

# Xiangjun Tan

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## Education

<b>Peking University (PKU)</b>	<i>Beijing</i>
Summer School, Introduction to Quantum Information Technology, GPA:88	Jun. 2022 - Aug. 2022
<b>University of New South Wales (UNSW)</b>	<i>Sydney</i>
Bachelor of Quantum Engineering/Physics double degree, Graduated with Distinction, Top10%	Sep. 2021 - Feb. 2024
<b>University of New South Wales (UNSW)</b>	<i>Sydney</i>
Bachelor of Physics(Honours)	Feb. 2024 - Dec. 2024
Expected graduate within 3 years to finish a 5-year full degree by overloading the coursework.	

## Awards and Honors

May 2024 – May 2025	<b>Award:</b> “IBM Quantum Researcher Program, awarded \$105,000 AUD”	<i>IBM, Washington</i>
Feb. 2023-2024	<b>Award:</b> “UNSW Science Talented Student”	<i>UNSW Science Sydney</i>
Dec. 2022-2023	<b>Scholarship:</b> “SQA undergraduate Student Research Scholarship ”	<i>Quantum Academy</i>
Feb. 2023	<b>Award:</b> UNSW Dean’s list	<i>UNSW Engineering</i>

## Research Projects

<b>Physics Beyond the Standard Model Enhanced Through Quantum Information</b>	<i>UNSW, Sydney</i>
Honours Project Supervisor: Prof. Susan Coppersmith, collaboration with Prof. Baha Balantekin	Jan. 2024 - Current
<ul style="list-style-type: none"><li>Developed an effective model to boost the calculation of Dark Matter (WIMP) -Nuclei Scattering through quantum simulation, supported by IBM Quantum.</li><li>Innovatively mapped Nuclear Shell Quasi-Spin Pairing Model onto Quantum Circuits, enhancing the accuracy of quantum simulations related to nuclear physics.</li><li>The energy difference between the ground state and quantum estimated energy was quantified as a function of quantum gate fidelity and the number of variational parameters based on the model and quantum devices.</li><li>Submitted the works to the 2024 Physics Research Poster Presentation Event in Sydney, hosted by the Australian Institute of Physics</li></ul>	
<b>Quantum Simulation of Phonon Scattering &amp; Topological Phonon Surface States</b>	<i>Institute of Theoretical Physics, CAS, Beijing</i>
Research Assistant Supervisor: A/Prof. Tiantian Zhang	Dec. 2023 -
<ul style="list-style-type: none"><li>Pioneered the mapping of the Four Phonon Scattering Hamiltonian to quantum circuits and evaluated by Variational Quantum Eigensolver.</li><li>Constructed an Effective Ansatz for Bosonic Vibrational Systems, facilitating more accurate simulations of phononic behaviours, which will contribute to the thermal conductivity of the materials</li><li>Applied the Tight-binding model for graphene, analysis of the surface states and the topological property on a supercell with open boundary condition.</li><li>Explored how will the topological defects and dilution effect the topological phonon surface states</li></ul>	
<b>Quantum Hall Effect in 2D Systems</b>	<i>UNSW, Sydney</i>
Taste of Research Supervisor: Prof. Alex Hamilton	Sep. 2023 - Dec. 2023
<ul style="list-style-type: none"><li>Measured the Quantum Hall Effect at ultra-low temperatures (below 2 Kelvin) and high magnetic fields (up to 9 Tesla), contributing to the understanding of quantum electronic properties in 2D materials.</li></ul>	
<b>Research on Quantum Computation for Neutrino Oscillation and Many-body Problems</b>	<i>UNSW, Sydney</i>
Talented Student Program Supervisor: Prof. Susan Coppersmith	Mar. 2023 - Jan.2024
<ul style="list-style-type: none"><li>Delved into the fundamentals of Many-body Physics and Quantum Field Theory (QFT), establishing a quantum simulation circuit for Collective Neutrino Oscillation under two flavours.</li><li>Encoded an efficient algorithm for collective neutrino oscillation simulations on the IBMQ Platform for up to 16 Qubits.</li><li>Implemented advanced error mitigation strategies to minimize computational errors and optimize quantum gate operations, demonstrating the potential for reducing resource overhead in quantum simulations.</li><li>Presented findings at QPQIS-2023 Conference in Beijing, showcasing the project’s contribution to the field of quantum simulation for high energy physics.</li></ul>	
<b>Modeling and Simulation of Silicon Qubit Devices</b>	<i>Sydney Quantum Academy, Sydney</i>
SQA Undergraduate Research Supervisor: Dr. Chris Escott	Jan. 2023 - Mar. 2023
<ul style="list-style-type: none"><li>Created a model to describe the physical defect, especially for the dilution in the materials.</li><li>Devised a customized Ising Model for simulation using Matlab, facilitating the exploration of qubit interactions and quantum state behaviours.</li></ul>	

**Research on Neutrino Oscillation in Different Mediums**  
Physics Research Project Supervisor: Dr. Michael Schmidt

*UNSW, Sydney*  
Aug. 2022 - Jan. 2023

- Investigated the time evolution of the Effective Hamiltonian in vacuum and matter, advancing the theoretical framework for neutrino oscillation in astrophysical contexts.
- Derived novel expressions for evolution in dark matter environments, offering insights into how neutrinos interact with unseen cosmic matter.
- Developed an interactive model for neutrino oscillation using Python, enhancing educational tools and theoretical predictions in particle physics.

**Activities**

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**UNSW Hero Program-Innovation Pro**  
Team Leader

*UNSW Sydney*  
May. 2023 - August. 2023

- Directed a team in the development and presentation of a pitch for innovative quantum computation technology, highlighting potential impacts on various industries.
- Conducted comprehensive research to underpin the pitch, ensuring the presentation was grounded in the latest quantum computing advancements and market needs.
- Developed and delivered a compelling presentation to stakeholders, effectively communicating complex quantum computing concepts to a non-specialist audience.
- Facilitated collaboration between team members with diverse expertise, fostering a creative and productive environment for idea generation and problem-solving.
- Successfully engaged with industry experts and potential investors during the pitch, garnering positive feedback and establishing valuable connections for future collaborations.

**UNSW Research Seminar Association**  
President / Founder

*UNSW Sydney*  
Apr. 2023 - Present

- Founded and currently presides over the Research Seminar Association (RSA), a university-certified society that significantly enhances the academic and professional network within UNSW, including thousands of members.
- Successfully organize weekly seminars featuring researchers and students to discuss cutting-edge topics, promoting interdisciplinary learning and collaboration.
- Spearheaded collaborations with international companies to provide job-sharing opportunities, contributing to members' career development by directly addressing employment challenges in the research sector.
- Led initiatives that resulted in a measurable increase in membership and engagement, establishing RSA as a pivotal platform for academic and professional exchange at UNSW.

**Quantum Computation Training Program (4th Edition)**  
Research Student

*University of Science and Technology of China*  
June. 2023 - Sep.2023

- Participated in an intensive training program on Quantum Computation, gaining hands-on experience with quantum algorithms and computational models.
- Collaborated on a project that simulated quantum systems, which enhanced understanding of quantum mechanics and computational techniques.
- Acquired advanced skills in quantum programming languages and tools, preparing for impactful research contributions in quantum computing.

**Technical Skills**

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**Programming**

Matlab, C, Python

**Professional Softwares**

Matlab, Ltspice, Mathematica

**Drawing & Typesetting**

Photoshop, Office, L<sup>A</sup>T<sub>E</sub>X

**Languages**

Chinese(Native), English