

Yongxin Chen

CONTACT INFORMATION

Department of Electrical and Computer Engineering
Iowa State University
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PROFESSIONAL APPOINTMENTS

Assistant Professor

Department of Electrical and Computer Engineering, Iowa State University, 2017.8 - Present.

Adjunct Assistant Professor

Department of Applied Mathematics & Statistics, Stony Brook University, 2016.11 - Present.

Research Fellow

Memorial Sloan Kettering Cancer Center (MSKCC), New York, 2016.8 - 2017.8.

Postdoc Researcher

University of Minnesota, Minneapolis, 2016.7 - 2016.8.

Research Assistant

University of Minnesota, Minneapolis, 2012 - 2016.

Teaching Assistant

University of Minnesota, Minneapolis, 2013.9 - 2013.12

EDUCATION

PhD in Mechanical Engineering.

University of Minnesota, Minneapolis, 2011 - 2016.

Thesis: *Modeling and control of collective dynamics: from Schrödinger bridges to optimal mass transport*

Advisor: Prof. **Tryphon T. Georgiou**.

GPA: 4.0/4.0.

Minor: Mathematics.

BS in Dept. of Mechanical Engineering.

Shanghai Jiao Tong University, Shanghai, China, 2007 - 2011.

GPA: 88.8/100.

Minor: Computer Science and Applied Computer system.

HONORS AND AWARDS

George S. Axelby Best Paper Award, IEEE Transaction on Automatic Control, 2017, "Optimal steering of a linear stochastic system to a final probability distribution, Part I"

Doctoral Dissertation Fellowship (DDF), University of Minnesota, 2015-2016.

IEEE CSS student travel award, 2013.

Academic Excellence Scholarship, Shanghai Jiao Tong University, China, 2008-2010.

National Scholarship, Shanghai Jiao Tong University, China, 2008.

First prize in national Mathematical Contest in Modeling in Shanghai Area, 2008.

First prize in the 9th Physics Contest in Shanghai Jiao Tong University, 2007.

First prize in the Physics Contest of high school in Jiangxi Province, 2006.

1. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal steering of a linear stochastic system to a final probability distribution, part II”, *IEEE Trans. Automat. Control*, **61** (5), pp. 1170-1180, 2016.
2. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal steering of a linear stochastic system to a final probability distribution, part I”, *IEEE Trans. Automat. Control*, **61** (5), pp. 1158-1169, 2016.
3. Y. Chen, T. T. Georgiou, and M. Pavon. “On the relation between optimal transport and Schrödinger bridges: A stochastic control viewpoint”, *Journal of Optimization Theory and Applications*, **169** (2), pp. 671-691, 2016.
4. Y. Chen, T. T. Georgiou. “Stochastic bridges of linear systems”, *IEEE Trans. Automat. Control*, **61** (2), pp. 526-531, 2016.
5. Y. Chen, T. T. Georgiou, and M. Pavon. “Fast cooling for a system of stochastic oscillators”, *Journal of Mathematical Physics*, **56** (11), p. 113302, 2015.
6. Y. Chen, T. T. Georgiou, and M. Pavon. “Entropic and displacement interpolation: a computational approach using the Hilbert metric”, *SIAM Journal on Applied. Math.*, **76** (6), pp. 2375-2396, 2016.
7. A. Zare, Y. Chen, M. R. Jovanović and T. T. Georgiou. “Low-complexity modeling of partially available second-order statistics via matrix completion”, *IEEE Trans. Automat. Control*, **62** (2), pp. 1368 - 1383, 2017.
8. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal transport over a linear dynamical system”, *IEEE Trans. Automat. Control*, **62** (5), pp. 2137 - 2152, 2017.
9. Y. Chen, T. T. Georgiou, M. Pavon, and A. Tannenbaum. “Robust transport over networks”, *IEEE Trans. Automat. Control*, **62** (9), 2017.
10. Y. Chen, T. T. Georgiou, L. Ning, and A. Tannenbaum. “Matricial Wasserstein-1 Distance”, *IEEE Control Systems Letters*, **1** (1), 2017.
11. Y. Chen, F. D. Cruz, R. Sandhu, A. Kung, P. Mundi, J. Deasy, and A. Tannenbaum. “Pediatric Sarcoma Data Forms a Unique Cluster Measured via the Earth Mover’s Distance”, *Scientific Reports* **7**, article number: 7035, 2017.
12. Y. Chen, J. Karlsson, and T. T. Georgiou. “The role of the time-arrow in mean-square estimation of stochastic processes”, *IEEE Control Systems Letters*, **2** (1), 2018.
13. K. Yamamoto, Y. Chen, L. Ning, T. T. Georgiou and A. Tannenbaum “Regularization and Interpolation of Positive Matrices”, *IEEE Trans. Automat. Control*, to appear.
14. Y. Chen, T. T. Georgiou, and A. Tannenbaum. “Matrix Optimal Mass Transport: a Quantum Mechanical Approach”, *IEEE Trans. Automat. Control*, to appear.
15. Y. Chen, T. T. Georgiou, M. Pavon, and A. Tannenbaum “Efficient-Robust Routing for Single Commodity Network Flows”, *IEEE Trans. Automat. Control*, to appear.
16. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal steering of a linear stochastic system to a final probability distribution, part III”, *IEEE Trans. Automat. Control*, to appear.

JOURNAL PAPERS
(UNDER REVIEW)

1. E. K. Ryu, Y. Chen, W. Li, and S. Osher. “Vector and Matrix Optimal Mass Transport: Theory, Algorithm, and Applications”, submitted to *SIAM Journal of Scientific Computing*, 2017.
2. Y. Chen, T.T. Georgiou, and M. Pavon. “Steering the distribution of agents in mean-field and cooperative games”, submitted to *IEEE Trans. Automat. Control*, 2017.
3. Y. Chen, E. Haber, K. Yamamoto, T. T. Georgiou, and A. Tannenbaum. “An efficient algorithm for matrix-valued and vector-valued optimal mass transport”, submitted to *SIAM Journal of Scientific Computing*, 2017.
4. Y. Chen, W. Gangbo, T. T. Georgiou, and A. Tannenbaum. “On the matrix Monge-Kantorovich problem”, submitted to *Journal of Functional Analysis*, 2017.
5. Y. Chen, T. T. Georgiou, and A. Tannenbaum. “Vector-valued Optimal Mass Transport”, submitted to *SIAM Journal on Applied. Math*, 2017.
6. Y. Chen, T. T. Georgiou, and A. Tannenbaum. “Interpolation of Matrices and Matrix-Valued Measures: The Unbalanced Case”, submitted to *SIAM Journal on Applied Algebra and Geometry*, 2017.
7. Z. Askarzadeh, R. Fu, A. Halder, Y. Chen, and T.T. Georgiou. “Stability Theory in ℓ_1 for Nonlinear Markov Chains and Stochastic Models for Opinion Dynamics over Influence Networks”, submitted to *IEEE Trans. Automat. Control*, 2017.

CONFERENCE
PAPERS

1. Y. Chen, T. T. Georgiou, and A. Tannenbaum. “Wasserstein Geometry of Quantum States and Optimal Transport of Matrix-Valued Measures ” in Workshop of Emerging Applications of Control and System Theory (EACST), 2017 (Dedicated to Professor Mathukumalli Vidyasagar on his 70th birthday.)
2. J. Lerner, R. Sandhu, Y. Chen, and A. Tannenbaum “Machine Learning for Joint Classification and Segmentation” in Workshop of Emerging Applications of Control and System Theory (EACST), 2017 (Dedicated to Professor Mathukumalli Vidyasagar on his 70th birthday.)
3. Y. Chen, T. T. Georgiou, L. Ning, and A. Tannenbaum. “Matricial Wasserstein-1 Distance” in *56th IEEE Conference on Decision and Control*, Melbourne, Australia, 2017.
4. H. Farooq, Y. Chen, T.T. Georgiou, and C. Lenglet. “Brain Parcellation and Connectivity Mapping using Wasserstein Geometry” in *20th International Conference on Medical Image Computing and Computer Assisted Intervention*, 2017.
5. Y. Chen, J. H. Oh, R. Sandhu, S. Lee, J.O. Deasy, and A. Tannenbaum. “Transcriptional responses to ultraviolet and ionizing radiation: An approach based on graph curvature” in *IEEE International Conference on Bioinformatics and Biomedicine*, 2016.
6. Y. Chen, T. T. Georgiou, M. Pavon, and A. Tannenbaum. “A new approach to robust transportation over networks” in *Proceedings of the 55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, 2016.
7. H. Farooq, Y. Chen, T.T. Georgiou, and C. Lenglet. “Some geometric ideas for feature enhancement of diffusion tensor fields” in *Proceedings of the 55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, 2016.

8. W. Chen, J. Liu, Y. Chen, S.Z. Khong, D. Wang, T. Basar, L. Qiu, and K. H. Johansson. “Characterizing the Positive Semidefiniteness of Weighted Laplacians via Generalized Effective Resistances” in *Proceedings of the 55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, 2016.
9. A. Zare, Y. Chen, M. R. Jovanović and T. T. Georgiou. “An alternating minimization algorithm for structured covariance completion problems” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
10. Y. Chen, T. T. Georgiou, and M. Pavon. “Stochastic control, entropic interpolation and gradient flows on Wasserstein product spaces” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
11. Y. Chen, T. T. Georgiou, and M. Pavon. “Noncommutative Sinkhorn theorem and generalizations” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
12. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal steering of ensembles” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
13. Y. Chen, S. Z. Khong, and T. T. Georgiou. “On the definiteness of graph Laplacians with negative weights: Geometrical and passivity-based approaches” in *2016 American Control Conference*, Boston, MA, USA, 2016.
14. Y. Chen, T. T. Georgiou, and M. Pavon. “Steering state statistics with output feedback” in *Proceedings of the 54th IEEE Conference on Decision and Control*, Osaka, Japan, 2015.
15. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal control of the state statistics for a linear stochastic system” in *Proceedings of the 54th IEEE Conference on Decision and Control*, Osaka, Japan, 2015.
16. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal mass transport over bridges” in *Proceedings of the 2nd Conference on Geometric Science of Information*, Paris, France, 2015.
17. Y. Chen, T. T. Georgiou, and M. Pavon. “Optimal steering of inertial particles diffusing anisotropically with losses” in *Proceedings of the 2015 American Control Conference*, Chicago, IL, USA, 2015.
18. Y. Chen and T. T. Georgiou. “The flatness of power spectral zeros and their significance in quadratic estimation” in *Proceedings of the 53rd IEEE Conference on Decision and Control*, Los Angeles, CA, USA, 2014.
19. Y. Chen, J. Karlsson, and T. T. Georgiou. “The role of past and future in estimation and the reversibility of stochastic processes” in *the 21st International Symposium on Mathematical Theory of Networks and Systems*, Groningen, The Netherlands, 2014.
20. Y. Chen, M. R. Jovanović, and T. T. Georgiou. “State covariances and the matrix completion problem” in *Proceedings of the 52nd IEEE Conference on Decision and Control*, Florence, Italy, 2013.

INVITED TALKS

1. “Vector-valued optimal mass transport: theory, algorithm and applications” *University of California, Los Angeles*, Los Angeles, CA, 2017.
2. “Matrix optimal mass transport, a Quantum mechanical approach”, *Princeton University*, Princeton, NJ, 2017.
3. “Densities and flows with applications in signal/image processing and control”, *New York University*, New York, NY, 2017.
4. “Modeling and control of collective dynamics”, *Keio University*, Tokyo, Japan, 2015.
5. “Modeling and control of collective dynamics”, *University of Michigan*, Ann Arbor, MI, USA, 2015.
6. “Modeling and control of collective dynamics”, *Institute for Mathematics and its Applications (IMA)*, Minneapolis, MN, USA, 2015.
7. “Schrödinger bridges and the steering of stochastic and deterministic systems”, *Lund University*, Lund, Sweden, 2015.
8. “Schrödinger bridges and the steering of stochastic and deterministic systems”, *KTH Royal Institute of Technology*, Stockholm, Sweden, 2015.
9. “Schrödinger bridges and the steering of stochastic and deterministic systems”, *University of Athens*, Athens, Greece, 2015.

CONFERENCE TALKS

1. “Modeling and Control of collective dynamics” in *2017 American Control Conference*, Seattle, WA, USA, 2017.
2. “A new approach to robust transportation over networks” in *the 55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, 2016.
3. “An alternating minimization algorithm for structured covariance completion problems” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
4. “Stochastic control, entropic interpolation and gradient flows on Wasserstein product spaces” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
5. “Noncommutative Sinkhorn theorem and generalizations” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
6. “Optimal steering of ensembles” in *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
7. “On the definiteness of graph Laplacians with negative weights: Geometrical and passivity-based approaches”, *2016 American Control Conference*, Boston, MA, USA, 2016.
8. “Optimal Control of the State Statistics for a Linear Stochastic System”, *54th IEEE Conference on Decision and Control*, Osaka, Japan, 2015.
9. “Steering State Statistics with Output Feedback”, *54th IEEE Conference on Decision and Control*, Osaka, Japan, 2015.
10. “Optimal steering of inertial particles diffusing anisotropically with losses”, *2015 American Control Conference*, Chicago, IL, USA, 2015.

11. “Schrödinger bridges and the steering of stochastic and deterministic systems”, *Workshop “New challenges in reciprocal processes, Schrödinger bridges, optimal transport with application to control engineering problems for classical and quantum systems”*, Padova, Italy, 2015.
12. “The flatness of power spectral zeros and their significance in quadratic estimation”, *53rd IEEE Conference on Decision and Control*, Los Angeles, CA, USA, 2014.
13. “State covariances and the matrix completion problem”, *52nd IEEE Conference on Decision and Control*, Florence, Italy, 2013.

PHD COMMITTEE

1. Hamza Farooq, Department of Electrical and Computer Engineering, University of Minnesota
2. Maryam Pouryahya, Department of Applied Mathematics & Statistics, Stony Brook University

REFeree

IEEE Transactions on Automatic Control (TAC),
 IEEE Transactions on Control of Network Systems (TCNS),
 IEEE Transactions on Control Systems Technology (TCST),
 SIAM Journal on Mathematical Analysis (SIMA),
 Journal of Scientific Computing (JOMP),
 Optimal Control Applications and Methods,
 IET Cyber-Physical Systems: Theory & Applications,
 IEEE Conference on Decision and Control,
 International Symposium on Mathematical Theory of Networks and Systems,
 American Control Conference,
 European Control Conference

CONFERENCE SESSION CHAIR

1. “Stochastic and Optimal Control”, *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.
2. “Ensemble Control”, *the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, MN, USA, 2016.

EXPERIENCE

Participant

Frontiers in Mathematical Oncology: Young Investigators Conference, Center for Scientific Computation and Mathematical Modeling (CSCAMM), 2017.4

Long-Term visitor, IMA thematic year on control theory and its applications, 2015.9-2016.6.

IMA New directions short course, topics in control theory, 2014.5-2014.6.

Undergraduate research projects

Design and Implementation of the control system of a mobile robot, 2009.10-2011.5.

The design and development of a Third-order Rubik’s cube Robot, 2009.9-2010.3.

The application of Monte Carlo method in statistic thermodynamics, 2009.1-2009.7.

SKILLS	Programming: Matlab, Python, (C, C++, used to know).
MEMBERSHIP	Institute of Electrical and Electronics Engineers (IEEE), Control Systems Society (CSS).
GRADUATE COURSE HIGHLIGHTS	<p>EE 5231 Linear system & Optimal control, AEM 8421 Robust control, ME 8281 Advance control system design, EE 5251 Optimal filtering & estimation, EE 8950 Vector space optimization, EE 8215 Nonlinear systems, EE 8950 Stochastic control, CSCI 5304 Computational matrix theory.</p> <p>MATH 8601 and 8602 Real analysis, MATH 8701 and 8702 Complex analysis, MATH 8801 and 8802 Functional analysis, MATH 8365 Riemannian Geometry.</p>