# Amirhossein Taghvaei


CONTACT INFO

E-mail: amirhoseintghv@gmail.com
Phone: +1-217-979-0204

Address: 36 Gabrielino Dr
Irvine, CA, USA, 94617


PROFESSIONAL EXPERIENCE

**University of California, Irvine**, Irvine, USA
*Postdoctoral Scholar* in Mechanical and Aerospace Engineering — September 2019-
Supervisor: Prof. Tryphon Georgiou

EDUCATION

**University of Illinois at Urbana-Champaign**, Illinois, USA
*Ph.D in Mechanical Engineering* (Advisor: Prashant G. Mehta) — 2013-2019
*M.S in Mathematics* — 2013-2017
Overall GPA: **3.98/4.0**

**Sharif University of Technology**, Tehran, Iran
*B.Sc. in Mechanical Engineering* — 2008-2013
*B.Sc. in Physics (Dual Major)*
Overall GPA: **18.39/20**

PUBLICATIONS

**Journal publications:**

- **A. Taghvaei**, T. T. Georgiou, L. Norton, A. R. Tannenbaum. *Fractional SIR Epidemiological Models*. Scientific Reports, 10(1):20882, 2020.
- R. Fu, **A. Taghvaei**, Y. Chen, T. T. Georgiou. *Maximal power output of a stochastic thermodynamic engine*. Automatica, 123:109366, 2021.
- **A. Taghvaei**, P. G. Mehta. *An optimal transport formulation of the ensemble Kalman filter*. IEEE Transactions of Automatic Control (TAC), Accepted
- **A. Taghvaei**, P. G. Mehta. *Optimal Transportation Methods in Nonlinear Filtering: The feedback particle filter*. IEEE Control Systems Magazine (CSM), Accepted
- **A. Taghvaei**, P. G. Mehta, S. P. Meyn. *Diffusion map-based algorithm for gain function approximation in the feedback particle filter*. SIAM/ASA Journal on Uncertainty Quantification, 8(3):1090–1117, 2020.
- C. Zhang, **A. Taghvaei**, P. G. Mehta. *A mean-field optimal control formulation for global optimization*. IEEE Transactions on Automatic Control (TAC), 64(1):282–289, 2018.
- **A. Taghvaei**, J de Wiljes, P. G. Mehta, and S. Reich. *Kalman filter and its modern extensions for the continuous-time nonlinear filtering problem*. Journal of Dynamic Systems, Measurement, and Control, 140(3):030904, 2018.
- C. Zhang, **A. Taghvaei**, P. G. Mehta. *Feedback Particle Filter on Riemannian Manifolds and Matrix Lie groups*. IEEE Transactions on Automatic Control (TAC), 63(8):2465–2480, 2017.

**Machine Learning Conferences:**

- **A. Taghvaei**, A Makkuva, S. Oh, J. Lee. *Optimal transport mapping via input-convex neural networks*. International Conference on Machine Learning **(ICML)**, 6672-6681, June 2020.
- **A. Taghvaei**, P. G. Mehta, *Accelerated flow for probability distributions*. International Conference on Machine Learning **(ICML)**, 6076–6085, Long Beach, June 2019.
- **A. Taghvaei**, J. Kim, P. G. Mehta, *How regularization effects the critical points in linear neural networks*. Advances in Neural Information Processing Systems **(NeurIPS)**, 2502–2512, Long Beach, December 2017.

**Control Conferences:**

- A. Dong, **A. Taghvaei**, T. T. Georgiou. *Lasso formulation of the shortest path problem*. IEEE Conference on Decision and Control (CDC), Jeju Island, Republic of Korea, December 2020 .

- R. Fu, O. Movilla, **A. Taghvaei**, Y. Chen, T. T. Georgiou. *Harvesting energy from a periodic heat bath*. IEEE Conference on Decision and Control (CDC), Jeju Island, Republic of Korea, December 2020 .
- S. Y. Olmez, **A. Taghvaei**, P. G. Mehta. *Deep FPF: Gain function approximation in high-dimensions*. IEEE Conference on Decision and Control (CDC), Jeju Island, Republic of Korea, December 2020.
- T. Wang, **A. Taghvaei**, P. G. Mehta. *Bio-inspired Learning of Sensorimotor Control for Locomotion*. IEEE American Control Conference (ACC), 2188–2193, Denver, July 2020.
- **A. Taghvaei**, P. G. Mehta, T. T. Georgiou. *Optimality vs Stability Trade-off in Ensemble Kalman Filters*. 24th International Symposium on Mathematical Theory of Networks and Systems (MTNS), 2020 (accepted)
- T. Wang, **A. Taghvaei**, P. G. Mehta. *Q-learning for POMDP: An application to learning locomotion gaits*. IEEE Conference on Decision and Control (CDC), 2758–2763, Nice, France, December 2019.
- J. W. Kim, **A. Taghvaei**, P. G. Mehta, S. P. Meyn. *An approach to duality in nonlinear filtering*. IEEE American Control Conference (ACC), 5360–5365, Philadelphia, July 2019.
- **A. Taghvaei**, P. G. Mehta. *Error analysis of the stochastic linear feedback particle filter*. IEEE Conference on Decision and Control (CDC), 7194–7199, Miami, December 2018.
- J. Kim, **A. Taghvaei**, P. G. Mehta. *Derivation and Extensions of the Linear Feedback Particle Filter based on Duality Formalisms*. IEEE Conference on Decision and Control (CDC), 7188–7193, Miami, December 2018.
- **A. Taghvaei**, P. G. Mehta. *Error analysis of the linear feedback article filter*. IEEE American Control Conference (ACC), 4261–4266, Milwaukee, June 2018.
- **A. Taghvaei**, P. G. Mehta. S. P. Meyn, *Error Estimates for the Kernel Gain Function Approximation in the Feedback Particle Filter*. IEEE American Control Conference (ACC), 4576–4582, Seattle, May 2017.
- C. Zhang, **A. Taghvaei**, P. G. Mehta. *Attitude Estimation of a Wearable Motion Sensor*. IEEE American Control Conference (ACC), 4570–4575, Seattle, May 2017.
- **A. Taghvaei**, P. G. Mehta. *Gain Function Approximation in the Feedback Particle Filter*. IEEE Conference on Decision and Control (CDC), 5446–5452 Las Vegas, December 2016.
- C. Zhang, **A. Taghvaei**, P. G. Mehta. *Attitude Estimation with Feedback Particle Filter*. IEEE Conference on Decision and Control (CDC), 5440–5445, Las Vegas, December 2016.
- **A. Taghvaei**, P. G. Mehta. *An Optimal Transport Formulation of Linear Feedback Particle Filter*. IEEE American Control Conference (ACC), 3614–3619, Boston, June 2016.
- C. Zhang, **A. Taghvaei**, P. G. Mehta. *Feedback Particle Filter on Matrix Lie group*, IEEE American Control Conference (ACC), 2723–2728, Boston, June 2016.
- **A. Taghvaei**, S. A. Hutchinson, and P. G. Mehta. *A Coupled Oscillator-based Control Architecture for Locomotory Gaits*. IEEE Conference on Decision and Control (CDC), 3487–3492, Los Angeles, December 2014.

**Ph.D. Thesis:**

- A. Taghvaei. *Design and analysis of particle-based algorithms for nonlinear filtering and sampling*. Ph.D. Dissertation, University of Illinois at Urbana-Champaign, 2019

## Internship Experience

**AI Researcher**, with Dr. Amin Jalali, Technicolor AI Research Lab, Palo Alto, Summer, 2018

- Project: Restricted Convex Potentials for Approximating the Wasserstein Metric and the Optimal Transport Mapping

**Algorithm developer**, with university start-up company, Rithmio, 2014-2015

- Project: Development of algorithms and software for real time classification of physical activities, based on wearable inertial sensors

## Honours and Awards

**CSE Fellow**[1], Computational Science and Engineering, UIUC, 2016-2017,

**Ranked 9th** in **National University Entrance Exam**, Iran, 2008

## Teaching Experience

Teaching Assistant (TA) in **Statistical Learning** with Prof. Bruce Hajek, Department of Electrical and Computer Enginerring, University of Illinois at Urbana-Champaign, Illinois, USA, Fall 2017

Teaching Assistant (TA) in *Mathematical Methods in Engineering II* with Prof. Prashant Mehta, Department of Mechanical Science and Enginerring, University of Illinois at Urbana-Champaign, Illinois, USA, Fall 2016

Teaching Assistant (TA) in *Analytical Mechanics I* with Professor Akhavan, Department of Physics, Sharif University of Technology, Fall Semester 2012, Tehran, Iran

Teaching Assistant (TA) in *Mechanics of Material III (Advanced)* with Professor Noseir, Department of Mechanical Engineering, Sharif University of Technology, Fall Semester 2012, Tehran, Iran

## Conference and workshop presentations

- *(Invited talk)* Feedback Particle Filter: Design, Estimation, and Eror Analysis. University of California Los Angeles, Nov, 2019
- *(Conference presentation)* Accelerated flow for probability distributions , International Conference on Machine Learning (ICML), Long Beach, June, 2019
- *(Invited talk)* Feedback Particle Filter: Design, Estimation, Analysis. University of California Irvine, June, 2019
- *(Invited talk)* Poisson equation, its approximation, and error analysis. Mathematical Analysis Seminar Series. University of Illinois at Urbana-Champaign, February, 2019
- *(Conference presentation)* Error analysis of the stochastic linear feedback particle filter, IEEE Conference on Decision and Control (CDC), Miami Beach, December 2018.
- *(Conference presentation)* Error analysis of the linear feedback article filter, IEEE American control conference (ACC), Milwaukee, June, 2018
- *(Conference presentation)* How regularization effects the critical points in linear neural networks, Advances in Neural Information Processing Systems **(NIPS)**, Long Beach, December, 2017
- *(poster presentation)* Mean-field optimal control formulation for global optimization, IPAM Workshop on mean-field games, Los Angeles, August, 2017
- *(poster presentation)* Optimization in linear neural networks, Midwest Machine Learning Symposium, Chicago, June, 2017
- *(Conference presentation)* Error Estimates for the Kernel Gain Function Approximation in the Feedback Particle Filter, IEEE American Control Conference (ACC), Seattle, May, 2017.
- *(poster presentation) (Best poster award) Numerical methods to solve the weighted Poisson equation*, Coordinated Science Laboratory Student Conference, University of Illinois at Urbana-Champaign, February, 2017
- *(invited talk) Bias-Variance Tradeoff in solution to the Poisson Equation*, 5th Workshop on Cognition and Control, University of Florida, Gainesville, January, 2017
- *(Conference presentation)* Gain Function Approximation in the Feedback Particle Filter, IEEE Conference on Decision and Control (CDC), Las Vegas, December, 2016.
- *(Conference presentation)* An Optimal Transport Formulation of Linear Feedback Particle Filter, In Proc. of the 2016 American Control Conference (ACC), Boston, June, 2016.
- *(talk) Gain Function Approximation in the Feedback Particle Filter*, 5th Workshop on Control and Game Theory, Purdue University, Purdue, April, 2016
- *(invited talk) Poisson Equation in Learning and Classification*, 4th Workshop on Cognition and Control, University of Florida, Gainesville, January, 2016

[1] Annual award to outstanding graduate students with interdisciplinary and computationally oriented research.

- *(Conference presentation)* A Coupled Oscillator-based Control Architecture for Locomotory Gaits, IEEE Conference on Decision and Control, Los Angeles, December, 2014

## Professional Service

**Mentorship** of Ph.D. students Rui Fu, Olga Movilla, and Anqi Dong at UC Irvine

**Mentorship** of Master's students Tixian Wang and Yagiz Olmez at UIUC

**Mentorship** of undergraduate students Ayano Hiranaka, Kumar Gandhi, Peter Ivanov, and Ulzee An at UIUC

**Invited Reviewer** of TAC, CSM, JCOMP, ASME, NeurIPS, ICML, ICLR, CDC, ACC

**Session chair** for filtering at IEEE Conference on Decision and Control (CDC), Las Vegas, December 2016

**Organizer** of the of the Coordinated Science Laboratory Student Conference, 2015-2018

**Organizer** of the Coordinated Science Laboratory (CSL) Social Hour, 2015-2017

**Organizer** of the Machine Learning reading group, CSL, Fall, 2018

**Participation** in Engineering Volunteering In Stem Education (ENVISION), University of Illinois at Urbana-Champaign, Spring and Fall 2017

**Participation** in the Mentoring Undergraduates in Science and Engineering (MUSE) program, University of Illinois at Urbana-Champaign, 2015-2016