Vicky Yao

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Research

Rice University • Houston, TX
2019- Assistant Professor, Department of Computer Science
co-PI, AI and Computational Biology for Health (AI4BIO), The Ken Kennedy Institute
Affiliate Member, Rice Synthetic Biology Institute

Princeton University • Princeton, NJ
2018-2019 Postdoctoral Research Associate, Lewis-Sigler Institute for Integrative Genomics
2012-2018 Graduate Research Assistant, Department of Computer Science
2009-2010 Research Intern, Lewis-Sigler Institute for Integrative Genomics
Adviser: Olga Troyanskaya

NHLBI, National Institutes of Health • Bethesda, MD
2005-2007 Research Intern, Laboratory of Epigenome Biology
Project: *Development of a genome-wide experimental technique that improves on the Chromosome Conformation Capture (3C) method*
Adviser: Keji Zhao

Education

2018 **Ph.D. in Computer Science** • Princeton University
Dissertation: *Integrative network-based approaches to analyze genomics data*
Adviser: Olga Troyanskaya
Committee: Ryan Adams, Barbara Engelhardt, Coleen Murphy, Mona Singh

2011 **M.S. in Statistics** • University of Chicago
Thesis: *Network Inference with Gene Expression Data Using Correlation and Regression-Based Methods*
Adviser: Mathias Drton

2011 **B.A. in Economics, Minor in Computer Science** • University of Chicago

Publications

* co-first authorship   # co-corresponding   <u>lab member</u>

Preprints

1. <u>Q Lai</u>, <u>R Dannenfelser</u>, JP Roussarie#, **V Yao**#. "Disentangling associations between complex traits and cell types with *seismic*." *bioRxiv*, 2024.

2. <u>L Li</u>, <u>R Dannenfelser</u>, <u>C Cruz</u>, **V Yao**. "ANDES: a novel best-match approach for enhancing gene set analysis in embedding spaces." *bioRxiv*, 2023.

3. **V Yao**, A Aly, S Kalik, J Gresack, W Wang, A Handler, A Schaefer, OG Troyanskaya, P Greengard, RU Chottekalapanda. "Neuron-Glia Signaling Regulates the Onset of the Antidepressant Response." *bioRxiv*, 2021.

Published

4. L Li, R Dannenfelser, C Cruz, **V Yao**. "Enhancing gene set analysis in embedding spaces: a novel best-match approach." *Proceedings of the International Conference on Research in Computational Molecular Biology (RECOMB)*, 2024.

5. P Rodriguez-Rodriguez, LE Arroyo-Garcia, L Li, C Tsagkogianni, W Wang, I Salas-Allende, Z Plautz, A Cedazo-Minguez, S Sinha, OG Troyanskaya, M Flajolet, **V Yao**, JP Roussarie. "The proto-oncogene DEK regulates neuronal excitability and tau accumulation in Alzheimer's disease vulnerable neurons." *Brain*, 2024.

6. R Dannenfelser, J Zhong, R Zhang, **V Yao**. "Into the Single Cell Multiverse: an End-to-End Dataset for Procedural Knowledge Extraction in Biomedical Texts." *Advances in Neural Information Processing Systems*, 2024. *[Datasets and Benchmarks Track Spotlight]*

7. R Dannenfelser, **V Yao**. "Splitpea: uncovering cancer patient-specific protein interaction network rewiring." *Pacific Symposium on Biocomputing*, 2024.

8. L Li, R Dannenfelser, Y Zhu, N Hejduk, S Segarra[#], **V Yao**[#]. "Joint embedding of biological networks for cross-species functional alignment." *Bioinformatics*, 2023.

9. RC Brewer, TV Lanz, CR Hale, GD Sepich-Poore, C Martino, AD Swafford, TS Carroll, S Kongpachith, LK Blum, SE Elliott, NE Blachere, S Parveen, J Fak, **V Yao**, O Troyanskaya, MO Frank, MS Bloom, S Jahanbani, AM Gomez, R Iyer, NS Ramadoss, O Sharpe, S Chandrasekaran, LB Kelmenson, Q Wang, H Wong, HL Torres, M Wiesen, DT Graves, KD Deane, VM Holers, R Knight, RB Darnell, WH Robinson, DE Orange. "Oral mucosal breaks trigger anti-citrullinated bacterial and human protein antibody responses in rheumatoid arthritis." *Science Translational Medicine*, 2023.

10. N Sapoval, A Aghazadeh, MG Nute, DA Antunes, A Balaji, R Baraniuk, CJ Barberan, R Dannenfelser, C Dun, M Edrisi, RAL Elworth, B Kille, A Kyrillidis, L Nakhleh, CR Wolfe, Z Yan, **V Yao**, TJ Treangen. "Current progress and open challenges for applying deep learning across the biosciences." *Nature Communications*, 2022.

11. R Dannenfelser*, G Allen*, B VanderSluis, AK Koegel, S Levinson, SR Stark, **V Yao**, A Tadych, OG Troyanskaya, WA Lim. "Discriminatory power of combinatorial antigen recognition in cancer T cell therapies." *Cell Systems*, 2020.

12. DE Orange*, **V Yao***, J Fak, S Parveen, M Frank, N Blachere, OG Troyanskaya, R Darnell. "RNA Identification of PRIME Cells Predicting Rheumatoid Arthritis Flares." *New England Journal of Medicine*, 2020.

13. JP Roussarie*, **V Yao***, Z Plautz, SE Kasturia, C Albornoz, E Schmidt, L Brichta, A Barnea-Cramer, N Heintz, PR Hof, M Heiman, M Flajolet, OG Troyanskaya, P Greengard. "Selective neuronal vulnerability in Alzheimer's Disease: a network-based analysis." *Neuron*, 2020.

14. D Sargin*, RU Chottekalapanda*, K Perit, **V Yao**, D Chu, DW Sparks, S Kalik, OG Troyanskaya, EF Schmidt, N Heintz, P Greengard, EK Lambe. "Mapping the physiological

and molecular markers of stress and antidepressant treatment in S100a10 corticostriatal neurons." *Molecular Psychiatry*, 2020.

15. J Zhou*, IE Schor*, **V Yao**, CL Theesfeld, R Marco-Ferreres, A Tadych, EEM Furlong, OG Troyanskaya. "Accurate genome-wide predictions of spatio-temporal gene expression during embryonic development." *PLoS Genetics*, 2019.

16. **V Yao***, R Kaletsky*, W Keyes, D Mor, AK Wong, CT Murphy, OG Troyanskaya. "An integrative tissue-network approach to identify and test human disease genes." *Nature Biotechnology*, 2018.

17. R Kaletsky*, **V Yao***, A Williams, AM Runnels, A Tadych, S Zhou, OG Troyanskaya, CT Murphy. "Transcriptome analysis of adult *Caenorhabditis elegans* cells reveals tissue-specific gene and isoform expression." *PLoS Genetics*, 2018.

18. **V Yao***, AK Wong*, OG Troyanskaya. "Enabling Precision Medicine through Integrative Network Models." *Journal of Molecular Biology*, 2018.

19. AV Rangan, CC McGrouther, J Kelsoe, N Schork, E Stahl, Q Zhu, A Krishnan, **V Yao**, OG Troyanskaya, S Bilaloglu, P Raghavan, S Bergen, A Jureus, M Landen; Bipolar Disorders Working Group of the Psychiatric Genomics Consortium. "A loop-counting method for covariate-corrected low-rank biclustering of gene-expression and genome-wide association study data." *PLoS Computational Biology*, 2018.

20. A Krishnan*, R Zhang*, **V Yao**, CL Theesfeld, AK Wong, A Tadych, N Volfovsky, A Packer, A Lash, OG Troyanskaya. "Genome-wide prediction and functional characterization of the genetic basis of autism spectrum disorder." *Nature Neuroscience*, 2016.

21. E Watson, V Olin-Sandoval, MJ Hoy, CH Li, T Louisse, **V Yao**, A Mori, AD Holdorf, OG Troyanskaya, M Ralser, AJ Walhout. "Metabolic network rewiring of propionate flux compensates vitamin B12 deficiency in *C. elegans*." *eLife*, 2016.

22. J Goya*, AK Wong*, **V Yao***, A Krishnan, M Homilius, OG Troyanskaya. "FNTM: a server for predicting functional networks of tissues in mouse." *Nucleic Acids Research*, 2015.

23. AK Wong, A Krishnan, **V Yao**, A Tadych, OG Troyanskaya. "IMP 2.0: a multi-species functional genomics portal for integration, visualization and prediction of protein functions and networks." *Nucleic Acids Research*, 2015.

24. M Bansal, ..., **NCI Dream Community**. "A community computational challenge to predict the activity of pairs of compounds." *Nature Biotechnology*, 2014.

25. Y Guan, **V Yao**, K Tsui, M Gebbia, MJ Dunham, C Nislow, OG Troyanskaya. "Nucleosome-coupled expression differences in closely-related species." *BMC Genomics*, 2011.

Honors & Awards

2022   NSF CAREER Award, *National Science Foundation*
2019   CPRIT Scholar, *Cancer Prevention & Research Institute of Texas*
2013   Facebook API Award, *HackPrinceton*
2011   Gordon Wu Fellow, *Princeton University*
2011   Google API Award, *Princeton Startup Weekend*

Selected Media Coverage

2023	**Houston Chronicle**, *To avoid rheumatoid arthritis flare-ups, get your teeth cleaned, Rice University researcher says*
2020	**CBS News**, *Newly-discovered cell could signal when rheumatoid arthritis patients will have painful flare-ups, study finds*
2020	**Science**, *Newly identified cell type may help predict, treat rheumatoid arthritis flares*
2020	**NBC News**, *Newly discovered cell could help predict rheumatoid arthritis flare-ups*
2013	**The New Yorker**, *The Story Behind "What Would I Say?"*
2013	**USA Today**, *'What would I say?' app plots your next Facebook status*
2013	**Slate**, *What Would You Say on Facebook If You Were a Bot?*
2013	**Huffington Post**, *Your Facebook Statuses Are Gibberish. Here's Proof.*

Invited Talks

2024	Baylor College of Medicine, *Center for Metagenomics and Microbiome Research Seminar*
2023	University of Houston, *Department of Mathematics Data-Enabled Science Seminar*
2023	International Workshop on Computational Network Biology: Modeling, Analysis, and Control, *Panel on Role of Emerging AI/ML in Computational Network Biology*
2023	Texas Children's Hospital, *Tropical Medicine Invited Seminar Series*
2023	Banff International Research Station, *Mathematical Methods in Cancer Biology, Evolution and Therapy*
2023	Baylor College of Medicine, *Computational and Integrative Biomedical Research Seminar*
2023	Texas A&M, *Texas Symposium on Critical Topics in Immunology*
2023	MD Anderson, *CRC Integromics Meeting Series*
2022	Charleston Conference on Alzheimer's Disease (CCAD)
2022	Rice University, *BioNetworks & BioXFEL REUs*
2022	Society of Chinese Bioscientists in America - Texas Chapter
2021	Baylor College of Medicine, *Human Genome Sequencing Center Seminar*
2021	Rice University, *Multi-Scale Biomolecular Networks REU*
2020	WiDS (Women in Data Science) Houston
2020	Rice University, *BioSciences Department Colloquia*
2019	Rice University, *Machine Learning Seminar*
2019	Carnegie Mellon University, *School of Computer Science Seminar*
2019	NIH, *NHGRI Seminar*
2019	University of Maryland, *Department of Computer Science Seminar*
2019	UCLA, *Bioinformatics Seminar*
2019	NIH, *NLM Seminar*
2017	Broad Institute, *Models, Inference & Algorithms*
2016	Intelligent Systems for Molecular Biology (ISMB) Conference, *plenary*

Teaching & Mentoring

2022-	**COMP 341: Practical Machine Learning for Real World Applications**, *Rice University* Development of mid-level undergraduate course that covers how to apply ML algorithms to real world problems, from data cleaning, model selection, to reporting findings

2020- **COMP 670: Graduate Seminar in Computational Biology**, *Rice University*
Development of discussion-based graduate seminar covering computational methods and discoveries in biomedical research

2020-2022 **COMP 572: Bioinformatics: Networks**, *Rice University*
Development and teaching of graduate-level course covering computational aspects of biological network analysis

2017 **Django Girls**, *Princeton University*
Coach for programming workshop for women with no coding experience

2012-2013 **COS 323: Computing for the Physical and Social Sciences**, *Princeton University*
Assistant in Instruction, ~90 students (Fall 2012), ~80 students (Fall 2013)

PhD Students

2022- Alyssa Cantú, *Department of Computer Science*
2022- Janmajay Singh, *Department of Computer Science*
2020- Wei-Hao Lee, *Systems, Synthetic, & Physical Biology Program*
2020- Qiliang Lai, *Department of Computer Science*
2020- Sunny Kim, *Department of Computer Science*
2020- Lechuan Li, *Department of Computer Science*

MS Students

2024- Jeffrey Zhong, *Department of Computer Science*

Undergraduates

Summer 2024 Avey Etaghene, *Summer REU (Houston Community College)*
Summer 2024 John Paul Marconi, *Summer REU (Lone Star College)*
Spring 2024- Kausar Alkaderi, *Departments of Computer Science*
Spring 2024- Grace Yu, *Departments of Computer Science*
Spring 2024 Neel Mallipeddi, *Departments of Computer Science*
Spring 2024 Albert Zhu, *Departments of Computer Science & Mathematics*
2023-2024 Jacob Williams, *Departments of Computer Science & Mathematics*
2021-2024 Jeffrey Zhong, *Department of Computer Science*
2022-2023 Charlie Cruz, *Departments of Mathematics & Linguistics*
Summer 2023 Refaat Alsaki, *Summer REU (Houston Community College)*
Fall 2022 Christina Wong, *Department of Computer Science*
Summer 2022 Katherine Chui, *Department of Computer Science*
Summer 2022 Jordyn Sibert, *Summer REU (San Jacinto College)*
Summer 2022 Alex Mercadel, *Summer REU (University of Texas at Austin)*
Spring 2022 Huzaifa Ali, *Department of Computer Science (now MCS student at UIUC)*
Spring 2022 Janhvi Somaiya, *Department of Computer Science*
2021-2022 Jackie Wu, *Department of Computer Science*
Fall 2021 Bikrant Das Sharma, *Department of Computer Science*
Summer 2021 Sritha Cheemerla, *Department of Computer Science*
2021 Nathaniel Hejduk, *Department of Computer Science (now PhD student at Northwestern)*
2020-2021 Xueyan Mu, *Department of Computer Science*
2020-2021 Jason Tan, *Department of Computer Science (now PhD student at Stanford)*

2020-2021   Nancy Cui, *Department of Bioengineering (now PhD student at MIT)*

Thesis Committees

2024-   Dorsa Khavas, "Machine learning-assisted directed evolution of RNA antibiotics with combinatorial libraries," *Department of Chemical and Biomolecular Engineering, Rice University (Adviser: Joff Silberg)*

2024-   Sarah Reid, "Elucidating the role of Dnmt3a in maladaptive synaptic plasticity," *Systems, Synthetic, and Physical Biology Program, Rice University (Adviser: Laura Lavery)*

2024-   Jon DeBonis, "Development of a Mathematical Model of IL-12 Pharmacokinetic and Pharmacodynamic Desensitization for Optimization of Therapy Design," *Department of Bioengineering, Rice University (Advisers: Oleg Igoshin & Omid Veiseh)*

2024-   Yangfan Ren, "Bayesian Graphical Models with Varying Effects," *Department of Statistics, Rice University (Advisers: Marina Vannucci & Christine Peterson)*

2023-   Jared Slone, "TCR-pMHC Binding Specificity Prediction from Structure Using Graph Neural Networks," *Department of Computer Science, Rice University (Adviser: Lydia Kavraki)*

2023-2024   Jaihee Choi, "Methods for High-Dimensional Inference in Genetic Association Studies for Complex Time-to-event Data," *Department of Statistics, Rice University (Adviser: Ryan Sun)*

2023   Trenton Piepergerdes, "Implementation of Genetic Circuits for Engineered Mesenchymal Stem Cell Differentiation," *Department of Bioengineering, Rice University (Adviser: Caleb Bashor)*

2022-2024   Yujie (Jeffrey) Jiang, "Statistical Modeling of Intratumor Heterogeneity for Cancer Evolution Insights," *Department of Statistics, Rice University (Adviser: Wenyi Wang)*

2022-   Pujun Guan, "Modulated Smooth Muscle Cells in Atherosclerosis: a Multimodal Single-Cell Analysis," *Quantitative Sciences, UTHealth (Adviser: Dianna Milewicz)*

2022   Advait Balaji, "Journey into the unknown: graph and machine learning based approaches for improved characterization of novel pathogens," *Department of Computer Science, Rice University (Adviser: Todd Treangen)*

2022   Yu Zhu, "Learning on Inhomogeneous Hypergraphs," *Department of Electrical and Computer Engineering, Rice University (Adviser: Santiago Segarra)*

2021-   Peng (Jason) Yang, "Advanced Statistical Models for Clinical Trial Design and Biomedical Research," *Department of Statistics, Rice University (Advisers: Ziyi Li & Ying Yuan)*

2021-2024   Kristen Curry, "The Microbiome in its Entirety: Community-Oriented Computational Tools for Deciphering Metagenomic Diversity," *Department of Computer Science, Rice University (Adviser: Todd Treangen)*

2021-   Romanos Fasoulis, "Graph Representation Learning for Structural Proteomics," *Department of Computer Science, Rice University (Adviser: Lydia Kavraki)*

2021-   Anja Conev, "3pHLA-score: improved structure-based peptide-HLA binding affinity prediction ," *Department of Computer Science, Rice University (Adviser: Lydia Kavraki)*

2021   Xiru Huang, "Integration of scRNA-seq and scDNA-seq," *Department of Computer Science, Rice University (Adviser: Luay Nakhleh)*

2021-2024   Yunxi Liu, "Finding Needles in the Haystack: Computational tools for Contaminant Detection and Error Correction in Genomic and Metagenomic Datasets," *Department of Computer Science, Rice University (Adviser: Todd Treangen)*

2021-2023   Yilei Fu, "Accurate and Efficient Computational Approaches for Long-read Alignment

and Genome Phasing of Human Genomes," *Department of Computer Science, Rice University (Adviser: Todd Treangen)*

2021   Yongze Yin, "Annotation-free algorithm for delineating prokaryotic homology groups," *Department of Computer Science, Rice University (Adviser: Luay Nakhleh)*

2021   Yushu Liu, "Inferring evolution history with Copy Number Aberrations," *Department of Computer Science, Rice University (Adviser: Luay Nakhleh)*

2021   Nick Sapoval, "SARS-CoV-2 genomic diversity and the implications for qRT-PCR diagnostics and transmission," *Department of Computer Science, Rice University (Adviser: Todd Treangen)*

2021-2022   Chunxiao Liao, "VariPhyer: A Modular Computational Platform for Verifying Microbial Phylogenetic Variant Analyses," *Department of Computer Science, Rice University (Adviser: Todd Treangen)*

2020-2022   Mithil Chokshi, "Genome Editing Strategies to Cure Cystic Fibrosis," *Department of Bioengineering, Rice University (Adviser: Gang Bao)*

2020-2021   Qi Wang, "GenomeDepot: Computational Methods for Decoding Biological Information Encoded in Engineered DNA and Microbial Genomes," *Systems, Synthetic, and Physical Biology Program, Rice University (Adviser: Todd Treangen)*

2020-2023   Baoyi Zhang, "Applying Statistical and Machine Learning Methods for Cancer Patient Stratification," *Department of Chemical and Biomolecular Engineering, Rice University (Adviser: Chao Cheng)*

2020-2023   Sarah Hall-Swan, "Molecular docking and structural analysis for applications in biomedicine," *Department of Computer Science, Rice University (Adviser: Lydia Kavraki)*

2020-2021   Minjie Wang, "Statistical Machine Learning Approaches for Data Integration and Graphical Models," *Department of Statistics, Rice University (Adviser: Genevera Allen)*

2019-2022   Shaoheng Liang, "Interpretable and Efficient Machine Learning in Cancer Biology," *Department of Computer Science, Rice University (Adviser: Ken Chen, Luay Nakhleh)*

Service

Professional

2021-   Editorial Board, *Journal of Computational Biology*

2020-2024   Program Committee, *Intelligent Systems in Molecular Biology (ISMB)*

2023   Program Committee, *International Conference on Research in Computational Molecular Biology (RECOMB)*

2024   Reviewer, *National Science Foundation (NSF)*

2022-2023   Co-organizer, *K2I AI in Health Conference Workshop: RAD Genomics*

2023   Local Chair, *ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB)*

2023   Program Committee, *ACM-BCB*

2023   Panel Reviewer, *NSF: Division of Biological Infrastructure*

2022   Co-organizer, *IEEE VIS Workshop: Visualization in Biomedical AI*

2021   Co-organizer, *ICML Workshop: Interpretable Machine Learning in Healthcare*

2021   Peer Reviewer, *Alzheimer's Society, UK*

2019   Poster Prize Committee, *ISMB*

2019-   Reviewer, *Bioinformatics Advances, Cell Reports, Cell Reports Methods, Communications Medicine, IEEE/ACM Transactions on Computational Biology and Bioinformatics,*

IEEE/ACM Transactions on Knowledge and Data Engineering, iScience, Journal of Computational Biology, mSystems, Nature Communications, NeurIPS Datasets and Benchmarks, Neuron, Patterns, PLoS Computational Biology, PLoS Genetics, Science, Science Advances, Scientific Reports

University & Department

2023-	Committee Member, *CS Department Working Group on Machine Learning Curriculum*
2022-2024	Committee Member, *Faculty Senate Working Group on Admissions*
2022-	Committee Member, *CS Department Working Group on Long-term Capital Planning*
2019-	Graduate Admissions Committee, *Department of Computer Science*
2022-2024	Platform Marshal, *Rice University Commencement*
2020-2021	Graduate Admissions Committee, *Systems, Synthetic, & Physical Biology Program*
2021	Ad Hoc Member, *Computational Faculty Search, Department of Bioengineering*
2020	Committee Member, *Masters of Data Science*

Outreach

2021-	Divisional Advisor (Engineering), *Lovett College, Rice University* Selected by College Magisters and the Office of Academic Advising to provide advising for undergraduate students interested in engineering prior to declaring a major
2020-	Faculty Associate, *Lovett College, Rice University*
2023	Panelist & Mentor, *Aspirations in Computing Awards, National Center for Women & Information Technology, Houston*
2023	Speaker, *Girls Who Code Club, Bellaire High School*
2022	Judge, *SCBA-TX Trainee Presentations, Society of Chinese Bioscientists in America*
2022	Speaker, *Rice CS Alumni Event, Mountain View*
2022	Judge, *D2K Showcase, Rice University*
2021	Judge, *HackRice, Rice University* Largest annual hackathon at Rice, with >400 participants (Rice and non-Rice students)
2021	Panelist, *CSters (Rice Women in Computing)*
2021	Judge, *Rice SASE Hackathon, Society of Asian Scientists and Engineers*

Professional Memberships

2020-	Association for Computing Machinery (ACM)
2020-	Institute of Electrical and Electronics Engineers (IEEE)
2019-	International Society of Computational Biology (ISCB)