

Shi Han

(+86) 185-6826-2841
hanshi1537@mail.ustc.edu.cn

Github: Hanshi-0410
Hans' Homepage

EDUCATION

University of Science and Technology of China (USTC)

Senior Student in Life Science, Division of Life Sciences and Medicine

Overall Weighted Score: 90.39/100

Overall GPA: 3.86/4.3

Ranking: 4/91 (Top 5 Student)

Sept. 2021 — Present

Core Curriculum Weighted Score: 93.8/100

Core Curriculum GPA: 4.10/4.30

Self-Motivated and Optimistic Compute × Bio Student with Dry & Wet Abilities

RESEARCH INTERESTS

- Computational Biology with Deep Learning Methods (e.g. single-cell multi-omic data modeling, metagenomic data exploration)
- Biomolecular Modeling (e.g. protein design and RNA design)

RESEARCH EXPERIENCE

Mapping the Single-cell Chromatin Accessibility Landscape with DNA Large Language Model

Jun. 2024 — Present

Research Intern, Department of Computer Science & Engineering, The Chinese University of Hong Kong (CUHK)

Hong Kong, China

Advisor: Assistant Prof. Yu Li

Role: My independent project

- Explore peak sequence information for scATAC-seq data to infer single-cell chromatin accessibility.
- Use pre-trained sequence embedding from the DNABERT2 model to enhance generalizability and scalability.
- Our model demonstrates superior performance on cross-tissues/species/batches compared to SOTA methods, with the potential to make universal cell embedding for scATAC-seq.

Discovery of Novel Ribozyme in Exotic Metagenome with Rfam and Deep Learning Methods

Mar. 2024 — Present

Research Intern, Department of Computer Science & Engineering, The Chinese University of Hong Kong (CUHK)

Hong Kong, China

Advisor: Assistant Prof. Yu Li

Role: Select and mine all biomedical data

- Propose Rfam and deep learning approaches for scanning metagenomes to discover novel bioactive ribozymes.
- Select large-scale metagenomes from extreme and remote environments with high levels of genome mutation accumulation.
- Develop a comprehensive taxonomy for ncRNAs to reduce classification misunderstandings significantly.
- Our methods identify several promising novel candidate ribozymes for validation through wet-lab experiments.

Innovative Design and Polymerization of Artificial Proteins for High-Performance Homopolymers

May. 2023 — Present

Research Assistant, School of Life Sciences, University of Science and Technology of China (USTC)

Hefei, China

Advisor: Prof. Haiyan Liu and Prof. Quan Chen

Role: My independent project

- Computationally design a monomer protein shaped like a triangle by deep learning.
- Employ the splicing protein intein to polymerize monomers into a polymer effectively.
- Aim to obtain a high molecular weight polymer with superior physical properties.

Design Blood ADP Indicator with Non-canonical Amino Acids Using Deep Learning Methods

Dec. 2023 — Feb. 2024

Research Assistant, Institute of Biophysics, Chinese Academy of Sciences (IBP, CAS)

Beijing, China

Advisor: Prof. Jiangyun Wang

Role: Perform all biomolecular modeling works

- Use RFdiffusion All-Atom to design ADP complementary scaffolds for indicator design.
- Design sequences using ProteinMPNN and insert coumarin-derived amino acids to induce a fluorescence shift upon ADP binding.
- Obtain several highly prospective candidate biosensor sequences for functional validation.

Harnessing Thermotolerant Yeast for High-Efficiency Tagatose Production (20th iGEM)

Jun. 2023 — Nov. 2023

Team Leader, School of Life Sciences, University of Science and Technology of China (USTC)

Hefei, China

Advisor: Associate Prof. Jiong Hong

Role: Lead and guide all team members

- Led the genetic engineering of yeast to construct pathway for tagatose metabolic.
- Successfully utilize a thermotolerant yeast (*Kluyveromyces marxianus*) to achieve high-yield production of tagatose.

Building a Continuous Directed Evolution System in Yeast: The pyEvolvR Platform (3rd iDEC)

Jun. 2023 — Nov. 2023

the Only Team Leader, School of Life Sciences, University of Science and Technology of China (USTC)

Hefei, China

Advisor: Associate Prof. Jiong Hong

Role: Lead whole team accomplish wet-lab works and wiki design

- Design and construct a continuous directed evolutionary system named pyEvolvR in yeast.
- Develop and validate a fluctuation test, confirming the functionality of the continuous directed evolution system.

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Engineering Oleaginous Yeast for Monoterpene Biosynthesis: a Dynamic Cell Factory (19th iGEM)

Jun. 2022 — Oct. 2022

Leading Member, School of Life Sciences, University of Science and Technology of China (USTC)

Hefei, China

Advisor: Associate Prof. Jiong Hong

Role: Core member for biology experiment

- Establish a biosynthetic pathway for three kinds of monoterpene in an oleaginous yeast (*Yarrowia lipolytica*).
- Construct a cyclic monoterpene biosensor for endogenous real-time detection of monoterpene concentration.
- Successfully bio-produce monoterpenes and enable endogenous detection, establishing a cell factory platform.

SKILLS

Programming Skills	C, Python, R, Latex, Markdown, Shell, HTML/CSS, JavaScripts
Software & Tools	Linux, Pytorch, Huggingface Transformers, Scanpy, Anndata, AlphaFold2, RFDiffusion
Wet-lab Abilities	Genetically Engineering in <i>E.coli</i> and Yeast, Protein Engineering
Language	Chinese (native), English (Professional Communication)

AWARDS AND HONORS

- Suzhou Educational Scholarship, USTC (Top 3) Oct. 2023
- Guoyuan Securities Scholarships, GYZQ. Oct. 2023
- 20th International Genetically Engineered Machine (iGEM) Competition - **Silver Medal** Nov. 2023
- 3rd International Directed Evolution Competition - **Science Contribution Award** Oct. 2023
- 9th China University Life Science Competition - **Second Prize in Province (Top 5%)** Aug. 2023
- 14th The Chinese Mathematics Competitions - **Second Prize in Province (Top 30%)** Jan. 2023
- National grants, MOE. Oct. 2022
- National Encouragement Scholarship, MOE. (2 out of 124) Oct. 2022
- Tsang Hin-Chi Educational Foundation 8th Outstanding Student Award Program Oct. 2022
- 19th International Genetically Engineered Machine (iGEM) Competition - **Silver Medal** Oct. 2022

ACTIVITIES

- Undergraduate Teaching Assistant**, University of Science and Technology of China, USTC Microbiology Lecturer: Assistant Prof. Jiong Hong, Prof. Yi Duan and Prof. Xinxing Yang Feb. 2024 — Jun. 2024
- Association Activities**, Bioinsight Association, University of Science and Technology of China, USTC the **President** of the association Jun. 2023 — Jun. 2024
Lead the members to discuss the frontiers of synthetic biology, learn and exchange ideas.
Obtain the **Outstanding Student Cadres in Association Management**.
- Club Activities**, Debate Team, School of Life Science the **Team Leader** of debate team Aug. 2022 — Aug. 2024
Lead our members in debate training and have a lot of fun in the meeting of minds!
- Scientific Research Practice**, Chinese Academic of Science, CAS Jun. 2023 — Aug. 2023
Explore the research practices in Beijing and Shanghai and successfully reproduce the experimental results with the help of graduate students.
- Textbook Author**, Chemical Biology (in Review)
National Planned Textbooks for Undergraduate Programs in General Higher Education during the 14th Five-Year Plan
One of the authors of a textbook for students majoring in chemical biology

COURSES

- Math Course: **Mathematical Analysis B1, B2(91, 90)**, Linear algebra (86), **Probability theory and mathematical statistics B(95)**,
- Biology Course: Mathematical Modeling of Biological Systems (88), **Bioinformatics (93)**, **Cell Biology I (98)**, **Molecular Biology I, II (97, 94)**, General Biology (96), Biochemistry A1 (94), Genetics (91), Physiology (91), Microbiology (98), Frontiers in Life Science I,II (A+,A+), Biochemistry A2 (91), Immunobiology I (88), **Biology Journal Club (97)**
- Chemistry Course: Inorganic Chemistry I (90), Analytical Chemistry I (97), Organic Chemistry B (93), Physical Chemistry B (92),
- Seminar Course: **Biochemistry Seminar (A+)**, **Molecular Biology Seminar (A+)**, **Cell Biology Seminar (A+)**
- Other Course: Optics B (88), Atomic Physics B (95), General Biology Experiments (A+), Experiments of Microbiology (A), Experiments in General Genetics (A), Fundamental Exp.of Biochem.and Molecular Biol. (A), Comprehensive biochemistry and molecular biology experiments (95), Experiment of Organic Chemistry (A), etc.