Qi, Runyu

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EDUCATION

Ph.D. in Biomedical Engineering *Aug.2025 -*
University of Texas Southwestern Medical Center, TX, United States

M.S. in Material Science and Engineering *Aug.2023 - Dec.2024*
with Computational Science and Engineering Concentration
University of Illinois Urbana-Champaign, IL, United States

B.E. in Material Science and Engineering *Sept.2019 - Jun.2023*
Tsinghua University, Beijing, China

RESEARCH EXPERIENCE

Computational and Experimental Analysis of Retrotransposons

Advisor: Dr. Yejing Ge (UT MDACC) *July. 2024 - Dec. 2024*

- Conducted bioinformatics analyses, including RNAseq, ChIPseq, and ATACseq, to explore retrotransposon function and compared results with lab data.
- Established and improved pipelines, automated scripts, and optimized workflows for high-performance computing clusters.
- Performed wet lab tasks such as cell culture, RNA extraction, and qPCR, enhancing technical skills in both computational and experimental biology.

Deep Learning for Pathway Prediction and GPCRs MD Simulation

Advisor: Dr. Diwakar Shukla (UIUC) *Jan. 2024 - Present*

- Conducted research on allosteric modulation in the Smoothened (SMO) GPCR signaling pathway, integrating computational models with molecular dynamics (MD) simulations to study dynamic behaviors.
- Adapted and re-implemented the Neural Relational Inference for Molecular Dynamics (NRI-MD) model to handle larger, more complex molecular structures, overcoming challenges with outdated Python code.
- Trained and optimized the model on a GPU cluster for efficient processing of complex datasets, enhancing skills in deep learning, molecular biology, and computational techniques.

Metabolic Glycan Engineering & Nanoparticle-Based mRNA Delivery Systems

Advisor: Dr. Hua Wang (UIUC) *Sept. 2023 - Present*

- Engineered metabolic labeling of human Mesenchymal Stem Cells (hMSCs) using azido-sugar and optimized DBCO-molecule conjugation for efficient mRNA nanoparticle delivery.
- Synthesized poly-peptide-based ionizable nanoparticle systems incorporating guanidine-azide molecules, characterized through H-NMR, and evaluated different DBCO-poly-L-lysine conjugations for improved mRNA delivery.
- Fabricated porous alginate hydrogels for dendritic cell recruitment, optimizing porogen bead size via nebulization and validating hydrogels for in situ immune cell modulation.

Surface-Enhanced Raman Spectroscopy and Electrochemical Detection of Energetic Materials
Advisor: Dr. Yunhan Ling (Tsinghua Univ.) *Jan. 2023 - Jun. 2023*

- Developed low-cost, high-performance detection devices for trace detection of energetic molecules using surface-enhanced Raman spectroscopy (SERS) and electrochemical methods.
- Synthesized nanostructured gold and gold-silver composite SERS substrates, employing surface modification and molecular imprinting to improve detection sensitivity.
- Achieved TNT detection at a low concentration (10^{-6} M) and specific quantitative detection of methylene blue and perchlorate. .
- Characterized substrates using scanning electron microscopy (SEM) and assessed performance through electrochemical and Raman spectroscopy measurements.

**See more on my homepage.*

PRESENTATIONS

A Review on PDMS-based Electronic Skin and Self-healing Property
Advisor: Dr. Lilian Hsiao (NC State) *Jul. 2022 - Aug. 2022*

- Conducted an extensive literature review on PDMS and electronic skins, analyzing over 10 research papers. Synthesized findings into an academic poster and delivered a successful video presentation.

AWARDS

The Tsinghua University School Scholarship *2022*
The second prize, 3^{rd} Virtual Simulation Creative Design Competition *2022*
The first prize, 5^{th} Tsinghua Univ. 3D Printing Skills Competition *2021*
The Tsinghua University School Sholarship *2021*
The second prize, 4^{th} Tsinghua Univ. 3D Printing Skills Competition *2020*
National third prize, 32^{th} Chinese Chemistry Olympiad *2018*
National third prize, 27^{th} China National Biology Olympiad *2018*

LEADERSHIP & SERVICE

Member, Tau Beta Pi - Illinois Alpha, UIUC *Apr. 2024*
Captain, Student Network Service Work-study Team, Tsinghua Univ. *Mar. 2021 - Jun. 2023*
President, Future Sci-tech Interests Club, Tsinghua Univ. *Sept. 2022 - Jun. 2023*
Volunteer, Olympic and Paralympic Winter Games, Beijing *Feb. 2022 - Mar. 2022*