Chengkai Zhu

Institute of Information Engineering
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Research Interests

- Quantum information theory, Quantum computation, Quantum machine learning

Education

09/2020 - 06/2023 **University of Chinese Academy of Sciences**,
M.S in Cyber security.
GPA – 3.84/4.00

01/2019 - 06/2019 **Oklahoma State University**,
Visiting student.

09/2016 - 06/2020 **China Agricultural University**,
B.S in Applied Mathematics.
GPA – 3.7/4.00

Research Experience

07/2021 – 04/2023 **Research Intern**, *Institute for Quantum Computing, Baidu Research*.
- Working on quantum information and quantum machine learning supervised by Xin Wang.
- Research developer for Paddle Quantum. Developing quantum information tools, classical shadows tools.
- Writing six patents in areas of parameter estimation of quantum channels, Hamiltonian simulation.

06/2021 – 06/2023 **Research Student**, *Institute of Information Engineering, Chinese Academy of Sciences*.
- Working on quantum circuits optimization supervised by Zhenyu Huang.
- Focusing on the quantum implementation of symmetric ciphers.

Publications

- **Chengkai Zhu***, Chenghong Zhu*, and Xin Wang. "Estimate distillable entanglement and quantum capacity by squeezing useless entanglement." submitted, arXiv:2303.07228 (2023). *We propose methods for efficiently computing upper bounds on the distillable entanglement and the quantum capacity via SDP.*
- **Chengkai Zhu** and Zhenyu Huang. "Optimizing the depth of quantum implementations of linear layers." International Conference on Information Security and Cryptology. Springer, Cham, 2023. *We obtain some SOTA results for quantum implementation of linear layers of different ciphers.*
- Hao-Kai Zhang*, **Chengkai Zhu***, Geng Liu, and Xin Wang. "Fundamental limitations on optimization in variational quantum algorithms." submitted, arXiv:2205.05056 (2022). *We show a new scaling theorem for generic variational quantum algorithms beyond vanishing gradients.*

Refereed conference talks

07/2023 **BIID 2023**, *Estimate distillable entanglement and quantum capacity by squeezing useless entanglement*, University of Tübingen, Germany.

12/2022 **Inscrypt 2022**, *Optimizing the depth of quantum implementations of linear layers*, Beijing, China.

Patents

07/2023 - X. Wang, G. Fan, R. Chen, **C. Zhu**, Quantum data measurement method, system, electronic equipment and media, CN114021728, Granted, 2023.

03/2023 - X. Wang, **C. Zhu**, R. Chen, G. Fan, Quantum channel noise parameter estimation method and device, electronic equipment and media, CN114239840, under review, 2023.

01/2023 - X. Wang, **C. Zhu**, Information processing method and device based on quantum system, CN115577791, under review, 2023.

01/2023 ◦ **C. Zhu**, X. Wang, Information processing method and device based on quantum system, CN115577792, under review, 2023.

Honors

12/2017 **Arawana Scholarship**, *CAU*.
◦ Ranked TOP 1% in College of Science, China Agricultural University.

12/2017 **The Second-class Scholarship**, *CAU*.

12/2017 **Merit Student**, *CAU*.

09/2017 **The Second Prize Award**, *Undergraduate Mathematical Contest in Modeling at CAU*.

08/2017 **The Third Prize Award**, *China Undergraduate Physics Tournament (CUPT) at HIT*.

03/2017 **The Fisrt Prize Award**, *The 8th English Debating Championship at CAU*.

Skills

Languages Python, Matlab, C

Frameworks Paddle Quantum, Qiskit, Q#

Utilities Anaconda, Sublime Text, Jupyter Notebook

Soft Skills Leadership, Time Management, Public Speaking

Extracurricular Activities

07/2019 – 08/2019 Being a volunteer teacher in Qinghai Province, China.
◦ Teaching left-behind children in primary school fundamental science in Haidong City, Qinghai Province.

07/2018 – 08/2018 Being a volunteer teacher in Ningxia Province, China.
◦ Teaching left-behind children in primary school fundamental science in Guyuan City, Ningxia Province.

Interests ◦ Basketball, Soccer, Swimming, Piano, Guitar

References

Dr. Zhenyu Huang,
Associate Professor,
State Key Laboratory of Information Security, Institute of Information Engineering, Chinese Academy of Sciences,
huangzhenyu@iie.ac.cn.

Dr. Xin Wang,
Associate Professor,
Thrust of Artificial Intelligence, Information Hub, Hong Kong University of Science and Technology (Guangzhou),
wangxinfelix@gmail.com.