

# QIUSHI (MAX) LIN

<https://qiushi-lin.github.io>

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## RESEARCH INTERESTS

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Developing theoretically principled machine learning algorithms, with a focus on reinforcement learning, online learning, and multi-armed bandits

## EDUCATION

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**Simon Fraser University (SFU)**, Burnaby, Canada  
M.Sc. in Computing Science (Thesis-Based Program)

2021 - 2023

GPA: 4.06/4.33

- Advisor: Hang Ma
- Course: [transcript]
  - CMPT 983: Theoretical Foundations of Reinforcement Learning [Ongoing]
  - CMPT 981: Optimization for Machine Learning [A]
  - CMPT 727: Statistical Machine Learning [A]
  - CMPT 983: Graph Representation Learning [A]
  - CMPT 827: Intelligent Systems [A+]
  - CMPT 741: Data Mining [A]
- Thesis: Learning Cooperation for Partially Observable Multi-Agent Path Finding [pdf] [slides]
- Committee: Oliver Schulte, Xue Bin (Jason) Peng

**Southern University of Science and Technology (SUSTech)**, Shenzhen, China  
B.Eng. in Computer Science and Technology

2016 - 2020

GPA: 3.75/4.00

- Departmental Highest Honors of Graduation

## RESEARCH EXPERIENCES

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**Research Assistant**, AIRob Lab (SFU Robotics Research Group)

09/2021- 12/2023

- supervised by Prof. Hang Ma
- focusing on reinforcement learning and multi-agent systems

**Summer Research Program**, Illinois Institute of Technology

07/2019

- supervised by Prof. Xin Chen from Northwestern University
- focusing on semantic segmentation of 3D point clouds for LiDAR sensor data

## PROJECTS

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**Convergence Rates of Log-Linear Policy Gradient Methods**

09/2023- 12/2023

- provide a general framework to derive convergence rates of policy gradient methods for log-linear policy class by reducing the problem to the one in tabular softmax settings
- extend theoretical guarantees of softmax policy gradient methods to derive theoretically guaranteed algorithms for log-linear policies with both exact and inexact policy evaluation
- empirically evaluate the proposed algorithms and compare them to standard policy gradient methods

**A Survey of Apprenticeship Learning**

09/2022- 12/2022

- review literature for a few widely used apprenticeship learning algorithms
- empirically evaluate these methods on a shared benchmark

## Moving Decentralized Agents in Formation

02/2023- 09/2023

- propose a bi-objective multi-agent reinforcement learning framework to solve the tasks of formation control and path planning in multi-agent systems
- theoretically analyze the effectiveness of the proposed method; empirically evaluate its performance and compare it to other centralized baselines

## Partially Observable Multi-Agent Path Finding

02/2023- 05/2022

- propose a multi-agent actor-critic framework that utilizes the heuristic-based attention mechanisms
- empirically evaluate the proposed method over various instances in different environments

## Semantic Segmentation of LiDAR Perception Data

07/2019

- process LiDAR perception data of roadways via traditional computer vision methods
- achieve semantic object segmentation on 3D point clouds to identify lanes, poles, barriers, etc.

## PUBLICATIONS, PREPRINTS, AND REPORTS

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### Publications

- **SACHA: Soft Actor-Critic with Heuristic-Based Attention for Partially Observable Multi-Agent Path Finding**  
Qiushi Lin and Hang Ma.  
In IEEE Robotics and Automation Letters (RA-L) 2023 [pdf] [code]

### Preprints

- **Mean Field Control with Envelope  $Q$ -learning for Moving Decentralized Agents in Formation**  
Qiushi Lin and Hang Ma.  
Preprint (In Submission) [pdf] [code]

### Reports

(\* = equal contribution)

- **On the Convergence Rates of Log-Linear Policy Gradient Methods** [pdf] [code]  
Qiushi Lin\*, Matin Aghaei\*, Anderson de Andrade\*, Sharan Vaswani.
- **A Survey of Apprenticeship Learning** [pdf]  
Qiushi Lin\*, Ziqian Bai\*, Minh Bui\*, Jiaqi Tan\*.

## AWARDS AND HONORS

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| • Westak International Sales Inc. Graduate Scholarship, SFU | 2023 |
| • Departmental Highest Honors of Graduation, SUSTech        | 2020 |

## TEACHING EXPERIENCES

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### Teaching Assistant, SFU

- MACM 101: Discrete Mathematics
- CMPT 310: Introduction to Artificial Intelligence
- CMPT 417/827: Intelligent Systems

## TECHNICAL SKILLS

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**Programming Languages:** Python, C/C++, MATLAB, SQL

**Frameworks and Tools:** Pytorch, Tensorflow, Linux, GitHub, LaTeX