Nishal **Silva**

ENGINEER · MUSICIAN · PHOTOGRAPHER · NINJA

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Experienced engineer and researcher with expertise in computer vision, machine learning, digital signal processing, and music technology. Strong analytical skills, problem-solving ability, and creative mindset.

Education

Ph.D in Information Engineering and Computer Science

University of Trento — *2025*

M.Sc in Telecommunication and Electronic Engineering

Sheffield Hallam University — *2018*

B.Eng (Hons) in Electronic Engineering

Sheffield Hallam University — *2014*

Research Interests

Computer Vision | Machine Learning | Artificial Intelligence | Digital Signal Processing
Mathematical Modelling | Algorithm Design | Internet of Things | Industrial Automation
Music Technology | Smart Musical Instruments | Music Information Retrieval | Internet of Musical Things

Work and Research Experience

University of Trento — *Trento, Italy*

Postdoctoral Researcher — *Feb. 2025 - present*

- Currently attached to the European Union-funded project: Musical Metaverse. I am involved in the investigation of integrating real-time musical pattern detection and smart musical instruments into the metaverse.

McGill University — *Montreal, Canada*

Visiting Researcher — *May. 2024 - Aug. 2024*

- I researched on the application of gestural controls to smart musical instruments. The research concluded with the development of a smart electric guitar equipped with a real-time musical, and gestural pattern detection system.

University of Visual and Performing Arts — *Colombo 02, Sri Lanka*

Visiting Researcher — *Jan. 2024 - Mar. 2024*

- I investigated potential use cases and musician's perception of smart musical instruments with a comprehensive user-study.

Forestpin (Pvt) Ltd — *Colombo 05, Sri Lanka*

Technical Consultant — *Aug. 2020 - Feb. 2021*

- Designing and implementing new functionalities to the forensic analytics software.

MAS Digital Excellence — *Battaramulla, Sri Lanka*

Software Research Engineer — *Jan. 2020 - Jul. 2020*

- Developed and deployed a computer vision based device to digitize sphygmomanometer readings in several hospitals treating COVID-19 patients, as part of a project to enable remote patient vitals monitoring.
- Was involved in a company wide IoT implementation project, aimed at tracking real-time productivity in sewing operations in multiple factories across South Asia, North America, and Africa.
- Was involved in designing a system to optimize machine changeovers during factory layout changes by predicting the output, sewing machine allocation and next order layouts.
- Developed, and piloted a computer vision based project to observe customer behaviour in a retail environment, thereby identifying "hot-spots" for strategic product placement.
- Developed a vision based "order retrieval" system for garment labels, to minimize errors and improve productivity.

MAS Pixel

Battaramulla, Sri Lanka

Research Engineer

Jan. 2018 - Dec. 2019

- Was involved in a large scale IoT project to improve the productivity using analytics with sewing machine data. Designed interfacing devices to obtain meaningful data from various types of sewing machines.
- Designed a system to track repetitive patterns in sewing operations, of which the operational data was obtained using the IoT framework, which were used to track operator efficiency and to identify improvements to the operation.
- Developed and implemented an image processing based quality assurance system for a digital printing application, to optimize the printing real estate, improve efficiency and improve quality.
- Developed a computer vision based algorithm to identify corners with minimal data and effort, which enabled multiple automated measurement systems to operate efficiently.
- Designed and deployed a computer vision and machine learning based quality checking system for garment labels to improve the accuracy by reducing errors.
- Designed and deployed several software bots to automate repetitive tasks in third party software.
- Attended multiple international conferences and trade shows, as a representative of the organization, to scout for new technologies.

MAS Technology Services

Colombo 02, Sri Lanka

Technical Consultant

Jan. 2015 - Dec. 2017

- Designed and implemented an augmented reality based device for garment and print prototyping through intelligent projection to the substrate.
- Designed and implemented several computer vision based programs to segment and classify images, which were used by multiple document processing bots.
- Attended multiple international conferences and trade shows, as a representative of the organization, to scout for new technologies.
- Designed a computer vision based system to detect structural defects in fabric rolls. This was used as part of an automated quality checking system aimed towards improving efficiency.
- Developed several computer vision and machine learning based systems to detect, segment and classify garments in stock photographs.
- Developed a mathematical model which was used to a automate a textile digital printing system, thereby improving efficiency, and accuracy by a significant margin.
- Presented several computer vision based solutions at inter-company exhibitions, which resulted in several multi factory deployments.
- Conducted several seminars and hands on training sessions on the use of computer vision to automate tasks in the apparel industry, which paved the way for several quality and efficiency improvement projects to be set in motion.

Arthur C. Clarke Institute for Modern Technologies

Katubedda, Sri Lanka

Communication Engineering Intern

Jan. 2013 - Aug. 2013

- Designed a section of an automated railway gate control system for Sri Lanka Railway Department.
- Worked on several radio signal communication devices.
- Attended several exhibitions as an exhibitor, on behalf of the Institute.
- Designed a prototype for an IoT enabled automated water tank.

Nielsen Lanka

Colombo 08, Sri Lanka

Marketing Research Intern

Sep. 2010 - Dec. 2010

- Worked as a call center operator.
- Performed marketing research on customer credit card usage for several major banks.

Independent Research

- Real-time pattern detection in continuous music streams.
- The usage of machine learning based pose detection methods on athletes, aimed at correcting their posture and techniques.
- Designing a mathematical model to represent musical notes in the MIDI format for real-time computational applications.
- A comparison between Probabilistic and Deterministic systems in the domain of Music and Digital Signal Processing.
- Utilization of alternate spectral representations to identify special characteristics of music.
- The use of computer vision and machine learning techniques to study customer behavior in a retail environment.
- The use of computer vision and machine learning techniques to implement automated stock maintenance systems for large scale retail environments.

Skills

Programming Languages	Python | C | C++ | C# | JavaScript | Assembly | VHDL
Programming Libraries	TensorFlow | Keras | OpenCV | Numpy | Boost
Operating Systems and Platforms	Windows | Linux | Raspberry Pi | Arduino | PIC | STM32 | FPGA
Mathematical Processing Packages	MATLAB | Octave
Computer Vision Software	ViDi Systems | HALCON | Cognex Vision Pro | IC Imaging Control
Documentation	MS Office Suite | LaTeX
Miscellaneous	Adobe Photoshop, After Effects, Lightroom | Google SketchUp | Steinberg Cubase | Git

Publications

- Embedded Real-time Pattern Detection for Smart Musical Instruments, *PhD Thesis*, Jan 2025.
- Real-Time Polyphonic Audio Pattern Detection on Smart Musical Instruments, *submitted to IEEE Transactions on Human Machine Systems*.
- Performer-Audience Multi-sensory Interactions: An IoMusT Performance Ecosystem Based on Real-Time Musical Pattern Recognition, *submitted to the International Journal of Human-Computer Studies*.
- Real-Time Pattern Recognition of Symbolic Monophonic Music, *19th International Audio Mostly Conference*, Sep 2024
- Demo of a smart musical instrument-based real time pattern detection system, *19th International Audio Mostly Conference*, Sep 2024
- A Structural Similarity Index based method to detect Synbolic Monophonic Patterns in Real-time, *25th International Conference on Digital Audio Effects*, Sep 2022.
- Towards Real-Time Detection of Symbolic Musical Patterns: Probabilistic vs. Deterministic Methods, *27th Finnish-Russian University Cooperation in Telecommunication Conference*, Aug 2021.
- On Musical Onset Detection via the S-Transform, *52nd Asilomar Conference on Signals Systems and Computers*, Oct, 2018.
- On Musical Onset Detection via the S-Transform, *Masters Thesis*, Dec, 2017.
- A Hand Gesture based TV remote, *Bachelors Thesis*, Oct, 2014.

Certifications

Rock and Pop Guitar - Grade 8

Trinity College London — *Jul. 2015*

PIC Microcontroller programming

Sceicne Link Technology Centre — *Sep. 2013*

Extracurriculars and Volunteer Work

Scout Movement

- Currently a Phase 1 trained scout leader.
- Served as a Boy Scout and a Rover Scout and attended several National and International Camps.
- Attended the World Scout Jamboree - Essex, UK as a representative of Sri Lanka.

Clubs and Societies

- Served as the Sergeant-at-arms of the Rotaract Club of Sri Lanka Institute of Information Technology.
- Served as the President, Editor and general member in the United Natinos Youth Association of St. Peter's College, and attended several Model United Nations Conferences as a representative of the club.
- Served as an interim social services director, project editor and general member of the Interact Club of St. Peter's College.

Music

- Guitarist of the TNL Onstage 2009 winning band - "Five Minutes Apart".
- Bass guitarist of the YES FM All Starz 2008 runner-up band - "The Purple People".
- Currently working as a freelance guitar instructor, recording and session guitarist, YouTube cover guitarist, and researcher.

Photography

- An enthusiastic landscape and travel photographer.
- Owner of a travel/ landscape and candid photography blog.