Junde Li

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Education

Pennsylvania State University **Jan. 2019 – Present**
PhD student in Computer Science and Engineering | GPA: 3.73/4.0
Advisor: Swaroop Ghosh

City University of Hong Kong **Oct. 2016**
MSc in Engineering Management | GPA: 4.02/4.3 ranked 1/88
Advisor: Alan Chan

Qingdao University **Jun. 2015**
BMgt in Logistics Management | GPA: 82.69/100

Research Interests

Quantum Computing, Autonomous Systems. I am interested in machine learning, computer vision, robotics, and hybrid quantum-classical machine learning and optimization in applications of drug discovery and autonomous vehicles.

Publications

Synopsis: 3 Journals, 7 Conferences and 1 Book Chapter with 96 citations (Google Scholar).

J3. **J. Li**, M. Alam, and S. Ghosh. Large-scale Quantum Approximate Optimization via Divide-and-Conquer. IEEE Transactions on Quantum Engineering (**TQE**), 2021. (Under Review)

J2. **J. Li**, R. Topaloglu, and S. Ghosh. Quantum Generative Models for Small Molecule Drug Discovery. IEEE Transactions on Quantum Engineering (**TQE**), 2021. (Under Review)

J1. **J. Li**, Q. Ma, A. Chan, and S. Man. Health Monitoring through Wearable Technologies for Older Adults: Smart Wearables Acceptance Model. Applied Ergonomics, 2019.

C7. K. Nagarajan, **J. Li**, S. Ensan, N. Khan, Sachidh, and S. Ghosh. SNaP: Investigating Power-Oriented Attacks on Spiking Neural Networks and Prevention. ACM/IEEE International Symposium on Low Power Electronics and Design (**ISLPED**), 2021. (Under Review)

C6. A. Farris, A. Kim, **J. Li** and S. Ghosh. Situating a Middle/High School Introduction to Quantum Computing in Advanced Quantum Drug Discovery Efforts. Middle Atlantic American Society for Engineering Education (**ASEE**), 2021.

C5. **J. Li**, M. Alam, C. Sha, J. Wang, N. Dokholyan, and S. Ghosh. Drug Discovery Approaches using Quantum Machine Learning. Design Automation Conference (**DAC**), 2021.

C4. M. Alam, A. Ash-Saki, **J. Li**, A. Chattopadhyay, and S. Ghosh. Noise Resilient Compilation Policies for Quantum Approximate Optimization Algorithm. IEEE International Conference on Computer-Aided Design (**ICCAD**), 2020.

C3. **J. Li**, and S. Ghosh. Quantum-soft QUBO Suppression for Accurate Object Detection. European Conference on Computer Vision (**ECCV**), 2020.

C2. **J. Li**, N. Gattu, and S. Ghosh. FAuto: An Efficient GMM-HMM FPGA Implementation for Behavior Estimation in Autonomous Systems. IEEE International Joint Conference on Neural Networks (**IJCNN**), 2020.

C1. **J. Li,** M. Alam, A. Ash-Saki, and S. Ghosh. Hierarchical Improvement of Quantum Approximate Optimization Algorithm for Object Detection. IEEE International Symposium on Quality Electronic Design (**ISQED**), 2020.

B1. A. Ash-Saki, M. Alam, **J. Li**, and S. Ghosh. Error-Tolerant Mapping for Quantum Computing. In Emerging Computing: From Devices to Systems, Springer, 2020. (In Press).

Invited Talks

1. Drug Discovery using Quantum Machine Learning, Generative Models Stage of Deep Learning 2.0 Virtual Summit, 2021. (details here)

Research Experiences

Pennsylvania State University 05/2020 – Present
Research Assistant *State College, PA*
Advisor: Swaroop Ghosh
Quantum Computing and Quantum Machine Learning

- [C3, J3] Hybrid quantum-classical optimization: designed an efficient hybrid algorithm for solving large-scale maximum cut-like NP-hard problems with near-optimal solutions and exponential speedup.
- [C5, J2] Quantum generative models: working on quantum generative networks for creating a large amount of drug candidates that are potentially effective for ongoing global pandemic by exploiting quantum computing advantage.
- [B1, C4] Qubit allocation and quantum program compilation: presented two policies, variation-aware qubit placement and variation-aware iterative mapping that can improve the circuit success probability by 8.408X on average.

Machine Learning for Autonomous Systems

- [C1, C3] Object detection (perception) for autonomous vehicles: proposed a novel hybrid algorithm for filtering out false positives in object detections with state-of-the-art accuracy for both generic and pedestrian detections.
- [C2] Driving behavior estimation for autonomous vehicles: designed a power-efficient FPGA embedded systems of machine learning model GMM-HMM for predicting driving behaviors of surrounding vehicles.

City University of Hong Kong 07/2016 – 12/2018
P/T Research Assistant *Hong Kong*
Advisor: Alan Chan
Human-computer Interaction and Human Factors

- [J1] Smart wearables and health technologies: took part in several research projects associated with Human Factors, Data Analytics, and Machine Learning in smart wearables and health technologies, and submitted proposal on these areas for applying research grant as co-PI.

Work Experiences

ApexQubit 02/2021 – Present
P/T Quantum Machine Learning Engineer *Remotely*
Advisor: Nihil Khaine
1. Develop prototype of purely classical generative model for utilization of quantum computations.

2. Integrate quantum algorithms into the classical model on small scale and compose a proof-of-concept.
3. Scale the quantum-classical model to handle larger molecules usable in practical applications.

Pennsylvania State University 01/2019 – 05/2020
(Head) Teaching Assistant, CMPSC 360 Discrete Mathematics *State College, PA*
Held weekly recitation classes and office hours.

Matrix Auto Technology Ltd 10/2018 – 12/2018
Artificial Intelligence Engineer *Hong Kong*
Advisor: Jean Lam
MAT is a startup company providing self-driving car solutions and services.
1. Participated in developing vehicle localization using particle filter, based on initial location from sensors.
2. Designed self-driving car workflow prototype based on paper review on environmental perception, localization, path planning, prediction, and control.

ASM Pacific Technology Ltd 07/2018 – 10/2018
Process Engineer (R&D) *Hong Kong*
Advisor: Pak Kin Leung
ASMPT is a leading integrated solution provider in semiconductor and electronics industries.
1. Pre-processed images taken from silicone pads for recognizing wafer ID by Photo OCR pipelines.
2. Coordinated with control, mechanical, software and vision teams for making machine improvements.
3. Conducted research and development in computer vision and applications for visual inspection.

Honors and Awards

Self-driving Car Engineer Nanodegree, Udacity	2020
Distinction, City University of Hong Kong	2016
Outstanding Student Thesis Award, Qingdao University	2015
Excellent Student Award, Qingdao University	2013
Merit Scholarships, Qingdao University	2011 - 2013

Professional Services

Reviewer for IEEE Transactions on Mobile Computing
Reviewer for Microprocessors and Microsystems
Reviewer for Applied Ergonomics
Sub-reviewer for Design Automation Conference, 2021, 2020
Sub-reviewer for International Conference on Hardware/Software Co-design and System Synthesis, 2019
Sub-reviewer for International Conference on Computer Design, 2019
Sub-reviewer for ACM/International Symposium on Low Power Electronics and Design, 2019

Technical Skills

Programming Languages:	Python, C/C++, MATLAB, Java, R
Deep Learning / Robotics:	PyTorch, TensorFlow, Caffe, OpenCV, ROS
Quantum Computing Tools:	Qiskit, PennyLane, Cirq, PyQuil
Hardware:	Verilog, High-level Synthesis

Selected Courses and Course Projects

Courses: Wireless and Mobile Sensing in the age of IOT, Field Programmable Gate Array, Computer Architecture, Operating Systems, Algorithm Design and Analysis, Natural Language Processing, Large-scale Machine Learning, Quantum Computation, Computer Vision

Project – Acoustic beamforming for vehicle localization: our course project aims to locate moving cars through an array of audio sensors mounted at wayside. Sound signals emitted from moving vehicles were collected using Arduino system and processed for pinpointing the direction-of-arrival and distance of multiple surrounding vehicles relative to ego vehicle (sensor array). Our DAS beamformer was able to locate vehicles within error of 4.46% compared to ground truth position.

Project – Natural language generation: this course project trains a natural language generation model on E2E NLG Challenge dataset and generates human-readable sentences for given meaning representations. Our seq2seq model was improved using data augmentation and error analysis techniques, and achieved the highest testing accuracy, 69.58% for BLEU benchmark metric, in the class.