# Xiangjun Tan

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## Education

**Peking University (PKU)** *Beijing*

Summer School, Introduction to Quantum Information Technology, GPA:88 Jun. 2022 - Aug. 2022

**University of New South Wales (UNSW)** *Sydney*

Bachelor of Quantum Engineering/Physics double degree, Graduated with Distinction, Top10% Sep. 2021 - Feb. 2024

**University of New South Wales (UNSW)** *Sydney*

Bachelor of Physics(Honours) Feb. 2024 - Dec. 2024

Expected graduate within 3 years to finish a 5-year full degree by overloading the coursework.

## Publications

[1] **Xiangjun Tan*** "Quantum Computing for Phonon Scattering Effects on Thermal Conductivity" *arXiv*, 2407.15808. [Link]

## Awards and Honors

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| May 2024-2025 | **Award**: "IBM Quantum Researcher Program, awarded $105,000 AUD" |
| Feb. 2023-2024 | **Award**: "UNSW Science Talented Student" |
| Dec. 2022-2023 | **Scholarship**: "SQA Undergraduate Student Research Scholarship " |
| Feb. 2023 | **Award**: UNSW Dean's list |

## Research Projects

**Physics Beyond the Standard Model Enhanced Through Quantum Information** *UNSW, Sydney*

Honours Project Supervisor: Prof. Susan Coppersmith, collaboration with Prof. Baha Balantekin Jan. 2024 - Current

- Developed an effective model to boost the calculation of Dark Matter (WIMP) -Nuclei Scattering through quantum simulation, supported by IBM Quantum.
- Innovatively mapped Nuclear Shell Quasi-Spin Pairing Model onto Quantum Circuits, enhancing the accuracy of quantum simulations related to nuclear physics.
- 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.
- Submitted the works to the 2024 Physics Research Poster Presentation Event in Sydney, hosted by the Australian Institute of Physics

**Quantum Simulation of Phonon Scattering & Topological Phonon Surface States** *Institute of Theoretical Physics, CAS, Beijing*

Research Assistant Supervisor: A/Prof. Tiantian Zhang Dec. 2023 - Current

- Pioneered the mapping of the Four Phonon Scattering Hamiltonian to quantum circuits and evaluated by Variational Quantum Eigensolver.
- 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
- Applied the Tight-binding model for graphene, analysis of the surface states and the topological property on a supercell with open boundary condition.
- Explored how will the topological defects and dilution effect the topological phonon surface states

**Quantum Hall Effect in 2D Systems** *UNSW, Sydney*

Taste of Research Supervisor: Prof. Alex Hamilton Sep. 2023 - Dec. 2023

- 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.

**Research on Quantum Computation for Neutrino Oscillation and Many-body Problems** *UNSW, Sydney*

Talented Student Program Supervisor: Prof. Susan Coppersmith Mar. 2023 - Jan.2024

- 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.
- Encoded an efficient algorithm for collective neutrino oscillation simulations on the IBMQ Platform for up to 16 Qubits.
- Implemented advanced error mitigation strategies to minimize computational errors and optimize quantum gate operations, demonstrating the potential for reducing resource overhead in quantum simulations.
- Presented findings at QPQIS-2023 Conference in Beijing, showcasing the project's contribution to the field of quantum simulation for high energy physics.

**Modeling and Simulation of Silicon Qubit Devices** *Sydney Quantum Academy, Sydney*

SQA Undergraduate Research Supervisor: Dr. Chris Escott Jan. 2023 - Mar. 2023

- Created a model to describe the physical defect, especially for the dilution in the materials.
- Devised a customized Ising Model for simulation using Matlab, facilitating the exploration of qubit interactions and quantum state behaviours.

**Research on Neutrino Oscillation in Different Mediums** *UNSW, Sydney*

Physics Research Project Supervisor: Dr. Michael Schmidt 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

**UNSW Hero Program-Innovation Pro** *UNSW Sydney*

Team Leader 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** *UNSW Sydney*

President / Founder 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)** *University of Science and Technology of China*

Research Student 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

**Programming** Matlab, C, Python

**Professional Softwares** Matlab, Ltspice, Mathematica

**Drawing & Typesetting** Photoshop, Office, LaTeX

**Languages** Chinese(Native), English