Xiaozhu Lin

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EDUCATION

ShanghaiTech University [Link] *Shanghai, China*

- Ph.D. in Computer Science and Technology (GPA 3.55) *Sept. 2021 - Present*
- School of Information Science and Technology (SIST)

China Jiliang University (CJLU) [Link] *Hangzhou, China*

- B.Eng. in Electronic Science and Technology (GPA 3.78) *Sept. 2017 - Jun. 2021*
- School of Optics and Electronics Technology (SOET)

RESEARCH INTERESTS

Sim-to-Real, Bio-inspired Robotics, Fluid-interactive Robotics, Fluid Dynamics, Learning-based Control, Ethology, Biomechanics, Reinforcement Learning, Imitation Learning, Data-driven Modeling, Active Flow Control, Multi-Agent Control, Collective Behavior, Human-Computer Interaction, Aerodynamic Effects.

PUBLICATIONS

(Notation: * for equal contribution)

Journal

- **Xiaozhu Lin**, Xiaopei Liu, Yang Wang. *Learning Agile Swimming: An End-to-End Approach Without CPGs*. IEEE Robotics and Automation Letters (RA-L), 2025. [arXiv] [Paper] [Video]

Conference

- Kaitian Chao*, **Xiaozhu Lin***, Xiaopei Liu, Yang Wang. *Learning Flow-Adaptive Dynamic Model for Robotic Fish Swimming in Unknown Background Flow*. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025. **In Press**
- Hongru Dai*, **Xiaozhu Lin***, Kaitian Chao, Yang Wang. *Ambient Flow Perception of Freely Swimming Robotic Fish using an Artificial Lateral Line System*. IEEE International Conference on Robotics and Automation (ICRA), 2025. **In Press**
- **Xiaozhu Lin**, Song Liu, Chengyuan Liu, Yang Wang. *Dynamic Modeling of Robotic Fish considering Background Flow using Koopman Operators*. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024. [Paper] [Video]
- **Xiaozhu Lin**, Wenbin Song, Xiaopei Liu, Xuming He, Yang Wang. *Exploring Learning-based Control Policy for Fish-like Robots in Altered Background Flows*. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023. [Paper] [Video]
- **Xiaozhu Lin**, Xianglong Tan, Longchuan Wang, Andre Rosendo. *3D Printed Optimization: Bayesian Neural Network Trade-Off between Cost and Load-Bearing*. IEEE International Conference on Robotics and Biomimetics (ROBIO), 2021. [Paper]

RESEARCH EXPERIENCE

MAgIC Lab, ShanghaiTech University [Link] *May. 2022 - Present*

- Lab Robotic Fish Group Creator & Leader, supervised by Prof. Yang Wang.
- I focus on breaking through the **agility** and **flow adaptability** of physical robotic fish under complex flow environments and revealing the underlying **bio-mechanisms** by leveraging CFD and learning-based methods.
- I create a series of robotic fish prototypes, such as ***Brizo***, ***Mish*** and ***Aish***, and an underwater platform ***Oceanus***, which can support the study of AUVs in various background flows as like as outdoor environment.

LIMA Lab, ShanghaiTech University [Link][Media] *Aug. 2021 - Apr. 2022*

- Student Researcher, supervised by Prof. Andre Rosendo.
- I focus on the 3D printed **structures optimization** using Bayesian Optimization (BO), and the inverted pendulum swing-up problem based on RL, especially in the **sim-to-real transfer** of trained policy.

Advanced Technology Research Institute, Zhejiang University *Mar. 2021 - May. 2021*

- Internship, supervised by Prof. Xinglin Sun.
- I participate in the development of embedded software for large sensor acquisition and integration module.

Machine Vision Processing Lab, China Jiliang University *Jan. 2018 - Sept. 2020*

- Research Assistant, supervised by Prof. Jun Ni.
- I participated in various industrial computer vision projects related to **3D reconstruction** and **defect detection** of fiber optic plug end faces, based on **Optical Interference** and Deep Learning.

***CYBER* Smart Car Lab, China Jiliang University** [Media] *Jan. 2018 - Sept. 2020*

- Student Manager & Technical Director, supervised by Prof. Dongxiao Chen.
- I create a 1/20 scale car model **from scratch** and designed various embedded algorithms to enable the car to racing on various road types **automatically** at speed exceeding **3m/s** with time-minimum goal. [Video]

HONORS & AWARDS (Selected)

- Merit Student Award (5%), ShanghaiTech University *Dec. 2024*
- **Zhejiang Province Outstanding Graduates Award (< 1%), CJLU** *May. 2021*
- China Jiliang University Outstanding Graduates Award (< 1%), CJLU *May. 2021*
- Top Ten Student Award (< 1%, only ten persons per year), CJLU *Dec. 2020*
- *Star of Optics and Electronics* Award (< 3%), CJLU [Link] *Dec. 2020*
- **National Scholarship (0.2%, highest level in China), CJLU** [Link] *Dec. 2019*
- Supmea Scholarship (< 3%), CJLU *Dec. 2019*
- **Zhejiang Province Government Scholarship (< 1%), CJLU** *Dec. 2018*
- TOSPO Innovation Scholarship (< 3%), CJLU *Dec. 2018*

COMPETITIONS (Selected)

- 3rd Prize @ 2022 DJI RoboMaster University AI Challenge [Link] [Video] *Apr. 2022*
- **1st Prize @ 15th National Undergraduate Smart Car Contest** [Video] *Aug. 2020*
- **2nd Prize @ 2019 National Undergraduate Electronic Design Contest** *Aug. 2019*
- 2nd Prize @ 9th Zhejiang Province Undergraduate Physics Innovation Contest *Dec. 2018*
- 3rd Prize @ 7th Zhejiang Province Undergraduate Electronic Design Contest *Aug. 2018*

PROJECTS (Selected)

Brizo: An Open-Source Robotic Fish Specially for Agile Swimming Learning *Sept. 2024 – Present*

- Developed an open-sourced and easily replicable robotic fish for agile swimming, dedicated to promoting the reproducibility of research related to robotic fish and facilitating rapid community development.

Learning for Position Holding in Real World Unknown Background Flow *Sept. 2023 – Present*

- Propose a learning-based framework to enable high-fidelity sim-to-real transfer of flow swim policy, and achieved for the first time the position holding of robotic fish under background flow with unknown flow velocity.

Flow-Adaptive Dynamics of Robotic Fish in Unknown Background Flow *Jan. 2024 – Sept. 2024*

- Proposed to leverage the Domain Adversarial Invariant Meta-learning (DAIML) to obtain adaptive and accurate dynamics for robotic fish in unknown background flow environments without the need for additional sensor.

Background Flow Perception for Free Swimming Robotic Fish using ALLS *Jan. 2024 – Sept. 2024*

- Developed a robotic fish with an Artificial Edge Line System (ALLS) and achieved recognition of ambient flow velocity for freely swimming robotic fish using LSTM, providing a foundation for outdoor control.

Learning Agile Swimming: An End-to-End Approach Without CPGs *Mar. 2024 – Jul. 2024*

- Proposed a model-free and shape-agnostic framework using RL and CFD simulator, and achieved agile swimming of robotic fish. And the framework can be easily extended to other fluid interaction robots. [Video]

Flow-Aware Modeling of Robotic Fish using Koopman Operator *Apr. 2023 – Sept. 2023*

- Proposed the Flow-Aware Robotic fish Model (FARM) and captured dynamics of robotic fish under background flow as a linear approximation using Extended Dynamic Mode Decomposition (EDMD). [Video]

Learning to Fold a Towel by One Hour Trial in Real World *Apr. 2023 – Jun. 2023*

- Achieved towels folding of robot arm by utilizing off-line RL offline without the simulator. [Report] [Video]

Exploring Learning-based Control for Robotic Fish in Background Flow *Jun. 2022 – Mar. 2023*

- Proposed RL-based framework that combines flow velocity estimator, achieved path following of robotic fish under altered flow in CFD simulator and observed the biological similar rheotaxis behavior. [Video]

Learning Inverted Pendulum Control with Sim-to-Real Transfer *Sept. 2021 – Mar. 2022*

- Achieved the sim-to-real transfer of trained policy by leveraging the re-designed state representation. [Video]

Flight Control Algorithm for Quadrotors Based on Cascade PID *Nov. 2019 – Jun. 2020*

- Built a quadrotor from scratch using STM32 and developed flight algorithms based on cascaded PID. [Video]

ACADEMIC & TEACHING SERVICE

Conference Reviewer

- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)

Teaching Assistant

- 2024 Spring EE160: Introduction to Control [Link]
- 2022 Fall SMRT1113: Internet of Things and Product Design [Link]

SKILLS

- DeepLabCut, Python, ROS, C, C++, MATLAB, PyTorch, MuJoCo, PyBullet, OpenAI Gym, NumPy, Yolov3, OpenCV.
- CAN, Waterproof, ESP32, MQTT, Arduino, MSP430, STM32, Keil, Fusion 360, SolidWorks, Altium Designer, 3D Printing, Soldering.
- Mandarin (native), English (fluent).