NAVEEN KUPPUSWAMY

Senior Research Scientist — Large Behavior Models & Tactile Robotics

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SUMMARY

I build robotic systems that learn from large-scale multimodal data and sense the world through touch, enabling reliable operation in complex human environments. At Toyota Research Institute, I lead research on large behavior models (LBMs) and pioneered tactile-informed foundation models that integrate vision, touch, and audio. My work spans from designing award-winning tactile sensors (SoftBubble, Punyo, PolyTouch) to developing contact-aware policies and evaluation frameworks for domestic manipulation.

EXPERIENCE

Senior Research Scientist (Robotics / Large Behavior Models)

Toyota Research Institute (TRI)

2016—Present | Cambridge, MA

- **Robot Data Lead for LBM 1.0:** Led large-scale on-robot data collection strategy and developed rigorous policy evaluation frameworks for contact-rich dexterous manipulation
- **Former Tactile Perception & Control Lead:** Pioneered whole-body tactile sensing and control (*Project Punyo*); Developed next-generation tactile sensors (*SoftBubble* and *PolyTouch* sensors) and tactile-informed diffusion policies
- **Strategic Collaborations:** Co-PI on TRI-funded projects with MIT (Edward Adelson, Pulkit Agrawal, Wojciech Matusik, Sangbae Kim), Stanford (Shuran Song, Mark Cutkosky, Jeanette Bohg), GeorgiaTech (Seth Hutchinson, Charlie Kemp), University of Michigan (Dimitry Berenson)
- Whole-body control and state estimation for contact-rich manipulation; contributor to Drake simulation library
- Worked under Russ Tedrake (SVP, Robotics Research)

Visiting Researcher

Robotics & Perception Group, UZH

2016—2017 | Zurich, Switzerland

- Quadrotor nonlinear control & trajectory optimization (host: Prof. Davide Scaramuzza)

Postdoctoral Fellow

Dynamic Interaction Control Lab, iCub Facility (IIT)

2014—2016 | Genoa, Italy

- Whole-body state & force estimation for humanoid robots (supervisor: Dr. Francesco Nori)
- Core contributor to iDynTree, wholeBodyInterface, and iCub platform libraries

Doctoral Student

AI Lab, University of Zurich

2009—2014 | Zurich, Switzerland

- Reduced-dimensional control and soft continuum robotics (EU: AMARSi, ROBOTDoC, OCTOPUS projects)
- Marie Curie Fellow; supervised MSc theses; TA/lectures in Machine Learning & Robotics

Research Engineer

Yujin Robot Co. Ltd.

2007—2008 | Seoul, South Korea

- Service robot middleware architecture; computer vision and ML for consumer robots

EDUCATION

Ph.D. in Artificial Intelligence

University of Zurich

2009—2014 | Zurich, Switzerland

- Marie Curie Fellow; Supervisor: Prof. Rolf Pfeifer

- Thesis: Exploiting reduced dimensionality in the design and control of embodied systems

M.S. in EECS

KAIST

2005—2007 Daejeon, South Korea

- Korean Research Foundation (KRF) Scholarship; Supervisor: Prof. Kim Jong-Hwan

B.E. in Instrumentation & Control

Anna University (SRM Engg. College)

2001—2005 Chennai, India

HONORS & AWARDS

- ICRA Best Paper Award, Field and Service Robotics (2025) — PolyTouch
- IEEE RA-L Best Paper Award (2020) — Contact patch estimation
- RSS Best Student Paper Finalist (2017)
- Best Paper Award — 2nd Int. Electronic Conf. on Sensors & Applications (2015)
- Fellowships: Marie Curie (2011–2014), Google RISE (2014), KRF (2005–2007), NCCR Robotics (2016)

PROFESSIONAL SERVICE

- Reviewer: IEEE T-RO, IEEE T-IE, IROS, ICRA, Humanoids, RSS
- Review Editor: Frontiers in Bioengineering and Biotechnology
- Leadership: Co-Chair, TRI LGBTQ+ ERG (2018—2021); ICRA 2020 Workshop on Visuotactile sensing organizer

LANGUAGES

English (Fluent) | Tamil (Native) | German (Intermediate) | Korean (Intermediate) | Hindi (Advanced) | Italian (Beginner)

SELECTED PUBLICATIONS

Representative work spanning tactile hardware to foundation models. Full list at Google Scholar

- TRI LBM Team et al. (among first authors) — A Careful Examination of Large Behavior Models for Multitask Dexterous Manipulation. *arXiv 2024* (soon to appear in *Science Robotics*)
- Zhao et al. — PolyTouch: A Robust Multi-Modal Tactile Sensor for Contact-rich Manipulation Using Tactile-Diffusion Policies. *ICRA 2025* | **Best Paper Award**
- Liu et al. — ManiWAV: Learning Robot Manipulation from In-the-Wild Audio-Visual Data. *CoRL 2024*
- Hou et al. — Adaptive Compliance Policy: Learning Approximate Compliance for Diffusion Guided Control. *arXiv 2024*
- Goncalves et al. — Punyo-1: Soft tactile-sensing upper-body robot for large object manipulation. *RoboSoft 2022*
- Kuppuswamy et al. — Fast Model-Based Contact Patch and Pose Estimation for Highly Deformable Dense-Geometry Tactile Sensors. *IEEE RA-L 2019* | **Best Paper Award**
- Kuppuswamy et al. — Soft Bubble grippers for robust and perceptive manipulation. *IROS 2020*
- Foehn et al. — Fast trajectory optimization for agile quadrotor maneuvers with a cable-suspended payload. *RSS 2017* | **Best Student Paper Finalist**

IMPACT METRICS

- **1000+ citations** (Google Scholar)
- **17+ issued patents**, 3 under review
- **3 Best Paper Awards** (ICRA, RA-L, RSS finalist)
- **Open source:** Core contributor to Drake, iCub, iDynTree, Punyo

TEACHING & MENTORSHIP

- Guest Lectures: UT Austin (2025, Prof. Lilian Chin), UIUC (2025, Prof. Joohying Kim), Stanford (2024, Prof. Shuran Song), MIT (2023, 6.843 - Russ Tedrake), MIT (2022, 2023, 2024, Ted Adelson)
- Mentored 7 summer interns at TRI; Supervised 2 BSc, 4 MSc theses; 7 semester projects at IIT and UZH

INVITED TALKS

RAI Zurich (2025); Univ. of Minnesota (2023); Cornell (2022); HKU Hong Kong (2021); Univ. Sheffield (2020); Stanford ME (2019); ETH Zurich ASL (2017); MIT CSAIL (2016); multiple industry venues on tactile manipulation and LBMs

MEDIA & OUTREACH

TRI Research Blog Posts

- Large Behavior Models — tri.global/LBM
- TRI's robots learn new skills in an afternoon — Medium
- Sensing is believing: Soft Bubble Gripper — TRI News

Press: Featured in Toyota Newsroom, MIT News, industry press

NON-PROFIT LEADERSHIP

Dwengo pzw — Engagement Manager (2013–2016): Robotics education for underprivileged students; Google RISE 2014 recipient

PROFESSIONAL LINKS

- TRI Profile: tri.global
- Punyo Project: punyo.tech