Zechuan Shi

Ph.D. Candidate in Bioinformatics | zechuas@uci.edu | GitHub: https://github.com/rootze

SUMMARY

Ph.D. Candidate in Bioinformatics with integrated dry and wet lab experience, spanning single-cell genomics, preclinical drug trials, and therapeutic target discovery. Developer of open-source bioinformatics tools and first/co-first author on multiple publications in neurodegeneration and immunology. Seeking bioinformatic Postdoc position.

EDUCATION

Ph.D. Candidate in Bioinformatics Expected Jun 2026
University of California, Irvine, Department of Neurobiology and Behavior
Principal Investigator: Vivek Swarup, Ph.D.

- **Research Direction:** Bioinformatics, Genomics, GWAS, Single Cell, Big Data, Alzheimer's Diseases
- My thesis research focuses on leveraging statistical methods and computational tools to investigate Alzheimer's disease, with the ultimate goal of discovering new therapeutic targets

Master of Science in Biotechnology Sep 2016 – May 2018
Johns Hopkins University
GPA: 3.92/4.0

- **Concentration:** Bioinformatics, Molecular Targets and Drug Discovery Technologies

SOFTWARE PACKAGES/TOOLS

Developer

compact Github: compact

- an in silico module perturbation method that unlocks a functional understanding of the dynamic gene networks in single-cell data

scROAD ShinyApp: scROAD

- a database that offers single-cell cCREs' transcription factor occupancy information generated from snATAC-seq analysis of human postmortem prefrontal cortex (PFC) tissue for dementia research

ArchRtoSignac Github: ArchRtoSignac

- an R package that allows easier implementation of both ArchR and Signac scATAC-seq analysis pipelines

Contributor

hdWGCNA Github: hdWGCNA

- an R package for performing weighted gene co-expression network analysis (WGCNA) in high dimensional transcriptomics data

FIRST/CO-FIRST AUTHOR PUBLICATIONS

* These authors contributed equally

5. **Shi, Z.***, Morabito, S.*, et al. (2025). In silico module perturbation analysis unlocks a functional understanding of the dynamic gene networks in single-cell data. (Manuscript in preparation)
4. Das, S.*, **Shi, Z.***, et al. (2025). Oligodendrocyte reprogramming ameliorates Alzheimer's disease by reestablishing intercellular communication. (Manuscript in preparation)
3. Childs, J.*, **Shi, Z.***, et al. (2025). Single nucleus RNA sequencing and spatial transcriptomics of mouse habenula after reinstatement of cocaine self-administration. (Manuscript in preparation)
2. **Shi, Z.***, Das, S.*, Morabito, S.*, Miyoshi, E., et al. (2024). Single-nucleus multi-omics identifies shared and distinct pathways in Pick's and Alzheimer's disease. **bioRxiv**, 2024.09.06.611761. DOI:

https://doi.org/10.1101/2024.09.06.611761 (Manuscript in review; **Science Advances**)

1. **Shi, Z.***, Das, S.*, Morabito, S., Miyoshi, E., & Swarup, V. (2022). Protocol for single-nucleus ATAC sequencing and bioinformatic analysis in frozen human brain tissue. **STAR Protocols**, 3(3), 101491. DOI: https://doi.org/10.1016/j.xpro.2022.101491

OTHER CO-AUTHOR PUBLICATIONS

8. Fotio, Y., Al Masri, S., **Shi, Z.**, et al. (2025). Metabolic reallocation in spinal cord oligodendrocytes drives chronic pain via neuronal β-amyloid production. (Manuscript in preparation)

7. Tran, K.M., Kwang, N.E., Butler, C.A., [et al., including **Shi, Z.**]. (2025). APOE Christchurch enhances a disease-associated microglial response to plaque but suppresses response to tau pathology. **Mol Neurodegeneration**, DOI: 10.1186/s13024-024-00793-x

6. Miyoshi, E., Morabito, S., Henningfield, C.M. [et al., including **Shi, Z.**]. (2024). Spatial and single-nucleus transcriptomic analysis of genetic and sporadic forms of Alzheimer's Disease. **Nature Genetics**, DOI: https://www.nature.com/articles/s41588-024-01961-x

5. Tiwari, V., Prajapati, B., Asare, Y. [et al., including **Shi, Z.**]. (2024). Innate immune training restores pro-reparative myeloid functions for remyelination in the aged central nervous system. **Immunity**, 57(9), 2173–2190.e8. DOI: https://doi.org/10.1016/j.immuni.2024.07.001

4. O'Shea, T.M., Ao, Y., Wang, S. [et al., including **Shi, Z.**]. (2024). Derivation and transcriptional reprogramming of border-forming wound repair astrocytes after spinal cord injury or stroke in mice. **Nat Neurosci**. DOI: https://doi.org/10.1038/s41593-024-01684-6

3. Garcia-Agudo, L.F., **Shi, Z.**, et al. (2024). BIN1K358R suppresses glial response to plaques in mouse model of Alzheimer's Disease. **Alzheimer's & dementia**: the journal of the Alzheimer's Association, 20(4), 2922–2942. DOI: https://doi.org/10.1002/alz.13767

2. Tran, K.M., Kawauchi, S., Kramár, E.A. [et al., including **Shi, Z.**]. (2023). A Trem2R47H mouse model without cryptic splicing drives age- and disease-dependent tissue damage and synaptic loss in response to plaques. **Mol Neurodegeneration**. DOI: https://doi.org/10.1186/s13024-023-00598-4

1. Ma, Z., Flynn, J., Libra, G., & **Shi, Z.** (2018). Elevated CO2 Accelerates Phosphorus Depletion by Common Bean (Phaseolus vulgaris) in Association with Altered Leaf Biochemical Properties. **Pedosphere**, 28(3), 422–429. DOI: https://doi.org/10.1016/S1002-0160(17)60420-X

PRESENTATION

Oral Session

- "In Silico Module Perturbation Analysis unlocks a functional understanding of the dynamic gene networks in single-cell data". **Annual Meeting of American Society of Human Genetics**, Denver, CO. Nov 2024.
- "Single-nucleus open chromatin accessibility landscape of Pick's and Alzheimer's disease". **Alzheimer's Association International Conference**, San Diego, CA. Jul-Aug 2022.

Poster Session

- "Single-nucleus multi-ome profiling of epigenomic modifications and transcriptome characterization of heterogeneity in early and late-stage Alzheimer's disease". **Alzheimer's Association International Conference**, Philadelphia, PA. Jul-Aug 2024.
- "Epigenetic dysregulation in Pick's and Alzheimer's disease". **15th Annual Emerging Scientists Symposium**, Irvine, CA. Mar 2024.
- "Characterizing BIN1K358R SNP rs138047593 effects in 5xFAD plaque pathology of Alzheimer's disease using snRNA-seq". **Annual Meeting of American Society of Human Genetics**, Washington DC. Nov 2023.
- "Effect of Elevated CO_2 on Growth, Biomass Partitioning, and Phosphorus Uptake in Common Bean (Phaseolus vulgaris) under Varied Nitrogen or Phosphorus Availability.". **The Annual Conference of Missouri Academy of Science**, St. Joseph, MO. Apr 2015.

INDUSTRY & TRANSLATIONAL EXPERIENCE

Biotech Investment Fellow, BlueRun Ventures – Beijing, China (Remote) Nov 2021 – Jan 2022

- Participated in a selective Bio2X venture program focused on biotechnology innovation and commercialization strategy
- Delivered bi-monthly reports on biotech industry trends, investment landscapes, and startup evaluations
- Collaborated with venture analysts to conduct due diligence and generate scientific insight for early-stage investment decisions
- Awarded for exceptional performance in biotechnology innovation analysis and startup evaluation

Preclinical Research Specialist, University of Pennsylvania – Philadelphia, PA Jul 2018 – Jul 2020
Advisor: Lewis Chodosh, M.D., Ph.D.
Project: Recurrent Breast Cancer Preclinical Drug Development

- Led preclinical oncology studies using MTB/TAN bi-transgenic HER2+ mouse models to evaluate therapeutic response and tumor recurrence
- Managed in vivo studies involving >600 mice across 11 transgenic lines to support target validation and efficacy profiling
- Performed RNA-Seq analysis to characterize minimal residual disease and identify prognostic biomarkers in disseminated tumor cells
- Collaborated cross-functionally with molecular biologists and pharmacologists to integrate transcriptomic data with phenotypic drug response

Consultant, PBG Healthcare Consulting – Philadelphia, PA Sep 2018 – Dec 2018
Wharton School of the University of Pennsylvania

- Collaborated with data scientists and medical researchers to optimize drug development pipelines
- Conducted market research and due diligence in partnership with business teams to assess therapeutic positioning
- Designed and distributed a primary research survey, identified key opinion leaders, and conducted interviews to define unmet clinical needs

R&D Intern, Gracomics LLC (Startup), MO Jan 2016 – May 2016
Advisor: Wayne Zhou, Ph.D.
Project: ELISA-based Diagnostic Kit Development

- Contributed to the development of an in-cell ELISA-based diagnostic kit aimed at improving applications in biomedical research and clinical diagnostics
- Gained hands-on experience in tissue culture, western blotting, ELISA, and DAMA staining techniques
- Supported assay optimization efforts to enhance sensitivity and reproducibility of ELISA in cellular contexts

EARLY RESEARCH EXPERIENCE

Undergraduate Research Fellow, Truman State University – Kirksville, MO May 2014 - Dec 2015
Advisor: John Ma, Ph.D.
Project: Effect of Elevated CO_2 on Growth, Biomass Partitioning, and Phosphorus Uptake in Common Bean (Phaseolus Vulgaris) under Varied Nitrogen or Phosphorus Availability

- Investigated the impact of elevated CO_2 on growth, biomass allocation, and phosphorus uptake in Phaseolus vulgaris under varying nitrogen and phosphorus conditions
- Performed phosphatase assays and nutrient uptake experiments to assess physiological responses to environmental changes
- Conducted statistical analyses to identify optimal nutrient regimes for enhanced plant growth
- Designed and executed experiments simulating climate change effects on crop nutrient dynamics
- Awarded the Gerhardt Research Fellowship and Grants-in-Aid of Scholarship and Research, recognizing research excellence and proposal merit

Summer Research Fellow, University of Pennsylvania – Philadelphia, PA May 2013 - August 2013
Advisor: Andy Minn, MD., Ph.D.

Project: Stromal Regulation of Breast Cancer DNA Damage Resistance

- Elucidated a DNA damage resistance mechanism against radiation by activating STAT1 and NOTCH3 due to the interaction between stromal cells and BrCa cells
- Performed tissue culture, siRNA knockdown, flow cytometry, RNA extraction and Q-RT PCR
- Tested Interferon antibody efficiency and analyzed the optimal range of interferon concentration

TEACHING & OUTREACH EXPERIENCE

Program Manager, genPALs and UCI GPS – STEM Data Science Cohort – Irvine, CA Jul 2022 – Jun 2024

- Organized bi-weekly seminars to promote the research in genomics and epigenomics
- Foster connections with invited speakers and industry professionals
- Coordinate with board members to organize professional networking events

Graduate Teaching Assistant, University of California – Irvine, CA Mar 2022 – Mar 2024
Classes: Bio 38: Mind, Memory, and Brain; Bio 48: The Mind-Body Connection in the Neuroscience of Well-Being; N 138: Sex Influences on Brain; NEURBIO 227. Bioinformatics and Systems Biology

- Graded 200+ students' writing assignments, programming tasks and exams
- Facilitated in-class discussion sections and answered students' questions

Cell Biology Teaching Assistant, Truman State University – Kirksville, MO Aug 2013 – Dec 2014

- Collected and analyzed biological data from weekly lab classes and assisted professors in preparing lab materials
- Interpreted research findings from 2 lab sessions per semester and helped students summarize data into reports
- Assisted 100+ students with their lab assignments and verified their operation procedures

Fellowship & Awards

Dunlop School of Biological Sciences Travel Award (2024-2025): University of California Conference Travel Award ($300)

Biological Sciences Travel Award (2023-2024): University of California Conference Travel Award ($300)

Bio2X Outstanding Trainee Award (2021-2022): BlueRun Ventures Winter 2021 - 2022 Bio2X Life Sciences Ideation Fellowship

Cum Laude (2015): Graduating with Honor, TSU

Gerhardt Research Funding (2015): a competitive research award ($3,000)

Grants-in-Aid of Scholarship and Research (GIASR) (2014): a competitive research grant for the initial stage of an individual student research project ($750)

President's Honorary Scholarship (2011-2015): an annual academic achievement scholarship ($4,500), TSU