Amirreza Razmjoo

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RESEARCH INTERESTS

Task Representation, Model Predictive Control, Underactuated and Uncertain Systems, Sampling-based Motion-Planning, Compliant Systems

EDUCATION

École Polytechnique Fédérale de Lausanne (EPFL), Jan. 2021 — present
Lausanne, Switzerland
Doctor of Philosophy, EDEE program
Thesis Topic: Improving Optimization-based Methods for Efficient Physical Robot Interaction
Supervisor: Dr. Sylvain Calinon

Sharif University of Technology, Sep. 2018 — Sep. 2020
Tehran, Iran
Master of Science in Mechanical Engineering
GPA: 18.85/20 (4.0/4.0)
Thesis Title: Teaching to Point at Different Objects as an Interactive Gesture to a Robot by Learning from Demonstration
Supervisors: Prof. Ali Meghdari, Dr. Alireza Taheri

University of Tehran (with honors), Sep. 2014 — Sep. 2018
Tehran, Iran
Bachelor of Science in Mechanical Engineering
GPA: 18.83/20 (3.95/4.0)
Thesis Title: Development of a Health-Monitoring Device for Activity Recognition and Fall Detection
Supervisors: Dr. Sadighi, Dr. Zakerzadeh

EXPERIENCE

Idiap Research Institute Martigny, Switzerland
Research Assistant Jan. 2021 — Present

- Within the SWITCH project, I designed and integrated multiple cutting-edge optimization strategies to enable seamless and safe **physical interaction** of robots. The contribution encompasses the creation of a robust motion manifold, essential for safeguarding **physical humanoid-human interactions**, meticulous consideration of environmental **geometry** to enhance robot-environment interactions, and leveraging prior environmental knowledge for efficient **contact-rich manipulations**.
- **Research Keywords:** Optimal Control, Underactuated System, Task Representation, Geometry-aware Control

CEDRA (Center of Excellence in Design, Robotics, and Automation) Tehran, Iran
Research Assistant Sep. 2018 — Sep. 2020

- We demonstrated how to combine features with non-linear relationships observed in various coordinate systems using **products of experts** which improved the performance and generalizability of **learning from demonstration** techniques. Additionally, we developed a ROS-based control system for two social robots, Arash2 & Armin, to support my research and simplify operation for non-experts.
- **Keywords:** Learning from Demonstration, Products of Experts, Social Robots, ROS, Linux.

NODET (National Organization for Development of Exceptional Talents) Tehran, Iran
Research Assistant Feb. 2019 — Sep. 2019

- Under the guidance of Prof. Hoda Mohammadzade and as a member of the FallArm team, I designed and implemented an innovative fall detection system by leveraging dynamic haar-cascade features.
- **Research Keywords:** Fall Detection in Videos, Computer Vision, and Image Processing

CAST (Center of Advanced Systems and Technologies) Tehran, Iran
Undergraduate Research Assistant Sep. 2017 — Sep. 2018

- Memebr of Dynamic portfolio.
- **Keywords:** Mechanical Design, Component Selection

Festo Tehran, Iran
Vocational Trainee Jun. 2017 — Sep. 2017

- I gained comprehensive knowledge of hydraulic-based systems, encompassing an understanding of the principles behind hydraulic systems, reading schematics, and mastering the intricacies of valve selection to optimize system performance across a range of industries and applications.

PUBLICATIONS

- T. Xue, A. Razmjoo, and S. Calinon, **Robust Manipulation Primitive Learning via Domain Contraction**, under review, 2024.

- Y. Zhang, A. Razmjoo, and S. Calinon, **Learn2Decompose: Learning Problem Decomposition for Efficient Task and Motion Planning**, under review, 2024.

- T. Xue, A. Razmjoo, S. Shetty, and S. Calinon, **Logic-Geometric learning and Control Using Graph of Tensor Networks**, *RSS-Workshop*, 2024.

- O. Beker, A. Razmjoo, A. Zamir, and S. Calinon, **VIMEX: Exemplar-Based Visual Memory for Robotic Task Description**, under review, 2024

- Y. Zhang, T. Xue, A. Razmjoo, **Logic Dynamic Movement Primitives for Long-horizon Manipulation Tasks in Dynamic Environments**, *RA-L*, 2024

- A. Razmjoo, T.Xue, S. Shetty and S. Calinon, **Products of Experts using Tensor Train for Efficient Sampling-Based Contact-Rich Manipulation**, under review, 2024

- T.Xue, A. Razmjoo, S. Shetty and S. Calinon, **Logic-Skill Programming: An Optimization-based Approach to Sequential Skill Planning**, *RSS*, 2024

- Y.Li, X. Chi, A. Razmjoo, S. Calinon, **Configuration Space Distance Fields for Manipulation Planning**, *RSS*, 2024

- T. Xue, A. Razmjoo, and S. Calinon, **D-LGP: Dynamic Logic-Geometric Program for Combined Task and Motion Planning**, *ICRA*, 2024.

- Y. Li, Y. Zhang, A. Razmjoo, and S. Calinon. **Learning Robot Geometry as Distance Fields: Applications to Whole-body Manipulation.**, *ICRA*, 2024.

- A. Razmjoo, T. Brecelj, K. Savevska, A. Ude, T. Petrič, and S. Calinon, **Optimal Latent Manifold for Reliable Physical Interaction: A Sit-to-Stand Assistance Application**, 6th Ergonomic Physical Human-Robot Collaboration: Harnessing Advancements in Robot Learning workshop, *IROS*, 2023.

- A. Razmjoo, T. Brecelj, K. Savevska, A. Ude, T. Petric, and S. Calinon, **Learning Joint Space Reference Manifold for Reliable Physical Assistance**, *IROS*, 2023.

- B. Ti, A. Razmjoo, Y. Gao, J. Zhao, S. Calinon, **A Geometric Optimal Control Approach for Imitation and Generalization of Manipulation Skills**, *Robotics and Autonomous Systems (RAS)*, 2023.

- A. Razmjoo, T. S. Lembono, S. Calinon, **Optimal Control Combining Emulation and Imitation to Acquire Physical Assistance Skills**, *ICAR*, 2021.

- A. Razmjoo, S. R. Hosseini, A. Taheri, A. Meghdari, **Can Learning from Demonstration Reproduce Natural and Understandable Movements**, *ICRoM*, 2020.

- A. Razmjoo, A. Sadighi, M. Zakerzadeh, S. Saeedi, **Development of a Health-Monitoring Device for Activity Recognition and Fall Detection**, *ICRoM*, 2019.

AWARDS

Admission Offer 2018
Excellent student M.Sc. admission offer to Sharif University of Technology.

Summa cum laude 2018
Achieved the top rank among 121 students upon graduating from the University of Tehran.

Dean's list 2015-2018
Ranked among the top 10 individuals of the year in that particular program.

F.O.E prize 2015, 2017
Recipient of the award given to the top three students of the year.

The Foundation of the University of Tehran Scholarship 2016-2017

Ranked 256 (top 0.2%) 2014
Among more than 220,000 people in the nationwide university entrance exam.

SKILLS

- **Research Topics:** Optimal Control, Learning from Demonstrations, (physical-) Human-Robot Interaction, Contact-rich Manipulation, Impedance/Admittance Control
- **Programming:** Python, MATLAB, ROS, LaTeX, Linux, C++ (Basics)
- **Softwares (libraries):** Pybullet, IsaacGym, Mujoco, Pinocchio, Crocoddyl, Pytorch, OpenCV, CasADi
- **Languages:** English (Professional Working Proficiency), Azerbaijani (Native), Persian (Native)