

# Qiu Chenghao

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## EDUCATION

### Tianjin University

09/2021-06/2025

Bachelor of Engineering in Computer Science and Technology GPA: 3.76/4 Ranking: 3/53

#### Honors:

- National Gold Award in Synthetic Biology Innovation Competition
- National Silver Award in Protein Design Challenge, Synthetic Biology Innovation Competition
- School-level Project, National College Students Innovation and Entrepreneurship Competition
- Merit Student of School of Future Technology, Tianjin University
- Third Prize of the "Next 30 years" Innovation Contest, School of Future Technology, Tianjin University
- Third Prize of the "Next 30 years" Innovation Contest, School of Chemical Engineering and Technology, Tianjin University
- Second Prize of 2024 Tianjin University 17<sup>th</sup> Challenge Cup National College Students' Extracurricular Academic Science and Technology Contest
- Second Prize of 2023 Tianjin University 16<sup>th</sup> Challenge Cup National College Students' Extracurricular Academic Science and Technology Contest
- Second Prize of 2022 Tianjin University 15<sup>th</sup> Challenge Cup National College Students' Extracurricular Academic Science and Technology Contest

## ACADEMIC PROJECTS

### Making Genomic Foundation Models more Foundational Requires Outlier

04/2024-Now

#### Removal: A Case Study on DNABERT-2

Research Assistant | Advisor: Han Liu | Northwestern University

- Developed **GERM (GE**nomi**c adapt-Robust Model)**, a robust genome foundation model built upon DNABERT-2, addressing the deployment on computational-resource-limited devices through the application of Quantization, a model compression technique that converts the weights and activations within DNABERT-2 from a high-precision data representation to a lower-precision data representation;
- Introduced **OutEffHop layer** ([Jerry Yao-Chieh Hu 2024](#)) to replace the Transformer attention mechanism, mitigating outlier emergence within Q-DNABERT and enabling rapid low-rank adaptation and robust post-training quantization;
- Demonstrated 38% and 68% average improvements by Accuracy metric compared with DNABERT-2 for fine-tuning and quantization, respectively, through benchmarking against state-of-the-art low-rank adaptation methods (such as LoRA, QLoRA, LoftQ) and post-training quantization techniques (including W8A8, Outlier Suppression, SmoothQuant, OmniQuant);
- Implemented and open-sourced adaptations of Outlier Suppression, SmoothQuant, and OmniQuant for the BERT series to promote advancements in the field;
- Outcomes: Co-first** author under review by **AISTATS 2025**.

### The Third National Synthetic Biology Innovation Competition

01/2024-08/2024

Competitor | Adviser: Qi, Haishan | Tianjin University

- Introduced ProteinBERT-Fluorescence, a protein foundation model optimized for fluorescence intensity score prediction, which enables efficient training and inference with limited resources, offering new insights for fluorescent protein design;
- Developed a data filtering methodology that leverages sequence length and scoring criteria to eliminate outliers and select data most pertinent to the target protein, which reducing the original dataset size from 200,000 to 45,000, achieving a 5-fold compression. This optimization enabled efficient fine-tuning in CPU-only environments;
- Based on the selection of the most probable mutation sites by Random Forest and literature analysis, the ProteinBERT-Fluorescence model is able to predict fluorescence intensity scores with an accuracy of

90%, allowing for a 10% margin of error;

- Demonstrated significant reduction in workload of wet lab experiments through the high accuracy and excellent usability of the ProteinBERT-Fluorescence model, resulting in cost savings in both time and finances.
- Achieved **Silver Award** in Protein Design Challenge, and **Gold Award** in Synthetic Biology Innovation Competition.

**National College Students Innovation and Entrepreneurship Project: Collection and Analysis of Electrophysiological Data Leveraging Edge Cloud Computing** **04/2023-05/2024**

*Research Assistant | Adviser: Tang, Shanjiang | Tianjin University*

- **Objective:** To develop an edge-cloud collaborative platform for the extensive acquisition and computation of neurophysiological signals, aiming at real-time collection of multimodal high-throughput neurophysiological signals, secure transmission, efficient storage, rapid retrieval, and edge-cloud collaborative computing.
- **In progress:** Developed a data acquisition classification system to process electrophysiological signals like EEG, ECoG, and ECG; Created a function toolkit for multimodal neurophysiological signal data based on extant literature and open-source programs such as MNE, MetaBCI, Brainflow, and Brainda; Proposed a method for data storage tailored for massive neurophysiological signals based on HDFS and Alluxio; Implemented a distributed electrophysiological signal query system based on Apache Spark, enabling efficient retrieval of petabyte-scale data.

**A Novel Biomimetic Robotic Arm Based on Topological Origami and Hyperboloid Mechanism** **04/2023-06/2023**

*Workshop | Adviser: Li, Junlan | Tianjin University*

- Employed the ESP32 single-chip microcontroller and Arduino to develop the core program of the robotic arm, enabling both individual and grouped manipulation of four servos;
- Mastered the BLE protocol, and scripted a program to establish Bluetooth connections, transmit, and receive data;
- Developed an interactive App based on Bluetooth debugger for mobile devices to send commands to the ESP32;
- Conducted tests to validate the proper functioning of Bluetooth communication and control features.

**Automatic Guided Vehicle (AGV)** **09/2021-12/2021**

*Coursework | Tianjin University*

- Developed the core program based on Arduino to implement the main functions of intelligent trajectory, autonomous placement, and speed control;
- Participated in the installation of AGV and performed motion analysis using SolidWorks.

**ACADEMIC COMPETITIONS**

**2024 Tianjin University 17th Challenge Cup National College Students' Extracurricular Academic Science and Technology Contest** **03/2024-05/2024**

**"CityClean Guardian" High-Altitude Glass Curtain Wall Cleaning Robot**

**"CityClean Guardian" High-Altitude Glass Curtain Wall Cleaning Robot**

- **Objective:** Developing an efficient and intelligent high-altitude glass curtain wall cleaning robot equipped with advanced wall-climbing capabilities, enabling automated cleaning of high-rise structures.
- Assisted in building the remote control system, designing and optimizing the UI operation interface to ensure intuitive and easy operation, allowing operators to remotely monitor and control the robot's cleaning activities from an office setting.

**2023 Tianjin University 16th Challenge Cup National College Students' Extracurricular Academic Science and Technology Contest** **03/2023-04/2023**

**Business proposal of an intelligent sterilizer**

**Business proposal of an intelligent sterilizer**

- **Objective:** Developing an intelligent device that integrates disinfection, sterilization, and air purification, achieving rapid and comprehensive disinfection of indoor environments. This innovation aims to enhance disinfection efficiency, reduce labor costs, and provide robust support for epidemic

prevention and control efforts.

- Introduced the fuzzy PID control algorithm on top of studying the traditional PID control algorithm, enhancing navigation deviation correction performance;
- Wrote driver programs with STM32CubeIDE to communicate with sensors and actuators, and develop control logic to automate tasks based on sensor data.

**2022 Tianjin University 15th Challenge Cup National College Students'**

**02/2022-06/2022**

**Extracurricular Academic Science and Technology Contest**

**Intelligent Unmanned Surface Vessel with Stratified Intake Structure**

- **Objective:** Developing a small, lightweight, and long-endurance intelligent unmanned water sampling vessel implementing autonomous navigation, automatic water sampling, real-time water quality monitoring, and other functions.
- Leveraged Raspberry Pi and Python library OpenCV to realize real-time camera capture;
- Designed video surveillance components by SolidWorks.

## **SKILLS**

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- **Programming Languages:** Proficient in Python.
- **Deep Learning:** Familiar with Deep Learning frameworks and concepts, including PyTorch programming and Transformer based models.
- **Development Tools:** Skilled in using VScode, PyCharm, Anaconda, Git, Linux, SLURM, Docker, VMware, and WSL.