

Ajay Gunalan

✉ ajay.gunalan@pm.me📧 ajaygunalan.github.io

☎ +39 320 349 6112

Biomedical Robotacist
Developing what is necessary...!

A medical device enthusiast with 4+ years of devoted experience in solving real-world problems by developing novel technologies for better diagnostic and surgical procedures.

Education

ITALIAN INSTITUTE OF TECHNOLOGY & UNIVERSITY OF GENOVA
Doctor of Philosophy in Bioengineering and Robotics

GENOVA, ITALY
November 2020 – October 2023

Thesis Title: Development of Endoscopic OCT probe for vocal chords.
Advisor: Leonardo De Mattos

B.S.A. CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY
Bachelor of Technology in Mechanical Engineering

CHENNAI, INDIA
August 2013 – May 2017

Experience

ITALIAN INSTITUTE OF TECHNOLOGY
Ph.D. Fellow

BIOMEDICAL ROBOTICS LAB, GENOVA, ITALY
November 2020 – Present

My Ph.D. research focuses on developing imaging platforms for minimally invasive procedures. More specifically, I'm interested in developing endoscopic OCT probe for vocal chords.

ITALIAN INSTITUTE OF TECHNOLOGY
Research Fellow

ADVANCED ROBOTICS DEPARTMENT, GENOVA, ITALY
October 2019 – October 2020

I'm involved in the UI team of Tele-operation project. [\[link\]](#)

- Developed Multi-Threaded & Multi-Process solutions in C & C++ for real-time audio, video, PCL stream. [\[link\]](#)
- Performed beamforming using XMOS Microphone array and ODAS library. [\[link\]](#)
- Integrated gas, temperature, mic and thermal camera with linux system. [\[link\]](#)
- Created URDF for hannes hand.

INDIAN INSTITUTE OF SCIENCE
Project Assistant

ROBERT BOSCH CENTRE FOR CYBER-PHYSICAL SYSTEM, BANGALORE, INDIA
February 2018 – June 2019

I was involved in developing a **quadruped robot** called *Stoch*. We used Deep Reinforcement Learning to generate the end point trajectory and realized on hardware using Central Pattern Generator. [\[link\]](#)

- Software development and testing of servo motor control for Stoch 2.0 [\[link\]](#)
- Straight line trajectory tracking using IMU. [\[link\]](#)
- IPC between drivers in C and Python using shared memory enabling low latency. [\[link\]](#)
- Non-Blocking I/O for controlling the robot during teleoperation. [\[link\]](#)
- Robotic arm simulation in Gazebo using ROS and MoveIt. [\[link\]](#)
- CAN bus communication between two debian based system.
- Real-Time Embedded Programming on STM32F4 board using ChibiOS (Basics).
- A thorough understanding of servos (inner-working) [\[link\]](#), actuator design (Quasi Direct Drive. 4Q control, compliance) [\[link\]](#) and overall mechatronic system architecture.

We developed a **banking service robot** and arm manipulators for specific clients. [\[link\]](#)

- Gravity compensation of arms for assistive mode.
- Position and Velocity control of DC motor in Arduino using PID.
- TCP/IP communication between ROS and non-ROS module.
- Motion planning simulation in Gazebo using ROS and MoveIt.
- Sensor Integration such as IMU, Tactile (FSR) and Ultrasonic.

Technical skills

Software Skills

Programming	C, C++, \LaTeX , Python, MATLAB, HTML
Version & Build	git, Make, CMake, Catkin, Jekyll
Debugging Tools	OpenOCD, gdb, Valgrind, strace, ptrace
Framework	ROS, MoveIt, Gazebo, ChibiOS (RTOS)
Single Board Computer	Raspberry-Pi, Odroid, Beaglebone, Jetson
Micro-controller	STM32F4 series (ARM Cortex-M4), Arduino
Content Making Tools	Obsidian, Audacity, GIMP, Inkscape, Kazam, kdenlive

Electronics Skills

Circuit Simulation	TINA-TI
PCB Design	KiCad

Optical Skills

Design & Simulation	OSLO
---------------------	------

Mechanical Skills

Design	Creo, SolidWorks
Simulation	ANSYS Workbench

Actuators & Sensors

Servos & Motors	Dynamixel, Kondos, pwm servos, Maxon, DC & stepper motors.
Sensors	ZED, Realsense, thermal cam, microphone, gas, temperature, imu, tactile (fsr), ultrasound.

Conference Publication(s)

[\[Google Scholar\]](#), [\[ORCID ID\]](#), [\[arXiv identifier\]](#)

1. D. Dholakiya, S. Bhattacharya, **A. Gunalan**, A. Singla, S. Bhatnagar, B. Amrutur, A. Ghosal, and S. Kolathaya. Design, development and experimental realization of a quadrupedal research platform: Stoch. In *2019 5th International Conference on Control, Automation and Robotics (ICCAR)*, pages 229–234, 2019 [\[doi\]](#), [pdf](#).

Honors and Awards

- Finalist, **Top 10 out of 11,000+ applicants**, in India Innovation Challenge Design Contest 2016 conducted by Department of Science and Technology, Government of India & Texas Instruments Inc., and anchored by Indian Institute of Management, Bangalore for our project, **Smart Intravenous Dripper**. [\[link\]](#)
- ISHRAE 2016–2017 President in B.S. Abdur Rahman University and was responsible for organizing and conducting various events related to ISHRAE.
- Won 1st prize in ISHRAE chennai chapter level quiz by St. Joseph’s College of Engineering, Chennai under the auspices of ISHRAE.
- Won 1st prize in technical quiz at Confluence 2016.
- Finalist in the semifinals of AQuest, An all India inter-collegiate engineering quiz contest by ISHRAE.
- Won 1st prize in design and fabrication of heat exchanger at mechfest 2016.

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.
- Internship (July 2016) at TIDC INDIA, Ambattur, India, where I learnt various process and methodologies involved in design 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 design 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.

List of Referees

1. Dr. Nikhil Deshpande
Research Scientist
Advanced Robotics, Italian Institute Of Technology, Genova, Italy
Email: nikhil.deshpande@iit.it