Neil R. Fernandes

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Research Interests

My research interests lie at the intersection of human-robot interaction, adaptive control systems, and social intelligence for robotics. My work explores adaptive human-robot interaction in dynamic environments, multi-modal interaction techniques, and compliant control systems that enable natural physical and social interactions. I am particularly interested in how these elements combine to create robots that respond contextually to human needs and society as a whole. Beyond technical implementations, I also examine the societal applications and ethical implications of integrating socially intelligent robots into settings with humans.

Education

University of Waterloo Sep 2024 –
Masters of Applied Science (M.A.Sc) in Electrical and Computer Engineering
Specialization: Pattern Analysis and Machine Intelligence
Advisors: Dr. rer. nat. Yue Hu and Dr. rer. nat. Kerstin Dautenhahn

University of Waterloo Sep 2019 - Apr 2024
Bachelors of Applied Science (B.A.Sc) in (Hons) Mechatronics Engineering
Summa Cum Laude; Option in Computing
Final Year Design Project Advisors: Dr. Sanjeev Bedi, Dr. Stephen L. Smith and Dr. Michael Mayer

Research Experience

Graduate Research Assistant Waterloo, ON
Social and Intelligent Robotics Research Lab Sep 2024 -

- Working on creating an assistive robot companion for immigrant families
- Assisting with learning outcomes for humanoid robots through social learning and other biologically-inspired approaches

Graduate Research Assistant Waterloo, ON
Active and Interactive Robotics Lab Sep 2024 -

- Working on physical Human Robot Interaction (pHRI) experiments with multi-modal human estimation
- Working on reinforcement learning for robotic control

Undergraduate Research Assistant Waterloo, ON
Human-Centred Robotics and Machine Intelligence Lab May 2022 - June 2022

- Developed algorithms for motion generation and control by integrating model-based optimization with model-free machine learning approaches
- Designed a testbench using SolidWorks and an Arduino for the REEM-C humanoid's machine vision feasibility tests
- Assisted research team in conducting kinematic studies using ROS and Gazebo
- Advisors: Dr. Katja Mombaur and Dr. Francisco Javier Andrade Chavez

Publications

Journal Articles

[J1] K.Rebello, S.Rasouli, C.Colombatto, ***N.Fernandes***, C.Nehaniv, K.Dautenhahn, "A *Little Less Mimicry, A Little More Empathy*: Modeling Robot Empathic Responses for Human-Robot Interaction", *(in review)* in *ACM Transaction in Human-Robot Interaction (THRI)*, 2025

Teaching Experience

Graduate Teaching Assistant
University of Waterloo, Canada

- Introduction to Social Robotics (ECE 757 & ECE 493), Dr. Kerstin Dautenhahn — Winter 2026
- Fundamentals of Programming (ECE 150), Douglas Harder; Dr. Werner Dietl — Fall 2025
- Sensors and Instrumentation (MTE 220), Dr. Derek Wright — Spring 2025
- Electrical Circuits and Instrumentation (GENE 123), Dr. John Long — Winter 2025

Undergraduate Teaching Assistant
University of Waterloo, Canada

- Introduction to Circuits for Mechatronics Engineers (MTE 120), Dr. Marie Charbonneau — Spring 2021
- Introduction to Circuits for Mechanical Engineers (ME 123), Dr. Mohammed Nassar — Spring 2021

Awards and Honours

- Jim & Diane Ohi Memorial Award — 2025
- Yang Family Graduate Scholarship in Electrical and Computer Engineering — 2024
- International Master's Award of Excellence (IMAE) — 2024
- Graduate Research Scholarship - In part by The Canada 150 Research Chair Program — 2024-2025
- Norman Esch Entrepreneurship Award for Capstone Design — 2024
- President's Research Award — 2022
- Dean's Honours List — 2021-2024
- Nomination - Sandford Fleming Foundation Award for Teaching Assistantship Excellence — 2021

Synergistic Activities

Reviewer: HRI, ICML, IROS, RO-MAN, CVIS
University Committee: UW Admission information form reviewer

Professional Experience

Toyota Motor Manufacturing Canada — Cambridge, ON

QC Automation Engineering Co-op - Automation Innovation Lab — May 2023 - Aug 2023

- Designed and implemented a vehicle information tracking and analysis system, utilizing MQTT brokers and UWB trackers that reduced 61.6% of manual vehicle re-inspections (Muda of overprocessing), faced by Toyota manufacturing plants in North America and Japan
- Worked with engineers in Japan to create several manufacturing system enhancements, focused on customer result and long-term sustainability
- Spearheaded control design of production ready robots and machinery on the Toyota Production Line, successfully commissioning multiple machines (Yaskawa Co-Bots, Toyopuc/Allen Bradley PLCs, …)
- Managers: William Chang and Shailesh Mistry

Engineering Analyst Co-op - North Assembly — Sep 2022 - Dec 2022

- Implemented an equipment and process changeover that reduced Lexus quarter glass chrome damages by 88.4%, reducing repair cost/time in the process and improving plant key point indicators (KPIs) through the Toyota Business Practice
- Designed and implemented an AGV safety barrier that helped save the company $950,000 by reducing downtime experienced on the multi-model production line using SolidWorks
- Manager: Jason Dennis

Huawei Research Institute Markahm, ON
Associate Research Scientist - Distributed Scheduling and Data Engine Lab Jan 2022 - Apr 2022

- Designed and implemented a fix for the platform's cube to support huge datasets without duplication. Provided a fix to the Btree Indexer to support the creation process for large datasets, using Presto DB
- Designed and implemented a novel UniStage scheduler that reduces query latency by 80%. Conducted benchmarks and performance tests on the feature for over 10,000 load tests using JMeter, Python and Shell
- Wrote technical documentation and updated the project documents with up-to-date information
- Leads: Michael Li and Jessica Surya

Volunteering and Services

- First year Grad Mentor, *Dept. of Electrical and Computer Engineering, University of Waterloo* 2025
- Language Ambassador, *Cohere4AI* 2024
- Mentor, *StarterHacks* 2020

Projects

Mimik *Video*

- Created an explorative study to see the relationship between robot likabaility and human personality through non-verbal communication
- Tools Used: Python, Choreographe (NAO)

Project Kite (B.A.Sc Capstone Project) *Website*

- Created a low cost UAV that helps with HV Insulator Inspection on Power lines
- Won the Norman Esch Capstone Award (awarded to the top 12 teams in a pool of 2000 teams)
- Tools Used: Python, C, CUDA

Positional determination for UAV Precision Landing *Paper*

- Created a positional determination system for UAV precision landing
- Used the methodology on Project Kite
- Tools Used: Python, C, CUDA, ViCON MoCAP

Technologies

Languages: C++, C, Java, Python, CUDA

Robots Used: PAL Robotics' REEM-C and TALOS, Unitree Go1, Franka Emika Panda, KUKA iiwa, Yasakawa HC10, Kawasaki BX/BT series, Alderban NAO and Pepper