Qingbiao **Li**

E11-4065, Faculty of Science and Technology, University of Macau, Avenida da Universidade, Taipa, Macau , P.R. Chna

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Work Experience

Assistant Professor *Macao, P.R China*

Faculty of Science and Technology, University of Macau *Aug 2024 - Present*

Research Direction: 1) Robot Learning for multi-robot and multi agent coordination, LLMs-based autonomous agent;

2) Machine Learning for intra-operative imaging for surgical robotics, medical imaging and diagnosis.

Postdoctoral Researcher for RAILS *Oxford, UK*

Oxford Robotics Institute (Supervisor: Dr Lars Kunze) *Feb 2023 - May 2024*

Focus on investigating causal inference for corner case generation for autonomous driving.

Research Intern in Project Silica *Cambridge, UK*

Microsoft Research Cambridge (Supervisor: Dr Ioan Stefanovici & Dr Katja Hofmann) *July 2021 - Oct 2021*

Explore explainable RL-based approaches to scheduling in the Silica glass library, towards a scheduler for production deployment.

Education

University of Cambridge *Cambridge, UK*

PhD in Computer Science (Supervisor: **Prof Amanda Prorok**) *Oct 2018 - Dec 2022*

- **Research Interest**: Robot Learning, Multi-robot Path Planning, On-device Learning, Graph Neural Networks (GNNs), Imitation Learning, Reinforcement Learning and Computer Vision (Medical Imaging).
- **Programming Languages**: Python, PyTorch, Tensorflow, PyTorch Geometric, Jax, Jraph, Deep Graph Library, C++.
- **Framework and Simulator**: Unity ML-Agent, Pybullet, Mujoco, Gazebo, AWS Robomaker, RLlib, ROS2 and ROS.

Imperial College London *London, UK*

MRes Medical Robotics and Image Guided Intervention (Distinction) *Oct 2017 - Sep 2018*

- **Master Thesis** (Supervisor: **Prof Daniel Elson**): Developed a tissue oxygenation monitoring technique using mulispectral imaging and conditional generative adversarial networks (cGANs)

The University of Edinburgh *Edinburgh, UK*

M. Eng (Hons) Mechanical Engineering (Thesis Supervisor: **Dr Filipe Teixeira-Dias**) *Sep 2013 - June 2016*

- **MEng Thesis**: Missile impact on snow inspried by British Antarctic Survey's project.

South China University of Technology *Guangzhou, China*

B. Eng. Mechanical Engineering and Automation *Sep 2011 - July 2013*

Research Experience

Robotics

Graph Neural Networks for Decentralized Multi-robot Path Planning *Cambridge, UK*

Prorok Lab, University of Cambridge (Supervisor: Dr Amanda Prorok) *Oct 2018 - Dec 2022*

- The **first** to use graph neural networks (GNNs) for explicit communication between a cooperative multirobot team for motion planning.
- Efficient, collision-free navigation for thousands of agents, using our Message-Aware Graph Attention Networks (MA-GATs): **video**
- Sim2Real for reinforcement learning to navigate robot team through a narrow passage in continous motion: **video**

Research Assistant in Bipedal Walking of Humanoid Robot *Edinburgh, UK*

SLMC, The University of Edinburgh (Supervisors: Dr Zhibin Li & Prof Sethu Vijayakumar) *Sep 2016 - June 2017*

- Robust control for bipedal locomotion using online Tikhonov regularisation: **video**.

Computer Vision (Medical Imaging)

Real-time Surgical Environment Enhancement for Robot-Assisted MIS *London, UK*

Hamlyn Centre, Imperial College London (Supervisor: Dr Benny Lo) *Mar 2020 - Sep 2020*

- Multi-scale super-resolution Generative Adversarial Network (GAN) for Robot-Assisted Minimally Invasive Surgery.
- Co-supervised Master student, provided academic guidance, revised paper and iterated it as ICRA 2021 paper:**video**

Vision-based Navigation in Flexible Endoscopy *London, UK*

Hamlyn Centre, Imperial College London (Supervisor: Dr George Mylonas) *Sep 2017 - Dec 2017*

- Customised multiple visual-inertial SLAM methods for endoscope use within the human body: **video**.

Publications

Journal Articles

Bo Lu, Tiancheng Zhou, **Qingbiao Li**, Bin Li, Jiewen Lai, Yu Wang, Yunhui Liu, Lining Sun, Peng Qi. MIGUEL-Net: A Monocular Image-Guided Depth Localization Network for Robotic Navigation in Endoscopic Submucosal Dissection *IEEE Transactions on Medical Imaging* ***(JCR Q1, IF 8.9)*** (Under Review). Elsevier, 2024

Kangyu Ji, Weizhe Lin, Yuqi Sun, Lin-Song Cui, Javad Shamsi, Yu-Hsien Chiang, Jiawei Chen, Elizabeth M Tennyson, Linjie Dai, **Qingbiao Li**, Kyle Frohna, Miguel Anaya, Neil C. Greenham, Samuel D. Stranks. Self-supervised deep learning for tracking degradation of perovskite light-emitting diodes with multispectral imaging *Nature Machine Intelligence* ***(JCR Q1, IF 23.8)*** pp. 1–11. Nature Publishing Group UK London, 2023

Linhan Yang, Bidan Huang, **Qingbiao Li**, Ya-Yen Tsai, Wang Wei Lee, Chaoyang Song, Jia Pan. TacGNN: Learning Tactile-based In-hand Manipulation with a Blind Robot using Hierarchical Graph Neural Network *IEEE Robotics and Automation Letters* ***(JCR Q2, IF 5.2)***. IEEE, 2023

Jiajun Cao∗, **Qingbiao Li**∗, Liping Xu, Rui Yang, Yuejin Dai. "Non-Parametric Surrogate Model Method Based on Machine Learning With Application on Low-Pressure Steam Turbine Exhaust System," *Journal of the Global Power and Propulsion Society (****JCR Q3, IF 1.209****)*. 2021. **PDF**

Qingbiao Li, Weizhe Lin, Zhe Liu, Amanda Prorok. "Message-Aware Graph Attention Networks for Large-Scale Multi-Robot Path Planning," *IEEE Robotics and Automation Letters* ***(JCR Q2, IF 5.2)***. 2020. **PDF**

Fernando Gama, **Qingbiao Li**, Ekaterina Tolstaya, Amanda Prorok, Alejandro Ribeiro. "Synthesizing Decentralized Controllers with Graph Neural Networks and Imitation Learning," *IEEE Transactions on Signal Processing* ***(JCR Q1, IF 5.4)***. 2022. **PDF**

Binyu Wang, Zhe Liu, **Qingbiao Li**, Amanda Prorok. "Mobile Robot Path Planning in Dynamic Environments through Globally Guided Reinforcement Learning," *IEEE Robotics and Automation Letters* ***(JCR Q2, IF 5.2)*** pp. 6932–6939. 2020. **PDF**

Weizhe Lin, Indigo Orton, **Qingbiao Li**, Gabriela Pavarini, Marwa Mahmoud. "Looking At The Body: Automatic Analysis of Body Gestures and Self-Adaptors in Psychological Distress," *IEEE Transactions on Affective Computing* ***(JCR Q1, IF 11.2)***. Springer, 2020. **PDF**

Qingbiao Li, Jianyu Lin, Neil T Clancy, Daniel S Elson. "Estimation of Tissue Oxygen Saturation from RGB Images and Sparse Hyperspectral Signals based on Conditional Generative Adversarial Network," *International Journal of Computer Assisted Radiology and Surgery* ***(JCR Q2, IF 3)***. pp. 987–995. Springer, 2019. **PDF**

Conference Proceedings

Chenning Yu∗, **Qingbiao Li**∗, Gao Sicun, Amanda Prorok. Accelerating Multi-Agent Planning using Graph Transformers with Near-Optimal Guarantees *IEEE International Conference on Robotics and Automation* ***(CCF-B, Qualis-A1)***. 2023

Benjamin Hudson, **Qingbiao Li**, Matthew Malencia, Amanda Prorok. "Graph Neural Network Guided Local Search for the Traveling Salesperson Problem," *International Conference on Learning Representations* ***(CCF-A, Qualis-A1)***, 2022, **PDF**

Jan Blumenkamp ∗, **Qingbiao Li**∗, Binyu Wang, Zhe Liu, Amanda Prorok. See What the Robot Can't See: Learning Cooperative Perception for Visual Navigation *IEEE/RSJ International Conference on Intelligent Robots and System* ***(CCF-C, Qualis-A1)***. 2023. **PDF**

Jan Blumenkamp ∗, **Qingbiao Li**∗, Binyu Wang, Zhe Liu, Amanda Prorok. Learning to Navigate using Visual Sensor Networks *IEEE International Conference on Robotics and Automation* ***(CCF-B, Qualis-A1)***. 2023. **PDF**, **best paper at CoPerception Workshop**

Jan Blumenkamp, Steven Morad, Jennifer Gielis, **Qingbiao Li**, Amanda Prorok. "A Framework for Real-World Multi-Robot Systems Running Decentralized GNN-Based Policies," *IEEE International Conference on Robotics and Automation* ***(CCF-B, Qualis-A1)***, 2021

Lifeng Zhou, Vishnu D Sharma, **Qingbiao Li**, Amanda Prorok, Alejandro Ribeiro, Pratap Tokekar, Vijay Kumar. Graph neural networks for decentralized multi-robot submodular action selection *IEEE International Conference on Safety, Security, and Rescue Robotics*. 2021. **PDF**

Amanda Prorok, Jan Blumenkamp, **Qingbiao Li**, Ryan Kortvelesy, Zhe Liu, Ethan Stump. "The Holy Grail of Multi-Robot Planning: Learning to Generate Online-Scalable Solutions from Offline-Optimal Experts," *International Conference on Autonomous Agents and MultiAgent Systems* ***(CCF-A)***. 2022. **PDF**

Jan Blumenkamp, **Qingbiao Li**, Amanda Prorok. "Evaluating the Sim-to-Real Gap of Graph Neural Network Policies for Multi-Robot Coordination," *IEEE International Conference on Robotics and Automation* ***(CCF-B, Qualis-A1)****, Real World Swarms Workshop*, 2021, **PDF**

Qingbiao Li, Fernando Gama, Alejandro Ribeiro, Amanda Prorok. "Graph Neural Networks for Decentralized Multi-robot Path Planning," *IEEE/RSJ International Conference on Intelligent Robots and Systems* ***(CCF-C, ERA-A, Qualis-A1)***, 2020, **PDF**, **Publication of the Year**

Qingbiao Li, Fernando Gama, Alejandro Ribeiro, Amanda Prorok. "Graph Neural Networks for Decentralized Path Planning," *International Conference on Autonomous Agents and MultiAgent Systems* ***(CCF-A, ERA-A, Qualis-A1)***, 2020, **PDF**

Ruoxi Wang, Dandan Zhang, **Qingbiao Li**, Xiao-Yun Zhou, Benny Lo. "Real-time Surgical Environment Enhancement for Robot-Assisted Minimally Invasive Surgery Based on Super-Resolution," *IEEE International Conference on Robotics and Automation* ***(CCF-B, Qualis-A1)***, 2021, **PDF**

Qingbiao Li, Xiao-Yun Zhou, Jianyu Lin, Jian-Qing Zheng, Neil T Clancy, Daniel S Elson. "Estimation of Tissue Oxygen Saturation from RGB Images based on Pixel-level Image Translation," *The Hamlyn Symposium on Medical Robotics*, 2018, **PDF**

Qingbiao Li, Iordanis Chatzinikolaidis, Yiming Yang, Sethu Vijayakumar, Zhibin Li. "Robust Foot Placement Control for Dynamic Walking using Online Parameter Estimation," *IEEE-RAS 17th International Conference on Humanoid Robotics (Humanoids)* ***(CCF-C, Qualis-A1)***, 2017, **PDF**

Honors & Awards

Chinese Government Award for Outstanding Self-financed Students Abroad *2023*

China Scholarship Council

Chui Wen Mei Memorial Bursary *2022*

Hughes Hall, University of Cambridge

Wiseman Prize *2020*

Department of Computer Science and Technology, University of Cambridge

Subsystem Excellence Award at Hyperloop Pod Competition *2016*

Space Exploration Technologies Corporation

International Student Scholarship *2013-2016*

The University of Edinburgh

Teaching Experience

Guest Lecturer for Introduction to Deep Learning *Macau, P.R. China*

Faculty of Science and Technology, University of Macau *Aug 2024 - Dec 2024*

- Designed three-hour lecture about the introduction to Graph Neural Networks and its application, designed practical tutorial to enhance student's understanding about Graph Neural Networks.

Guest Lecturer for Motion Capture for Experimental Robotics Research *Cambridge, UK*

Department of Computer Science and Technology, University of Cambridge *Jan 2019 - Dec 2022*

- Designed two-hour lecture that includes a one-hour lecture on the fundamentals and advancements of motion capture technology in robotics, followed by a one-hour live demonstration focusing on trajectory following real robots and its the practical application to enhance the precision and performance of trajectory following.

Teaching Assistant / Lab Demonstrator in Multi-Robot Systems (MRS) *Cambridge, UK*

Department of Computer Science and Technology, University of Cambridge *Jan 2019 - Dec 2022*

- Provided Q and A session with students about practical assignments, and supervised students' mini-project.
- Simulation environment ROS and AWS RoboMaker, physical experiment using TurtleBot.

Teaching Assistant *Edinburgh, UK*

School of Engineering, The University of Edinburgh *Jan 2016 - Nov 2016*

- **Mechanical Engineering 1**
  - Basic of Statics and Dynamics, Solid Mechanics and Thermodynamics.
- **Fluid Mechanics 2**
  - Fluid Statics, Bernoulli's Equation, Hydraulic Structures.

Supervision Experience

MPhil Thesis Supervision *Macau, P.R.China*

Faculty of Science and Technology, University of Macau *Sep 2024 - Present*

- **Tiantian Zhang, Tinghuang, Chen Tong, Shiyuan Yang, Chan Cheok Hin**

MPhil Thesis Supervision *Cambridge, UK*

Department of Computer Science and Technology, University of Cambridge *Sep 2020 - Dec 2023*

- **Peter Woo, 2022-2023**
- **Benjamin Hudson & George Papagiannis, 2020-2021**

Invited Talks

Machine Learning for Embodied Artificial Intelligence: from Surgical Robotics to Multi-robot Coordination *Sep. 2024*

Department of Computer Science and Engineering, The Chinese University of Hong Kong (CUHK)

Graph Neural Network for Multi-robot Coordination *Jan. 2024*

Institute for Interdisciplinary Information Sciences, Tsinghua University

Graph Neural Network Guided Local Search for the Traveling Sales-person Problem *Dec. 2022*

Lightning Talk at Learning on Graphs, University of Cambridge

Message-Aware Graph Attention Networks for Large-Scale Multi-Robot Path Planning *April. 2021*

University of Pennsylvania, Philadelphia, United States

From Graph Neural Networks to Decentralized Multi-Robot Path Planning *Dec. 2020*

Zhejiang University, Hangzhou, China

Graph Neural Networks for Decentralized Path Planning *Dec. 2019*

Robotics X Tencent, Shenzhen, China

Skills and Language Proficiency

Courses and Software **MOOC Certificate**, AutoCAD, PTC Creo, Microsoft Office, DaVinci Resolve, MATLAB, LaTeX

Chinese Mandarin (Native), Cantonese (Intermediate)

English Proficient **German** Basic (Passed A2)

Community Activities

Program Committee *2022-Present*

AAMAS 2023 Blue-Sky Track, AAAI 2022

Journal/Conference Reviewer *2017-Present*

IJRR, T-RO, Autonomous Robots (AURO), RA-L, IROS, ICRA, RA-L, AAMAS, RSS

Community Activities

Contributing to Chinese Documentation of Deep Graph Library (GDL) *2020*

Department of Computer Science and Technology, University of Cambridge