

Xiangjun Tan

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Education

University College London (UCL)	<i>London</i>
PhD in Physics, Supervisor: Prof. Sougato Bose	Oct. 2025 - Oct. 2029
University of New South Wales (UNSW)	<i>Sydney</i>
Bachelor of Physics(Honours), Thesis Supervisor: Prof. Susan Coppersmith	Feb. 2024 - Dec. 2024
University of New South Wales (UNSW)	<i>Sydney</i>
Bachelor of Quantum Engineering/Physics double degree, Graduated with Distinction, Top10%	Sep. 2021 - Feb. 2024

Publications

- [1] **Xiangjun Tan***, **Zhanning Wang**, “Toward Axion Signal Extraction in Semiconductor Spin Qubits via Spectral Engineering,” *IEEE Transactions on Quantum Engineering*, DOI: 10.1109/TQE.2025.3599670. [\[Paper Link\]](#)
- [1] **Xiangjun Tan***, **Zhanning Wang**, “Annual-Modulation Fingerprint of the Axion Wind Induced Sideband Triplet in Quantum Dot Spin Qubit Sensors,” *Phys. Rev. D*, under review. [\[arXiv Link\]](#)
- [1] **Xiangjun Tan***, “Quantum Computing for Phonon Scattering Effects on Thermal Conductivity,” *Phys. Rev. Research*, under review. [\[arXiv Link\]](#)

Awards and Honors

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 \$3333 AUD”
Feb. 2023	Award: UNSW Dean’s list

Research Projects

Neural Network Quantum States for Many-body Quantum Dynamics

Center on Frontiers of Computing Studies, Peking University

Research Assistant Supervisor: Prof. Xiao Yuan

Dec. 2024 - Current

Physics Beyond the Standard Model Enhanced Through Quantum Information

UNSW, Sydney

Honours Project Supervisor: Prof. Susan Coppersmith, collaboration with Prof. Bahaa 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 Pairing Model onto Quantum Circuits, enhancing the accuracy of quantum simulations, which could be related to the target nuclear response function.
- Quantified the relation between the estimation energy difference and other variables in the model and developed a benchmark to see how to suppress the error. The relative error has been reduced by 88.2% according to my second-order perturbation correction.
- Submitted the works to the Physics Research Poster Presentation Event in Sydney, Australian Institute of Physics, and in QPQIS-2024. [\[Poster Link\]](#)

Quantum Simulation of Phonon Scattering & Topological Phonon Surface States

Institute of Theoretical Physics, CAS, Beijing

Research Assistant Supervisor: A/Prof. Tiantian Zhang

Dec. 2023 - Dec. 2024

- Pioneered mapping the Multi Phonon Scattering Hamiltonian to quantum circuits and evaluated by Variational Quantum Eigensolver with quantum error mitigation strategies.
- 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-like hexagonal lattice, analysis of the surface states and the topological property on a supercell with different boundary conditions.
- Explored how the topological defects and dilution affect 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. [\[Poster Link\]](#)

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. The code has been uploaded to [\[Github\]](#).
- 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 oscillations.
- 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 and finished the internal presentation. [\[Article Link\]](#)

Activities

UNSW Research Seminar Association

UNSW Sydney

President / Founder

Apr. 2023 - Present

- Founded and currently presides over the Research Seminar Association ([RSA](#)). This university-certified society significantly enhances the academic and professional network within UNSW, including two thousands of society 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.

Technical Skills

Programming Matlab, C, Python

Professional Softwares Matlab, Ltspace, Mathematica

Drawing & Typesetting Photoshop, Office, L^AT_EX

Languages Chinese(Native), English