

MUXUAN LIANG

Fred Hutchinson Cancer Research Center
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RESEARCH INTEREST

- Medical decision making, biomarker discovery, and cancer surveillance;
- Causal inference, high-dimensional inference, and machine learning.

EDUCATION

Ph.D. in Statistics Sept, 2014 - Oct, 2018
University of Wisconsin-Madison, Madison, WI.
Advisor: Dr. Menggang Yu.
Committee: Drs. Menggang Yu, Kam-Wah Tsui, Jun Shao, and Grace Wahba.
Thesis: Subgroup identification and estimation of individualized causal effects in precision medicine.

B.S. in Mathematics and Applied Mathematics Sept, 2010 - May, 2014
Tsinghua University, Beijing, China
Advisor: Dr. Jianyang Zeng.

EXPERIENCE

Post-Doctoral Research Fellow Dec, 2019 - Current
Fred Hutchinson Cancer Research Center, Seattle, WA.
Mentors: Drs. Yingqi Zhao and Yingye Zheng
- Work on causal inference and active learning with applications in treatment recommendation, high-dimensional data, and cancer surveillance.

Data Scientist Dec, 2018 - Dec, 2019
Ads Metrics Team, Google, Mountain View, CA.
- Investigate impact of language targeting products on users and advertisers;
- Develop algorithms to detect defect launches on language classifiers.

Summer Intern Jun, 2017 - Aug, 2017
Eli Lilly & Company, Indianapolis, IN.
- Mentored by Dr. Haoda Fu;
- Work on complex treatment recommendation using deep neural networks.

Research Assistant Jun, 2014 - Oct, 2018
Department of Biostatistics & Medical Informatics
University of Wisconsin-Madison, Madison, WI.
- Develop algorithms to predict risk of re-admission;
- Provide methodology support for UW Health Innovation Program.

SELECTED HONORS AND AWARDS

ASA Biometrics Section Travel Award (\$1500)	2018
Poster Award on NIC-ASA & ICSA Midwest Joint Meeting (\$500)	2018
Summer Optimization Program at SAMSI	2016
Zeng Geru Scholarship	2013
Asia Science Camp in Israel (Representative of China)	2012

PAPERS

Google Scholar: <https://scholar.google.com/citations?user=7MuuifUAAAAJ&hl=en>

Published:

Statistical Methodology

1. Li, Y., **Liang, M.**, Mao, L., and Wang, S. (2021). Robust estimation and variable selection for the accelerated failure time model. *Statistics in Medicine (Accepted)*.
2. **Liang, M.**, and Zhao, Y.Q. (2021). Comment on “More efficient policy learning via optimal retargeting” and “Learning optimal distributionally robust individualized treatment rules”. *Journal of the American Statistical Association (Accepted)*.
3. **Liang, M.**, and Yu, M. (2020). A Semiparametric Approach to Model Effect Modification. *Journal of the American Statistical Association (In print)*.
4. **Liang, M.**, Ye, T., Fu H. (2018). Estimating Individualized Optimal Combination Therapies through Outcome Weighted Deep Learning Algorithms. *Statistics in Medicine, 37(27), 3869-3886*.
5. Huling, J. D., Yu, M., **Liang, M.**, Smith, M. (2018). Risk prediction for heterogeneous populations with application to hospital admission prediction. *Biometrics, 74(2), 557-565*.
6. Zhang, S., **Liang, M.**, Zhou, Z., Zhang, C., Chen, N., Chen, T., and Zeng, J. (2017). Elastic restricted Boltzmann machines for cancer data analysis. *Quantitative Biology, 5(2), 159-172*.
7. **Liang, M.**, Li, Z., Chen, T., and Zeng, J. (2014). Integrative data analysis of multi-platform cancer data with a multimodal deep learning approach. *IEEE/ACM Transactions on Computational Biology and Bioinformatics, 12(4), 928-937*.

Biomedical Applications

8. Park, J., **Liang, M.**, Alpert, J. M., Brown, R. F., and Zhong, X. (2021). The Causal Relationship Between Portal Usage and Self-Efficacious Health Information-Seeking Behaviors: Secondary Analysis of the Health Information National Trends Survey Data. *Journal of Medical Internet Research, 23(1), e17782*.

9. Zhong, X., Park, J., **Liang, M.**, Shi, F., Budd, P. R., Sprague, J. L., and Dewar, M. A. (2020). Characteristics of patients using different patient portal functions and the impact on primary care service utilization and appointment adherence: retrospective observational study. *Journal of Medical Internet Research*, *22(2)*, e14410.
10. Zhong, X., **Liang, M.**, Sanchez, R., Yu, M., Budd, P. R., Sprague, J. L., and Dewar, M. A. (2018). On the effect of electronic patient portal on primary care utilization and appointment adherence. *BMC Medical Informatics and Decision Making*, *18(1)*, 1-12.
11. Coriano, C.G., Liu, F., Sievers, C.K., **Liang, M.**, Wang, Y., Lim, Y., Yu, M. and Xu, W. (2018). A Computational-Based Approach to Identify Estrogen Receptor α/β Heterodimer Selective Ligands. *Molecular Pharmacology*, *93(3)*, 197-207.

Under Review/Revision:

12. **Liang, M.**, Ning, Y., Smith, M., and Zhao, Y.Q.. Statistical Inference of Decision Rules under a Non-differentiable Convex Surrogate Loss in a General Classification Framework. *Submitted*.
13. **Liang, M.**, Mao, L., and Chen, G.. Learning Optimal Individualized Treatment Rule under Generalized Value Function. *Submitted*.
14. **Liang, M.**, Choi, Y.G., Ning, Y., Smith, M., and Zhao, Y.Q.. Estimation and Inference on High-dimensional Individualized Treatment Rule in Observational Data using Split-and-pooled De-correlated Score. [arXiv:2007.04445](https://arxiv.org/abs/2007.04445).
15. **Liang, M.**, and Yu, M.. Relative Contrast Estimation and Inference for Treatment Recommendation. [arXiv:2010.13904](https://arxiv.org/abs/2010.13904)
16. **Liang, M.**, Zhong, X., and Park, J.. Learning a High-dimensional Classification Rule using Auxiliary Outcomes. [arXiv:2011.05493](https://arxiv.org/abs/2011.05493)
17. Mafee, M., Buhalog, B., **Liang, M.**, Xu, Y., and Aylward, J.. Length-to-width ratio in Mohs defects: what is the golden rule. *Under review*.
18. Vardar, B., Meram, E., Karaoglu, K., **Liang, M.**, Yu, M., Laeseke, P., and Ozkan, O.. Radioembolization followed by Transarterial Chemoembolization in Hepatocellular Carcinoma. *Under review*.

In Preparation:

19. **Liang, M.**, and Zhao, Y.Q.. Active clinical trial for high-dimensional individualized treatment rules. *In preparation*.

Book Chapter:

Liang, M., and Zhao, Y.Q.. Estimation and inference of individualized treatment rules using efficient augmentation and relaxation learning. *In preparation.*

TALKS

“Can a joint model improve targeted label prediction?”

- INFORMS Annual Meeting, Anaheim, CA., 10/2021.

“Relative contrast functions for individualized treatment recommendation.”

- Joint Statistical Meetings 2021 (online), 08/2021.
- ENAR Spring Meeting 2021 (online), 03/2021.

“Indirect and direct learning of optimal individualized treatment rule.”

- College of Health Solutions, Arizona State University, 05/2021.
- Department of Statistics, Purdue University, 03/2021.
- Biostatistics Department, MD Anderson Cancer Center, 02/2021.

“Learning a high-dimensional classification rule using auxiliary outcomes: A transfer learning approach.”

- INFORMS Annual Meeting 2020 (online), 11/2020.
- Seminar Series, Fred Hutchinson Cancer Research Center, 08/2020.

“Can a joint model improve targeted label prediction? Conditions and approaches.”

- HIP Meeting, Madison, WI., 06/2020.

“Estimation and inference on high-dimensional individualized treatment rule in observational data using split-and-pooled de-correlated score.”

- Seminar Series, Fred Hutchinson Cancer Research Center, 05/2020.
- ENAR Spring Meeting 2020 (online), 03/2020.
- NeurIPS 2019, Vancouver Convention Center, Vancouver, CA., 12/2019.

“On the effect of electronic patient portal on primary care utilization.”

- INFORMS Annual Meeting 2019, Seattle, USA, 10/2019.

“Ranking patients based on relative treatment effect with fairness.”

- Winner poster on NIC-ASA & ICSA Midwest Joint Meeting, 10/2018.

“A semiparametric approach to model effect modification.”

- Awardee talk, Joint Statistical Meetings, Vancouver, Canada, 08/2018.
- Invited talk, SGSA, Madison, WI., 03/2018.

TEACHING AND MENTORING

Teaching Assistant

Jun, 2016 - Dec, 2016

Course Title: STAT 741 Survival Analysis (Graduate level)

Department of Biostatistics & Medical Informatics

University of Wisconsin-Madison, Madison, WI.

- Held discussion, graded assignments and exams, evaluated students.

Co-mentored Student: Jaeyoung Park, Ph.D. candidate

Dec, 2019 - Present

Department of Industrial and Systems Engineering

University of Florida, Gainesville, FL.

- Co-mentored with Dr. Xiang Zhong and has published two papers.

- Invited external Ph.D. committee member.

SOFTWARE

ITRInference: Estimation and inference of a high-dimensional individualized treatment rule.

- R-based package;
- Incorporate bespoke choices to fit nuisance parameters.

RobustAFT: A unified Expectation-Maximization (EM) approach with the L1-norm penalty for the accelerated failure time model.

- R-based package;
- Consider multiple robust loss function for variable selection with right-censored data.

iMAVE: Dimension reduction for individualized treatment effect.

- R-based package with C++ backend using Eigen library for linear algebra;

VennLasso: Variable selection for heterogeneous populations (with Dr. Jared Huling).

- R-based package with C++ backend using Eigen library for linear algebra;
- Implement alternating direction method of multipliers (ADMM) algorithm.

Multideep: Integrative data analysis of multi-platform cancer data using deep Boltzmann machine.

- Matlab code;
- Implement stochastic gradient descent with bespoke structure of deep neural networks;
- Paper and code are cited over 150 times by the end of year 2020.

TECHNICAL SKILLS

Programming Languages: R, Python, C++ , GoLang (MapReduce).

Software: MATLAB, SQL, SAS.

PROFESSIONAL MEMBERSHIPS

American Statistical Association	Dec, 2017 - Present
Eastern North American Region, International Biometric Society	Dec, 2017 - Present

SERVICE

- Journal reviewer:
 - Statistics in Medicine
 - Biometrics
 - Journal of Nonparametric Statistics
 - IEEE Robotics and Automation Letters
 - Journal of Machine Learning Research
 - Journal of the American Statistical Association
 - Journal of the Royal Statistical Society: Series B
- Conference:
 - Session Chair, ENAR 2021.
- Committee:
 - ICSA Student Paper Award Committee, 2021.
 - Fred Hutch Post-doctoral Fellow Steering Committee, 2021.
 - Committee Member of Statistics Graduate Student Association at UW-Madison, 2018.