Yuyan Wang

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EDUCATION

Princeton University, Princeton, NJ   *Sept. 2012 - June 2016*
- **Ph.D.** in Statistics, Department of Operations Research and Financial Engineering
- Thesis: Robust High-Dimensional Regression and Factor Models, GPA: 4.0/4.0

University of Science and Technology of China (USTC), Hefei, China   *Sept. 2008 - July 2012*
- **B.S Honors** in Statistics, Special Class for the Gifted Young (4-year undergrad program for talented youths under 16 years old). GPA: 3.95/4.0 (94.53/100); Rank: **1st / 188**
- Awards: Guo Moruo Scholarship (<1%, highest undergrad award) and National Scholarship (1%, twice)

RESEARCH INTERESTS

Topics: Machine Learning and Personalization, User Behavior Modeling and Understanding, Long-Term Value Optimization, Algorithmic Fairness

Methodologies: Deep Learning, Reinforcement Learning (RL), Statistical Modeling, Causal Inference, Field Experiment, Big Data Analytics

INDUSTRY EXPERIENCE

Google Brain, Mountain View, CA   *Oct. 2019 - Present*
- **Senior Researcher** on Google Brain Reinforcement Learning Research & Engagement Team, **Tech lead** on user understanding and long-term value optimization for Google recommendation products. **Co-lead** on "Assistive Machine Learning for Long-Term User Journeys" Moonshot (a working group of **16** researchers and ML engineers), as part of a highly selective program at Google Brain for long-term audacious initiatives. Selected projects:

  Surrogate for Long-Term User Experience in Recommender Systems
  - Developed a framework to identify sequential and temporal user behavior patterns that are predictive of long-term user experience in recommender systems, which is a sparse, noisy and long-horizon signal that is hard to be optimized directly. Online large-scale experiments which utilize these signals as reward surrogates in an RL-based recommender demonstrated significant improvements in key business metrics including user growth and retention, achieving 20% of the annual goal of a 10-person team.

- **Paper** [14] accepted to KDD 2022. Quote from a Vice President at Google: "This is an excellent paper. I think the entire Core Experiences team (900+ employees) would benefit from reading it, and I would like to send it to everyone in Core Experiences team."

Optimizing Long-Term User Experience as a Multi-Task Learning Problem
- Studied the underexplored trade-offs between fairness and accuracy in multi-task learning; Proposed a data-dependent fairness mitigation framework, *MTA-F*, and a set of metrics that captures the multi-dimensional fairness-accuracy trade-offs uniquely presented in multi-task problems. **Paper** [9] accepted to KDD 2021.
- Demonstrated an intriguing trade-off between minimizing task training conflicts and improving multi-task generalization in multi-task models and that larger models are not always better. Proposed a simple adaptive framework for optimizing the trade-off. **Paper** [12] accepted to the WebConf 2022.

Uber Technologies Inc., San Francisco, CA   *Sept. 2016 - Sept. 2019*
- *Senior Applied Scientist*: 02/2018 - 09/2019; *Applied Scientist II*: 09/2016 - 01/2018
- **Tech lead** on Uber Eats home feed ranking and recommendation; Founding member of Uber Eats Applied Science team which became a team of 80+ during my time there. Selected projects:

Multi-Objective Hierarchical Optimization for the Three-Sided Marketplace
- Developed a multi-objective optimization framework for Uber Eats restaurant recommendation, which optimizes for the three-sided marketplace consisting of eaters, restaurant-partners and delivery-partners.
- Online A/B experiments showed significant increases in user retention (+0.7%), basket value (+0.5%) and orders (+0.8%) for global markets, which translate to **$1.3M weekly gain** in revenue.
- **Patented** the work as first author.
- Published a tech blog as first author, which was selected as top 10 machine learning articles of the month (0.7%) by an independent publisher. Won "Most impressive business impact" award by Uber Eats.

Holistic Optimization with Heterogeneous & Hierarchical Contents
- Proposed and developed *HRank*, a holistic recommendation framework for personalized optimal home feed layout, combining machine learning and probabilistic structural modeling for users' browsing behavior on heterogeneous and hierarchical contents.
- *HRank* was rolled out live globally, which brought a significant increase in user conversion rate (+1.5%), amounting to **$1.1M weekly gain** in revenue.
- Work presented at two external Meetups, and featured in Uber Machine Learning Orientation Video.

Microsoft Research, Redmond, WA   *June 2015 - Aug. 2015*
- *Research Intern* at Internet Services & Research Center

Morgan Stanley, New York City, NY   *June 2014 - Aug. 2014*
- Strategies & Modeling *Summer Associate*

Chinese Academy of Sciences (CAS), Beijing, China   *Feb. 2012 - June 2012*
- *Research Intern* at Academy of Mathematics and Systems Science

University of California, Los Angeles (UCLA), Los Angeles, China   *July. 2011 - Sept. 2011*
- *Cross-disciplinary Scholars in Science and Technology (CSST) program,* winner of CSST Award (6/90)

MANUCRIPTS

[15] Wang, Y., Tao L., Zhang X.. "Recommending for a Three-Sided Food Delivery Marketplace: A Multi-Objective Hierarchical Approach."

Under review at Marketing Science.

SELECTED PUBLICATIONS & PATENTS

[14] Wang, Y., Sharma, M., Badam, S., Xu, C., Sun, Q., Richardson, L., Chung, L., Chi, E.H., Chen, M.. "Surrogate for Long-Term User Experience in Recommender Systems." Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery & Data Mining (**KDD 2022, to appear**).
Full paper with oral presentation; Acceptance rate: 15.0%.

[13] Wang, Y., Tao L., Zhang X.. "Recommending for a Multi-Sided Marketplace with Heterogeneous Contents." Sixteenth ACM Conference on Recommender Systems (**Recsys 2022**).
Top conference for Recommender Systems. Extended abstract with oral presentation; Acceptance rate: 28.0%.

[12] Wang, Y., Zhao, Z., Dai B., Fifty, C., Lin, D., Hong L., Li, W., Chi, E.H.. "Can Small Heads Help? Understanding and Improving Multi-Task Generalization." Proceedings of the ACM Web Conference 2022 (**WWW / theWebConf 2022**).
Full paper with oral presentation; Acceptance rate: 17.7%.

[11] Wang, J., Le, Y., Chang, B., **Wang, Y.**, Chi, E.H., Chen, M.. "Learning to Augment for Casual User Recommendation." Proceedings of the ACM Web Conference 2022 (**WWW / theWebConf 2022**).
Full paper with oral presentation; Acceptance rate: 17.7%.

[10] Oberst, M., D'Amour A., Chen M., **Wang Y.**, Sontag D., Yadlowsky S. Bias-robust Integration of Observational and Experimental Estimators. American Causal Inference Conference (**ACIC 2022**).
Journal version on arXiv: https://arxiv.org/pdf/2205.10467.pdf.

[9] Wang, Y., Wang, X., Beutel, A., Prost, F., Chen, J., Chi, E. H.. "Understanding and Improving Fairness-Accuracy Trade-offs in Multi-Task Learning." Proceedings of the 27th ACM SIGKDD Conference on Knowledge Discovery & Data Mining (**KDD 2021**).
Full paper with oral presentation; Acceptance rate: 15.4%.
Short version accepted to BayLearn 2021.

[8] Chen, M., **Wang, Y.**, Xu C., Le, Y., Sharma, M., Richardson, L., Wu S., Chi, E.H.. "Values of User Exploration in Recommender Systems." Fifteenth ACM Conference on Recommender Systems (**Recsys 2021**).
Full paper with oral presentation; Acceptance rate: 18.4%.

[7] Chen, Z., **Wang, Y.**, Lin, D., Cheng, D.Z., Hong, L., Chi, E.H., Cui, C.. "Beyond Point Estimate: Inferring Ensemble Prediction Variation from Neuron Activation Strength in Recommender Systems." Proceedings of the 14th ACM International Conference on Web Search and Data Mining (**WSDM 2021**).
Full paper with oral presentation; Acceptance rate: 18.6%.

[6] Wang, Y., Zhang, X., Liu, I., Ning, Y., Peng, C. (2021). "Multi-layer Optimization for a Multi-sided Network Service." **U.S. Patent No. 11,127,066**. Washington, DC: U.S. Patent and Trademark Office.
Patent for work at Uber.

[5] Zhang, X., Zhang, S., **Wang, Y.**, Gogate, M., Ning, Y., Peng, C., Liu, I., Lee, C. (2021). "Optimizing Listing Efficiency and Efficacy for a Delivery Coordination System." **U.S. Patent No. 11,157,579**. Washington, DC: U.S. Patent and Trademark Office.
Patent for work at Uber.

[4] Wang, Y., Ning, Y., Liu, I., Zhang, X. (2018). "Food Discovery with Uber Eats: Recommending for the Marketplace." **Uber Engineering Blog.**
Selected as [Top 10 machine learning articles of the month](#) (0.7%) by an independent publisher.

[3] Li, Q., Cheng, G., Fan, J., **Wang, Y.** (2018). Embracing the Blessing of Dimensionality in Factor Models. Journal of the American Statistical Association, 113.521 (2018): 380-389. (**JASA**).
Top-tier journal in Statistics.

[2] Lin, N., Jing, R., **Wang, Y.**, Yonekura E., Fan, J., Xue, L. (2017). A statistical investigation of the dependence of tropical cyclone intensity change on the surrounding environment. **Monthly Weather Review**, 145 (7), 2813-2831.
Collaboration with the Civil & Environmental Engineering Department at Princeton University.

[1] Fan, J., Li, Q., **Wang, Y. (Alphabetical order)** (2017). Estimation of High-Dimensional Mean Regression in Absence of Symmetry and Light-tail Assumptions. Journal of the Royal Statistical Society: Series B (Statistical Methodology) 79.1 (2017): 247-265. (**JRSS-B**).
Top-tier journal in Statistics. Authors are alphabetically ordered.

INVITED TALKS & CONFERENCE PRESENTATIONS

"Recommending for a Three-Sided Food Delivery Marketplace: A Multi-Objective Hierarchical Approach." 2022 INFORMS Annual Meeting. Indianapolis, IN, October 2022.

"Recommending for a Three-Sided Food Delivery Marketplace: A Multi-Objective Hierarchical Approach." 16th ACM Conference on Recommender Systems (Recsys 2022). Seattle, WA, September 2022.

"Surrogate for Long-Term User Experience in Recommender Systems." 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining. Washington DC, August 2021.

"Recommending for a Three-Sided Food Delivery Marketplace: A Multi-Objective Hierarchical Approach." ISMS Marketing Science Conference 2022. Virtual Event, June 2022.

"Understanding and Improving Fairness-Accuracy Trade-offs in Multi-Task Learning." ISMS Marketing Science Conference 2022. Virtual Event, June 2022.

"Can Small Heads Help? Understanding and Improving Multi-Task Generalization." ACM The Web Conference 2022. Lyon, France, April 2022.

"Surrogate for Long-Term User Experience in Recommender Systems." Google Research Brain Dump. Virtual Event, February 2022.

"Understanding and Improving Fairness-Accuracy Trade-offs in Multi-Task Learning." Bay Area Machine Learning Symposium (BayLearn) 2021. Virtual Event, October 2021.

"Improving Long-term User Conversion via Surrogate Reward in a REINFORCE Recommender System." Google Research Conference 2021. Virtual Event, October 2021.

"Improving Long-term User Conversion via Surrogate Reward in a REINFORCE Recommender System." Google Research Reinforcement Learning Workshop, Virtual Event, July 2021.

"Understanding and Improving Fairness-Accuracy Trade-offs in Multi-Task Learning." 27th ACM SIGKDD Conference on Knowledge Discovery and Data Mining. Virtual, Singapore, August 2021.

"Understanding and Improving Fairness-Accuracy Trade-offs in Multi-Task Learning." Faire, Data Team. Virtual Meeting, San Francisco, CA, July 2021.

"From User Understanding to User Conversion". Google Research, Brain Team. Mountain View, CA. May 2021.

"Food Discovery with Uber Eats: Holistic Multi-Objective Optimization for the Marketplace." SigOpt. San Francisco, CA, August 2019.

"Food Discovery with Uber Eats: Recommending for the Marketplace." Facebook Research, Core Data Science Team. Menlo Park, CA, June 2019.

"Food Discovery with Uber Eats: Holistic Multi-Objective Optimization for the Marketplace." Airbnb. San Francisco, CA, June 2019.

"Uber Eats Restaurant Ranking and Recommendation." Moving the World with Data Meetup. San Francisco, CA, October 2018.

"Uber Eats Restaurant Ranking and Recommendation." AI Applications @ Uber Eats Meetup. San Francisco, CA, October 2017.

"Robust Approximate Lasso for High-Dimensional Regression." IBM Thomas J. Watson Research Center. Yorktown Heights, NY, February 2016.

"Estimation of High-Dimensional Mean Regression in the Absence of Symmetry and Light-Tail assumptions." Department of Biostatistics, Yale University. New Haven, CT, September 2015.

"Bayesian time series for online query frequency prediction." Internet Services & Research Center, Microsoft Research, Redmond, WA, August 2015.

"Estimation of High-Dimensional Mean Regression in the Absence of Symmetry and Light-Tail assumptions." 2015 Joint Statistical Meetings (JSM), Seattle, WA, August 2015.

"Robust Estimation of High-Dimensional Mean Regression." NSF Workshop for Empr Process and Mod Stat Decision Theory. New Haven, CT, May 2015.

TEACHING EXPERIENCE

Guest Lecture / Tutorials
- Recommender Systems: Algorithms & Applications. Fuqua School of Business, Duke University.   *Jan. 2023*
- A Gentle Introduction to Recommender Systems. Stern School of Business, New York University. *June 2022*
- A Gentle Introduction to Recommender Systems. Heinz College, Carnegie Mellon University.   *Sept. 2021*
- Experimentation and A/B Testing Best Practices. Uber Technologies.   *Oct. 2018*

Mentorship
- Mentor for Undergrad Consortium at KDD 2022 (KDD-UC)   *June 2022 - present*
- CSRMP mentor for 3 grad & undergrad students from historically marginalized groups   *Nov. 2021 - present*
- Mentor for one **student researcher** and two **interns** at Google Brain   *May 2021 – present*
- Mentor for two **full-time team member** and one **intern** at Uber.   *June 2017 - Sept 2019*

Assistant Instructor at Princeton University
- ORF 504: Financial Econometrics   *Spring 2016*
- ORF 245: Fundamentals of Statistics   *Spring 2014, Spring 2015, Fall 2015*
- ORF 405: Regression and Applied Time Series Analysis   *Fall 2013, Fall 2014*

PROFESSIONAL & ACADEMIC SERVICES

Organizer: Workshop on Action, Task and User Journey Modeling.   *Oct 2022*
Session chair, ISMS Marketing Science Conference 2022.   *June 2022*
Session chair, Long-term Dynamics for Responsible Recommendation Systems Workshop'21.   *Nov. 2021*
TPC member, Reinforcement Learning for Real Life (RL4RealLife) Workshop @ ICML 2021.   *July 2021*
Reviewer: Google PhD Fellowship   *2021 - Present*
Reviewer: NeurIPS, ICML, CIKM, TheWebConf   *2019 - Present*

SELECTED AWARDS

Cummins Merit Fellowship, Princeton University   *Jan. 2013*
Guo Moruo Scholarship, USTC   *May 2012*
Outstanding Research Award, USTC   *Feb. 2012*
CSST Award, UCLA   *Sept. 2011*
National Scholarship, Ministry of Education of China   *Nov. 2010, Nov. 2009*

SKILLS

Programming skills: Python (proficient), R (proficient), Tensorflow, Hive, SQL, Spark, C/C++, Matlab, q/kdb+
Languages: Mandarin (native), English (fluent)

OTHERS

Brain STAR Women Steering Committee at Google Brain   *2022 - present*

Organizer of Reinforcement Learning Research & Engagement Team Meeting at Google Brain *2022 - present*
Organizer of "Assistive ML for Long-Term User Journeys" Moonshot biweekly meeting *2021 - present*
Organizer of Discovery team Lunch & Learn, Eater Data Science reading group at Uber *2017 - 2019*
Organizer of Wilks Statistics Seminar at Department of ORFE at Princeton University *2015 - 2016*
Vice President of Student Union of School for Gifted Young at USTC *2011 - 2012*