

YIFENG PENG

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EDUCATION

Stevens Institute of Technology

School of Systems and Enterprises

- Doctor of Philosophy

Hoboken, NJ

Feb 2023 - Jun 2027 (Expected)

The Hong Kong University of Science and Technology (HKUST)

Electronic and Computer Engineering

- Doctor of Philosophy

Hong Kong

Sep 2022 - Dec 2022

University of Electronic Science and Technology of China

Bachelor of Engineering in Electronic Information Engineering

University of Glasgow (Joint Degree of Glasgow College at UESTC)

Bachelor of Engineering in Electronic Information Engineering

Chengdu, China

Sep 2018 - Jul 2022

Chengdu, China

Sep 2018 - Jul 2022

SKILLS

Programming language Python, Verilog, MATLAB, C/C++

Tools Linux, Origin, Keil, Pycharm, PennyLane, Qiskit

Research Interests Quantum Machine Learning, Quantum Computer Vision, Quantum Computing

PROJECTS

5G and Beyond Vulnerability Detection | ML, QML, QAI

Feb. 2023 - Present

Advisor: Prof. WANG Ying (SIT)

- I am deeply engaged in advancing the field of quantum machine learning (QML) and quantum AI (QAI) algorithms. Utilizing simulation tools such as PennyLane and Qiskit, my work progresses to empirical verification on IBM's quantum computers. My contributions include the development of innovative QML and QAI algorithms designed to harness the unique capabilities of quantum computing, significantly enhancing performance and computational speed.
- I proposed several machine learning algorithms based on the Word2Vec model, SmiLe Net, RAFT, and DEFT. These algorithms are used to achieve the prediction of the Root cause for 5G Vulnerability.
- The proposed machine learning algorithm SmiLe Net enables predicting and learning the non-linear relationship between the inputs and the outputs, which is a lightweight 5G vulnerability detection and requires fewer MACs than other algorithms, thereby facilitating a large-scale communication system.
- I proposed a real-time framework RAFT for real-time root cause in 5G and Beyond vulnerability detection. The RAFT framework leverages the fuzz testing generated experimental results and the provided ground truth to examine and analyze the characteristics of the vulnerabilities and unintended emergent behaviors of the 5G authentication and authorization process.

Explanations at the Circuit-Element Level for Prediction on Layout | ML

Jun. 2022- Dec. 2022

Advisor: Prof. XIE Zhiyao (HKUST)

- In this work, we proposed a new technique named APPLE to explain the ML prediction at the resolution level of circuit elements, which is used to detect lithography hotspots.
- I designed the experiments for Complex benchmarks using ML prediction. In addition, I also tried adversarial attack experiments for different kinds of lithography.

Large rotating magnetocaloric effect of textured polycrystalline HoB₂ alloy

Dec. 2021 - Feb. 2022

Advisor: Prof. FU Hao (UESTC)

- I put forward critical advice to modify the structure of the paper, including the writing of the ABSTRACT and EXPERIMENT sections. Paper Revision including improving the sentence structure of the paper and changing the vocabulary.

Semi-Deterministic Policy Gradient | AI, Reinforcement Learning**Feb. 2022 - Nov. 2022**

Advisor: Dr. YANG Yaodong (KCL), Team WANG Jun (UCL)

- In this work, we aimed to derive the gradient of the semi-deterministic policy and an SDPG estimator and extend the applicability of SDPG through the Markov decision process.
- I performed experiments of GOAL, PLATFORM, and Mujoco, adjusted the parameters, and visualized the experimental data; completed research essay writing and picture drawing.

A Neural Network-based Channel Matrix Inversion Method | ML**Sep. 2020 - Nov. 2021**

Advisor: Prof. CHEN Jienan (UESTC)

- In this work, we constructed a fully connected neural network by deep learning techniques to do the channel matrix inversion. We used ModelSim to simulate logic circuits in Verilog designs and Design Compiler to compare the loss. The results showed that our method got lower computing complexity and power consumption.
- I derived the equations in the neural network, organized the research process, and compared computing complexity.

A New RC-LIGBT Design Featuring Floating P-Island State | Physics**Jan. 2020 - Apr. 2020**

Advisor: Prof. YI Bo (UESTC)

- In this work, we conducted a literature review to investigate possible solutions for performing the “snapback free” function by the experimenting device without generating high specific on-resistance.
- I applied Sentaurus TCAD to design and identify a practical version of RC-LIGBT with other two peers in the research team.

A Novel Self-powered Wearable Device, MIT Communication Lab | HCI**Jun. 2019 - Aug. 2019**

Advisor: Wei Sun Leong (MIT Postdoctoral)

- In this work, we studied scholarly books: Wearable Sensors and Systems, Macro Fiber composite-based energy harvester for human knee, and Gait Analysis Using Wearable Sensors to improve my knowledge base and seek technical guidance to find a proper self-power system that is benign to the human body and a functional combination of wearable device components.
- I designed new self-powered wearable devices that can automatically offer gait analysis and body condition monitoring via self-power with sweat and human kinetic energy.

PUBLICATIONS AND PATENTS

1. **Yifeng Peng**, Xinyi Li, Ying Wang. “Quantum Squeeze-and-Excitation Networks” (Accepted by IEEE International Conference on Quantum Computing & Engineering (QCE24) WKS-QML)
2. **Yifeng Peng**, Xinyi Li, Ying Wang. “QRNG-DDPM: Enhancing Diffusion Models through Fitting Mixture Noise with Quantum Random Number” (Accepted by IEEE International Conference on Quantum Computing & Engineering (QCE24) WKS11-QAI)
3. **Yifeng Peng**, Xinyi Li, Sudhanshu Arya, Ying Wang. “HyQ2: A Hybrid Quantum Neural Network for NextG Vulnerability Detection” (In review for IEEE Transactions on Quantum Engineering)
4. **Yifeng Peng**, Xinyi Li, Zhiding Liang, Ying Wang. “Hybrid Quantum Downsampling Networks” (In review for the 39th Annual AAAI Conference on Artificial Intelligence(AAAI 2025))
5. **Yifeng Peng**, Xinyi Li, Zhiding Liang, Ying Wang. “Qsco: A Quantum Scoring Module for Open-set Supervised Anomaly Detection” (In review for the 39th Annual AAAI Conference on Artificial Intelligence(AAAI 2025))
6. **Yifeng Peng**, Jingda Yang, Sudhanshu Arya, Ying Wang. “SmiLe Net: A Supervised Graph Embedding-based Machine Learning Approach for NextG Vulnerability Detection” (Accepted for MILCOM 2023-2023 IEEE Military Communications Conference (MILCOM))
7. **Yifeng Peng**, Xinyi Li, Jingda Yang, Sudhanshu Arya, Ying Wang. “RAFT: A Real-time Framework for Root Cause Analysis in NextG Vulnerability Detection”(Accepted for 2024 IEEE 21st Consumer Communications & Networking Conference (CCNC))
8. **Yifeng Peng**, Xinyi Li, Sudhanshu Arya, Ying Wang. “DEFT: A Novel Deep Framework for Fuzz Testing Performance Evaluation in NextG Vulnerability Detection”(Published in IEEE Access (Volume: 11))

9. **Yifeng Peng**, Xinyi Li, Sudhanshu Arya, Ying Wang. "12XI: Synergistic Machine Learning where $\underline{1} + 1 > \underline{2}$ in NextG Vulnerability Detection" (In review for IEEE Open Journal of the Communications Society)
10. **Yifeng Peng**, Xinyi Li, Ying Wang. "A Survey on Quantum Machine Learning" (In review for IEEE Transactions on Neural Networks and Learning Systems)
11. Sudhanshu Arya, **Yifeng Peng**, Jingda Yang, Ying Wang. "Distributed 3D-Beam Reforming for Hovering-Tolerant UAVs Communication over Coexistence: A Deep-Q Learning for Intelligent Space-Air-Ground Integrated Networks" <https://doi.org/10.48550/arXiv.2307.09325>
12. Bo Yi, **Yifeng Peng**, Qing Zhao, Moufu Kong, Junji Cheng, and Haimeng Huang. "Simulation study of an ultra-low specific on-resistance high-voltage pLDMOS with self-biased accumulation layer" IEICE Electronics Express, <https://doi.org/10.1587/elex.16.20190673>
13. Zhiyao Xie, Tao Zhang, **Yifeng Peng**. "Security and Reliability Challenges in Machine Learning for EDA: Latest Advances" 2023 24th International Symposium on Quality Electronic Design (ISQED)
14. Xiaoyu Zhou, Yafen Shang, Tian Luo, **Yifeng Peng**, and Hao Fu. "Large rotating magnetocaloric effect of textured polycrystalline HoB₂ alloy contributed by anisotropic ferromagnetic susceptibility" Applied Physics Letters, <https://doi.org/10.1063/5.0088571>.
15. Bo Yi, Jia Lin, Ruifeng Yang, **Yifeng Peng**. "A SOI LIGBT Device with Diode-Clamped Carrier Stored Layer" (Patent No: 201910316577.6), China National Intellectual Property Administration
16. CHEN JIENAN; WU QIDIE; DAI WEIJIE; TAO JIYUN; **PENG YIFENG**. "Neural network training method and device, MIMO equalizer and method, and readable medium" (Patent No: 211343819OA), China National Intellectual Property Administration