



ORIGINQ

QUANTUM COMPUTING FULL-PHYSICAL
SYSTEM LEARNING MACHINE

量子计算全物理体系学习机

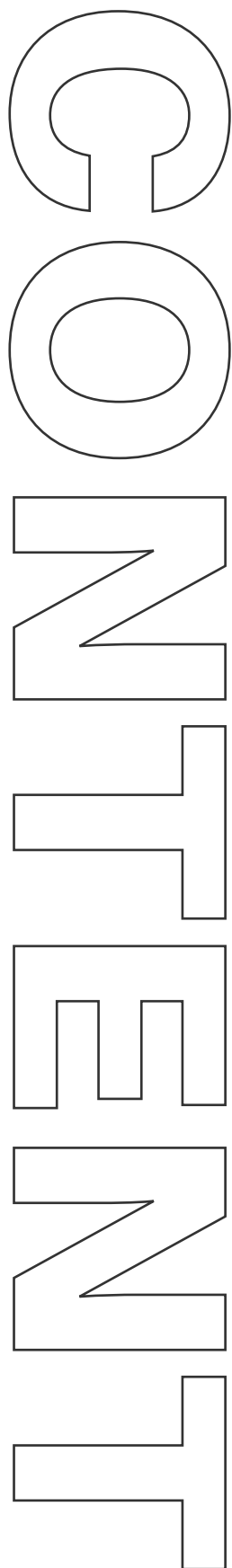


INTRODUCTION TO LEARNING MACHINE

Quantum Computing Full Physical System Learning Machine is a one-stop learning system built by Benyuan Quantum Computing Technology (Hefei) Co., LTD., focusing on providing quantum computing learning environment and creating a quantum computing program development environment. At present, many universities and large institutions have used quantum computing full physical system learning machine as the main equipment for quantum computing learning.

The learning machine is equipped with a number of functional modules, including 3D simulation virtual laboratory, quantum computing micro-classroom, quantum computing graphical programming module, etc. The close coordination between the multiple modules helps learning machine users understand the construction of quantum computers, understand the algorithms of quantum computing, and write quantum programs.





① BACKGROUND

② MODULES

③ 3D SIMULATION VIRTUAL LABORATORY

- Superconducting Quantum Computer virtual laboratory
- Semiconducting Quantum Computer virtual laboratory
- Ion trap quantum computer

④ MICRO CLASS OF QUANTUM COMPUTING

⑤ QUANTUM COMPUTING GUI PROGRAMMING

⑥ VERSION INTRODUCTION

⑦ INTRODUCTION TO ORIGIN QUANTUM

⑧ PARTNER INSTITUTIONS

01

BACKGROUND

产品背景

At present, plans for the quantum computing industry are made both in China and abroad. The talents in quantum software and algorithms are in short supply. There is an urgent need for a lot of quantum computing talents. Because the number and performance of real quantum computers are relatively limited, they cannot meet the large needs of quantum computing learners and industry practitioners.

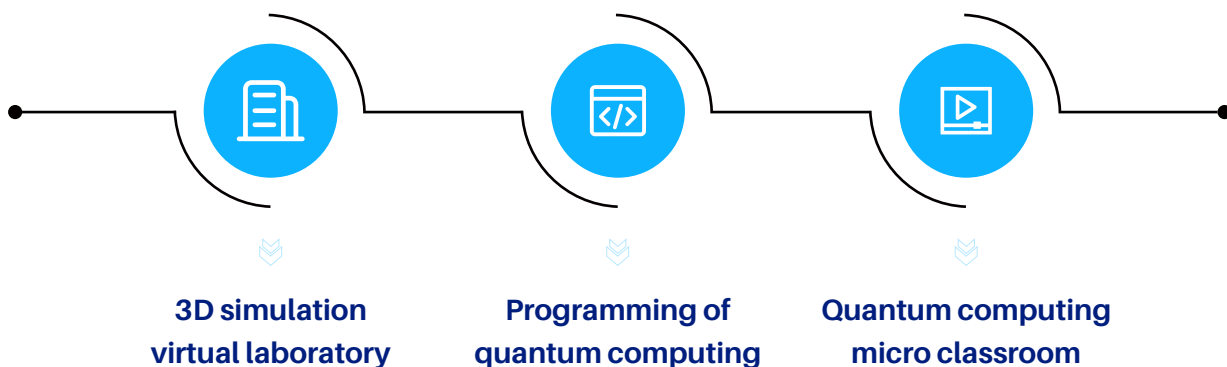
Origin Quantum Computing Learning Machine can fully meet the quantum computing needs of users of different industries. With its powerful special quantum computing simulation environment, Origin Quantum Computing Learning Machine can meet the needs of students, researchers and engineers to learn theoretical knowledge and operating principles about the quantum computer and write and run quantum programs on the learning machine. Just like a real quantum computer, the learning machine can simulate the execution process and To help relevant personnel focus on learning, researching and testing quantum algorithms.



02

MODULES

功能模块



算微课堂

computing micro classroom



量子开源社区

Quantum open source community

算GUI编程

aming of quantum computing



系统设置

System settings

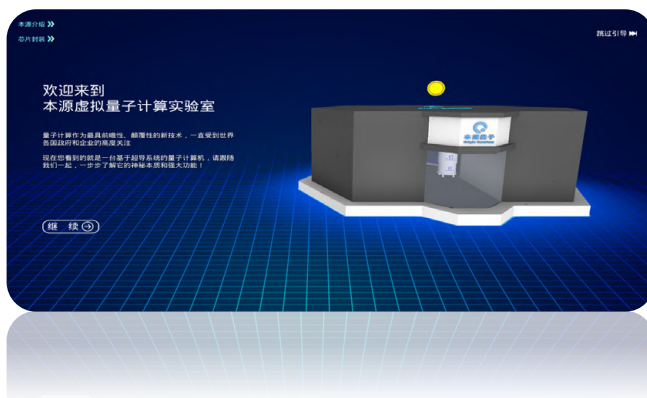
The 3D simulation lab for full-physical system quantum computing mainly showcases the superconducting quantum computer (research enterprises: IBM, Google, Origin Quantum), the semiconducting quantum computer (research enterprises: Intel, Origin Quantum), and the trapped ion quantum computer. All quantum computing physical systems are explained in varying degrees of detail from fundamental concepts to deep principles and from external structure to internal precision to help users know about the current international development status of quantum computers.



SUPERCONDUCTING QUANTUM COMPUTER VIRTUAL LABORATORY

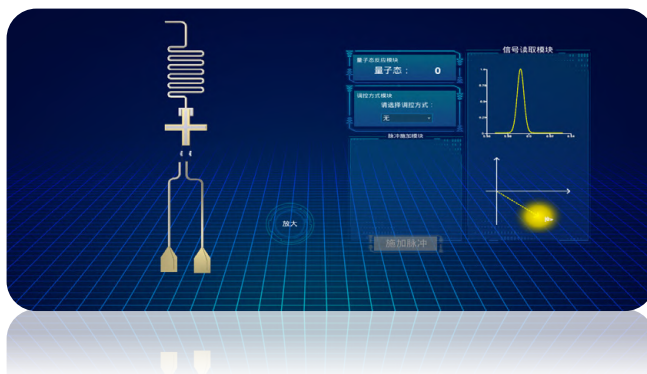
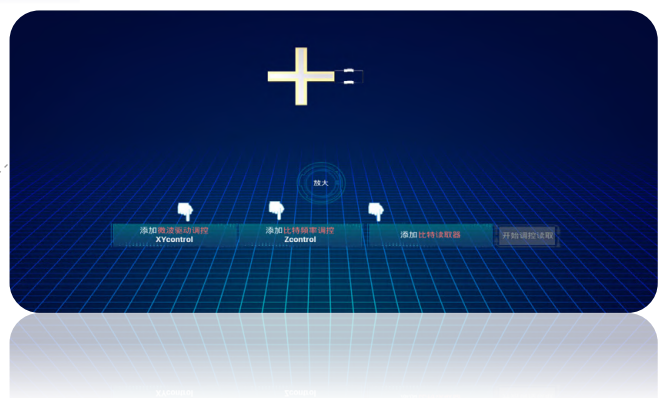
The superconducting quantum computer Virtual lab includes 3D display module, multiple interactive learning modules and DJ algorithm display module.

3D display module shows dilution refrigerator, measurement and control machine, spectrum analyzer, oscilloscope, vector analyzer and other components. Working state of a diluted superconducting quantum chip near absolute zero. The interactive learning module shows the whole process of assembling, reading, regulating and connecting superconducting qubits. DJ algorithm display module has a wealth of example lines, algorithm principle explanation video and line operation results show.

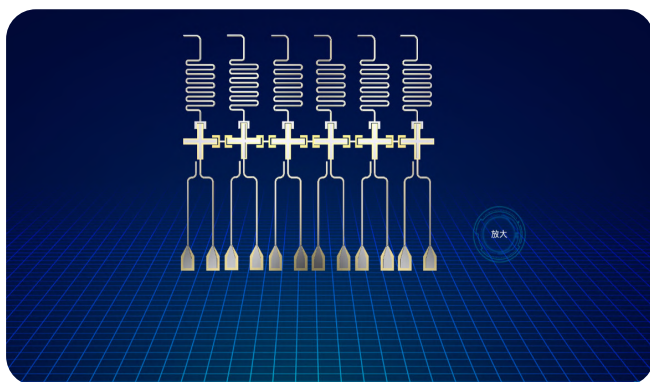


01 • 3D virtual laboratory

02 • Assembly of superconducting qubit



03 • Measurement and control of superconducting qubit

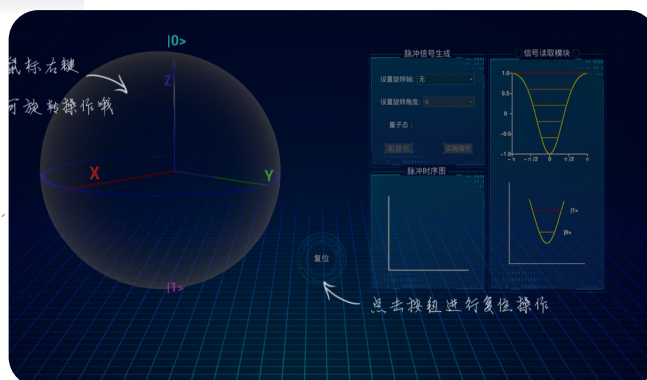


04

- Coupling and connection of superconducting qubit

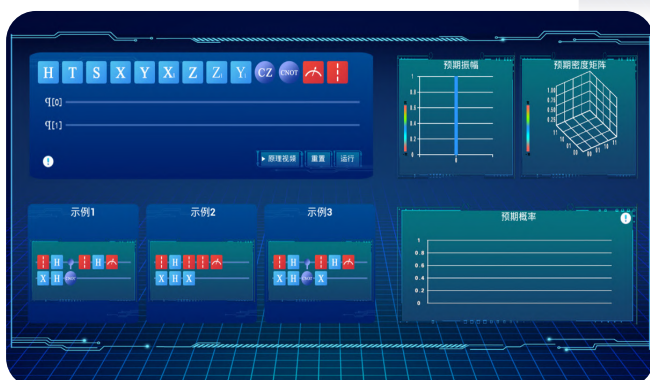
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- Demonstrate quantum computing vividly



06

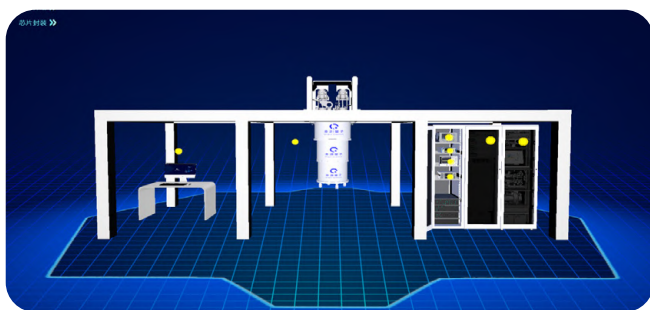
- Exhibition of DJ algorithm case



SEMICONDUCTING QUANTUM COMPUTER VIRTUAL LABORATORY

The semiconductor quantum computer virtual laboratory includes 3D display module, multiple interactive learning modules and Grover algorithm display module.

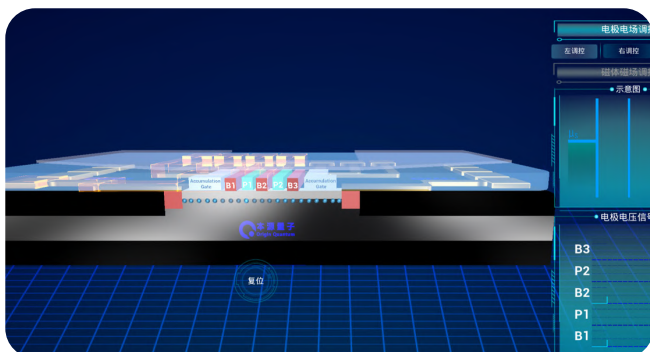
3D display module shows dilution refrigerator, measurement and control machine, spectrum analyzer, oscilloscope, vector analyzer and other components. The external structure of the dilution chiller can be peeled layer by layer to facilitate users to gain insight into the internal structure of the dilution chiller, and can switch the low temperature mode to show the working state of the semiconductor quantum chip near absolute zero. Interactive learning module shows the whole process of semiconductor quantum chip assembly and semiconductor quantum bit assembly, reading, regulation and connection in the form of passing through. Grover algorithm display module has a wealth of example lines, algorithm principle explanation video and line operation results display.



01 • 3D virtual laboratory

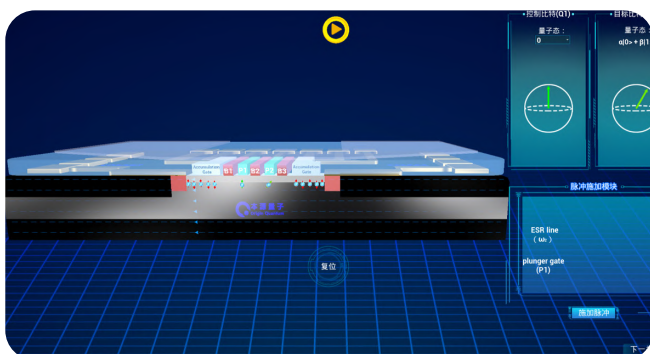


02 • Operate the chip to assemble the game



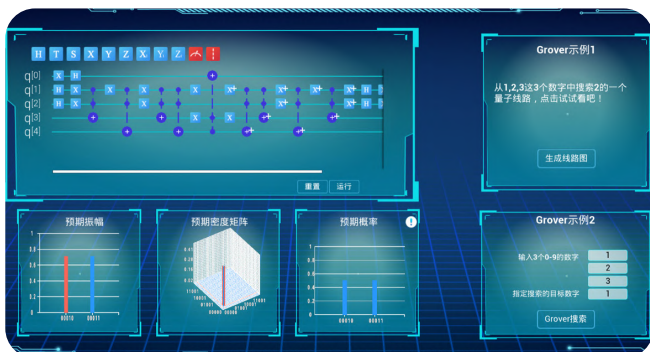
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- Semiconducting qubit control



04

- Demonstrate quantum computing vividly



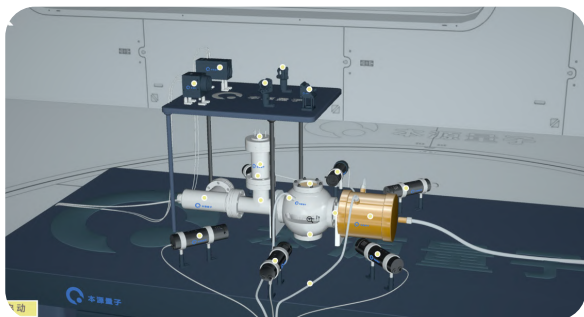
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- Exhibition of Grover algorithm case

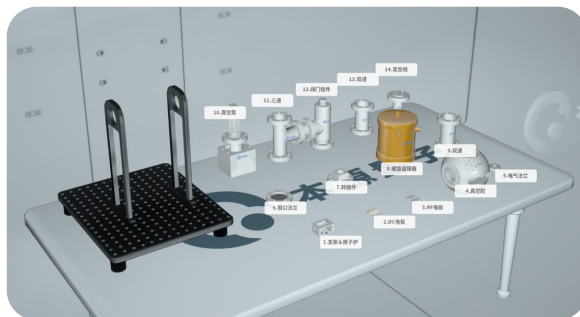
TRAPPED ION QUANTUM COMPUTER VIRTUAL LABORATORY

The trapped ion quantum computer virtual laboratory includes 3D display module, multiple interactive learning modules and algorithm display module.

3D display module displays trapped ion quantum computer, DC voltage controller, magnetic field controller, RF controller, laser controller and other components. Interactive learning modules allow you to assemble trapped ion platforms sequentially or in a free mode, as well as demonstrate the principle of trapping charged particles.



• 3D virtual laboratory



• Assembly of trapped ion platform



• Demonstration of ion confinement



• Exhibition of DJ algorithm case

04

MICRO CLASS OF QUANTUM COMPUTING

量子计算微课堂

RSA加密系统

通过上面的这个游戏，你应该可以看出，随着系统设置的密码越来越长，破解密码所需要耗费的时间相应的也会呈指数难度增长。

根据已经披露的文献，目前被破解的最长RSA密钥是768个二进制位。也就是说，长度超过768位的密钥，还无法破解（至少没人公开宣布）。

因此可以认为，1024位的RSA密钥基本安全，2048位的密钥极其安全。

所以到当前为止，世界上还没有任何可靠的攻击RSA算法的方式。只要其密钥的长度足够长，用RSA加密的信息理论上是不能被破解的。

正是由于RSA加密系统的高可靠性以及现阶段不太可能被破解的特性，在公开密钥和电子商业中被广泛应用。

大到国家的国防军事系统，如导弹发射密令、高端反导系统、尖端武器研发资料、国家安全机密资料保密，小到各种商业公司的商业机密、用户数据、独家知识产权核心专利保密等，基本上都使用了RSA加密系统。

再贴一点，美国Apple公司开发的Apple App签名，HTTPS 加密链接，利用OpenSSL库对Socket传输进行RSA+AES安全加密，等等这些无一不是RSA加密系统的应用案例。

经过对RSA加密系统一番介绍，你可能产生了疑问，既然RSA加密如此“安全”，这世上真的就没有可以破解它的方法了吗？

如果你能想到这里，小量很佩服你，毕竟你掌握了“相对论”的精髓了，哈哈！

RSA加密系统

RSA加密系统融入非对称加密算法，非常可靠，密钥越长，它就越难破解。

Shor算法

质因数分解算法

Shor算法与经典算法对比

Shor算法的RSA解密与经典算法破解对比

下一步

CONVERSATIONAL TEACHING

This module adopts conversational teaching to introduce RSA encryption system, quantum algorithm, quantum computing principles, quantum computing advantages, quantum computing physical system, quantum computing programming teaching and other knowledge to users in a simple and easy to understand way, and gradually help users enter the wonderful world of quantum computing.

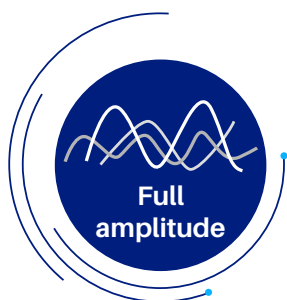
VIDEO TEACHING

This module exhibits the basic knowledge of quantum computing to users in the form of videos, including quantum computing and quantum cloud, quantum computing basics, quantum programming tools, quantum computer hardware introduction, etc., to help users more vividly understand the mystery of quantum computing.

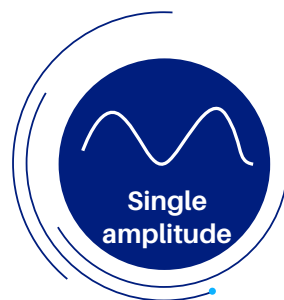


VIRTUAL QUANTUM COMPUTING MODEL

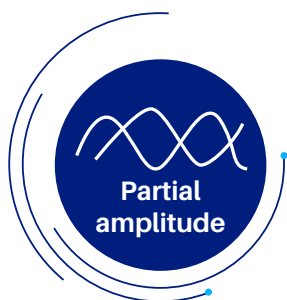
Full-amplitude quantum simulator, single-amplitude quantum simulator, partial-amplitude quantum simulator, noise inclusive quantum simulator.



- All amplitude information (count 2^n) of the quantum state is stored.
- Memory capacity is a bottleneck, it is generally difficult to exceed 40 qubits (16PB).



- Only any amplitude information is calculated to avoid storing all information at any one time.
- The result is calculated by path integral principle and tensor network optimization.



- The result of any given subset of the total amplitude can be calculated.
- By calculating the quantum circuit of segmentation, it can be combined with any calculation method.



- The simulation results are more similar to real quantum computers.
- Quantum computing learning machines provide rich noise models.
- The correspondence between the noise model and the quantum logic gate can be customized.

COMPLETE QUANTUM COMPUTING PROGRAMMING CAPABILITIES

The quantum computing learning machine is equipped with graphical programming pages, provides complete single-bit gates and multi-bit gates, and encapsulates quantum algorithm cases for users to call easily.



06

VERSION INTRODUCTION 版本介绍



02 Personal edition

Quantum learning machine personal edition includes PC client and Web version, the PC version of quantum learning machine can download the installation package through the official channel of the source, the quantum learning machine client is loaded on their own computer, the Web version of quantum learning machine can be accessed online through the source quantum cloud.



01 Standalone edition

It integrates software and hardware to facilitate display. Each quantum learning machine has only one unique authorization activation code officially authorized by Origin Quantum to protect the personal permissions of users.



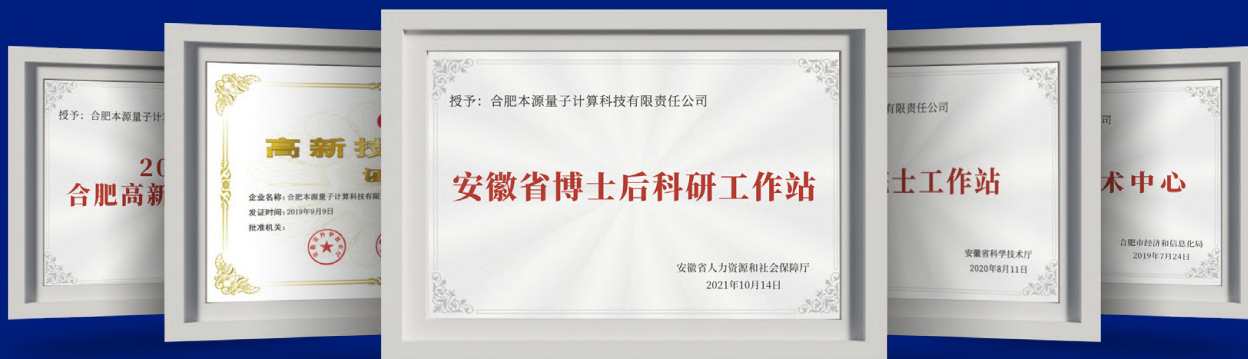
03 cluster edition

It is equipped on the existing cluster, and used for multiplayer online learning in the form of account distribution. The virtual computing service will expand the number of qubits according to the needs of users.

COMPANY PROFILE

Origin Quantum Computing Technology (Hefei) Co., LTD, leading enterprise of domestic quantum computing, was founded in Hefei High-tech Zone in 2017, and has branches in Beijing, Chengdu and Shenzhen. Benyuan Quantum is committed to building a full-stack ecological layout of quantum computing, and is a high-tech enterprise focusing on the development of quantum computer complete machines and their software. It aims to accelerate the development of quantum computing technology, explore the application of quantum computing, cultivate the quantum computing ecosystem, and promote the benefit of quantum computing technology services.

CORPORATE HONORS



- Anhui academician workstation
- Anhui provincial postdoctoral research station
- Anhui quantum computing Engineering Research Center
- Quantum computing Key Laboratory of Anhui Province
- Anhui new research and development institution
- unicorn Enterprise
- National intellectual property advantage enterprises
- Quantum computing Hefei Technology Innovation Center
- National high-tech enterprises

08

PARTNER INSTITUTIONS

合作院校



Shanghai Jiao Tong University



Key Laboratory of Quantum Information, CAS



Wuhan University



Huazhong University of Science and Technology



University of Science and Technology of China



Communication University of China



Central South University



Shandong University



Zhengzhou University



Southeast University



East China Normal University



Ocean University of China



Chongqing University of Posts and Telecommunications



Xidian University



Nankai University



China University of Petroleum (Beijing)



China University of Mining and Technology



Shanghai Maritime University



Anhui University



Nanjing University of Posts and Telecommunications



Wuhan University of Technology



Tianjin Polytechnic University



Northern University for Nationalities



Shanghai University



Nanning Normal University



Ningbo University



Guangdong Ocean University



Hubei Normal University



Chaozhou College



Zhejiang Vocational College of Finance



Shenzhen Vocational and Technical College



Nanjing Vocational College of Tourism



Guangdong Polytechnic of Industry and Commerce



Wing shan secondary



Non-ferrous metal industry talent center



Cyber Security Science and Technology Museum



CCF Professional Group on Quantum Computing



PURPOSE

宗旨

Bring quantum computing out of the laboratory to
truly serve humanity

VISION

愿景

Produce China's Autonomous Controllable
Quantum Computer



Origin Quantum Computing Technology (Hefei) Co., Ltd.

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