Amirhossein Taghvaei

CONTACT INFO

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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)* Controlled Interacting Particle Systems for Estimation and Sampling, University of Washington, Feb, 2021
- *(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

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

- *(invited talk) Poisson Equation in Learning and Classification*, 4th Workshop on Cognition and Control, University of Florida, Gainesville, January, 2016
- *(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