Qiao Liu – Curriculum Vitae

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Research Statement

I'm a Postdoctoral Scholar at Department of Statistics, Stanford University working with Prof. Wing Hung Wong. My primary research interest lies in this multi-disciplinary area where I have been devoting to developing practical statistical and machine learning tools with significance in both statistical theory and applications. Currently, I am interested in the following topics:

- Causal inference with spatial and temporal heterogeneity with applications in multiomics data to identify causal pathways in complex human diseases.
- Genomic large language models (LLMs) development and applications in interpreting the functional impact of genetic variants in large cohort studies.
- Single cell genomics with emphasis on modeling the cell state transition dynamics with the state-of-the-art *generative AI* techniques.

Academic appointment

2021.06-Present Postdoctoral Scholar - Stanford University, Stanford, USA
Department of Statistics, advised by Prof. **Wing Hung Wong**

Education

2019.09-2021.06 Visiting Ph.D. student - Stanford University, Stanford, USA
Department of Statistics, advised by Prof. **Wing Hung Wong**

2016.09-2019.09 Ph.D. student in Control Science and Engineering - Tsinghua University, Beijing, China
Department of Automation, advised by Prof. **Rui Jiang**

2015.08-2016.01 Exchange Student - Lund University, Lund, Sweden
Department of Computer Science, GPA:**5.0**/5.0

2012.09-2016.06 Bachelor in Engineering - Beihang University, Beijing, China
ShenYuan Honors College (A special Elite Class, formerly a.k.a. School of Advanced Engineering)
GPA:**91.5**/100

Publications

(†=co-first author; *=corresponding author)

Preprints

1. **Qiao Liu**, Zhongren Chen, Wing Hung Wong. CausalEGM: a general causal inference framework by encoding generative modeling [J]. arXiv, 2022.
2. Zijing Gao[†], **Qiao Liu**[†,*], Wanwen Zeng, Wing Hung Wong[*], Rui Jiang[*]. EpiGePT: a Pretrained Transformer model for epigenomics[J]. bioRxiv, 2023.

3. Kexin Ding, Mu Zhou, Zichen Wang, **Qiao Liu**, Corey W. Arnold, Shaoting Zhang*, Dimitri N. Metaxas*. Graph Convolutional Networks for Multi-modality Medical Imaging: Methods, Architectures, and Clinical Applications[J]. arXiv preprint arXiv:2202.08916, 2022.

Peer-reviewed papers (as lead author)

4. Qijin Yin, Xusheng Cao, Rui Fan, **Qiao Liu***, Rui Jiang* and Wanwen Zeng*. DeepDrug: A general graph-based deep learning framework for drug-drug interactions and drug-target interactions prediction[J]. ***Quantitative biology***, 2023 (in press).

5. **Qiao Liu**†, Wanwen Zeng†, Wei Zhang, Sicheng Wang, Hongyang Chen, Rui Jiang*, Mu Zhou*, Shaoting Zhang*. Deep generative modeling and clustering of single cell Hi-C data[J]. ***Briefings in Bioinformatics***, 2023, 24(1): bbac494.

6. Wanwen Zeng†, **Qiao Liu**†, Qijin Yin†, Rui Jiang*, Wing Hung Wong*. HiChIPdb: a comprehensive database of HiChIP regulatory interactions[J]. ***Nucleic Acids Research***. 2022.

7. **Qiao Liu**, Kui Hua, Xuegong Zhang, Wing Hung Wong*, Rui Jiang*. DeepCAGE: incorporating transcription factors in genome-wide prediction of chromatin accessibility[J]. ***Genomics, Proteomics & Bioinformatics***, 2022.

8. **Qiao Liu**, Shengquan Chen, Rui Jiang*, Wing Hung Wong*. Simultaneous deep generative modeling and clustering of single cell genomic data[J]. ***Nature Machine Intelligence***, 2021, 3(6): 536-544.

9. **Qiao Liu**, Jiaze Xu, Rui Jiang*, Wing Hung Wong*. Density estimation with deep generatative neural networks [J]. Proceedings of the National Academy of Sciences of the United States of America(***PNAS***), 2021, 118(15), e2101344118.

10. **Qiao Liu**, Zhiqiang Hu, Rui Jiang*, Mu Zhou*. Cancer drug response prediction via a hybrid graph convolutional network[J]. ***Bioinformatics***, 2020. 36(Supplement_2): i911-i918. Also in *Proceedings of the 19th European Conference on Computational Biology* (***ECCB***), 2020.(conference acceptance rate:20.2%)

11. **Qiao Liu**, Hairong Lv, Rui Jiang*. hicGAN infers super resolution Hi-C data with generative adversarial networks. ***Bioinformatics***, 2019, 35(14): i99-i107. Also in *Proceedings of the 27th Intelligent Systems for Molecular Biologythe 18th European Conference on Computational Biology* (***ISMB/ECCB***), 2019. (conference acceptance rate:18.9%)

12. Pengyu Chen†, **Qiao Liu**†, Lan Wei, Beier Zhao, Yin Jia, Hairong Lv*, Xiaolu Fei*. Automatically structuring on Chinese ultrasound report of cerebrovascular diseases via natural language processing[J]. ***IEEE Access***, 2019, 7: 89043-89050.

13. **Qiao Liu**, Fei Xia, Qijin Yin, Rui Jiang*. Chromatin accessibility prediction via a hybrid deep convolutional neural network[J]. ***Bioinformatics***, 2017, 34(5): 732-738.

14. **Qiao Liu**, Mingxin Gan, Rui Jiang*. A sequence-based method to predict the impact of regulatory variants using random forest[J]. ***BMC Systems Biology***, 2017, 11(2): 7. Also in *Proceedings of the 15th Asia Pacific Bioinformatics Conference* (***APBC***), 2017.

Peer-reviewed papers (as co-author)

15. Shuo Li, Weihua Zeng, Xiaohui Ni, **Qiao Liu**,..., Wing Hung Wong*, Steven M. Dubinett* and Xianghong Jasmine Zhou*. Comprehensive tissue deconvolution of cell-free DNA by deep learning for disease diagnosis and monitoring[J]. Proceedings of the National Academy of Sciences of the United States of America(***PNAS***), 120 (28) e2305236120, 2023.

16. Shuang Zhang, Yuti Liu, Shuang Chen, **Qiao Liu**, Wanwen Zeng. Applications of Transformer-based Language Models in Bioinformatics: A Survey[J]. ***Bioinformatics Advances***, 2023.

17. Christopher Lance, Malte D Luecken, Daniel B Burkhardt,...,**Qiao Liu**,...,Fabian J Theis*. Multimodal single cell data integration challenge: results and lessons learned[J]. Proceedings of Machine Learning Research(***PMLR***), 2022.

18. Zhana Duren, Fengge Chang, Fnu Naqing, Jingxue Xin, **Qiao Liu**, Wing Hung Wong*. Regulatory analysis of single cell multiome gene expression and chromatin accessibility data with scREG[J]. ***Genome Biology***, 2022, 23(1): 1-19.

19. Jinxiang Ou, Yunheng Shen, Feng Wang, **Qiao Liu**, Xuegong Zhang, Hairong Lv*. AggEnhance: Aggregation Enhancement by Class Interior Points in Federated Learning with Non-IID Data[J]. ACM Transactions on Intelligent Systems and Technology (***TIST***), 2022.

20. Qijin Yin, **Qiao Liu**, Zhuoran Fu, Rui Jiang*. scGraph: a graph neural network-based approach to automatically identify cell types[J]. ***Bioinformatics***, 2022.

21. Tianxing Ma, **Qiao Liu**, Haochen Li, Mu Zhou, Rui Jiang, Xuegong Zhang*. DualGCN: a dual graph convolutional network model to predict cancer drug response[J]. ***BMC bioinformatics***, 2022, 23(4): 1-13.

22. Feng Wang, Guoyizhe Wei, **Qiao Liu**, Jinxiang Ou, Xian Wei, Hairong Lv*. Boost Neural Networks by Checkpoints [C]. Conference on Neural Information Processing Systems (***NeurIPS***), 2021, 33. (acceptance rate:26%)

23. Shengquan Chen, **Qiao Liu**, Xuejian Cui, Rui Jiang*. OpenAnnotate: a web server to annotate the chromatin accessibility of genomic regions[J]. ***Nucleic Acids Research***, 2021, 49(W1): W483-W490.

24. Kexin Ding, **Qiao Liu**, Edward Lee, Mu Zhou, Aidong Lu, Shaoting Zhang*. Feature-enhanced graph networks for genetic mutational prediction using histopathological images in colon cancer[C]. International Conference on Medical Image Computing and Computer Assisted Intervention (***MICCAI***), 2020, (pp. 294-304).

25. Qingzhu Yang, **Qiao Liu**, Hairong Lv*. A Decentralized System for Medical Data Management via Blockchain [J]. ***Journal of Internet Technology***, 2020, 21(5): 1335-1345.

26. Junfeng Liu, **Qiao Liu**, Qingzhu Yang*. Mstree: a multispecies coalescent approach for estimating ancestral population size and divergence time during speciation with gene flow [J]. ***Genome biology and evolution***, 2020, 12(5): 715-719.

27. Chencheng Xu, **Qiao Liu**, Jianyu Zhou, Minzhu Xie, Jianxing Feng, Tao Jiang*. Quantifying functional impacts of regulatory variants with multi-task Bayesian neural network[J]. ***Bioinformatics***, 2020, 36(5): 1397-1404.

28. Chencheng Xu, **Qiao Liu**, Minlie Huang, Tao Jiang*. Reinforced molecular optimization with neighborhood-controlled grammars[C]. Conference on Neural Information Processing Systems (***NeurIPS***), 2020, 33. (acceptance rate:20.1%)

29. Qijin Yin, Mengmeng Wu, **Qiao Liu**, Rui Jiang*. DeepHistone: a deep learning approach to predicting histone modifications[J]. ***BMC Genomics***, 2019,20(2):193.

30. Shaoming Song, Hongfei Cui, Shengquan Chen, **Qiao Liu**, Rui Jiang*. EpiFIT: Functional interpretation of transcription factors based on combination of sequence and epigenetic information[J]. ***Quantitative Biology***, 2019, 1-11.

31. Bai Li, Mu Lin, **Qiao Liu**, Ya Li*, Changjun Zhou*. Protein folding optimization based on 3D off-lattice model via an improved artificial bee colony algorithm[J]. ***Journal of Molecular Modeling***, 2015, 21(10): 261.

Invited Talks

2023.04 **UC Berkeley Biostats Seminar**, UC Berkeley, USA.
2023.04 **Tsinghua Stats Seminar**, Tsinghua University, China (remote talk).
2022.08 **CEGS 2022**(NIH Centers of Excellence in Genomic Science Annual Meeting), Duke University, USA.
2022.08 **JSM 2022**(Joint Statistical Meetings), Washington DC, USA.
2022.06 **CVI 2022**(CVI Early Career Research Roundtable), Stanford University, USA.
2021.12 **NeurIPS 2021**(Thirty-fifth Conference on Neural Information Processing Systems), remote talk.
2020.09 **ECCB 2020**(The 19th European Conference on Computational Biology), remote talk.
2020.03 **CEGS 2020**(NIH Centers of Excellence in Genomic Science Seminar), Stanford University, USA.
2019.11 **BIBM 2019**(2019 IEEE International Conference on Bioinformatics & Biomedicine), San Diego, USA
2019.07 **ISMB 2019**(The 27th Conference on Intelligent Systems for Molecular Biology), Basel, Switzerland
2019.03 **BUAFAI 2019**(The First Beijing Universities Academic Forum of Artificial Intelligence), Beijing, China
2017.01 **APBC 2017**(The Fifteenth Asia Pacific Bioinformatics Conference), Shenzhen, China

Selected Honers and Awards

2022.12 **Outstanding Ph.D. Thesis Award**, Beijing Municipal Commission of Education
2021.06 **Outstanding Graduates Award**, Beijing Municipal Commission of Education (**5**% of all graduate students)
2021.06 **Tsinghua Outstanding Ph.D. Thesis Award**, Tsinghua University (**6**% of all Ph.D. Thesis)
2021.06 **Tsinghua University Outstanding Graduates Award**, Tsinghua University (**5**% of all graduate students)
2020.08 **ECCB Fellowship**, International Society for Computational Biology
2019.04 **ISMB Travel Fellowship**, International Society for Computational Biology
2018.10 **National Scholarship**, Ministry of Education of China (**0.2**%)
2016.06 **Outstanding Graduates Award**, Beijing Municipal Commission of Education
2015.06 **Microsoft Young Fellowship**, Microsoft Research Asia (**40** winners nationwide)

Selected Competitions

2021.12 **NeurIPS 2021 Competition, Multimodal Data Integration**, rank **1**st/2611 in two Joint Embedding tasks NeurIPS conference
2021.05 **RNA Unpaired Probability Prediction Competition**, rank **3**rd/1012, Baidu AI Studio, Baidu Inc
2019.03 **Liver Cancer Image Diagnose Competition**, rank **2**nd/1397, Digital China Innovation Contest, DCIC 2019
2014.10 1^{st} **Prize in NCSMC**(The 6^{th} National College Students Mathematical Competition), Chinese Mathematical Society
2014.09 **National** 1^{st} **Prize in CUMCM**(Contemporary Undergraduate Mathematical Contest in Modeling), China Society for Industrial and Applied Mathematics
2013.10 1^{st} **Prize in NCSMC**(The 5^{th} National College Students Mathematical Competition), Chinese Mathematical Society

Teaching Experiences

2023 Summer **Teaching Assistant**, ICME Data Science Summer Workshop, Stanford University
Introduction to Generative Models

2019.02-2019.06 **Teaching Assistant**, Fundamental Industry Training Center, Tsinghua University
Intelligent Algorithms and Systems

2018.09-2019.01 **Teaching Assistant**, Department of Automation, Tsinghua University
Introduction to Artificial Intelligence

2017.09-2018.01 **Teaching Assistant**, Department of Automation, Tsinghua University
Introduction to Artificial Intelligence

Professional Activities

Member of *American Statistical Association (ASA), International Society of Computational Biology (ISCB).*
Reviewer for Statistical Journals: *Journal of the American Statistical Association, Computational Statistics.*
Reviewer for Machine Learning Journals: *Nature Methods, Nature Machine Intelligence, Engineering Applications of Artificial Intelligence, Complex & Intelligent Systems.*
Reviewer for Bioinformatics Journals: *Bioinformatics, Briefings in Bioinformatics, Genomics, Proteomics & Bioinformatic, Bioinformatics Advances, Drug Discovery Today, Computational biology, BMC Genomics, BMC Bioinformatics, NAR Genomics and Bioinformatics.*
Reviewer for Biomedical Journals: *IEEE Transactions on Medical Imaging.*
PC member of conferences *AAAI 2023, 2024.*