Zechuan Shi

zechuas@uci.edu | GitHub: https:/github.com/rootze

EDUCATION

Ph.D. Candidate in Bioinformatics Expected Dec 2025
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

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

3. Morabito, S.*, **Shi, Z.***, et al. (2024). In silico module perturbation analysis unlocks a functional understanding of the dynamic gene networks in single-cell data. (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)

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

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. (Accepted in **Nature Genetics**)

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. **BioMed Central 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

- "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**, Devner, CO. Nov 2024. ***Oral 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. July-August 2024. ***Poster Session***
- "Epigenetic dysregulation in Pick's and Alzheimer's disease". **15th Annual Emerging Scientists Symposium**, Irvine, CA. March 2024. ***Poster Session***
- "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. ***Poster Session***
- "Single-nucleus open chromatin accessibility landscape of Pick's and Alzheimer's disease". **Alzheimer's Association International Conference**, San Diego, CA. July-August 2022. ***Oral Session***
- "Effect of Elevated CO2 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. April 2015. ***Poster Session***

RESEARCH EXPERIENCE

Graduate Researcher, University of California – Irvine, CA Sep 2020 – Current
Advisor: Vivek Swarup, Ph.D.

- 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

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

- Managed over 600 mice from 11 transgenic mouse lines
- Conducted 4 different preclinical drug studies of HER2-positive breast cancer on the MTB/TAN bi-transgenic mouse model with a high risk of recurrence
- Performed RNA-Seq analysis to identify the difference of tumor residues from normal cells and find potential prognostic markers for disseminated tumor cells

Undergraduate Research Fellow, Truman State University – Kirksville, MO May 2014 - Dec 2015
Advisor: John Ma, Ph.D.
Project: Effect of Elevated CO2 on Growth, Biomass Partitioning, and Phosphorus Uptake in Common Bean (Phaseolus Vulgaris) under Varied Nitrogen or Phosphorus Availability
Gerhardt Research Fellowship and Grants-in-Aid of Scholarship and Research

- Researched on phosphatase assay and tested plants' nutrient uptake under the change of environment conditions

- Conducted statistics analysis to optimize the growth conditions of Phaseolus Vulgaris under various nutrient availability
- Implemented project about effects of elevated CO2 on the growth of common beans

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

PROFESSIONAL & TEACHING EXPERIENCE

Board 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)

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