Colombo, Sri Lanka. This project was carried out to promote robotics among students.                       |                       |

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## REFERENCES

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- Dr. Ranga Rodrigo,  
Head of the Department,  
Department of Electronic and Telecommunication Engineering,  
University of Moratuwa, Sri Lanka.  
Email: ranga@uom.lk / head-entc@uom.lk  
Telephone : +94 11 264 0422  
Homepage: <https://ent.uom.lk/team/dr-ranga-rodrigo/>
- Dr. Peshala Jayasekara,  
Senior Lecturer,  
Department of Electronic and Telecommunication Engineering,  
University of Moratuwa, Sri Lanka.  
Email: peshala@uom.lk  
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.  
Email: chamira@uom.lk  
Telephone : +94 11 264 0051/3316  
Homepage: <https://ent.uom.lk/team/dr-chamira-u-s-edussooriya/>