

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	<i>Center on Frontiers of Computing Studies, Peking University</i>
Research Assistant Supervisor: Prof. Xiao Yuan	Dec. 2024 - Current
Physics Beyond the Standard Model Enhanced Through Quantum Information	<i>UNSW, Sydney</i>
Honours Project Supervisor: Prof. Susan Coppersmith, collaboration with Prof. Baha Balantekin	Jan. 2024 - Current
<ul style="list-style-type: none">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	<i>Institute of Theoretical Physics, CAS, Beijing</i>
Research Assistant Supervisor: A/Prof. Tiantian Zhang	Dec. 2023 - Dec. 2024
<ul style="list-style-type: none">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 materialsApplied 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	<i>UNSW, Sydney</i>
Taste of Research Supervisor: Prof. Alex Hamilton	Sep. 2023 - Dec. 2023
<ul style="list-style-type: none">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

Talented Student Program Supervisor: Prof. Susan Coppersmith

- 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. [\[Poster Link\]](#)

UNSW, Sydney

Mar. 2023 - Jan.2024

Modeling and Simulation of Silicon Qubit Devices

SQA Undergraduate Research Supervisor: Dr. Chris Escott

- 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.

Sydney Quantum Academy, Sydney

Jan. 2023 - Mar. 2023

Research on Neutrino Oscillation in Different Mediums

Physics Research Project Supervisor: Dr. Michael Schmidt

- 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. [\[Article Link\]](#)

UNSW, Sydney

Aug. 2022 - Jan. 2023

Activities

UNSW Research Seminar Association

President / Founder

- 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.

UNSW Sydney

Apr. 2023 - Present

Technical Skills

Programming

Matlab, C, Python

Professional Softwares

Matlab, Ltspice, Mathematica

Drawing & Typesetting

Photoshop, Office, L^AT_EX

Languages

Chinese(Native), English