

# RENYUAN LIU

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## EDUCATION

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- **Guangzhou University** Sept. 2022 – Jun. 2026 (Expected)  
B.Eng. in Computer Science (Information Security); **GPA: 89.81/100.00**; **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

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- **R. Liu** and Q. Fu, Attention-Driven LPLC2 Neural Ensemble Model for Multi-Target Looming Detection and Localization. *The 2025 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, IF = 3.9)*.
- C. Fang\*, H. Zhou, **R. Liu**, and Q. Fu\*, A Neuromorphic Binocular Framework Fusing Directional and Depth Motion Cues Towards Precise Collision Prediction. *Accepted at Neurocomputing (JCR Q1, CCF-C, IF = 6.5)*.
- H. Zhou, C. Fang, **R. Liu**, and Q. Fu, A Bio-Plausible Neural Network Integrating Motion and Disparity Pathways for Looming Perception. *Accepted at Acta Electronica Sinica (CCF-A in Chinese Category)*.
- J. Huang\*, Z. Qin, M. Wang, **R. Liu**, and Q. Fu\*, A Biomimetic Collision Detection Visual Neural Model Coordinating Self-and-Lateral Inhibitions. *The 14th International Conference on Biomimetic and Biohybrid Systems*.

## MANUSCRIPTS UNDER REVIEW

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- **R. Liu**, H. Zhou, C. Fang and Q. Fu, How Fly Neural Perception Mechanisms Enhance Visuomotor Control of Micro Robots. *Submitted to 2026 International Conference on Robotics and Automation (ICRA, CCF-B)*.
- 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*.

## HONORS AND AWARDS

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- **First Prize (Provincial)**, Chinese Collegiate Computing Competition (4C) May 2025
- **Honorable Mention (International)**, Mathematical Contest in Modeling (MCM) Jan. 2025
- **First Prize (National; Top 5%)**, Asia and Pacific Mathematical Contest in Modeling (APMCM) Nov. 2024
- **First Prize & Innovation Silver Award (Provincial; Top 2 out of 1,167 Teams)**,  
“Greater Bay Area Cup” Guangdong-Hong Kong-Macao Financial Mathematics Modeling Competition Nov. 2024
- **Third-Class Scholarship (Top 12%)**, *Guangzhou University* Nov. 2024
- **First-Class Scholarship (Top 5%)**, *Guangzhou University* Nov. 2023

## SKILLS

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- **Language:** IELTS 6.5 (R8.0, L6.5, W6.0, S5.5), CET-6 564 (R242/248.5)
- **Programming Skills:** C/C++, Python, Matlab, ROS, Webots, STM32-Chip Robot Development

## RESEARCH EXPERIENCE

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**Computational Autonomous Learning Systems Lab** Advisor: Prof. Pengcheng Liu  
Department of Computer Science, University of York, York, UK (On-Site)

- **Biologically Plausible Mechanisms for Long-Term Motion Learning.** Jun. 2025 – Sept. 2025
  - **Robotic arm motion planning:** Learned expert-guided trajectory optimization via Learning from Demonstration (**LfD**) and applied biologically inspired probabilistic movement primitives (**ProMPs**) for push-grasping with the *Franka Emika Panda*.
  - **Navigation and manipulation:** Working on developing a **lifelong learning** navigation-manipulation system on *TurtleBot 3* with *OpenMANIPULATOR-X* that adapts to new environments while **retaining** performance in previously learned ones.

**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
  - 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.
  - **Fly-Inspired Ultra-selective Looming Perception and Avoidance on Resource-Constrained Micro-Robots**, poster presentation at *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 robustness.
  - Implemented the oLGMD model into the embedded system of *Colias*, and conducted closed-loop arena comparative experiments, achieving the highest success ratio of collision avoidance at **97.51%** while nearly **halving** the processing time compared with previous LGMD models; 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 Method, 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 stereo and RGB-D datasets across varied indoor-outdoor collision scenarios for model training and evaluation. conducted collision avoidance experiment on the *TurtleBot 4* robot.
  - Designed detailed figures illustrating the models and experiments; drafted manuscripts introductions, and contributed to manuscripts revisions.