XIANG FEI

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EDUCATION

Carnegie Mellon University, USA — Aug. 2024 - Aug. 2026
Master of Science, Robotics, Robotics Institute at School of Computer Science

The Chinese University of Hong Kong (Shenzhen), China — Sept. 2020 - May 2024
Bachelor of Engineering, Computer Science and Engineering, School of Data Science
Major GPA: 3.873/4.000 (Top 5%)

Honors & Awards
2020-2023 Dean's List Honor of School of Data Science, Sept. 2021 - 2023
2021-2022 Academic Performance Scholarship of The Chinese University of Hong Kong, Shenzhen, Dec. 2022
Undergraduate Research Award of The Chinese University of Hong Kong, Shenzhen, Nov. 2022
2020-2021 Master's List Award of Muse College, Nov. 2021
Bowen Scholarship of The Chinese University of Hong Kong, Shenzhen, Sept. 2020

University of California, Berkeley, USA — Jan. - May 2023
Visiting student
Cumulative GPA: 4.000/4.000
Core Courses: (CS182) Designing, Visualizing and Understanding Deep Neural Networks; (EECS C106B) Robotic Manipulation and Interaction; (CS170) Efficient Algorithms and Intractable Problems

PUBLICATIONS (INCLUDING WORKING PAPERS)

X. Fei, H. Zhao, X. Zhou, J. Zhao, T. Shu, F. Wen. *Power System Fault Diagnosis with Quantum Computing and Efficient Gate Decomposition*. Scientific Reports (Under Review). [arXiv]
X. Fei, T. Tian, L. Li, H. Choset. *Bag-of-Word-Groups (BoWG): A Robust Loop Closure Module for In-pipe Visual-Laser-Inertial SLAM*. Carnegie Mellon Robotics Institute Summer Scholars Working Papers Journal 2023. [PDF, Poster, Slides, Video]
Y. Cao, X. Zhou, **X. Fei**, H. Zhao, W. Liu, J. Zhao. *Linear-Layer-Enhanced Quantum Long Short-Term Memory for Carbon Price Forecasting*. Quantum Machine Intelligence (Q1). [PDF, Code, Dataset]
X. Zhou, H. Zhao, Y. Cao, **X. Fei**, G. Liang, J. Zhao. *Carbon Market Risk Estimation Using Quantum Generative Adversarial Network and Amplitude Estimation*. Energy Conversion and Economics. [Abstract]
X. Zhou, X. Wang, **X. Fei**, W. Liu, J. Zhao. *Carbon Disclosure Effect on Listed Companies under the Net-zero Emission Target: The Case of China*. National Outstanding Award (National Top 5) of National University Student Energy Economy Academic Creativity Competition. [Abstract]
Data Analysis Team: **X. Fei**, H. Bi, S. Dai, Y. Xu, C. Tao. *Carbon Rating Report of China's 100 Overseas Listed Companies*. (REPORT) 2022 Global Forum on Sustainable Development. [PDF]

RESEARCH CONCENTRATION 1: Robotics Systems, and Simultaneous Localization and Mapping

Robust Loop Closure Module Development for In-pipe SLAM, *Researcher* — Jun. - Aug. 2023
Biorobotics Lab, Robotics Institute, Carnegie Mellon University (Mentor: Prof. Howie Choset)

- Developed a feature detector that utilizes image pyramids to detect features at multiple scales
- Introduced a novel definition of word groups, leveraging the spatial co-occurrence of detected features
- Designed the data structure of a novel database that stores the word group information of each image in an online manner and enables efficient loop closure score computation
- Proposed a novel loop closure detection module called Bag-of-Word-Groups (BoWG), which is robust and can achieve much higher precision while maintaining acceptable recall compared to the original method in VINS-Mono
- Took the lead as the first author in writing the paper "Bag-of-Word-Groups (BoWG): A Robust Loop Closure Module for In-pipe Visual-Laser-Inertial SLAM"

SLAM for Vision-based Navigation, *Researcher* Mar. - May 2023

Berkeley AI Research Lab, University of California, Berkeley (Mentors: Dr. Chih-Yuan Chiu, Prof. Somil Bansal)

- Developed a novel autonomous navigation pipeline that utilizes both learning-based perception (LB-WayPtNav) and SLAM by establishing a switching mechanism based on the robot's states and the external environment
- Utilized reachability analysis to identify the scenarios (tight corners, narrow hallways) where LB-WayPtNav may fail to navigate
- Built experiment scenes and showed that the particle filtering SLAM-based navigation method effectively handles failure cases

EEG-driven Auditory Attention, *Researcher* Sept. 2022 - Feb. 2023

Human Language Technology Laboratory, Shenzhen Research Institute of Big Data (Mentor: Prof. Haizhou Li)

- Conducted a comprehensive literature review to learn the foundations of EEG-based detection of the locus of auditory attention
- Collected tester-specific EEG data by using head-mounted EEG devices in a noise-free laboratory
- Implemented a CNN-based method with MATLAB to identify the locus of auditory attention without relying on knowledge of speech envelops, achieving an average accuracy of 88.5% in a decoding time of 1-2 seconds
- Joined the review team for ICASSP2023 and evaluated a paper on the combination of CNN and ViT for automatic sleep scoring

RESEARCH CONCENTRATION 2: Quantum Science and Engineering

Quantum Computing Algorithm for Power System Fault Diagnosis, *Researcher* Aug. 2022 - May 2023

Energy Internet Lab, CUHKSZ (Mentor: Prof. Junhua Zhao)

- Developed a novel framework to tackle power system fault diagnosis using the quantum approximate optimization algorithm
- Derived the Hamiltonian for the power system fault diagnosis problem by utilizing the Ising model
- Proposed the symmetric equivalent decomposition of the multi-qubit rotation gate, which enhances problem-solving efficiency
- Incorporated the unique characteristic of small probability events in power system faults into the developed quantum algorithm
- Gained simulation results indicating that the proposed method achieves accurate optimal outcomes at a faster speed compared to the classical higher-order solver provided by D-wave
- First-authored the paper "Power System Fault Diagnosis with Quantum Computing and Efficient Gate Decomposition"

Quantum Machine Learning for Carbon Price Forecasting, *Researcher* Apr. - Sept. 2022

Energy Internet Lab, CUHKSZ (Mentor: Prof. Junhua Zhao)

- Proposed and implemented a hybrid quantum computing-based carbon price forecasting framework called Linear-Layer-Enhanced Quantum Long Short-Term Memory (L-QLSTM)
- Implemented parameter sharing between linear and variational layers, reducing parameters and enhancing learning performance
- Results show that the proposed L-QLSTM method greatly improves the learning accuracy compared to the QLSTM method
- Co-authored the paper "Linear-layer-enhanced quantum long short-term memory for carbon price forecasting"

Carbon Market Risk Estimation Using Quantum GAN and Amplitude Estimation, *Researcher* May - Oct. 2023

Shenzhen Institute of Artificial Intelligence and Robotics for Society (AIRS) (Mentor: Prof. Junhua Zhao)

- Proposed a quantum computing-based carbon market risk estimation framework that utilizes quantum conditional generative adversarial networks-quantum amplitude estimation (QCGAN-QAE) to enhance the estimation accuracy and efficiency
- Improved the circuit structure of the quantum generator in QCGAN by reordering the data entanglement layer and data rotation layer, while introducing the quantum fully connected layer before rotation operations
- Incorporated the binary search approach into QAE to bolster the computational efficiency
- Simulation results manifested that the proposed framework markedly enhances the efficiency and precision of Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR) compared to the original methods
- Authored a paper "Carbon Market Risk Estimation Using Quantum Generative Adversarial Network and Amplitude Estimation"

RESEARCH CONCENTRATION 3: Energy, Carbon Market, and Sustainability

The Impact of Carbon Disclosure on Company Financial Performance, *Researcher* Jan. 2022 - Dec. 2022

Energy Internet Lab, CUHKSZ (Mentor: Prof. Junhua Zhao)

- Proposed an efficient table extraction pipeline incorporating PP-PicoDet (table detection), SLANet (table structure recognition), and PP-OCRv3 (table text extraction) to extract table content from ESG reports
- Utilized web crawlers and the proposed table recognition technology to establish a comprehensive database of emission disclosure information from 4336 Chinese A-share listed companies, covering data from 2017 to 2022
- Developed a difference-in-differences model to examine carbon disclosure behavior's impact on indicators of companies
- Investigated the correlation between company stock market performance, carbon disclosure behavior, and the implementation of national/regional emission trading systems (ETS) in China

- Authored a paper "Carbon Disclosure Effect on Listed Companies under the Net-zero Emission Target: The Case of China"

Carbon Rating Report of China's 100 Overseas Listed Companies, *Researcher* Aug. 2021 - Jun. 2022
Shenzhen Institute of Artificial Intelligence and Robotics for Society (AIRS) (Mentor: Prof. Junhua Zhao)
- Contributed to the collaborative effort to design an innovative method for calculating carbon scores
- Selected appropriate metrics capable of accurately measuring corporate carbon scores
- Conducted data collection and analysis, focusing on energy disclosure data from China's 100 overseas listed companies
- Published a comprehensive research report at the 2022 Global Forum on Sustainable Development

INTERNSHIPS

Winning Health Technology Group Co., Ltd., *Algorithm Engineer (Computer Vision)* Jul. - Sept. 2022
- Took on the role of initiating the monocular endoscope 3D reconstruction project and implemented a sophisticated 3D reconstruction technique for the gastrointestinal tract [Project Report]
- Utilized the sparse reconstruction and camera pose obtained by Structure from Motion with SIFT descriptors as self-supervised signals to train a designed two-branch Siamese network to achieve dense depth estimation and feature descriptors
- Reconstructed a watertight triangle mesh surface of the gastrointestinal tract with high accuracy by using marching cubes method
- Contributed to creating a promotional video for the company's science and technology festival, highlighting creative teamwork

Shenzhen Teabreak Network Technology Co., Ltd., *Leader of the Back-end Development Department* Dec. 2020 - Mar. 2022
- Played a key role in the development of more than 5 products, contributing to the backend program development, product strategy, requirements gathering, feature prioritization, and successful execution [Code]
- Successfully organized and executed Halloween promotion activities for JD.com, Inc. at CUHK(SZ), effectively engaging the target audience and driving participation and sales during the festive season
- Received recognition as the top-performing entrepreneurial team at the school's incubation base in 2021

EXTRACURRICULAR ACTIVITIES

Teaching Assistant of the Discrete Mathematics Course
- Conducted tutorial courses to assist students in their understanding of complex mathematical concepts and course material
- Developed homework assignments for students and provided timely and constructive feedback through grading
- Offered guidance and clarification to students, addressing their questions and concerns to enhance their learning experience

Peer Advisor of the School of Data Science
- Organized orientation activities to help freshmen acclimate to university life and foster a sense of community
- Facilitated communication between freshmen and professors, ensuring they had access to the necessary support and resources
- Provided advice on study strategies and overall student life, helping freshmen navigate their university experience

Member of the Chinese University of Hong Kong (Shenzhen) Basketball Team
- Participated in the second level of the Chinese University Basketball League
- Engaged in friendly matches against opponents such as Shenzhen Technology University and Shenzhen Sports School

COMPETITION & AWARDS

National University Student Energy Economy Academic Creativity Competition
· 2023 National Outstanding Award of Graduate Group (National Top 10) May 2023
· 2022 National Outstanding Award of Undergraduate Group (National Top 5) May 2022

2022 CCF "Sinan Cup" Quantum Computing Programming Competition
· National Second Prize (National Top 18) Aug. 2022

2022 Mathematical Contest in Modeling
· Meritorious Winner (Global Top 7%) May 2022

INTERESTS, LANGUAGES, SKILLS

Previous Fields of Research: Robotics Systems; Simultaneous Localization and Mapping (SLAM); Quantum Science and Engineering; Computer Vision; Energy, Carbon Market and Sustainability
Languages: English (TOEFL 103; GRE 325+4), Mandarin (native)
Skills: ROS, Python, Pytorch, C++, C, Matlab, Linux, Git, CUDA, Django, MySQL, Latex, Microsoft Office