

# *Thoughts on the Contest of CCF "Sinan Cup" Quantum Computing Programming Challenge*

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**Abstract:** Quantum computing, as a new tool for future computation power has attracted a great international attention and experiences a rapid development. In order to promote the innovative development of quantum computing in China and assist in the cultivation of quantum computing talents at universities and enterprises, starting from 2022, the Chinese Computer Society (CCF) has hosted the CCF "Sinan Cup" Quantum Computing Programming Challenge. On the basis of our experience in the second CCF "Sinan Cup" Quantum Computing Programming Challenge, this paper deeply analyses several problems concerning the preparation for the contest. For instance, taking care for the mental health of students, improvement of teachers' motivation to work, enhancing medial publicity and turning public attention to the quantum technology industry. We also give some suggestions for future competitions towards the improvement of the professional level of disciplines and quantum computing application capabilities to get better results in the next competition.

## 1. Introduction

As one of the emerging technologies in the 21st century, quantum computing is regarded as the next breakthrough in the development of human science and technology, and has a very important position in the global science and technology field, which can bring revolutionary changes to artificial intelligence, new material research and development, biomedical and other fields. In this coming quantum wave, our country has keenly grasped the issues of The Times and grasped the major historical opportunities for the development of quantum technology. General Secretary Xi presided over the Political Bureau of the Central Committee of the Communist Party of China in the twenty-fourth collective study emphasized the need to fully understand the importance and urgency of promoting the development of quantum technology, to strengthen the development of quantum technology strategic planning and systematic layout, grasp the megatrend, play a good first move.

The outline of the National "14th Five-Year Plan" clearly proposes to support the development of quantum technology in the aspects of national strategic scientific and technological strength, strategic emerging industries, digital economy, and the integration of military and civilian science and technology.

So far, China has made significant technological breakthroughs in the field of quantum computing. The third generation of autonomous superconducting quantum computer "Original Wukong", independently developed by Origin Quantum Computing Technology (Hefei) Co.Ltd., is the most advanced programmable and deliverable superconducting quantum computer in China. At the same time, Origin Quantum Company and China Computer Federation (CCF) jointly held the CCF "Sinan Cup" quantum computing Programming Challenge. The event opened two categories, four tracks, since 2022, has been successfully launched into the third edition. Our team was honored to participate in the second college group competition, under the strong support of the instructor, the team members carefully prepared for the competition, and finally won the second prize. Looking back on the whole competition process, we feel deeply and gain a lot. As participating students, we are deeply aware of the important role of the Sinan Cup event in all aspects. Here, we have deeply thought about the relevant issues and given relevant suggestions for the future work.

## **2. The Deeper Significance of the Sinan Cup Competition**

### **2.1. Boosting the Prosperous Development of Quantum Technology Industry**

The organization of the Sinan Cup has attracted a large number of talents in the field of quantum computing. During the competition, they can exercise and improve their programming and algorithm design abilities, thus providing a strong talent guarantee for the development of the quantum technology industry. The design of the competition questions is closely integrated with the current hot and difficult issues in the field of quantum computing, and the innovative thinking of the participants can provide more innovative solutions for the problems in the development of quantum technology<sup>[1]</sup>. Participants of Sinan Cup include not only college students but also scientific researchers and enterprises, which provides a good platform for cooperation industry-university-research, and can promote the industrialization process of quantum computing technology and accelerate the development of the quantum technology industry<sup>[2]</sup>. Raising public awareness of the quantum technology industry: By holding such competitions, more people can understand and realize the importance and prospects of the quantum technology industry, improve public awareness and attention to the quantum technology industry, and create a good social environment for the development of the quantum technology industry.

### **2.2 Promoting the Construction of Quantum Information Science Majors in Colleges and Universities**

As the third university in the country to be approved to add a major in quantum information science, Yangtze University, in order to achieve the talent cultivation goals of "upholding virtue, solid foundation, seeking truth and innovation, and integrating knowledge with practice", cooperates with the Origin Quantum computing technology (Hefei) Co.Ltd. in industry-academia-research cooperation, and jointly builds a quantum computing training base. It promotes and encourages students to participate in the CCF "Sinan Cup" Quantum Computing Programming Challenge, aiming to cultivate high-quality compound talents with comprehensive development in morality, intelligence, physical fitness, aesthetics, and labor, who master the principles, design, and application of quantum communication, quantum computing, and quantum precision measurement, and can play an important role in the development of China's quantum

technology industry.

The School of Physics and Optoelectronics Engineering of Yangtze University has about 20 teams participating in the second Sinan Cup university group competition and won the "Outstanding Organization Award". During the competition, students' practical training ability and logical thinking ability were exercised and improved, not only gaining valuable experience but also cultivating the ability of team collaboration. At the same time, teachers also gained inspiration from it, optimized related practical training projects and curriculum design, and promoted the construction and development of professional courses. This way of promoting learning through competition not only improves comprehensive quality of students, but also promotes the construction of quantum information majors in colleges and universities, helping to cultivate more new talents in the field of quantum<sup>[3]</sup>.

### **2.3. Accelerating the Cultivation of Talents in Quantum Information Science**

Participating in the Sinan Cup is a rare opportunity for learning and practice. In this process, the players will delve into the basic principles of quantum computing and learn how to quantumize classical algorithms. This can not only exercise the players' ability to apply knowledge and adapt quickly but also significantly improve their professional level. Faced with various challenges in the competition, players need to continuously try, communicate, and innovate to gradually explore more practical solutions. At the same time, these challenges also provide players with opportunities to temper their will and enhance their self-confidence<sup>[4]</sup>.

In addition, the Sinan Cup competition also provides a valuable exchange platform for quantum computing talents, allowing everyone to present personal ideas, exchange experiences, and make progress together. Moreover, players also have the opportunity to communicate face-to-face with industry experts, receive valuable guidance and suggestions, thus further improving their abilities and level.

## **3. Profound experiences and insights from participation**

### **3.1. Caring for the mental health of students**

Students will inevitably experience stress and tension during competitions. In order to develop their psychological health and face the competition in the best condition, teachers need to take into account the specific situation of the students and help them to build up and enhance their self-confidence through psychological support and guidance, so that they can maintain a good state of mind during the training and competition. After the competition, we should also counsel the students to summarize their experiences and correctly analyze their shortcomings, so that they can face the results of the competition in a good state of mind, thus better promoting the overall healthy growth of the students<sup>[6]</sup>.

### **3.2. Improvement of teachers' motivation to work**

Higher motivation is conducive to higher quality academic instruction for students. Teachers' enthusiasm and motivation can infect students and stimulate their enthusiasm for participation and creative thinking. Moreover, increased motivation of teachers will make them more patient in guiding students and helping them to solve problems, thus establishing a more harmonious teacher-student relationship<sup>[4]</sup>. At the same time, it can also promote the communication and cooperation among team members, cultivate students' teamwork ability and sense of collective honor, so as to improve the efficiency and quality of the game, and lay a solid foundation for

cultivating more excellent talents.

### 3.3. Enhancing publicity and attention

Most of the students only emphasize on theoretical study, but neglect the cultivation of practical ability, especially in academic competitions. Most students don't want to spend a lot of time and energy to prepare for this competition because it isn't listed in the White List of National Competitions by the Ministry of Education. For teachers, with the lack of support from the college and their own heavy research tasks, it is difficult for them to ensure that they have enough energy to pay attention to the competitions just based on their sense of responsibility and honor. All these have seriously led to the lack of attention and publicity to the Sinan Cup competition, until the official notice of the competition came out, and then conveyed to the students, then the time is short, the task is heavy, and the enthusiasm of the students to participate in the contest will be greatly reduced<sup>[7]</sup>.

Therefore, we should increase publicity, raise our own awareness, publicize such events in advance, give students sufficient time to prepare, play a positive role in guiding the event, and promote the development of comprehensive ability of students.

## 4. Ideas and proposals for future work

After summarizing the competition and in-depth thinking, we believe that our future work can be carried out in the following aspects.

### 4.1. Strengthen the foundation and practical training.

The cultivation of our personal professional skills and the improvement of the level of practice should be based on the learning of theoretical knowledge, mastering the underlying logic of the theoretical system and constructing a complete knowledge framework in order to lay a good theoretical foundation. Sinan Cup is based on the Origin Quantum QPanda/pyQPanda programming framework to answer the questions, the contest official will provide participants with an online integrated development environment IDE. We first need to understand its programming development environment, master its programming logic language, which will help us to utilize the quantum computation programming to solve the actual problem.

### 4.2. Inspiring Learning through Competition

Targeted training to promote learning and understanding. Before the contest, we made a detailed analysis of all kinds of training topics on the official website of Origin Quantum one by one, and through in-depth discussion of each knowledge point in the contest questions, we promoted thinking with questions to help us continuously clarify our thoughts, strive for accuracy, and avoid mistakes<sup>[3]</sup>.

### 4.3. Establishment of teams to improve efficiency.

In the 2nd CCF "Sinan Cup" Quantum Computing Programming Challenge, participants can sign up either individually or in teams. During the preliminary learning process, we each assigned specific learning tasks, and then through the form of group meetings, we explained and discussed them one by one, and finally achieved the effect of learning with half the effort with half the effort. Led by the common goal, our learning and training is more directional, through the continuous

division of labor, exchange of learning, mutual inspiration, deepen understanding, we finally achieved good results.

## 5. Conclusion

We are honored to participate in CCF "Sinan Cup" Quantum Computing Programming Challenge and have gained a lot of valuable experience. This event not only provides an opportunity for us to show our talents, but also a stage to promote our learning, communication and growth. In the process, we realized the cutting-edge technology and the latest developments in the field of quantum computing, and more deeply appreciated the great potential and bright future of quantum computing.

Finally, we would like to thank all the staff of the event organizers for their hard work and careful organization, which provided us with such a high-level competition platform. We believe that in the near future, quantum computing will bring more far-reaching impact on the progress and development of human society.

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