

Duy-Nguyen Ta

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RESEARCH INTERESTS

- **Robot learning grounded in model-based robotics:** policy learning (imitation, diffusion policies, reinforcement learning) and sampling-based MPC for whole-body loco-manipulation, with the large-scale simulation, data, training, and deployment infrastructure behind it.
- **Probabilistic machine learning and inference** for robust perception and sensorimotor policies in robot manipulation and navigation.

WORK EXPERIENCE

Robotist, Robotics and AI Institute (RAI, formerly Boston Dynamics AI Institute) Oct 2023 – Now

- **Whole-body loco-manipulation policies for Boston Dynamics Spot** (tire rolling, upright recovery, object dragging), Whole-Body Control team Sep 2025 – Now
 - Co-maintainer of [judo](#), the Institute's open-source sampling-based MPC (SMPC) framework.
 - Built massive GPU-parallel expert-data generation from SMPC rollouts using MuJoCo Warp; designed the end-to-end data-collection pipeline and storage format for large-scale diffusion-policy training, and the policy-evaluation pipeline with GPU-parallel environments.
 - Built and operate the team's on-premise Ray RL training cluster, harvesting idle company GPUs.
 - Took over the lightweight shared-memory node-graph deployment middleware (a zero-boilerplate ROS replacement): documented the core framework, rebuilt its application layer for Spot hardware and MuJoCo simulation, and developed a UI for visualizing and debugging running node graphs.
- **Dexterous mobile manipulation** Oct 2023 – Sep 2025
 - Diffusion models for policy and dynamics learning for contact-rich and whole-body manipulation.
 - Scene graphs for semantic navigation and scene-grounded hierarchical task analysis (CVPR 2025).
 - Language-inferred factor graphs for instruction following.
- Mentored research interns and collaborated across teams, contributing to publications at CoRL 2026, CVPR 2025, and multiple arXiv preprints (see Publications [20]–[24]).
- Bazel build systems, CI infrastructure, and engineering support for company-wide development.

Principal Engineer, Perception, Outrider Inc.

Jul 2022 – Sep 2023

- State estimation, localization and mapping, object tracking, autonomous navigation for yard trucks.

Senior Research Engineer, Toyota Research Institute, Dexterous Manipulation

- **Intuitive Physics** – Manipulation of hard-to-model objects for food prep applications 2020 – Jun 2022
 - Conditional Energy-based Models for learning policies from demonstrations with Behavior Cloning.
- **Object perception for TRI's dish-loading demo** – *Perception team lead* Oct 2017 – 2020
 - Neural networks for probabilistic object pose estimation in cluttered environments.
 - Multicamera calibration, hand-eye robot calibration, depth-based object tracking and visual odometry.
 - Aleatoric and epistemic uncertainties, out-of-domain detection, distribution shift in continual learning.

Senior Robotics and Vision Scientist, iRobot Corporation, Technology Organization

- **Pose-graph sparsification for long-term persistent mapping** Jan 2017 – Sep 2017
 - Fast and near optimal approximation method for pose graph node marginalization and edge removal.
- **Highly optimized generic SLAM backend for resource-limited robots** 2015 – 2016
 - Developed a new generic factor graph based SLAM backend, highly optimized for memory resources using C++ template meta-programming.
 - Deployed on Roomba 980 with extremely limited computational resources (LPC32xx, ARM 32bit).
 - About 30× faster than gtsam's preconditioned conjugate gradient implementation.

Research Assistant, Georgia Institute of Technology, College of Computing

- **A unified framework for perception and optimal control in factor graphs** 2013 – 2014
 - Enhanced factor graph capabilities in representing and solving deterministic optimal control problems.
 - Used integrators on Lie-group manifolds to represent dynamics constraints as hard constrained factors.
 - Implemented LP, QP, and SQP to optimize constrained factor graphs.

- **Object-centric approaches for fast autonomous navigation** 2013 – 2014
 - Designed linear-time object-centric approximation for filtering-based SLAM.
- **Perception for autonomous navigation on a small quad-rotor** 2011 – 2012
 - Developed monocular SLAM on ARDrone quadrotor for autonomous navigation in challenging environments: outdoor forests and indoor hallways.
- **Tracking and pose estimation for Augmented Reality (AR) on mobile devices** 2007 – 2010
 - Implemented robust feature-based tracking, model-based edge tracking, and direct method template patch tracking for Augmented Reality applications.

Research Intern, Nokia Research Center

- **Urban Scene Recognition for Augmented Reality** Summer 2010
 - Implemented vocabulary tree for scene recognition.
 - Experimented with many feature detectors and descriptors.
- **Real-time Planar Target Tracking for Handheld AR** Summer 2009
 - Implemented feature-based planar-target tracking on mobile devices. Deployed on Nokia N900.
- **Real-time Tracking for Mobile AR with Database of Geo-tagged Labeled Images** Summer 2008
 - Developed a novel outdoor tracking method for AR using SURF features with geo-tagged, labeled images. Deployed on Nokia N95 (8-12fps). CVPR 2009 oral (5% acceptance rate).

Software Developer, Nanyang Technological University, Interaction and Entertainment Research Center

- **Augmented Reality and Interactive Systems for Arts and Entertainment** 2005 – 2007
 - Developed many interaction systems for arts and entertainment with AR and computer vision for various national and international exhibitions and theater performances.

Research Assistant, National University of Singapore, Dept. of Electrical and Computer Engineering

- **Magic Land** 2003 – 2005
 - Installed a shape-from-silhouette 3D capture system with 9 cameras. The live-captured 3D models are rendered from a virtual viewpoint in AR in real-time.
 - Developed Magic Land, an interactive tabletop AR game that allows players to see and interact with their own 3D images and other virtual characters.
 - Exhibited at Singapore Science Center, SIGCHI'05, WIRED NextFest'05. Journal paper TVCG'05.

EDUCATION

Georgia Institute of Technology, Atlanta, Georgia, USA

- Ph.D. in Computer Science
 - Advisor: Prof. Frank Dellaert, in perception and control for autonomous navigation 2011 – 2014
 - Advisor: Prof. Blair MacIntyre, in perception for Augmented Reality 2007 – 2010

National University of Singapore Dept. of Electrical and Computer Engineering, Singapore

- M.Eng. in Computer Engineering 2003 – 2005
 - Live 3D human capture for mixed reality interactive systems

HCMC University of Technology, School of Computer Engineering, Vietnam

- B.Eng. in Computer Engineering 1998 – 2003
 - *Summa cum laude*. Top 5 out of 220 students.

SKILLS

Theory:

- Specialization: factor graphs, SLAM, Bayesian methods, optimal control, sampling-based MPC.
- Experience: Lie-group optimization, diffusion and energy-based models, reinforcement learning.

Practice:

- Programming: Python, C/C++, PyTorch
- Learning infrastructure: MuJoCo / MuJoCo Warp, Ray clusters, large-scale data pipelines
- Engineering: Bazel, CI/CD, ROS and custom robot middleware, GTSAM, OpenCV, Linux

PUBLICATIONS

- [24] M. Schuck, M. Sorokin, S. Manni, D. Ta, A.P. Schoellig, M. Hutter, S. Le Cl  ac'h, J. Br  digam, **Learning Loco-Manipulation From SMPC Demonstrations With Sparse Offline-to-Online RL**, *CoRL*, 2026. [arXiv:2608.12063](https://arxiv.org/abs/2608.12063)

- [23] J.Z. Zhang, M. Sorokin, J. Brüdigam, B. Hung, S. Phillips, D. Yershov, F. Niroui, T. Zhao, L. Fermoselle, X. Zhu, C. Cao, D. Ta, T. Pang, J. Wang, P. Culbertson, Z. Manchester, S. Le Cléac'h, **Sumo: Dynamic and Generalizable Whole-Body Loco-Manipulation**, [arXiv:2604.08508](#), 2026. *Presented at the RSS 2026 Workshop on Whole-Body Control and Manipulation*.
- [22] H. Li, L. Sun, Y. Hu, D. Ta, J. Barry, G. Konidaris, J. Fu, **NovaFlow: Zero-Shot Manipulation via Actionable Flow from Generated Videos**, *ICRA*, 2026. [arXiv:2510.08568](#)
- [21] Y. Chang, L. Fermoselle, D. Ta, B. Bucher, L. Carlone, J. Wang, **ASHiTA: Automatic Scene-grounded Hierarchical Task Analysis**, *CVPR*, 2025.
- [20] S. Raychaudhuri, D. Ta, K. Ashton, A.X. Chang, J. Wang, B. Bucher, **Zero-shot Object-Centric Instruction Following: Integrating Foundation Models with Traditional Navigation**, [arXiv:2411.07848](#), 2024.
- [19] D.N. Ta, E. Cousineau, H. Zhao, S. Feng, **Conditional energy-based models for implicit policies: The gap between theory and practice**, *RSS 2022 Workshop on Implicit Representations for Robotic Manipulation*, 2022.
- [18] D.N. Ta, N. Banerjee, S. Eick, E. Pittore, and S. Lenser, **Fast Nonlinear Approximation of Pose Graph Node Marginalization**, *ICRA*, 2018.
- [17] M. Kobilarov, D.N. Ta, F. Dellaert, **Differential Dynamic Programming for Optimal Estimation**, *ICRA*, 2015.
- [16] D.N. Ta, F. Dellaert, **Linear-Time Estimation with Tree Assumed Density Filtering and Low-Rank Approximation**, *IROS*, 2014.
- [15] D.N. Ta, M. Kobilarov, F. Dellaert, **A Factor Graph Approach to Estimation and Model Predictive Control on Unmanned Aerial Vehicles**, *ICUAS*, 2014.
- [14] D.N. Ta, K. Ok, F. Dellaert, **Vistas and parallel tracking and mapping with Wall-Floor Features: Enabling autonomous flight in man-made environments**, *Robotics and Autonomous Systems*, Available online 28 March 2014, ISSN 0921-8890.
- [13] D.N. Ta, K. Ok, F. Dellaert, **Monocular Parallel Tracking and Mapping with Odometry Fusion for MAV Navigation in Feature-lacking Environments**, *IEEE/RSJ IROS'13 International Workshop on Vision-based Closed-Loop Control and Navigation of Micro Helicopters in GPS-denied Environments*, 2013.
- [12] R. Roberts, D.N. Ta, J. Straub, F. Dellaert, **Saliency detection and model-based tracking: a two part vision system for small robot navigation in forested environment**, *SPIE Defense, Security, and Sensing*, International Society for Optics and Photonics, 2012.
- [11] C. Beall, D.N. Ta, K. Ok, F. Dellaert, **Attitude heading reference system with rotation-aiding visual landmarks**, *IEEE 15th International Conference on Information Fusion (FUSION)*, 2012.
- [10] K. Ok, D.N. Ta, F. Dellaert, **Vistas and wall-floor intersection features-enabling autonomous flight in man-made environments**, *IROS Workshop on Visual Control of Mobile Robots*, 2012.
- [9] D.N. Ta, W.C. Chen, N. Gelfand, and K. Pulli, **SURFTrac: Efficient tracking and continuous object recognition using local feature descriptors**, *CVPR*, 2009. (Oral, 5% acceptance rate)
- [8] D.N. Ta, K. Raveendran, Y. Xu, K. Sreen, and B. MacIntyre, **Art of defense: a collaborative handheld augmented reality board game**, *Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games*, pp. 135–142, 2009.
- [7] C. Boj, D. Diaz, D.N. Ta, W. Liu, A.D. Cheok, **Free Network Visible Network**, *11th International Symposium of Electronic Arts, ISEA06*, San Jose, USA. pp. 7-13, Aug 2006.
- [6] E.T. Khoo, S.P. Lee, A.D. Cheok, and D.N. Ta, **Age Invaders: Social and Physical Inter-Generational Family Entertainment**, *Special Issue of Springer Journal Virtual Reality, VR-based Edutainment*, 2006.
- [5] A.D. Cheok, K.S. Teh, D.N. Ta, Q.T.C. Tran, S.P. Lee, W. Liu, C.C. Li, D. Diaz, and C. Boj, **Social and Physical Interactive Paradigms for Mixed-Reality Entertainment**, *ACM Computer in Entertainment (CIE)*, vol. 4, no. 2, pp. 5, Apr 2006.

- [4] D.N. Ta, Q.T.C. Tran, K. Xu, A.D. Cheok, S.L. Teo, Z.Y. Zhou, A. Mallawaarachchi, S.P. Lee, W. Liu, H.S. Teo, T.N. Le, Y. Li, and H. Kato, **Real Time 3D Human Capture System for Mixed-Reality Art and Entertainment**, *IEEE Transaction on Visualization and Computer Graphics (TVCG)*, vol. 11, no. 6, pp. 706-721, Nov 2005.
- [3] Q.T.C. Tran, D.N. Ta, A.D. Cheok, S.L. Teo, K. Xu, Z.Y. Zhou, A. Mallawaarachchi, S.P. Lee, W. Liu, H.S. Teo, T.N. Le, Y. Li, and H. Kato, **Magic Land: a 3D Human Capture Mixed Reality System for Museum Experiences**, *International Workshop: Re-Thinking Technology in Museums: Towards a new understanding of visitors experiences in museums*, Limerick, Ireland, 2005.
- [2] Q.T.C. Tran, D.N. Ta, A.D. Cheok, S.L. Teo, K. Xu, Z.Y. Zhou, A. Mallawaarachchi, S.P. Lee, W. Liu, H.S. Teo, T.N. Le, Y. Li, and H. Kato, **Magic Land: Live 3d Human Capture Mixed Reality Interactive System**, *CHI '05 Extended Abstracts on Human Factors in Computing Systems*, ACM Press, New York, NY, pp. 1142-1143, Portland, OR, USA, Apr 2005.
- [1] T.H. Cao, D.N. Ta, Q.T.C. Tran, **Searching the Web: a Semantics-Based Approach**, Bock, H.G.et al.(Eds): *Modelling, Simulation and Optimization of Complex Processes, Proceedings of the 2003 International Conference on High Performance Scientific Computing (HPSC2003)*., Springer-Verlag, pp. 57-68, Ha Noi, Viet Nam, Mar 2003.

PATENTS

- **Systems, devices, and methods for generating a pose estimate of an object**, with Kunimatsu Hashimoto, Eric A. Cousineau, and Russell L. Tedrake, [USA Patent 11308314](#), Apr 2022.
- **Systems and methods for calibrating a depth-IR image offset**, with Alexander Alspach and Naveen S. Kuppuswamy, [USA Patent 10628968](#), Apr 2020.
- **Method, apparatus, and computer program product for object tracking**, with Wei-Chao Chen, Natasha Gelfand, and Kari Pulli. USA Patents [US20100232643 A1](#) (2009) and [US8818024 B2](#) (2014).

DEMOS & EXHIBITIONS

- **SURFTrac**: ISMAR 2008, CVPR 2009
- **Art-of-Defense**: ISMAR 2008
- **Periphery**: The 2nd International Art and Science Exhibition, Tsinghua University, Beijing China 2006
- **Ultimate Commodity**: Esplanade Theater, Singapore, 2006, and Fringe Festival, Toronto, 2007
- **Free Network Visible Network**: ISEA06 Zero One, San Jose, 2006
- **Magic Land**: WIRED NextFest Chicago 2005, SIGCHI 2005, Singapore Science Center 2004

TEACHING EXPERIENCE

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|---|------|
| <i>Teaching Assistant, Georgia Institute of Technology</i> | 2011 |
| <ul style="list-style-type: none"> ▪ CS 7495 Advanced Computer Vision | |
| <i>Teaching Assistant, National University of Singapore</i> | 2004 |
| <ul style="list-style-type: none"> ▪ EE 2007 Microprocessor System. Assembly language programming for Intel 8086/8088 microprocessor | |

SCHOLARSHIPS

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|---|-------------|
| <ul style="list-style-type: none"> ▪ Research scholarship, National University of Singapore | 2003 – 2005 |
| <ul style="list-style-type: none"> ▪ Academic excellence scholarship, HCMC University of Technology, Vietnam | 1998 – 2003 |
| <ul style="list-style-type: none"> ▪ Academic excellence scholarship, High School for the Gifted, VN National University | 1995 – 1998 |

REFERENCES

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