(+86) 185-6826-2841
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Shi Han

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* *Sept. 2021 — Present*
Overall Weighted Score: **90.39/100** Core Curriculum Weighted Score: **93.8/100**
Overall GPA: **3.86/4.3** Core Curriculum GPA: **4.10/4.30**
Ranking: 4/91 (**Top 5 Student**)

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 *E.coli* 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 Couse: 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.