Xiaotao Shen, Ph.D.

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🧪 Research Interests

> Mass Spectrometry Data Processing Algorithms and Software Development.
> Multi-omics Data Integration Methods Development.
> Precision Exposome and Multi-omics Integration for Healthcare.
> Multi-omics Profiling for Human Pregnancy Related Disease Diagnosis and Mechanism Research.
> Aging and Neurodegenerative Diseases.
> Microbiome Data Processing.
> Wearable Data and Precision Medicine.

🎓 Education & Research Experiences

> **Postdoctoral Research Fellow** *2019/4–present*, **Stanford University**
(Advisor: Prof. Michael Snyder)

> **Research Scientist** *2019/1–2019/3*, **Chinese Academy of Sciences**
(Advisor: Prof. Zheng-Jiang Zhu)

> **Ph.D. in Bioinformatics and Metabolomics** *2013/9–2018/12*, **Chinese Academy of Sciences**
(Advisor: Prof. Zheng-Jiang Zhu)

> **B.S. in Biotechnology** *2009/9–2013/6*, **Inner Mongolia University**

🏆 Honors & Awards

1. SPORR 2023 Rigor and Reproducibility Awards **Stanford Program on Research Rigor and Reproducibility** (*2023*)
2. Winner Selected by the Event Committee **Exposome Data Challenge Event** (*2021*)
3. Student Travel Award for Oral Presentation **The International Metabolomics Society** (*2018*)
4. International Conference Travel Award **The Metabolites Journal** (*2018*)
5. China National Scholarship **Ministry of Education of the People's Republic of China** (*2017*)
6. Award for Outstanding Youth Report **The 3rd China MS Analysis Conference** (*2017*)
7. Merit Student **University of Chinese Academy of Sciences** (*2016*)
8. Award for Outstanding Youth Report **The 34th China MS Society Conference** (*2016*)
9. Inner Mongolia Outstanding Graduate **Inner Mongolia Autonomous Region** (*2013*)
10. National Encouragement Scholarship **Inner Mongolia University** (*2011*)

📄 First/Co-first Author Publications

+: Co-first Author. *: Co-Corresponding Author

1. X. Shen+, R. Kellogg+, D. Panyard+, N. Bararpour+, K. Castillo, B. Lee-McMullen, A. Delfarah, J. Ubellecker, S. Ahadi, Y. Rosenberg-Hasson, A. Ganz, K. Contrepois, B. Michael, I. Simms, C. Wang, D. Hornburg, M.P. Snyder*, **Multi-omic Microsampling Captures Health Perturbations in A Lifestyle Context**. *Nature Biomedical Engineering*, 2023, 10.1038/s41551-022-00999-8. 🔗

2. X. Shen+*, C. Wang+, M.P. Snyder*, **massDatabase: Utilities for the Operation of the Public Compound and Pathway Database**, *Bioinformatics*, 2022, btac546. 🔗

3. X. Shen+, W. Shao+, C. Wang+, L. Liang, S. Chen, S. Zhang, M. Rusu*, M.P. Snyder*, **Deep Learning-based Pseudo-Mass Spectrometry Imaging Analysis for Precision Medicine**, *Briefing in Bioinformatics*, 2022, bbac331. 🔗

4. X. Shen+, H. Yan+, C. Wang+, P. Gao, C.H. Johnson*, M.P. Snyder*, **TidyMass an Object-oriented Reproducible Analysis Framework for LC-MS Data**, *Nature Communications,* 2022, 4365. 🔗

5. P. Gao[+], X. Shen[+], X. Zhang, C. Jiang, M. P. Snyder[*], **Precision Environmental Health Monitoring by Longitudinal Exposome and Multi-omics Profiling**, *Genome Research*, 2022, **32,** 1199-1214. 🔗

6. X. Shen[+], S. Wu[+], L. Liang, S. Chen, K. Contrepois, Z.-J. Zhu[*] and M.J. Snyder[*], **metID: an R Package for Automatable Compound Annotation for LC−MS-based Data**, *Bioinformatics*, 2021, 1, 1-2. 🔗

7. X. Shen, R. Wang, X. Xiong, Y. Yin, Y. Cai, J. Ma, N. Liu, Z.-J. Zhu[*], **Large-scale Metabolite Identification for Untargeted Metabolomics Using Metabolic Reaction Network**, *Nature Communications*, 2019, 10:1516. 🔗

8. X. Shen and Z.-J. Zhu[*], **MetFlow: An Interactive and Integrated Workflow For Metabolomics Data Cleaning and Differential Metabolite Discovery**, *Bioinformatics*, 2019, 35, 16. 🔗

9. H. Jia[+], X. Shen[+], Y. Guan, M. Xu, M. Mo, J. Zhu[*] and Z.-J. Zhu[*], **Assessment of The Response to Neoadjuvant Chemo-Radiation in Rectal Cancer Patients based on A Metabolomics Approach**, *Radiotherapy and Oncology*, 2018, 128, 548-556. 🔗

10. J. Wang[+], T. Zhang[+], X. Shen[+], J. Liu, D. Zhao, Y. Sun, L. Wang, Y. Liu, X. Gong, Y. Liu, Z.-J. Zhu[*], F. Xue[*], **Serum Metabolomics for Early Diagnosis of Esophageal Squamous Cell Carcinoma by UHPLC-QTOF/MS**, *Metabolomics*, 2016, 12: 116. 🔗

11. X. Shen, X. Gong, Y. Cai, Y. Guo, J. Tu, T. Zhang, J. Wang, F. Xue, Z.-J. Zhu[*], **Normalization and Integration of Large-Scale Metabolomics Data Using Support Vector Regression**, *Metabolomics*, 2016, 12: 89. 🔗

📖 Collaborative Publications

1. W. Wei, N. Riley, X. Lyu, X. Shen, J. Guo, S. Raun, M. Zhao, M. Moya-Garzon, H. Basu, A. Tung, V. Li, W. Huang, A. Wiggenhorn, K. Svensson, M. Snyder, C. Bertozzi, J. Long, **Organism-wide, cell-type-specific secretome mapping of exercise training in mice**, *Cell Metabolism*, 35: 1-19, 2023.

2. S. Zhang, J. Cooper-Knock, A. Weimer, M. Shi, L. Kozhaya, D. Unutmaz, C. Harvey, T. Julian, S. Furini, E. Frullanti, F. Fava, A. Renieri, P. Gao, X. Shen, I. Timpanaro, K. Kenna, J. Baillie, M. Davis, P. Tsao, M.P. Snyder, **Multiomic analysis reveals cell-type-specific molecular determinants of COVID-19 severity**, *Cell Systems*, 13(8):598-614, 2022. 🔗

3. M. Wei, L. Zhao, J. Lv, X. Li, G. Zhou, B. Fan, X. Shen, D. Zhao, F. Xue, J. Wang, T. Zhang, **The Mediation Effect of Serum Metabolites On The Relationship Between Long-Term Smoking Exposure and Esophageal Squamous Cell Carcinoma**, *BMC cancer*, 21, 415. 🔗

4. J. Lv, J. Wang, X. Shen, J. Liu, D. Zhao, X. Li, B. Fan, Y. Sun, F. Xue, Z.-J. Zhu, T. Zhang, **A Serum Metabolomics Analysis Reveals A Panel of Screening Metabolic Biomarkers for Esophageal Squamous Cell Carcinoma**, *Clinical and Translational Medicine*, 2021, 11, 5. 🔗

5. X. Li, L. Zhao, M. Wei, J. Lv, Y. Sun, X. Shen, D. Zhao, F. Xue, T. Zhang, J. Wang, **Serum Metabolomics Analysis for The Progression of Esophageal Squamous Cell Carcinoma**, *Journal of Cancer*, 2021, 12, 3190–3197. 🔗

6. L. Liang, M. Rasmussen, B. Piening, X. Shen, S. Chen, H. Rost, J. Snyder, R. Tibshirani, L. Skotte, N. Lee, K. Contrepois, B. Feenstra, H. Zackriah, M.J. Snyder, M. Melbye, **Metabolic Dynamics and Prediction of Gestational Age and Time to Delivery in Pregnant Women**, *Cell*, 2020, 181, 7, 1680-1692. 🔗

7. Z. Wang, B. Cui, F. Zhang, Y. Yang, X. Shen, Z. Li, W. Zhao, Y. Zhang, K. Deng, Z. Rong, K. Yang, X. Yu, K. Li, P. Han, and Z.-J. Zhu, **Development of A Correlative Strategy to Discover Colorectal Tumor Tissue Derived Metabolite Biomarkers in Plasma Using Untargeted Metabolomics**, *Analytical Chemistry*, 2019, 91, 3, 2401-2408. 🔗

8. Z. Zhou, X. Shen, X. Chen, J. Tu, X. Xiong, and Z.-J. Zhu, **LipidIMMS Analyzer: Integrating Multi-dimensional Information to Support Lipid Identification in Ion Mobility–Mass Spectrometry based Lipidomics**, *Bioinformatics*, 2018, 35, 4, 698-700. 🔗

9. Z. Zhou, J. Tu, X. Xiong, X. Shen, and Z.-J. Zhu, **LipidCCS: Prediction of Collision Cross-Section Values for Lipids with High Precision to Support Ion Mobility-Mass Spectrometry based Lipidomics**, *Analytical Chemistry*, 2017, 89, 9559–9566. 🔗

10. Z. Zhou, X. Shen, J. Tu, and Z.-J. Zhu, **Large-Scale Prediction of Collision Cross-Section Values for Metabolites in Ion Mobility-Mass Spectrometry**, *Analytical Chemistry*, 2016, 88, 11084-11091. 🔗

📄 Submitted Publications

+Co-first Author. *: Co-Corresponding Author

1. X. Shen*, M.P. Snyder*, **microbiomeDataset: A tidyverse-style framework for organizing and processing microbiome data**. Under review in *Bioinformatics*.

2. X. Zhou+, X. Shen+, J. Johnson, D. Spakowicz, M. Agnello, W. Zhou, M. Avina, A. Honkala, F. Chleilat, S. Chen, K. Cha, S. Leopold, C. Zhu, L. Chen, L. Lyu, D. Hornburg, S. Wu, X. Zhang, C. Jiang, L. Jiang, L. Jiang, R. Jian, A. Brooks, M. Wang, K. Contrepois, P. Gao, S. Rose, T. Tran, H. Nguyen, A. Celli, B. Hong, E. Bautista, Y. Dorsett, P. Kavathas, Y. Zhou, E. Sodergren, G.M. Weinstock, M.P. Snyder*. **Longitudinal profiling of the microbiome at four body sites reveals core stability and individualized dynamics during health and disease**. Under review in *Cell*.

3. S. Chen+, X. Shen+, L. Liang+, M. P. Snyder*, **Longitudinal Urine Metabolic Profiling and Gestational Age Prediction in Pregnancy**. Submitted to *Science Translational Medicine*. 🔗

4. S. Chen+, G. Wang+, X. Shen+, D. Hornburg, S. Rego, R. Hoffman, S. Nevins, X. Cheng, M.P. Snyder*, **Integration and Comparison of Multi-omics Profiles of NGLY1 Deficiency Plasma and Cellular Models to Identify Clinically Relevant Molecular Phenotypes**. Submitted to *Clinical and Translational Medicine*. 🔗

📜 Patents

1. M.P. Snyder, R. Kellogg, X. Shen, **Multi-omic Sample Analysis Methods**, *2022*, USA.

2. L. Liang, M.P. Snyder, X. Shen, S. Chen, **Methods for Evaluating Gestational Progress and Applications Thereof**, *2021*, USA.

3. Z-J. Zhu, X. Shen, **A Method for Metabolite Annotation and Dysregulated Pathway Analysis**, *2019*, China.

🖵 Oral Presentations

1. **Remote and Flexible Microsampling Multi-omics for Precision Medicine. Invited presentation,** *2023/4*, iPOP summit, Stanford University, USA.

2. **Bioinformatics Algorithm Development for Mass Spectrometry Data and its Application to Precision Medicine. Invited presentation,** *2023/4*, University of Colorado, Denver, USA.

3. **Bioinformatics Algorithm Development for Mass Spectrometry Data and its Application to Precision Medicine. Invited presentation,** *2023/4*, University of Minnesota, Minneapolis, USA.

4. **Bioinformatics Algorithm Development for Mass Spectrometry Data and its Application to Precision Medicine. Invited presentation,** *2023/3*, Altos Labs, Redwood city, USA.

5. **Bioinformatics Algorithm Development for Mass Spectrometry Data and its Application to Precision Medicine. Invited presentation,** *2023/3*, University of Connecticut, Storrs, USA.

6. **Multi-omics Microsampling for The Profiling of Lifestyle-Associate Changes in Health. Invited presentation,** *2023/2*, Huazhong University of Science and Technology, China.

7. **Bioinformatics Algorithm Development for Mass Spectrometry Data and its Application to Precision Medicine. Invited presentation,** *2023/2*, Ohio State University, Columbus, USA.

8. **Multi-omics Microsampling for The Profiling of Lifestyle-Associate Changes in Health. Stanford Postdoc Symposium,** *2023/2*, Stanford, USA.

9. **Bioinformatics Algorithm Development for Mass Spectrometry Data and its Application to Precision Medicine. Invited presentation,** *2023/1*, Rutgers New Jersey Medical School, USA.

10. **Bioinformatics Method Development for Mass Spectrometry and its Application to Precision Medicine**. **Stanford CVI Early Career Research Roundtable**, *2022/11*, Stanford, USA.

11. **Deep Learning-based Pseudo-Mass Spectrometry Imaging Analysis for Precision Medicine**. **CASMS Virtual Conference**, *2022/10*, Virtual meeting.

12. **TidyMass: an Object-oriented Reproducible Analysis Framework for LC-MS Data**. **ACS Fall 2022**, *2022/8*, Virtual meeting.

13. **metID: an R Package for Automatable Compound Annotation for LC−MS-based Data**. **The 69th American Society for Mass Spectrometry Conference**, *2021/11*, Philadelphia, USA.

14. **Decoding Links Between the Exposome and Health Outcomes by Multi-omics Analysis**. **Exposome Data Challenge Event**, *2021/4*, Virtual meeting.

15. **Metabolic Reaction Network-based Recursive Metabolite Identification for Untargeted Metabolomics**. **The 14th International Conference of the Metabolomics Society**, *2018/6*, Seattle, USA.

16. **Assessment of the Response to Neoadjuvant Chemo-Radiation in Rectal Cancer Patients based on a Metabolomics Approach**. **The 3rd China Mass Spectrometry Analysis Conference**, *2017/12*, Xiamen, China. 🔗

17. **Normalization and Integration of Large-Scale Mass Spectrometry-based Metabolomics Data Using Support Vector Regression**. **The 34th China Mass Spectrometry Society Conference**, *2016/9*, Xining, China.

18. **Normalization and Integration of Large-Scale MS-based Metabolomics Data Using Support Vector Regression**. **The 64th American Society for Mass Spectrometry Conference**, *2016/6*, San Antonio, USA. 🔗

Poster Presentations

1. **TidyMass An Object-oriented Reproducible Analysis Framework for LC-MS Data**. **Stanford Data Science Conference**, *2023/5*, Stanford University, USA.

2. **Deep Learning-based Pseudo-Mass Spectrometry Imaging Analysis for Precision Medicine**. **Stanford Genetics Retreat 2022**, *2022/9*, Monterey, USA.

3. **Deep Learning-based Pseudo-Mass Spectrometry Imaging Analysis for Precision Medicine**. **Bay Area Metabolism Meeting (BAMM) 2022**, *2022/9*, Palo Alto, USA.

4. **TidyMass An Object-oriented Reproducible Analysis Framework for LC-MS Data**. **The 70th American Society for Mass Spectrometry Conference**, *2022/6*, Minneapolis, USA.

5. **Longitudinal Interactions Between Levels of Serum Cytokine and the Microbiome from Four Body Sites**. **IMMUNOLOGY2022**, *2022/5*, Portland, USA.

6. **TidyMass An Object-oriented Reproducible Analysis Framework for LC-MS Data**. **Stanford Genetics Retreat 2021**, *2021/9*, Palo Alto, USA.

7. **Longitudinal Urine Metabolic Profiling and Gestational Age Prediction in Pregnancy**. **The 17th International Conference of the Metabolomics Society**, *2020/6*, Virtual meeting.

8. **Metabolic Reaction Network based Metabolite Annotation in Untargeted Metabolomics**. **The 13th International Conference of the Metabolomics Society**, *2017/6*, Brisbane, Austria.

Teaching Experience

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›	**LC-MS Data Processing and Analysis Using R language**	*2022/9*, **Biotree Company**
		Responsibilities: Lecture
›	**R Language for Reproducible Data Analysis**	*2020/4*, **SCPA**
		Responsibilities: Lecture
›	**Stanford School of Medicine Intern**	*2019/8–Present*, **Stanford University**
		Responsibilities: Mentor
›	**Mass Spectrometry Analysis**	*2014/9–2014/12*, **Chinese Academy of Sciences**
		Responsibilities: Guest lecturer

🏃 Volunteering

> **Member of Youth Editorial Board** *2023/2–present*, **Phenomics**
> **Member of Youth Editorial Board** *2023/1–present*, **Brain-X**
> **Member of Youth Editorial Board** *2022/7–present*, **iMeta**
> **Co-chair** *2021/7–2022/8*, **Stanford Chinese Postdoctoral Association**
> **Organizer** *2020/2–2021/12*, **Stanford Chinese Postdoctoral Oral Presentation Improvement**
> **Member** *2019/7–2021/7*, **Stanford Chinese Postdoctoral Association**
> **Member** *2013/9–2014/7*, **Student Association of IRCBC, Chinese Academy of Sciences**

🗨 Journal Referee

> *Nature Biotechnology*
> *Nature Communications*
> *Briefing in Bioinformatics*
> *Bioinformatics*
> *GigaScience*
> *PLOS one*
> *Phytochemistry*
> *Genomics, Proteomics&Bioinformatics*
> *Communications Chemistry*
> *Communications Biology*
> *Frontiers Molecular Biosciences*
> *iMeta*
> *Proteomics*

🏠 Technical Strength

- **Languages**: Mandarin (Very fluent), English (Fluent).
- **Programming Languages**: R 🅡, Python 🐍, HTML, Bash.
- **Bioinformatic Tools**: RNA-seq, Proteomics.
- **Other Skills**: Markdown, Photoshop, Illustrator, Linux, GitHub ⭘, Shiny 🔗

👥 References

> **Professor Michael Snyder**
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> Chair, Department of Genetics, Stanford University
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> Email: mpsnyder@stanford.edu
> **Professor Zheng-Jiang Zhu**
> Ph.D. Advisor
> Director of Metabolomics Research Center, The Interdisciplinary Research Center on Biology and Chemistry, Chinese Academy of Sciences
> Phone number: +86 21-68582296
> Email: jiangzhu@sioc.ac.cn
> **Professor Caroline Johnson**
> Collaborator
> Yale School of Public Health
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