Ajay Gunalan Ph.D.

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It's Not Possible. No, It's Necessary.

Love to work on the cutting edge of technology and develop the next generation of autonomous agents and robots.

Education

University of Genoa & Italian Institute of Technology — Genoa, Italy
Ph.D. in Bioengineering and Robotics — Nov 2020 - Mar 2024

B.S.A. Crescent Institute of Science and Technology — Chennai, India
B.Tech. in Mechanical Engineering | CGPA: 8.45/10 — Aug 2013 - May 2017

G.R.T Mahalakshmi Vidyalaya — Chennai, India
12th Grade | 88.0% — Mar 2013

A.V.Meiyappan Matriculation — Chennai, India
10th Grade | 87.4% — Mar 2011

Skills

Programming Languages	C, C++, Python, MATLAB, LaTeX
Libraries & Frameworks	OpenCV, PyTorch, CUDA, ROS, ROS2, MoveIt, git, Make
Embedded Systems	Arduino, STM32F4, Embedded Linux

Experience

Johns Hopkins University — Baltimore, USA
Postdoc — Nov 2024 – Present

- Implemented task-space admittance control on the robotic arm (UR5e) using ROS2 in C++ (code);
- Developed a calibration algorithm in C++ for the force-torque sensor to compensate for gravity and bias (code);
- Developed Python-based AI agents to autonomously generate grounded code from research papers (code);

Italian Institute of Technology — Genoa, Italy
Ph.D. Student — Nov 2020 - Apr 2024

My Ph.D. thesis focused on **surgical laser robot** for vocal-cord surgery (thesis): (1) Enhanced laser-based optical imaging efficiency using compressive sensing for; (2) Developed ROS-based visual servoing for laser microsurgery using segment anything model tracking; (3) Implemented laser spot tracking via optical flow and Kalman filtering with OpenCV (video); (4) Integrated OCT imaging for precise depth control in laser surgery

Italian Institute of Technology — Genoa, Italy
C++ Software Engineer — Oct 2019 - Oct 2020

Interfaced multiple real-sense, zed & other sensors with Nvidia jetson to stream audio, video & pointcloud simultaneously in virtual reality (VR) for **tele-operated robots** by multi-threading. (blog)

Indian Institute of Science — Bangalore, India
Software Engineer — Feb 2018 - Jun 2019

(1) Motion planning simulation of a robotic arm in Gazebo using ROS and MoveIt; (2) CAN bus communication between two linux system; (3) Software development for servo motor control and trajectory tracking for **quadruped robot**; (4) Improved the communication rate between low-level drivers and control algorithms by shared-memory (IPC); (5) Control the robot like in a video game using non-blocking communication (blog, pub.)

Asimov Robotics Pvt. Ltd. — Kochi, India
Software Engineer Internship — Jul 2017 - Dec 2017

(1) Gravity compensation for a banking **humanoid robot**; (2) Position and velocity control of DC motor; (3) TCP/IP communication between ROS and non-ROS module; (4) Sensors like IMU, etc. integration using I2C & SPI. (blog)

Selected Awards

- Finalist, **Top 10 out of 11,000+** applicants, in IICDC 2016 by Texas Instruments Inc. & Indian Institute of Management, Bangalore for our **medical device**, "Smart Intravenous Dripper". (blog)

Publications

1. *S. Li,* ***A. Gunalan*** *et al. "Auto-CALM: Autonomous Computer-Assisted Laser Microsurgery," to IEEE Transactions on Medical Robotics and Bionics. [doi, video]*

2. ***A. Gunalan*** *et al. "Compressive Image Scanning Microscope," In: International Symposium on Computational Sensing, Luxembourg, 2023.* [link]

3. ***A. Gunalan****, L. S. Mattos, "Towards OCT-Guided Endoscopic Laser Surgery—A Review," Diagnostics, 2023.* [link]

4. *S. Li, M.A. Azam,* ***A. Gunalan****, et al. "One-Step Enhancer: Deblurring and Denoising of OCT Images", Applied Sciences, 2022.* [link]

5. *D. Dholakiya, S. Bhattacharya,* ***A. Gunalan****, et al. "Design, Development and Experimental Realization of a Quadrupedal Research Platform: Stoch". In:IEEE International Conference on Control Automation and Robotics (ICCAR), 2019.* [link]

Miscellaneous

- Took seminars on simulation of a robotic arm in Gazebo using ROS and **MoveIt** for students of Dr. Shishir Kolathaya and Prof. Ashitav Goshal at IISc, Bangalore [link].
- Internship (July 2016) at TIDC INDIA, Ambattur, India, where I learnt various process and methodologies involved in desgin and fabrication of cam chain used in two-wheelers.
- Internship (June 2016) at J.K. Fenner(India) Ltd, Sriperumbudur, India, where I learnt various process and methodologies involved in desgin and fabrication of rubber seal's used in bearings.
- Inplant Training (June 2015) at Ashok Leyland, Ennore, India, where I had a practical exposure to various manufacturing methods and assemble line production system.

Referees

1. Muyinatu Bell — Baltimore, USA
   Johns Hopkins University — Email: mledijubell@jhu.edu

2. Leonardo De Mattos — Genova, Italy
   Italian Institute of Technology — Email: leonardo.demattos@iit.it

3. Nikhil Deshpande — Nottingham, UK
   University of Nottingham — Email: nikhil.deshpande@nottingham.ac.uk

4. Yonas Tefera — Italian Institute of Technology
   Italian Institute of Technology — Email: yonas.tefera@iit.it