# Ali Reza Pedram

| | | |
|---|---|---|
| CONTACT INFORMATION | Walker Department of Mechanical Engineering<br>University of Texas at Austin, Austin TX 78712<br>Linkedin: Ali Reza Pedram<br>Personal Website: https://alirezapedram.github.io/website/ | Phone: +1 240-302-0809<br>Email: apedram@utexas.edu<br>Google Scholar: Ali Reza Pedram |

**EDUCATION**

PhD, Dynamic Systems and Control, **Mechanical Engineering**, in progress
Graduate Portfolio in **Robotics**
**The University of Texas at Austin**
GPA: **3.96/4.0**

MSc, **Mechanical Engineering**, July 2017
**Sharif University of Technology**, Tehran, Iran
GPA: **3.96/4.0**

BSc, **Mechanical Engineering** and **Applied Physics** (dual degree), July 2015
**Sharif University of Technology**, Tehran, Iran
GPA: **3.93/4.00**

**RESEARCH INTERESTS**

- **Robotics and Motion Planning**
- **Optimal Stochastic Control and Networked Control Systems**
- **Information Theory, Estimation Theory, and Privacy in Dynamic Systems**
- **Optimization and Machine Learning**
- **Reinforcement Learning**
- **Game Theory and Team Theory**

**DOCTORAL DISSERTATION**

**Information-Theoretic Control, Path Planning, and Learning**

Advisors: Prof. Takashi Tanaka and Prof. Luis Sentis                    (June 2018 - Present)

- **Information-Geometric Path Planning**: I introduced a framework to incorporate the expected perception cost in the path planning algorithm to find path plans traceable with moderate sensing efforts. To this end, I proposed a new sampling-based algorithm called IG-RRT* that is followed by novel smoothing stage.
- **Visual Attention for Vision-based Autonomous Navigation**: I designed an algorithm for task-dependent (top-down) attention allocation mechanism to reduce perception effort in vision-based autonomous navigation.
- **Privacy in Cloud-based Control of Dynamic Systems**: I devised a tractable algorithm for imposing privacy, both differential privacy and information-theoretic privacy, in cloud-based control schemes.
- **System Identification and Learning**: I proposed a new information-theoretic method to analyze the identification of linear systems and provide the fundamental bounds for the achievable learning rate.
- **Mean-Field Traffic Routing Games**: I devised a tax mechanism for multi-team road traffic games which mitigates the congestion and eliminates the necessity of commutations between vehicles.
- **Optimal Control of Communication Channels**: I derived a convex formulation for the control of the communication channels with memory.

**MASTER'S THESIS**

**Batch Fabrication, Test, and Control of Neutrally-buoyant Magnetic Microrobots**

Advisors: Prof. Metin Sitti and Prof. Hossein Nejat          (September 2016 - June 2017)

- I proposed and implemented a method for batch fabrication of buoyant magnetic microrobots. I developed an LQR-based optimal controller for buoyant magnetic microrobots in coil excitation setup.

**RELEVANT COURSES**

- **Control/Systems**: Digital Control, Estimation Theory, Stochastic Estimation/Control, Nonlinear and Optimal Control, Multi-variable and Robust Control, Networked Control Systems and Information Theory, Fuzzy Control, Linear System Theory and Control
- **Optimization/Machine Learning**: Convex Optimization, Large Scale Optimization for Learning, Stochastic Process I, Reinforcement Learning, Cyber-Physical Intelligent Systems
- **Mechatronics/Robotics**: Robot Mechanism Design, Advanced Mechatronics and Lab, Advanced Robotics and Lab, Algorithms for Sensor-Based Robotics, Advanced Dynamics

| | |
|---|---|
| PROFESSIONAL POSITIONS | |

- **Graduate Research Assistant**, UT Austin (2018 – Present)
- **Teaching Assistant**, Mechatronics Lab, UT Austin (2017 – 2018)
- **Guest Researcher**, Max Plank Institute of Physical Intelligence, Stuttgart, Germany (2016 – 2017)
- **Teaching Assistant**, Automatic Control, Sharif University of Technology (2015 – 2016)
- **Journal Reviewer,** IEEE Transaction on Automatic Control, Automatica, and IEEE Transactions on Information Theory (2019 – Present)
- **Conference Reviewer,** IROS, CDC, ACC, and ECC (2019 – Present)

AWARDS AND ACHIEVEMENTS

- **Iranian National Elite Foundation Scholarship** (2015 – 2016)
- **Merit-based admission to the MSc program as an outstanding undergraduate student**, Sharif University of Technology (2014)
- **Ranked 169th out of 150,000 applicants**, Nation-wide University Entrance Exam, Iran (2010)

SOFTWARE    C++, Python, MATLAB/Simulink, ROS, SolidWorks, Comsol Multiphysics

INVITED TALKS **Information-Theoretic Approach to Gaussian Belief Space Path Planning for Minimum Sensing Navigation**
Georgia Institute of Technology (Feb. 2023)

PEER-REVIEWED JOURNAL PUBLICATIONS

- **AR. Pedram**, R. Funada, T. Tanaka, "Gaussian Belief Space Path Planning for Minimum Sensing Navigation", **IEEE Transactions on Robotics (2022)**
- A. Govindarajan, A. Kiaghadi, **AR. Pedram**, H. Rifai. "Source Apportionment of Polychlorinated Dibenzo-P-Dioxins and Dibenzofurans in the Sediments of an Urban Estuary ", **Environmental Monitoring and Assessment(2022)**
- H. Jung, **AR. Pedram**, T. Cuvelier, T. Tanaka, "Optimized Data Rate Allocation for Dynamic Sensor Fusion over Resource Constrained Communication Networks", **International Journal of Robust and Nonlinear Control(2022)**
- T. Tanaka, E. Nekouei, **AR. Pedram**, KH. Johansson, "Linearly Solvable Mean-Field Traffic Routing Games", **IEEE Transactions on Automatic Control (2020)**
- **AR. Pedram**, H. Nejat Pishkenari, M. Sitti, "Optimal Controller Design for 3D Manipulation of Buoyant Magnetic Microrobots via Constrained LQR Approach", **Journal of Micro-Bio Robotics**, 15(2): 105-117
- **AR. Pedram**, H. Nejat Pishkenari, "Smart Micro/Nano-robotic Systems for Gene Delivery", **Current Gene Therapy**, 17(2): 73-79

PEER-REVIEWED CONFERENCE PROCEEDINGS

- **AR. Pedram**, T. Tanaka, "Smoothing Algorithm for Minimum Sensing Path Plans in Gaussian Belief Space", **submitted to 2023 Annual American Control Conference (ACC)**
- **AR. Pedram**, R. Funada, T. Tanaka, "Dynamic Allocation of Visual Attention for Vision-based Autonomous Navigation under Data Rate Constraints", **2021 IEEE Conference on Decision and Control (CDC)**
- **AR. Pedram**, J. Stefan, R. Funada, T. Tanaka, "Rationally Inattentive Path-Planning via RRT*", **2021 Annual American Control Conference (ACC)**
- **AR. Pedram**, T. Tanaka, "Online Parameter Identification of Linear Dynamical Systems through the Lens of Feedback Channel Coding Theory", **2020 Annual American Control Conference (ACC)**
- **AR. Pedram**, T. Tanaka, "Linearly-Solvable Mean-Field Approximation for Multi-Team Road Traffic Games", **2019 IEEE Conference on Decision and Control (CDC)**
- **AR. Pedram**, T. Tanaka, M. Hale, "Bidirectional Information Flow and the Roles of Privacy Masks in Cloud-Based Control", **2019 IEEE Information Theory Workshop (ITW)**
- **AR. Pedram**, T. Tanaka, "Some Results on the Computation of Feedback Capacity of Gaussian Channels with Memory", **2018 56th Annual Allerton Conference on Communication, Control, and Computing (Allerton)**, pp. 919-926. IEEE, 2018

Workshops, Symposia, and Poster Sessions

- 8th Midwest Workshop on Control and Game Theory (MWCGT), April 2019 at Washington University in St. Louis, MO, USA
- 3rd Summer School on Cognitive Robotics, July 2019 at University of Southern California (USC), CA, USA