Jacinto Colan

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Education

Doctor of Engineering
Nagoya University, Micro-Nano Mechanical Science and Engineering — April 2021

Master of Engineering
Nagoya University, Micro-Nano Systems Engineering — April 2018

Bachelor of Science in Electronic Engineering
National University of Engineering — August 2010

Technical Skills

- Robot control
- Motion planning
- Robotics Simulation
- Embedded systems
- Real-time systems
- Programming languages: C/C++, Python, Matlab
- Multi-threading programming
- Mechanical design (CAD)
- Robotics Middleware: ROS, Orocos
- ML Frameworks: PyTorch, TensorFlow
- Rapid Prototyping

Professional Experience

Nagoya University — Nagoya, Japan
Postdoctoral Researcher — Apr 2021 – Present

Researcher at the Intelligent Robotics and Biomechatronics Laboratory. Leading projects at the intersection of hardware and software for medical and assistive applications.

- CREST Project (Reliable Interventional AI Robotics sharing its ambiguity of AI diagnosis with medical profession): 2021 - Present
  - Developing an autonomous surgical assistant robot that leverages reliable AI strategies, computer vision, and human motion prediction to assist surgeons in complex procedures.
  - Implemented ROS-based software for integration and real-time control of various components, including robotic manipulators, GUI, DAQs, sensors, and surgical instruments.
  - Proposed methods for learning manipulation of deformable objects based on generative models (CVAE), model predictive control (MPC), and advanced image processing techniques.
  - Designed surgical simulation environments for sim-to-real transfer of model-free RL algorithms trained in the manipulation of soft tissues.
  - Designed and developed biocompatible robotic instruments for surgical applications.

- Project: Learning in-hand manipulation for a compliant underactuated gripper with interactive human supervision: 2022-Present
  - Developing compliant multi-fingered robotic hands based on novel planar linkage mechanisms for enhanced stiffness and integration with vision-based tactile sensing.
  - Performed kinematic analysis and real-time control for the proposed mechanism.
  - Proposed methods for learning tactile-based in-hand manipulation by real-to-sim approaches.

- CHIRON Project (AI-empowered general purpose assistive robotic system for dexterous object manipulation through embodied teleoperation and shared control): 2021 - 2023
  - Investigating solutions for challenges in robot's teleoperation through the combination of embodiment, VR, and AI.
  - Exploring novel approaches in whole-body control of humanoids and mobile manipulators (Toyota HSR, PAL Robotics Tiago).
  - Designed and developed a wearable haptic interface with kinesthetic/cutaneous feedback for dexterous in-hand manipulation in VR applications.
  - Tutored and provided academic counseling to graduate students.

Nagoya University Nagoya, Japan
Graduate Student Apr 2015 – Mar 2021

Research on the development of a cooperative robotic system for neurosurgical applications.

- SmartArm Project (ImPACT - Bionic Humanoids Propelling New Industrial Revolution):
  - Developed a human-robot interface for intuitive and dexterous control of a bimanual surgical robot based on industrial arms and flexible surgical instruments.
  - Implemented ROS-based software for integration and real-time control of various components, including robotic manipulators (Denso VS050), GUI, DAQs, sensors, and surgical instruments.
  - Proposed a novel approach for constrained motion planning in surgical applications combining simultaneous non-linear optimization and hierarchical task-priority control.
  - Implemented a ROS-based real-time low-level motion controller for the industrial manipulator Denso VS050 based on EtherCAT communication.
  - Worked in collaboration with research teams at the University of Tokyo and Kyushu University.
- Trainee in the Leadership Development Program for Space Exploration and Research (Nagoya University Leading Graduate Schools Programs).
  - Mission proposal for Nagoya University ChubuSat micro-satellite.

Arca Continental Lindley Lima, Peru
Maintenance Supervisor Feb 2014 – Mar 2015

- Supervised a crew of 10 people to perform preventive/corrective maintenance work of beverage production machinery and equipment.
- Trained operational and technical personnel on industrial process automation.
- Managed maintenance requests, supplies, and services carried out by service providers.
- Analyzed and optimized operation and maintenance key performance indicators (KPI).

Backus Lima, Peru
Maintenance Supervisor Jan 2012 – Feb 2014

- Led a team of 6 people to perform preventive/corrective maintenance work of beverage production machinery and equipment.
- Designed and implemented automation projects for a new water bottling production line.
- Analyzed equipment failure tracking reports for preventive failure detection.
- Management of spare parts requests to ensure availability according to scheduled work.
- Assisted in the implementation and training of good manufacturing practices (Lean Manufacturing).
- Planned, supervised, and developed continuous improvement projects (PDCA).
- Led the implementation of quality management tools.

Equipmed Americas Lima, Peru
Biomedical Engineer Jul 2010 – Dec 2011

- Responsible for installation, maintenance, calibration, and repair of biomedical equipment.
- Trained personnel and customers in equipment operation and provided technical assistance.
- Worked closely with USA and China suppliers for resolution of consultations and claims.

Core competences

- Leadership
- Critical Thinking
- Active Learning
- Communication
- Teamwork
- Mentoring

Publications

- Colan, Jacinto, et al. "A concurrent framework for constrained inverse kinematics of minimally invasive surgical robots." Sensors 23.6 (2023): 3328.
- Colan, Jacinto, et al. "OpenRST: An Open Platform for Customizable 3D Printed Cable-Driven Robotic Surgical Tools." IEEE Access 11 (2023): 6092-6105.
- Colan, Jacinto, et al. "A review on tactile displays for conventional laparoscopic surgery." Surgeries 3.4 (2022): 334-346.
- Colan, Jacinto, et al. "Optimization-Based Constrained Trajectory Generation for Robot-Assisted Stitching in Endonasal Surgery." *Robotics* 10.1 (2021): 27.
- Colan, Jacinto, et al. "A Cooperative Human-Robot Interface for Constrained Manipulation in Robot-Assisted Endonasal Surgery." *Applied Sciences* 10.14 (2020): 4809.

Conferences and presentations

- "Constrained Motion Planning for a Robotic Endoscope Holder Based on Hierarchical Quadratic Programming." IEEE International Conference on Control and Robotics Engineering (ICCRE), Nagaoka, Japan. 2023.
- "Task Segmentation Based on Transition State Clustering for Surgical Robot Assistance." IEEE International Conference on Control and Robotics Engineering (ICCRE), Nagaoka, Japan. 2023.

- "Visual Tactile Sensor Based Force Estimation for Position-Force Teleoperation." IEEE International Conference on Cyborg and Bionic Systems (CBS), Wuhan, China. 2022.
- "Cutaneous Feedback Interface for Teleoperated In-Hand Manipulation." IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan. 2022.
- "Sensorless grip force estimation of a cable-driven robotic surgical tool based on Gaussian Process Regression." International Symposium on Micro-NanoMechatronics and Human Science (MHS), Nagoya, Japan. 2022.
- "Bidirectional Tether Less Soft Actuator with Expeditious Position Control Mechanism." International Symposium on Micro-NanoMechatronics and Human Science, Nagoya, Japan. 2021.

Honors & awards

- Best Paper Award - International Conference CBS 2022 2022
  "Visual Tactile Sensor Based Force Estimation for Position-Force Teleoperation".
- Best Paper Award – International Symposium MHS 2022 2022
  "Sensorless grip force estimation of a cable-driven robotic surgical tool based on Gaussian Process Regression".
- Polytechnique Montreal Research Internship Scholarship 2020
- Best Paper Award – International Symposium MHS 2019 2019
  "Usability Study on Hands-on User Interface for Neurosurgical Articulated Forceps: Joystick and Serial-link based Design".
- Best Presentation Award - SICE Annual Conference 2016
  "Design and Prototype of an Intuitive User Interface for Forceps with Multi-Degrees of Freedom".
- Japanese Government Postgraduate Scholarship (Monbukagakusho) 2015 - 2021

Grants

- JSPS Grant-in-Aid for Early-Career Scientists 2022 - 2024
  "Learning in-hand manipulation for a compliant underactuated gripper with interactive human supervision" (¥4.5M)
- JST AIP Challenge Program 2022 - 2023
  "Reliable online tool tissue force estimation for robot assisted surgical systems" (¥1M)
- Nagoya University Research Grant for Doctoral students (¥1M) 2018 - 2021

Licenses and certifications

- Professional specialist in Maintenance Management & Overhaul - PMM Business School 2010
- Diploma in Project Management & Administration - UCAM Catholic University of Murcia 2010
- Certified Lean Six Sigma Green Belt - PUCP Quality Institute 2010

Languages

English: Full proficiency Japanese: Intermediate Spanish: Native