Qingbiao **Li**

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Biography

Qingbiao Li is a PhD student at ProrokLab in the University of Cambridge, supersived by Dr Amanda Prorok. His research interests include *Robot Learning, Multi-robot Path Planning, Graph Neural Networks (GNNs), Imitation Learning and Reinforcement Learning*. During his PhD, he focus on developing a **communciation-aware decentralised multi-agent path planning** framework, where **Graph Neural Networks (GNNs)** are under active investigation to build communication channels for multi-agent systems so that agents can learn how to communicate between each other explicitly. His research can be applied in mobility-on-demand, automated warehouse and smart cities.

He has delivered multiple research projects with demonstrable and solid results in computer vision (SLAM for Flexible Endoscopy), bipedal walking of humanoid robot and mechancial design of industral robot. He has experience and practical skills in applying ML to cope with real-world challenges, including multi-robot path planning, and medical imaging (non-invasive StO2 estimation).

Education

University of Cambridge — *Cambridge, UK*
PhD in Computer Science — *Oct 2018 - Present*

Imperial College London — *London, UK*
MRes Medical Robotics and Image Guided Intervention (Distinction) — *Oct 2017 - Sep 2018*
Individual Project: Developed tissue oxygenation saturation monitoring technique based on optical imaging (RGB and Hyperspectral Imaging) by conditional generative adversarial networks (cGAN).

The University of Edinburgh — *Edinburgh, UK*
M. Eng (Hons) Mechanical Engineering — *Sep 2013 - June 2016*
Individual Project: Missile Impact on Snow inspried by project from British Antarctic Survey.

South China University of Technology — *Guangzhou, China*
B. Eng. Mechanical Engineering and Automation — *Sep 2011 - July 2013*

Work Experience

Research Assistant in Bipedal Walking of Humanoid Robot — *Edinburgh, UK*
SLMC, School of Informatics, The University of Edinburgh — *Sep 2016 - June 2017*

- Investigated innovative approaches to achieve model-free control of biped walking of humanoid robots.
- Theoretical proof and simulation validation of online parameter estimation based on Tikhonov regularisation to obtain robust control of bipedal walking.

Industrial Robotics Research Assistant (Funded by Erasmus+) — *Hannover, Germany*
The Institute of Production Engineering and Machine Tools (IFW), Leibniz University of Hanover — *Sep 2016 - June 2017*

- Mechanism design for industrial robot for industrial-level milling process, includes CAD modelling transmission device and robot arm.
- Kinematic simulation to analyse torque distribution during operation.

Academic Projects

Vision-based Navigation in Flexible Endoscopy — *London, UK*
Imperial College London, supervised by **Dr George Mylonas** — *Sep 2017 - Dec 2020*

- This project aimed to track the endoscope pose in real time during flexible endoscopy and generate a 3D point cloud and a map within the human colon simultaneously.
- Investigated available visual SLAM methods (ORB-SLAM) and visual-inertial SLAM methods (VINS-Mono, OKVIS), and customize them for small scale, near focus.
- Our SLAM pipeline can obtain conclusive registration and surface reconstruction based on point cloud data.

Missile Impact on Snow (MEng thesis with distinction) *Edinburgh, UK*

UNIVERSITY OF EDINBURGH, SUPERVISED BY **DR FILIPE TEIXEIRA-DIAS** *Oct 2015 - Apr 2016*

- This study aimed to optimize the design of the impactor developed by British Antarctic survey for long-term tracking on the motion of the glaciers.
- Investigated the characteristics of the impact dynamics of the impactor and its interaction with different types of snow, covering a range of impact energies.

Publications

JOURNAL ARTICLES

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* (2020). 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* 14.6 (2019) pp. 987–995. Springer, 2019. PDF

CONFERENCE PROCEEDINGS

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*, 2020, PDF

Qingbiao Li, Fernando Gama, Alejandro Ribeiro, Amanda Prorok. "Graph Neural Networks for Decentralized Path Planning," *International Conference on Autonomous Agents and MultiAgent Systems*, 2020, 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*, 2018, PDF

Jian-Qing Zheng, Xiao-Yun Zhou, **Qingbiao Li**, Celia Riga, Guang-Zhong Yang. "Abdominal Aortic Aneurysm Segmentation with a Small Number of Training Subjects," *The Hamlyn Symposium on Medical Robotics, 2018*, 2018, PDF

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

Honors & Awards

PhD Studentship *2018-2021*

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

First Prize - "ThyssenKrupp" Elevator Cab Design Competition *2012*

School of Automation Science and Engineering, South China University of Technology

Skills

MOOC Certificate

Artificial Intelligence Planning; Introduction to Robotics; Machine Learning Techniques; An introduction to Interactive Programming in Python.

Programming Skills Python, Pytorch, Pytorch Geometric, Deep Graph Library (DGI), MATLAB, LaTeX, NumPy

Language Proficiency

English Fluent

German Basic (Passed A2)

Chinese Mandarin (Native), Cantonese (Intermediate)