THAI P. DUONG

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Research Interests

Robot Dynamics Learning, Planning and Control; Model-based Reinforcement Learning; Robot Perception and Environment Representation; Robot Exploration and Safety; Decision Making under Uncertainty.

Education

Ph.D. **University of California, San Diego** **2018 - 2023 (expected)**
Electrical and Computer Engineering. Track: Intelligent Systems, Robotics & Control. La Jolla, CA

M.S. **Oregon State University** **2015**
Electrical Engineering and Computer Science. Corvallis, OR

B.S. **Hanoi University of Science & Technology** **2011**
Electronics and Telecommunications. Honors Program. Hanoi, Vietnam

Experience

Graduate Researcher **University of California, San Diego** **2018 – Present**
Advisor: Prof. Nikolay Atanasov, Existential Robotics Laboratory La Jolla, CA
Working on machine learning for robotics: robot dynamics learning, planning and control, robot exploration and safety, robot perception, decision making under uncertainty, etc. (ROS, C++, python, pytorch, tensorflow, quadrotors, cars)

R&D Intern **Amazon Robotics** **2022**
Working on optimization-based motion planning for robot manipulators.

Software Engineer I/II **Microsoft Corporation, Office Performance Team** **2015 – 2018**
Working on bugs/anomalies detection and power optimizations (C++/C#).

Projects

Robot dynamics learning and control | *neural ODE, python, pytorch, quadrotors, cars* **2020 - Present**

- Encoding physics knowledge and Lie group constraints in machine learning models for dynamics learning and control. *Papers: [7] [4] [2].*
- Adaptive control with disturbance features learned from data. *Papers [10][12].*
- Safe navigation using physics-guided dynamics learning. *Papers [6] [11].*
- Learning distributed control policies from demonstration. *Papers [5].*

Environment understanding for robot navigation | *ROS, C++, cars* **2018 - Present**

- Sparse online Bayesian occupancy map of the environment using relevance vector machine and efficient collision checking algorithms for autonomous navigation. *Papers [8] [9].*
- Optimal planning with large language model guidance. *Papers [1].*

Selected Publications

Preprints

[1] Z. Dai, A. Asgharivaskasi, **T. Duong**, S. Lin, M. Tzes, G. Pappas, N. Atanasov, " *Optimal Scene Graph Planning with Large Language Model Guidance*", submitted to IEEE International Conference on Robotics and Automation (ICRA), 2024 [arxiv].

[2] A. Altawaitan, J. Stanley, S. Ghosal, **T. Duong**, N. Atanasov, " *Hamiltonian Dynamics Learning from Point Cloud Observations for Nonholonomic Mobile Robot Control*", submitted to IEEE International Conference on Robotics and Automation (ICRA), 2024 [arxiv].

Conferences

[3] E. Sebastian, **T. Duong**, N. Atanasov, E. Montijano and C. Sagues, "*Learning to Identify Graphs from Node Trajectories in Multi-Robot Networks*", International Symposium on Multi-Robot & Multi-Agent Systems (MRS), 2023 [website][arxiv].

[4] V. Duruisseaux, **T. Duong**, N. Atanasov, M. Leok, "*Lie Group Forced Variational Integrator Networks for Learning and Control of Robot Systems*", Learning for Dynamics & Control Conference (L4DC), 2023 [website][arxiv].

[5] E. Sebastian, **T. Duong**, N. Atanasov, E. Montijano and C. Sagues, "*LEMURS: Learning Distributed Multi-robot Interactions*", IEEE International Conference on Robotics and Automation, 2023 [website][arxiv].

[6] Z. Li*, **T. Duong***, N. Atanasov, "*Safe Autonomous Navigation for Systems with Learned SE(3) Hamiltonian Dynamics*", Learning for Dynamics & Control Conference (L4DC), 2022 [pdf] [website] (**equal contribution*).

[7] **T. Duong**, N. Atanasov, "*Hamiltonian-based Neural ODE Networks on the SE(3) Manifold For Dynamics Learning and Control*", Robotics: Science and Systems (RSS), Virtual, 2021 [code][pdf] [website].

[8] **T. Duong**, N. Das, M. Yip, N. Atanasov, "*Autonomous Navigation in Unknown Environments using Sparse Kernel-based Occupancy Mapping*", International Conference on Robotics and Automation (ICRA), Virtual, 2020 [code][pdf] [website].

Journals

[9] **T. Duong**, M. Yip, N. Atanasov, "*Autonomous Navigation in Unknown Environments with Sparse Bayesian Kernel-based Occupancy Mapping*", IEEE Transactions on Robotics (T-RO), 2022 [code][pdf] [website].

[10] **T. Duong**, N. Atanasov, "*Adaptive Control of SE(3) Hamiltonian Dynamics with Learned Disturbance Features*", IEEE Control Systems Letters, 2022 [pdf] [website].

[11] Z. Li, **T. Duong**, N. Atanasov, "*Robust and Safe Autonomous Navigation for Systems with Learned SE(3) Hamiltonian Dynamics*", IEEE Open Journal of Control System, 2022 (*Invited Paper*) [website].

Workshops

[12] **T. Duong**, N. Atanasov, "*Physics-guided Learning-based Adaptive Control on the SE(3) Manifold*", Physical Reasoning and Inductive Biases for the Real World Workshop at NeurIPS, Virtual, 2021 [pdf].

Talks

- "Learning and Control of Hamiltonian Dynamics on the SE(3) Manifold", 2022 SIAM Conference on Mathematics of Data Science (MDS'22)
- "Autonomous Navigation in Unknown Environments with Sparse Bayesian Kernel-based Occupancy Mapping", 2023 International Conference on Robotics and Automation (ICRA'23)
- "Learning Environment and Dynamics Representations for Autonomous Robot Navigation", Robograd Seminar, UCSD, 2023

Services

Reviewers: IEEE Transactions on Robotics (T-RO), IEEE Robotics and Automation Letters (RAL), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), American Control Conference (ACC), Learning for Dynamics and Control (L4DC).

Program Committee:

AAAI'23 workshop "When Machine Learning meets Dynamical Systems: Theory and Applications".

Technical Skills

Programming: C++/Python/Matlab, Object-oriented Design.
Operating Systems: Linux, ROS.
Libraries and Toolbox: Tensorflow, Pytorch, Pybullet, Gazebo, Docker.
Hardware Platforms: RaceCar, PX4 Quadrotors.

Honors and Awards

ICRA 2023 Travel Grant, IEEE Robotics and Automation Society 2023
ECE Department Fellowships, University of California, San Diego 2018-2019
Jacobs Fellowships, University of California, San Diego 2018
First place, Microsoft Coding Competition, Oregon State University 2013
Phi Kappa Phi Society, Oregon State University 2013
President's Honors List, Hanoi University of Science & Technology 2011
Department's Honors List, Hanoi University of Science & Technology 2010

Teaching Experience

Teaching Assistant, Planning & Learning in Robotics, University of California, San Diego Spring 2021
Teaching Assistant, Sensing & Estimation in Robotics, University of California, San Diego Winter 2020
Teaching Assistant, Stochastic Signals & Systems, Oregon State University Fall 2014
Teaching Assistant, Discrete Structures in Computer Science, Oregon State University Summer 2014
Teaching Assistant, Intro. to Probability & Random Signals, Oregon State University Winter 2014

Mentoring

MS students:
Sambaran Ghosal (UCSD), Rishabh Bhattacharya (UCSD), Quan Luo (UCSD) 2020-present

BS students:
Minh Pham (UCSD), Yuchen Zhang (UCSD), Behrad Rabiei (UCSD), Jiawen Yu (UCSD),
Adin Ackerman (UCSD), Anthony Tseng (UCSD), Jason Stanley (UCSD) 2020-present

MAE Women's Mentoring Program: Dehao Lin(UCSD), Zihang He(UCSD), David Yount(UCSD) 2023
International student office's mentorship program: Iman Sayyadzadeh (UCSD), Taiga Morioka (UCSD) 2023