

# RENYUAN LIU

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## EDUCATION

- **Guangzhou University** Sept. 2022 - Jun. 2026 (Expected)  
B.Eng. in Computer Science (Information Security); **GPA: 90.13/100.00**; **Ranking: Top 10%**  
**Curriculum:** Machine Learning 100\*, Data Structure and Algorithm Laboratory 99\*, Operating System 98\* (Course Project 95\*), Programming Practice 98\*, Data Structure and Algorithm 97\*, Programming Laboratory I 95\*, Computer Network (Course Project 95\*), Principles of Computer Composition, Higher Mathematics, Discrete Mathematics, Linear Algebra, Probability and Mathematical Statistics (\*: rank 1st in all students of the course).
- **The University of Hong Kong/University of Macau** (Summer Camp) Nov. 2023  
**GPA: 97.50/100.00** (Interdisciplinary Programme)  
**Honor:** Commendation Letter for Outstanding Performance in the Winning Team

## ACADEMIC PUBLICATIONS

- **R. Liu** and Q. Fu, **Attention-Driven LPLC2 Neural Ensemble Model for Multi-Target Looming Detection and Localization**. *Accepted at 2025 International Joint Conference on Neural Networks*.
- G. Gao, **R. Liu**, M. Wang and Q. Fu, **A Computationally Efficient Neuronal Model for Collision Detection With Contrast Polarity-Specific Feed-Forward Inhibition**. *Biomimetics*, vol. 9, no. 11, p. 650, 2024.

## HONORS AND AWARDS

- **Honorable Mention**, Mathematical Contest in Modeling (MCM) Jan. 2025
- **National First Prize (Top 5%)**, Asia and Pacific Mathematical Contest in Modeling (APMCM) Nov. 2024
- **Provincial First Prize & Innovation Silver Award (Top 2 out of 1,167 Teams)**,  
“Greater Bay Area Cup” Guangdong-Hong Kong-Macao Financial Mathematics Modeling Competition Nov. 2024
- **The Third-Class Scholarship (Top 12%)**, *Guangzhou University* Nov. 2024
- **The First-Class Scholarship (Top 5%)**, *Guangzhou University* Nov. 2023

## RESEARCH EXPERIENCE

*Machine Life and Intelligence Research Centre, Guangzhou University.* Advisor: Prof. Qinbing Fu

- **Real-time Visual Processing Systems Development of Micro-Mobile Robot** Sept. 2023 - Present
  - Deployed visual neural network models inspired by insect neurons onto the **STM32-based micro-robot *Colias***, achieving real-time collision perception and avoidance.
  - Optimized model memory usage to fit within the **62 KByte** SRAM capacity of *Colias*; developed and refined algorithms to enable real-time execution under extreme computational constraints (processing time < **33 ms** on the STM32F427 chip); performed debugging, tuning, and conducted both offline and online experiments.
  - Selected code can be accessed below:  
**Fly Visuomotor-Inspired Attention-LPLC2 Model (independently, 2k lines of code in C);**  
**Locust Vision-Inspired Optimized-LGMD Model (independently, 1k lines of code in C).**
- **Attention-Driven LPLC2 Neural Ensemble Model for Multi-Target Looming Detection and Localization**, paper accepted at IJCNN, *first author*. Jul. 2024 - Nov. 2024
  - Conducted full-cycle research on modeling the lobula plate/lobula columnar type 2 (LPLC2) neural ensemble in the fruit fly *Drosophila*, known for its ultra-selectivity to looming stimuli.

- Developed the multi-attention LPLC2 (mLPLC2) neural network model inspired by the visual system of the fly by leveraging a bottom-up attention mechanism driven by motion-sensitive neural pathways (**independently, 3k lines of code in C/C++**).
- Our current work focus on implementing mLPLC2 model into the embedded visual-perceptual and motion-control system of the micro robot *Colias* in real world.
- **A Computationally Efficient Neuronal Model for Collision Detection with Contrast Polarity-Specific Feed-Forward Inhibition**, article published at *Biomimetics*, *second author*. Mar. 2024 - Jul. 2024
  - Participated in the entire research on modeling the optimized locust lobula giant movement detector neuron with detailed feed-forward inhibition (oLGMD) to enhance processing speed and the robustness towards translating movement.
  - Implemented the oLGMD model into the embedded system of *Colias*, and conducted closed-loop arena comparative experiments to evaluate the performance of oLGMD, achieving the highest success ratio of collision avoidance at 97.51% while nearly halving the processing time compared with previous LGMD models; conducted all online comparison experiments of this paper, analyzing the results using real-world data collected by the *Colias* robot; designed criteria to assess time efficiency and collision selectivity.
  - Led the initial writing of the paper; participated in revising the submitted paper.
- **Other Research Activities on Computational Neuroscience and Robotics** Mar. 2023 - Present
  - Reading and giving reports of research articles during research seminars on a weekly basis.
  - **Provincial Key** College Students' Innovative Entrepreneurial Training Plan Program: Bio-Inspired LGMD Collision Detection Model Leveraging Optical Flow and Learning-Based Optimization.
  - Modeled self-inhibition in neural networks for collision perception against translating motion; developed neuro-morphic binocular models for collision prediction which combines directional and depth motion cues; optimized directional-selective neuron parameters using a genetic algorithm; collected a stereo RGB-D dataset capturing diverse indoor-outdoor collision scenarios to support model training and evaluation; conducted collision avoidance experiments on the *Colias* and *TurtleBot* robots.
  - Designed detailed figures illustrating the models and experiments; drafted manuscript introductions, and contributed to manuscript revisions. **Three manuscripts of the above works are under review.**

## SKILLS

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- **Language:** IELTS 6.5 (R8.0, L6.5, W6.0, S5.5), CET-6 564
- **Programming Skills:** C/C++, Python, Matlab, Webots, STM32-Chip Robot Development

Hobbies: Movie, Music, Photography, Basketball, Jogging, Badminton, Hiking.