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 International Joint Conference on Neural Networks (CCF-C, acceptance rate ≈ 38%).*
- 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 (JCR Q1).*
- J. Huang*, Z. Qin, M. Wang, **R Liu**, and Q. Fu*, A Biomimetic Collision Detection Visual Neural Model Coordinating Self-and-Lateral Inhibitions. *Accepted at the 14th International Conference on Biomimetic and Biohybrid Systems (Living Machines 2025).*

MANUSCRIPTS UNDER REVIEW

- M. Wang*, **R. Liu***, W. He, and Q. Fu, A neuronal assembly model with elevated time derivative boosts loom-selectivity. *Submitted to PeerJ Computer Science (JCR Q1).*
- C. Fang*, H. Zhou, **R. Liu**, and Q. Fu*, A neuromorphic binocular framework fusing directional and depth motion cues towards precise collision prediction. *Submitted to Neurocomputing (JCR Q1).*
- H. Zhou, C. Fang, **R. Liu**, and Q. Fu, A bio-plausible neural network integrating motion and disparity pathways for looming perception. *Submitted to Acta Electronica Sinica (CCF-A, in Chinese).*

HONORS AND AWARDS

- **Provincial First Prize**, Chinese Collegiate Computing Competition May 2025
- **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)**, Nov. 2024
  "Greater Bay Area Cup" Guangdong-Hong Kong-Macao Financial Mathematics Modeling Competition
- **The Third-Class Scholarship (Top 12%)**, *Guangzhou University* Nov. 2024
- **The First-Class Scholarship (Top 5%)**, *Guangzhou University* Nov. 2023

SKILLS

- **Language: IELTS 6.5** (R8.0, L6.5, W6.0, S5.5), **CET-6 564** (242/248.5 in the reading section)
- **Programming Skills:** C/C++, Python, Matlab, Webots, STM32-Chip Robot Development

RESEARCH EXPERIENCE

Machine Life and Intelligence Research Centre Advisor: Prof. Qinbing Fu
School of Mathematics and Information Sciences, Guangzhou University, Guangzhou, China

- **Real-time Visual Processing Systems Development of Micro-Mobile Robot** Mar. 2023 – Present
  - Reading and giving reports of research articles during research seminars on a weekly basis.
  - 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.
  - **A poster** illustrating a fly-inspired closed-loop visual-perception and motion-control system for the micro-robot *Colias* has been submitted to *the 26th Towards Autonomous Robotic Systems (TAROS 2025) Conference*.
  - 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 2025, 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++**).
- **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.
- **Bio-Inspired LGMD Collision Detection Model Leveraging Optical Flow and Learning-Based Optimization**, **Provincial Key** *College Students' Innovative Entrepreneurial Training Plan Program*. May 2024 – Present
  - Developed neuromorphic 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 experiment on the *TurtleBot* robot.
  - Designed detailed figures illustrating the models and experiments; drafted manuscript introductions, and contributed to manuscript revisions.

Computational Autonomous Learning Systems Lab Advisor: Prof. Pengcheng Liu
Department of Computer Science, University of York, York, UK (On-site) Jun. 2025 – Aug. 2025 (Expected)

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