Mikhail Yurochkin

moonfolk@umich.edu

Research Interests

- Fairness and robustness in Artificial Intelligence
- Model fusion and federated Learning
- Applications of Optimal Transport in Machine Learning
- Bayesian (nonparametric) modeling and inference

Education

Ph.D., Statistics 2013 – 2018

University of Michigan, Ann Arbor, MI, United States

- Thesis: "Geometric Inference in Bayesian Hierarchical Models with Applications to Topic Modeling"
- Advisor: Professor XuanLong Nguyen

M.A., Statistics 2013 – 2015

University of Michigan, Ann Arbor, MI, United States

Bachelor's, Applied Mathematics and Physics 2009 – 2013

Moscow Institute of Physics and Technology, Moscow, Russia

Work Experience

Research Staff Member June 2018 – Present

IBM Research AI, Cambridge, MA, United States

Responsible for producing publishable results advancing state-of-the-art in the fields of artificial intelligence and machine learning. Leading a team of 6 researchers and engineers on a federated learning project. Engaging in projects with MIT faculty and research groups as part of the MIT IBM collaboration. Specifically, leading collaboration with Prof. Justin Solomon's Geometric Data Processing group on new applications of Optimal Transport to machine learning problems and working with Prof. Tamara Broderick and her group on Gaussian Processes for Big Data.

Research Associate May 2018 – June 2018

University of Michigan, Ann Arbor, MI, United States

Leading two research projects in collaboration with senior PhD students and faculty. This work led to two paper submissions to NeurIPS 2018. Contributing to project on analyzing driving behaviors using Bayesian modeling as part of collaboration between University of Michigan and Toyota Research Institute.

Data science research intern June 2017 – Aug 2017

Adobe, San Jose, CA, United States

Explored various approaches for graph learning in the context of convolutional neural networks on graphs. Developed novel approach for deep learning on graph structured data which can automatically learn the latent graph representation. Applied developed techniques to forecasting number of visits to a major retailer's website across cities for improved marketing and sales. Submitted a patent application based on these results.

Consultant for Statistics, Computing, and Analytics Research Sept 2016 – Dec 2017

University of Michigan, Ann Arbor, MI, United States

Individual appointments and walk-in consultations for faculty and graduate students. Assisted researchers in areas such as biology, dentistry, marketing, survey methodology, political science, public health, computer science, and more with identifying appropriate statistical methodology for the corresponding data and research question. Additionally helped with data collection and processing, software choice and implementation.

Science team intern May 2016 – Aug 2016

LogicBlox/Predictix, Atlanta, GA, United States

Developed novel machine learning approaches for analyzing sales data of a major retailer. Explored recent publications in various fields of artificial intelligence and machine learning to identify promising starting point for the problem. Applied expertise in Bayesian modeling to propose, implement and test explainable retail demand forecasting model based on Factorization Machines and Indian Buffet Process. Published a paper at NeurIPS 2017 based on this work.

Graduate Student Research Assistant July 2014 – April 2018

University of Michigan, Ann Arbor, MI, United States

Conducting research for the NSF-supported projects:

- "Geometric approaches to hierarchical and nonparametric model-based inference" (award #1351362). Formulated topic modeling with Latent Dirichlet Allocation as geometric problem. Developed two new geometry based algorithms for topic modeling, significantly outperforming previous state-of-the-art techniques in terms of estimation speed. Second algorithm additionally can learn latent number of topics utilizing geometric structure of the problem. These results were published at NeurIPS 2016 and 2017. Gave multiple talks and poster presentations. My adviser included some of these results in the curriculum of a data science masters level class and a research oriented undergraduate level class.
- "Data is Social: Exploiting Data Relationships to Detect Insider Attacks" (award #1409551). Proposed Bayesian modeling approaches to identify insider attacks from SQL queries of a bank database. Worked in collaboration with PhD students and faculty from the University at Buffalo.

Graduate Student Instructor Sept 2013 – April 2016

University of Michigan, Ann Arbor, MI, United States

Teaching labs, grading, holding office hours:

- Topics in Biostatistics Jan 2015 – April 2016
- Applied Probability Sept 2014 – Dec 2014
- Introduction to Statistics Jan 2014 – April 2014
- Introduction to Probability Sept 2013 – Dec 2013

Professional Services

Program Committee

- Neural Information Processing Systems (NeurIPS) 2017, 2018, 2019
- International Conference on Machine Learning (ICML) 2017, 2018, 2019
- International Conference on Learning Representations (ICLR) 2018, 2019, 2020

Reviewer

- Bayesian Analysis (BA) 2019
- Journal of Machine Learning Research (JMLR) 2019
- Journal of Computational and Graphical Statistics (JCGS) 2016
- Neural Information Processing Systems (NeurIPS) 2016

Conference Presentations

Note: presentations associated with publications are listed in the publications section

- Data Science Research Forum (poster) Dec 2017
- Joint Statistical Meetings (speed session talk and poster) Aug 2017
- Michigan Student Symposium for Interdisciplinary Statistical Sciences (talk) March 2017
- Michigan Institute for Computational Discovery and Engineering Symposium (poster) April 2016
- Michigan Student Symposium for Interdisciplinary Statistical Sciences (poster) March 2016
- From Industrial Statistics to Data Science (poster) Oct 2015

Awards

- Reviewer award NeurIPS 2018, 2019
- Rackham Conference Travel Grant 2016, 2017

- Abramov scholarship (awarded to less than 5% students) 2010

Publications

[1] D. Mukherjee, A. Guha, J. Solomon, Y. Sun, and **M. Yurochkin**. Outlier-Robust Optimal Transport. In *International Conference on Machine Learning*, 2021. (21.5% acceptance rate).

[2] S. Maity, S. Xue, **M. Yurochkin**, and Y. Sun. Statistical inference for individual fairness. In *International Conference on Learning Representations*, 2021. (28.7% acceptance rate).

[3] A. Bower, H. Eftekhari, **M. Yurochkin**, and Y. Sun. Individually Fair Rankings. In *International Conference on Learning Representations*, 2021. (28.7% acceptance rate).

[4] A. Vargo, F. Zhang, **M. Yurochkin**, and Y. Sun. Individually Fair Gradient Boosting. In *International Conference on Learning Representations*, 2021. (spotlight: 5.6% acceptance rate).

[5] **M. Yurochkin** and Y. Sun. SenSeI: Sensitive Set Invariance for Enforcing Individual Fairness. In *International Conference on Learning Representations*, 2021. (talk: 1.8% acceptance rate).

[6] M. Weber, **M. Yurochkin**, S. Botros, and V. Markov. Black Loans Matter: Distributionally Robust Fairness for Fighting Subgroup Discrimination. *NeurIPS Fair AI in Finance Workshop (spotlight talk)*, 2020.

[7] L. Li, A. Genevay, **M. Yurochkin**, and J. Solomon. Continuous Regularized Wasserstein Barycenters. In *Advances in Neural Information Processing Systems*, 2020. (20.0% acceptance rate).

[8] S. Claici*, **M. Yurochkin***, S. Ghosh, and J. Solomon. Model Fusion with Kullback–Leibler Divergence. In *International Conference on Machine Learning*, 2020. (21.8% acceptance rate).

[9] D. Mukherjee*, **M. Yurochkin***, M. Banerjee, and Y. Sun. Two Simple Ways to Learn Individual Fairness Metric from Data. In *International Conference on Machine Learning*, 2020. (21.8% acceptance rate).

[10] S. Xue, **M. Yurochkin**, and Y. Sun. Auditing ML models for individual bias and unfairness. In *International Conference on Artificial Intelligence and Statistics*, 2020.

[11] H. Wang, **M. Yurochkin**, Y. Sun, D. Papailiopoulos, and Y. Khazaeni. Federated Learning with Matched Averaging. In *International Conference on Learning Representations*, 2020. (talk: 1.9% acceptance rate).

[12] **M. Yurochkin**, A. Bower, and Y. Sun. Training individually fair ML models with sensitive subspace robustness. In *International Conference on Learning Representations*, 2020. (spotlight: 6.0% acceptance rate).

[13] **M. Yurochkin**, S. Claici, E. Chien, F. Mirzazadeh, and J. Solomon. Hierarchical Optimal Transport for Document Representation. In *Advances in Neural Information Processing Systems*, pages 1599–1609, 2019. (21.2% acceptance rate).

[14] **M. Yurochkin**, M. Agarwal, S. Ghosh, K. Greenewald, and N. Hoang. Statistical Model Aggregation via Parameter Matching. In *Advances in Neural Information Processing Systems*, pages 10954–10964, 2019. (21.2% acceptance rate).

[15] P. Monteiller, S. Claici, E. Chien, F. Mirzazadeh, J. Solomon, and **M. Yurochkin**. Alleviating Label Switching with Optimal Transport. In *Advances in Neural Information Processing Systems*, pages 13612–13622, 2019. (21.2% acceptance rate).

[16] **M. Yurochkin**, Z. Fan, A. Guha, P. Koutris, and X. Nguyen. Scalable inference of topic evolution via models for latent geometric structures. In *Advances in Neural Information Processing Systems*, pages 5949–5959, 2019. (21.2% acceptance rate).

[17] **M. Yurochkin**, A. Guha, Y. Sun, and X. Nguyen. Dirichlet Simplex Nest and Geometric Inference. In *International Conference on Machine Learning*, pages 7262–7271, 2019. (extended oral presentation: 4.5% acceptance rate).

[18] **M. Yurochkin**, M. Agarwal, S. Ghosh, K. Greenewald, N. Hoang, and Y. Khazaeni. Bayesian Nonparametric Federated Learning of Neural Networks. In *International Conference on Machine Learning*, pages 7252–7261, 2019. (22.6% acceptance rate).

[19] **M. Yurochkin**, S. Upadhyay, D. Bouneffouf, M. Agarwal, and Y. Khazaeni. Online Semi-Supervised Learning with Bandit Feedback. *ICLR Limited Labeled Data (LLD) Workshop*, 2019.

[20] **Mikhail Yurochkin**. *Geometric Inference in Bayesian Hierarchical Models with Applications to Topic Modeling*. PhD thesis, University of Michigan, 2018.

[21] **M. Yurochkin**, A. Guha, and X. Nguyen. Conic Scan-and-Cover algorithms for nonparametric topic modeling. In *Advances in Neural Information Processing Systems*, pages 3881–3890, 2017. (20.9% acceptance rate).

[22] **M. Yurochkin**, X. Nguyen, and N. Vasiloglou. Multi-way Interacting Regression via Factorization Machines. In *Advances in Neural Information Processing Systems*, pages 2595–2603, 2017. (20.9% acceptance rate).

[23] N. Ho, X. Nguyen, **M. Yurochkin**, H. Bui, V. Huynh, and D. Phung. Multilevel Clustering via Wasserstein Means. In *Proceedings of the 34th International Conference on Machine Learning*, pages 1501–1509, 2017. (25.4% acceptance rate).

[24] **M. Yurochkin** and X. Nguyen. Geometric Dirichlet Means algorithm for topic inference. In *Advances in Neural Information Processing Systems*, pages 2505–2513, 2016. (22.7% acceptance rate).

Patents

- K. Greenewald, **M. Yurochkin**, M. Agarwal, S. Ghosh, N. Hoang and Y. Khazaeni. A method for combining pre-trained neural networks into a memory and computation efficient global model. Filed on September 20, 2019.
- S. Upadhyay, **M. Yurochkin**, M. Agarwal, D. Bouneffouf and Y. Khazaeni. Method for Online Partially Rewarded Learning. Filed on August 28, 2019.

Media coverage

- "Finding a good read among billions of choices", MIT News.
- "Optimal Transport for Label Switching: Using Geometry to Solve Problems in AI", IBM Research.

Additional information

- Personal webpage: `https://moonfolk.github.io/`
- LinkedIn: `https://www.linkedin.com/in/mikhail-yurochkin-a45659114`
- GitHub: `https://github.com/moonfolk`
- Google Scholar: `https://scholar.google.com/citations?user=QjBF9sUAAAAJ`