Zong-Chao Liu

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HIGHLIGHTS OF QUALIFICATIONS

Ph.D. candidate highly motivated and experienced in cutting-edge multi-omics and cancer research

- Expert in population genetics, single-cell and spatial genomics; also familiar with functional experiments for genomics research
- Highly trained biostatistician with expertise in clinical statistics, trial methodology, and epidemiological studies
- Fluent programmer in R/Python with R package development experience; familiar with bash, SQL, html, JavaScript, Neo4J, SAS
- Thorough understanding, motivation, and practical experience in LLMs or foundation models for genomics research
- Solid foundation in statistical genetics, probability theory, and machine learning methodologies
- Proven ability to contribute to interdisciplinary collaborations with clinicians, epidemiologists, and bioinformaticians
- Recognized clinical statistician by editorial teams from highly impactful journals

EDUCATION

School of Oncology, Peking University

Ph.D. in *Epidemiology and biostatistics, GPA:3.84/4.00* — *Beijing, China (2022-present)*

Mailman School of Public Health, Columbia University

M.S. in *Biostatistics, theory and methods track, GPA:3.88/4.00* — *New York, USA (2019-2021)*

School of Public Health, Shandong University

M.B.B.S. in *Preventive Medicine, division of biostatistics and epidemiology, GPA:3.92/4.00* — *Jinan, China (2014-2019)*

Exchange student in School of Population and Public Health, University of British Columbia — *Vancouver, Canada (2017)*

RESEARCH EXPERIENCE

School of Oncology, Peking University, China — *2022-present*

State Key Laboratory of Holistic Integrative Management of Gastrointestinal Cancers

Ph.D. candidate

- Designed and implemented a novel causal stable learning framework to identify genetically influenced metabotypes, enabling robust gene–metabolite integration across multi-ethnic cohorts
- Led analyses from UK Biobank and large-scale cohorts, generating cross-ancestry metabolic genetic regulation maps
- Conducted genome-wide prediction modeling using penalized regression, linear mixed models, and biostatistical methods to dissect the heritable basis of metabolic traits relevant to cancer risk
- Developed scalable pipelines for GWAS, xQTLs, machine learning, and metabolomics analyses, ensuring reproducibility, efficient compute on HPC clusters, and transparent documentation for team use
- Served as the biostatistical lead on multi-omics and clinical research projects, advising on study design, power calculation, statistical modeling, and interpretation of complex data across collaborative research teams
- Contributed to WHO-IARC cancer prevention guidelines as an acknowledged author

Columbia University, USA — *2019-2021*

Department of Biostatistics | NYSPI Department of Mental Health Data Science | Department of Epidemiology

Research assistant

- Designed a custom case-control matching algorithm for the ABCD Study, balancing covariates across thousands of pediatric subjects using a scalable matching ratio strategy
- Conducted experiments with 3D VGG and ResNet models to predict CBCL-attention scores from DTI-derived fractional anisotropy maps under various experimental conditions
- Integrated Model-X knockoff filters and gradient-based interpretation methods into neural networks to robustly identify biologically meaningful features while controlling the false discovery rate
- Developed and automated pipelines to map ICD-10-CM codes into general and sub-level Clinical Classification categories for pediatric patients from the Kids' Inpatient Database (KID)
- Designed statistical workflows to identify autism spectrum disorder cases and quantify adjusted and specific standardized morbidity ratios for associated comorbidities

- Applied hierarchical clustering and time-series analysis to differentiate patient subgroups and visualize comorbidity progression trajectories across developmental stages

Guangdong Institute of Gastroenterology, China *2018-2019*

Ministry of Education, Key Laboratory of Human Microbiome and Chronic Diseases (Sun Yat-Sen University)

Research assistant

- Developed scripts and pipelines for automated patient data curation and radiomic feature extraction from CT and MRI images, enabling high-throughput imaging biomarker discovery
- Applied machine learning models to predict pathological complete response to neoadjuvant therapy in rectal cancer, using multi-modality radiomic features
- Assisted in radiogenomic analyses of 146 glioma patients, identifying robust MRI-based imaging biomarkers that reflect global DNA methylation and other molecular features
- Devised novel analytic frameworks Radiomic Oncology (RO) and Radiomic Set Enrichment Analysis (RSEA), to annotate molecular phenotypes from MRI patterns, integrating mutational, transcriptional, and epigenetic signatures
- Demonstrated that heterogeneity in enhanced T2-weighted MRI regions quantitatively maps to methylation subtypes and immune infiltration status, with implications for diagnosis and prognosis in glioma

TECHNICAL SKILLS

- **Area of Interest:** computational biology, population genetics, AI virtual cell, clinical cancer research, biomarker discovery, etc.
- **Knowledge:** statistical genetics, biostatistical methods, AI for multi-omics research
- **Data:** UKBB, TCGA, GEO, GTEx, KEGG, 3D-SNP, RegulomeDB, HaploReg, etc.
- **Bioinformatics software**: PLINK1.9/2.0, SnpEff, PGSC, GCTA, GATK, UCSC genome browser, DNAnexus, Seurat, etc.
- **Programming**: R (including Shiny), Python, JavaScript, html, SAS, git
- **Language:** Fluent in orally and written in English (GRE:327+4.5, TOEFL: 111), Cantonese and Mandarin

HONORS & AWARDS

- Selected Young Scientist for the 72nd Lindau Nobel Laureate Meeting (1 of 29 nationwide) *2023*
- Best Oral Presentation Award of AACR-KCA Joint Conference in Precision Oncology *2023*
- Excellent Student Award of Peking University Health Science Center *2024*
- Peking University Outstanding Scientific Research Award *2023*
- Young Scientist Award for Entitled Papers in Gut IDDF (Co-authored) *2023*
- CNKI Academic Essentials for high-impact medical papers (Ranked 2nd for all medical research Sep-Oct 2023) *2023*
- Excellent Student Scholarship & Outstanding Graduates *2015-2019*
- Member of the Elite Class, Chinese Academy of Sciences *2018*
- Bronze Award, Information Technology and Entrepreneurship Competition *2016*
- First Prize, Shenzhen Cup Mathematical Modeling Competition *2016*

FUNDINGS & SUPPORTS

- Peking University Cancer Hospital & Institute Scientific Research Grant Lead researcher
- Noncommunicable Chronic Diseases-National Science and Technology Major Project Core member
- National Natural Science Foundation of China Core member
- Beijing Hospitals Authority's Ascent Plan Core member

RELEVANT WORK EXPERIENCES

- **Beijing Anzhen Hospital** *Part-time biostatistician* *2023-present*
- **Doctors Help Doctors Co., Ltd** *Scientific advisor* *2024-present*
- **Peking University Cancer Hospital & Institute** *Full-time Research assistant/Biostatistician* *2021-2022*
- **Tsinghua University Vanke School of Public Health** *Part-time research assistant* *2020-2021*
- **Qingdao Center for Disease Control and Prevention** *Staff intern* *2019*
- **Shandong Qianfoshan Hospital** *Intern physician* *2017*

OTHER ACADEMIC ACTIVITIES

- **Acknowledged contributor** for *IARC Working Group Report No. 12* (2025): *Gastric Cancer Prevention in China*, in *Population-based Helicobacter pylori Screen-and-Treat Strategies for Gastric Cancer Prevention: Guidance on Implementation* (Ed. J.Y. Park). Published by the International Agency for Research on Cancer (IARC), Lyon, France.
- **Chinese Congress on Holistic Integrative Oncology (2024):** Presented recent research on upper gastrointestinal tumors.
- **Sino-German Academic Annual Conference (2023):** Presented recent research on upper gastrointestinal tumors; engaged in academic exchanges with Dr. Markus Gerhard's team, Technical University of Munich.
- **NEJM Watch Commentary (2023):** Invited author for an official commentary on the recently published paper in NEJM, "Helicobacter pylori, Homologous-Recombination Genes, and Gastric Cancer" **[link]**.
- **CNKI Academic Essentials (2023):** First author of "Interpretation of the Global Cancer Statistics Report 2020," achieving 50k+ downloads and 2000+ citations; ranked as a high-impact medical paper.

RELEVANT PROJECTS

- **Jackademia:** an R package tailored for academic researchers preparing for bodybuilding competitions. Features include training max tracking, body composition estimation based on NSCA-CSCS guidelines, and nutrition simulation tools. **See here**
- **Fragility Index for Clinical Trials:** A designed online tool for fragility index calculation in meta-analysis research. **See here**
- **A Simulation Study to Compare Two Bootstrapping Methods for propensity-score matching:** Calculated and compared the variability of the average treatment effects with true variance by propensity score matching method under complex and simple bootstrap scenarios. **See here**
- **Implementation and optimization of algorithms on cancer diagnosis dataset:** Implement optimization algorithms (Newton Raphson; Gradient Decent; Path-wise Coordinate Descent) on the UCI breast cancer dataset. **See here**
- **Analyses of daily COVID-19 cases across nations:** Estimated parameters for logistic growth curve by gradient descent; Implemented both Gaussian Mixture Model with EM algorithm and K-means algorithm to cluster the estimated parameters for all the affected countries. **See here**
- **A Bayesian model of hurricane trajectories:** Implemented regular Metropolis–Hastings algorithm to achieve stationary distribution in Markov Chain; Estimated the parameters and numerical standard errors; Predicted the spatial moving trends and wind speed of the hurricanes. **See here**

JOURNAL ROLES

Invited as a Trusted Reviewer by Springer Nature's Reviewer Communities

- Nature Medicine – Statistical reviewer (× 4)
- BMJ Public Health – Peer reviewer (× 2)
- BMJ Open – Peer reviewer (× 2)
- Chinese Journal of Inflammatory Bowel Diseases – Invited expert reviewer

PUBLICATIONS (29 published, 2 under review, 12 first/co-first authored)

2025

- #Peng Yuan, #**Zongchao Liu**, Liang Dai, Yan Yan, Yaya Wu, Keneng Chen, Wenqing Li, Qi Wu. Pathologic complete response after neoadjuvant therapy for resectable esophageal squamous cell carcinoma: endoscopic characteristics and implications. Endosc Int Open ; 0: a26255884.
- Yin ZY, Xu HM, Wang MY, Wang XL, **Liu ZC,** Jin Y, Zhang Y, Zhang JY, Zhou T, You WC, Pan KF, Li WQ. Integrating genetics and transcriptomics to decipher susceptibility genes for risk stratification of gastric cancer and effect modification of Helicobacter pylori treatment. EBioMedicine. 2025 Jun;116:105767.
- **Liu ZC**, Li WQ. Revisiting Helicobacter pylori eradication: evolving evidence and global implications for gastric cancer prevention. Gastroenterology. 2025 May 14:S0016-5085(25)00715-2.
- Jin QY, Torres RC, Yang C, He LH, **Liu ZC**, Li WQ, Liu WD, Zhang LF, Falush D, Zhang Y, Pan KF. Population structure of Helicobacter pylori and antibiotic resistance-associated variants in a high-risk area of gastric cancer. J Clin Microbiol. 2025

May;63(5):e0003325.

- Wang M, Yin Z, Xu H, **Liu Z**, Huang S, Wu W, Zhang Y, Zhou T, You W, Pan K, Li W. Plasma L-aspartic acid predicts the risk of gastric cancer and modifies the primary prevention effect: a multistage metabolomic profiling and Mendelian randomization study. Cancer Biol Med. 2025 Apr 15.
- Jiang XW, Zhang L, **Liu ZC**, Zhou T, Li WQ, Liu WD, Zhang LF, You WC, Zhang Y, Pan KF. Integrative metabolomics and microbiomics analysis reveals distinctive microbiota-metabolites interactions in gastric carcinogenesis. Int J Cancer. 2025 Jun 15;156(12):2389-2400.
- **Liu ZC**, Li WQ. Large-scale cluster randomised trial reveals effectiveness of Helicobacter pylori eradication for gastric cancer prevention. Clin Transl Med. 2025 Feb;15(2):e70229. doi: 10.1002/ctm2.70229. PMID: 39936539.

2024

- **Liu ZC**, Cao BY, Xu HM, You WC, Pan KF, Li WQ. Research progress in high-risk areas of gastric cancer in China. Journal of Multidisciplinary Cancer Management (Electronic Version). 10(4):1–8.
- Pan KF, Li WQ, Zhang L, Liu WD, Ma JL, Zhang Y, Ulm K, Wang JX, Zhang L, Bajbouj M, Zhang LF, Li M, Vieth M, Quante M, Wang LH, Suchanek S, Mejías-Luque R, Xu HM, Fan XH, Han X, **Liu ZC**, Zhou T, Guan WX, Schmid RM, Gerhard M, Classen M, You WC. Gastric cancer prevention by community eradication of Helicobacter pylori: a cluster-randomized controlled trial. Nat Med. 2024 Nov;30(11):3250-3260.
- Shen X, Zhou H, Zhou X, **Liu Z**, Meng X, Zhang L, Song Y, Guo R, Wang F, Li K, Li W, Yang Z, Liu Z, Li N. 68Ga-grazytracer PET for noninvasive assessment of response to immunotherapy in solid tumors and lymphomas: a phase 1/2 clinical trial. Nat Commun. 2024 Oct;15(1):8791.
- **Liu Z**, He Y, Xu H, Yin Z, Wang M, You W, Pan K, Cui P, Li W. Integrating genomics and metabolomics to inform Helicobacter pylori eradication for targeted gastric cancer prevention. Gut. 2024;73:A135-A136.
- **Liu Z**, Xu H, You W, Pan K, Li W. Helicobacter pylori eradication for primary prevention of gastric cancer: progresses and challenges. J Natl Cancer Cent. 2024 Jul;4(4):299-310. doi: 10.1016/j.jncc.2024.06.006. PMID: 39735441.
- Xu HM, Han Y, **Liu ZC**, Yin ZY, Wang MY, Yu C, Ma JL, Sun D, Liu WD, Zhang Y, Zhou T, Zhang JY, Pei P, Yang L, Millwood IY, Walters RG, Chen Y, Du H, Chen Z, You WC, Li L, Pan KF, Lv J, Li WQ. Helicobacter pylori treatment and gastric cancer risk among individuals with high genetic risk for gastric cancer. JAMA Netw Open. 2024 May;7(5):e2413708.
- Jin Y, Cai L, Yin Z, Xu H, **Liu Z**, Hu Z, Yang L, Wang K, Hou W, Zhang Y, Zhang J, You W, Pan K, Zhang J, Li W. From gastritis to gastric cancer: a multi-stage landscape profiling reveals pro-cancerous microenvironment establishment mediated by H. pylori-induced epithelial-immune interactions. Gut. 2024;73:A331-A335.
- Zhuang Z, Lin J, Wan Z, Weng J, Yuan Z, Xie Y, **Liu Z**, Xie P, Mao S, Wang Z, Wang X, Huang M, Luo Y, Yu H. Radiogenomic profiling of global DNA methylation associated with molecular phenotypes and immune features in glioma. BMC Med. 2024 Sep;22(1):352.

2023

- Hu Z, **Liu Z**, Li W, You W, Pan K. Health economic evaluation on population-based Helicobacter pylori eradication and endoscopic screening for gastric cancer prevention. Chin J Cancer Res. 2023 Dec;35(6):595-605.
- Xu H, Han Y, **Liu Z**, et al. Leveraging genetic predisposition to gastric lesion progression for risk assessment of gastric cancer: a longitudinal genome-wide association study. Gut. 2023;72:A1-A3.
- Su XQ, Yin ZY, Jin QY, **Liu ZC**, Han X, Hu ZQ, Zhang L, Ma JL, Li ZX, Zhang Y, Zhou T, Liu WD, You WC, Pan KF, Shi L, Li WQ. Allium vegetable intake associated with the risk of incident gastric cancer: a continuous follow-up study of a randomized intervention trial. Am J Clin Nutr. 2023 Jan;117(1):22-32.
- Wang K, Xu SS, **Liu Z**, Wang W, Hee J, Tang K. A quasi-experimental study on the effectiveness of a standardized comprehensive sexuality education curriculum for primary school students. J Adolesc. 2023 Dec;95(8):1666–1677.
- Peng L, Guo Y, Gerhard M, Gao JJ, **Liu ZC**, Mejías-Luque R, Zhang L, Vieth M, Ma JL, Liu WD, Li ZX, Zhou T, Li WQ, You WC, Zhang Y, Pan KF. Metabolite alterations and interactions with microbiota in Helicobacter pylori-associated gastric lesions. Microbiol Spectr. 2023 Aug 17;11(4):e0534722.

2022

- Wu XZ, **Liu ZC**, Qin XX, Li Y, Zhang LF, Li ZX, Zhang Y, Zhou T, Zhang JY, Liu WD, You WC, Pan KF, Li WQ. The risk of incident gastric cancer for populations with different precancerous gastric lesions: a prospective follow-up study. Chinese J Epidemiol. 2022 Dec 10;43(12):1972-1978.
- Fan H, Li X, Li ZW, Zheng NR, Cao LH, **Liu ZC**, Liu MW, Li K, Wu WH, Li ZX, Zhou T, Zhang Y, Liu WD, Zhang LF, You WC, Wang Y, Wu J, Pan KF, Qin J, Li WQ. Urine proteomic signatures predicting the progression from premalignancy to malignant gastric

cancer. EBioMedicine. 2022 Dec;86:104340.

- Li WQ, Qin XX, Li ZX, Wang LH, **Liu ZC**, Fan XH, Zhang LH, Li Y, Wu XZ, Ma JL, Zhang Y, Zhang LF, Li M, Zhou T, Zhang JY, Wang JX, Liu WD, You WC, Pan KF. Beneficial effects of endoscopic screening on gastric cancer and optimal screening interval: a population-based study. Endoscopy. 2022 Sep;54(9):848-858.
- Wenhui W, **Liu ZC** (Co-first), Zhexuan L, Weidong L, Lanfu Z, Yang Z, Tong Z, Weicheng Y, Kaifeng P, Wenqing L. Effects of Helicobacter pylori eradication on the profiles of blood metabolites and their associations with the progression of gastric lesions: a prospective follow-up study. Cancer Biol Med. 2022 Aug;19(8):1259–1273.
- **Liu ZC**, Wu WH, Huang S, Li ZW, Li X, Shui GH, Lam SM, Li BW, Li ZX, Zhang Y, Zhou T, You WC, Pan KF, Li WQ. Plasma lipids signify the progression of precancerous gastric lesions to gastric cancer: a prospective targeted lipidomics study. Theranostics. 2022 Jun 6;12(10):4671-4683.
- **Liu ZC**, Li ZX, Zhang Y, Zhou T, Zhang JY, You WC, Pan KF, Li WQ. Interpretation on the report of Global Cancer Statistics 2020. Journal of Multidisciplinary Cancer Management (Electronic Version). 7(2):1–13.

2021

- Zhuang Z, **Liu Z** (Co-first), Li J, Wang X, Xie P, Xiong F, Hu J, Meng X, Huang M, Deng Y, Lan P, Yu H, Luo Y. Radiomic signature of the FOWARC trial predicts pathological response to neoadjuvant treatment in rectal cancer. J Transl Med. 2021 Jun 10;19(1):256.
- Li X, Zheng NR, Wang LH, Li ZW, **Liu ZC**, Fan H, Wang Y, Dai J, Ni XT, Wei X, Liu MW, Li K, Li ZX, Zhou T, Zhang Y, Zhang JY, Kadeerhan G, Huang S, Wu WH, Liu WD, Wu XZ, Zhang LF, Xu JM, Gerhard M, You WC, Pan KF, Li WQ, Qin J. Proteomic profiling identifies signatures associated with progression of precancerous gastric lesions and risk of early gastric cancer. EBioMedicine. 2021 Dec;74:103714.
- **Liu Z**, Lin Z, Cao W, Li R, Liu L, Wu H, Tang K. Identify key determinants of contraceptive use for sexually active young people: a hybrid ensemble of machine learning methods. Children. 2021 Nov;8(11):968.