Nithish Krishnabharathi Gnani

Autonomous Systems & Robotics Engineer | Physical AI, Cyber-Physical Systems & Mechatronics

Stockholm, Sweden
Phone: +46 767577662
Email: nithishkgnani@gmail.com
LinkedIn: linkedin.com/in/nithish-k-gnani
Publications: scholar.google.com/citations?user=sVE_GcMAAAAJ
Website: nithishkgnani.github.io

EDUCATION

Master of Science, Autonomous Systems and Intelligent Robots Sep 2024 – Sep 2026
EIT Digital dual master degree program, with minor in Innovation and Entrepreneurship.

- KTH Royal Institute of Technology, Sweden (`Computer Science, ICT Innovation`)
- Polytech Nice Sophia, Université Côte d'Azur, France (`Autonomous Robotics`)

Summer school: Digital Platforms in Smart Cities, Aalto University, Finland
Relevant coursework: OOP with C++, Microcontroller Systems, Digital Control, Robotics and Sensor Fusion, Computer Vision, Artificial Intelligence, Social Robotics, Dependable Autonomous Systems, Project Management, Business Intelligence.

Bachelor of Technology, Mechanical Engineering 2013 – 2017
National Institute of Technology Karnataka (NITK), India (`4-year program`)

SKILLS

Robotics & Autonomy: ROS, ROS2, NVIDIA Isaac Sim, Gazebo, UR3, Robotiq grippers, RMPflow, path planning, digital twins

Mechatronics & Hardware: 3D printing, CAD, sensor integration, wiring, soldering, rapid prototyping

Embedded Systems: Arduino, Nordic nRF52 series, STM32, Raspberry Pi, SPI, I2C, UART

Programming & Tools: C, C++, Python, MATLAB, Simulink, Linux, Ubuntu, Docker, Git, OpenCV

Networking: TCP/IP, UDP, sockets, P4, SmartNIC, Wireshark, Tshark, Scapy, Nmap, ARP

AI/ML: Deep Learning, Reinforcement Learning, Search, VLA, RAG, Agentic AI

Control & Perception: PID, LQR, state feedback, Intel RealSense RGB-D, YOLOv8, PyTorch, TensorFlow, scikit-learn

Languages: English (native), French (TCF B1), Learning Swedish

ACADEMIC AND PROFESSIONAL EXPERIENCE

Master's Thesis and Summer Work, Vehicle Data and Driver Support Jan – Aug 2026
Scania (TRATON) *Södertälje, Sweden*

- Built a telemetry-to-modelling pipeline, converting 20,000+ hours of battery-electric truck raw fleet operation data into comparable road/load/weather scenarios for energy analysis.
- Developed XGBoost and neural-network models to separate driver-control behavior from route and vehicle conditions; adding acceleration and braking signals reduced unexplained energy variation across primary test scenarios.
- Built a real-time AI-driver model; in SIL-simulator runs benchmarked against recorded real-world telemetry, reduced energy consumption by about 30% versus real-driver controls while maintaining average speed.

MSc Project: BalanceBot Hardware Control Deployment Sep 2024 – Apr 2025
Polytech Nice Sophia *Sophia Antipolis, France*

- Modelled a 2-wheeled inverted-pendulum robot in MATLAB/Simulink, covering pinned 1-DOF balancing and nonlinear 2-DOF translating dynamics.
- Integrated Raspberry Pi 3B+, Pololu Balboa32U4, I^2C, IMU, motor drivers, and encoders for physical deployment.
- Designed PID, phase-lead, state-feedback, and LQR controllers; deployed and tuned controllers on hardware, identifying physical saturation and backlash limits.

Project Assistant / Technical Associate Mar 2019 – Jul 2024
Indian Institute of Science (IISc) | DESE / Centre for Networked Intelligence (CNI) *Bangalore, India*
Worked on industry-funded R&D projects across robotics, embedded sensing, real-time control, and cyber-physical platforms, delivering working prototypes, hardware tooling, and peer-reviewed publications.

- **Networked Haptic Teleoperation Testbed [Video]**
  - Built a 400 km intercity tactile cyber-physical systems testbed connecting Geomagic Touch operators to a UR3 robot over a wide-area network [publication].
  - Programmed the haptic and robot-side control stack using C/C++, OpenHaptics, ROS/rospy, UDP packetization, UR external control, kinematic feedback packets, and video streaming.

  - Designed custom 3D-printed gripper fingers with force-sensitive resistor (FSR) arrays, Arduino ADC capture, and tactile feedback for grasping and object manipulation.
  - Solved real-world control-to-video latency challenges; haptic boundary feedback significantly reduced overshoot compared with video-only operation.
- **Robotic Teleoperation Using Digital Twins – RoboTwin**
  - Built a dual-digital-twin teleoperation architecture synchronizing a UR3 robot, Robotiq gripper, and remote physical environment [preprint].
  - Developed the ROS2 and NVIDIA Isaac Sim stack with Geomagic Touch, OpenHaptics, RMPflow motion generation, RealSense RGB-D sensing, YOLOv8 object detection, and SSIM discrepancy updates.
  - Validated with 17 participants under variable network latency; enabled remote-side safety filtering before physical execution and reduced known-object rendering traffic by 25x.
- **Operator Intent for Model-Mediated Teleoperation (with TU Delft)**
  - Evaluated an 8,000 km intercontinental teleoperation setup with TU Delft, controlling a UR3 robot drawing on a moving whiteboard.
  - Implemented the IISc-side robotic setup using ROS2, UR3 control, custom marker-gripper tooling, Intel RealSense D415 RGB-D tracking, and 90 Hz position estimation for dynamic object interaction.
  - Developed an intent-aware controller preserving relative motion under model mismatch [publication].
- **In-Network Edge Intelligence & Time-Sensitive Networking (EdgeP4 / TSN)**
  - Developed tremor-suppression and pose-correction mechanisms on P4-programmable edge switches for the intercity robot testbed, reducing correction latency below 100 μs and network load by 99.9% [publication].
  - Implemented Time-Aware Shaper (IEEE 802.1Qbv) on SmartNICs and PTP (IEEE 1588) on Linux, achieving 20 μs deterministic latency for real-time robot control [preprint].
- **Sensor Identification and Localization via Acoustic PUF**
  - Built an acoustic localization prototype using nRF52840 nodes, microphones, BLE, timers, and TDoA.
  - Localized microphones against known speaker positions in a multipath-heavy cabin setup using kNN.
  - Developed an acoustic physically unclonable function, achieving 99.4% uniqueness-signature accuracy, 99.9% position-signature accuracy, and 5 cm displacement sensitivity [publication].

Team Leader, Maintenance [*Manufacturing Plant*] Jul 2017 – Apr 2018
Coca-Cola (HCCB Pvt Ltd) *Hyderabad, India*

- Led a team of 20+ associates responsible for the uptime and operational reliability of high-speed bottling and packaging lines.
- Performed hands-on root-cause failure analysis on capping and conveyor machinery, reducing machine downtime and earning the JIPM TPM Consistency Award [🔗].

SELECTED PUBLICATIONS

EdgeP4: In-Network Edge Intelligence for a Tactile Cyber-Physical System Testbed Across Cities [🔗]
Nithish K. Gnani, Joydeep Pal, Deepak Choudhary, H Verma, SK Rana, Kaushal S. Mhapsekar, TV Prabhakar, Chandramani Singh.
IEEE INFOCOM Workshops 2024, Best Paper Award

Utilizing Operator Intent for Haptic Teleoperation under High Latencies [🔗]
HJC Kroep, P Makridis, J Huidobro, K Wosten, D Choudhary, N. K. Gnani, TV Prabhakar, S Coppens, RR Venkatesha Prasad, K Van Berlo.
IEEE Transactions on Mobile Computing, 2025

Sensor Identification via Acoustic Physically Unclonable Function [🔗]
Girish Vaidya, TV Prabhakar, Nithish K Gnani, Ryan Shah, Shishir Nagaraja.
ACM Digital Threats: Research and Practice, 2022

Judicious data management for sustaining an energy harvesting sensor node [🔗]
K Singh, P Shukla, Sachin SM, Nithish K Gnani, TV Prabhakar, Joy Kuri.
Concurrency and Computation: Practice and Experience, 2021

PROFESSIONAL ACTIVITIES, OUTREACH & HOBBIES

- **Teaching:** instructor for advanced courses on 5G, and cyber-physical systems for NSE TalentSprint, and PGCIL.
- **Yuwa India:** taught underprivileged girls in rural India through the Yuwa education and sports program [🔗].
- **Designing and 3D printing** functional hardware parts, enclosures, tooling, and custom prototypes [🔗].