

# Peter Yang

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## EDUCATION

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<b>University of Cambridge</b> <i>PhD in Quantum Information/Computing</i>	Peterhouse, Cambridge, England Oct 2024 –
<b>University of Cambridge</b> <i>Master of Science in Physics <b>First Class</b></i>	Peterhouse, Cambridge, England Oct 2023 – Jun 2024
<b>University of Cambridge</b> <i>BA in Natural Sciences, Physics; <b>First Class (GPA: 4.00/4.00)</b></i>	Peterhouse, Cambridge, England Oct 2020 – Jun 2023
<b>Shrewsbury School</b> <i>A-Level Diploma; Math(A*), Further Math(A*), Chemistry(A*), Physics(D1)</i>	Shrewsbury, England Sep 2018 – Jun 2020

## RESEARCH EXPERIENCE

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<b>Department of Computer Science, University of Cambridge</b> <i>Research Student</i>	<a href="#">Dr Prakash Murali</a> May 2024 –
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- Investigated on quantum architecture, Design a optimized quantum error correction scheme based on resource estimation of the quantum system.
- Tailored qubits allocation for the quantum system, e.g. choose a best QEC algorithm for certain application. The underlying quantum algorithm is mainly based on Hamiltonian simulation.
- Utilize circuit cutting to reduce the overall resource, e.g. to reduce the code distance. Paper in preparation.

<b>Hitachi Laboratory, University of Cambridge</b> <i>Research Undergraduate</i>	<a href="#">Dr David Arvidsson-Shukur</a> Oct 2023 –
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- Investigated on quantum Imaging, how much spatial information can be encoded in a finite-size quantum wavefunction based on interference using theoretical tools like quantum fisher information and quantum Cramér–Rao bound.
- Simulate small distance detection using Python with a finite difference method for time dependent Shroedinger's equation of wavepacket.
- Achieved a quadratic resolution boost compared to classical method on direct imaging. Paper in preparation.

<b>Yusuf Hamied Department of Chemistry, University of Cambridge</b> <i>Summer Intern</i> <a href="#">Github</a>	<a href="#">Dr.Alex Thom</a> July 2023 – Sep 2023
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- Investigated Hamiltonian simulation in quantum computing starting with literature review. Research on deterministic product formula and used pytket to simulate Heisenberg model.
- Implement randomised approach, mainly with Childs' random permutation and Campbell's qDrift and extracted system size-circuit depth relation with pytket.
- Wrote notes on higher dimension random walk and quantum channel mixing to help with better algorithm design.
- Developed original algorithm called physDrift by grouping particle number terms in qDrift and doing important sampling. Improved empirical error bound over previous method. [Preprint arXiv:2309.14378](#) Paper in preparation.

<b>Coherent Quantum Lab, University of Cambridge</b> <i>Undergraduate Research Assistant</i> <a href="#">Github</a>	<a href="#">Dr.Helena Knowles</a> , Cavendish Oct 2022 – Mar 2023
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- Simulated isolated NV center quantum system using MATLAB with dipolar interaction/ Octahedra lattice as well as random angle position. Assembled and adjusted AFM to observe the position of diamond sample.
- Used Qutip to simulate microwave ODMR line broadening. With appropriate experiment value of the external magnetic field, found the split of the dip as well as the contrast. And use it to calculate T2 relaxation time with dephasing and hyperfine interaction.
- Simulated controlled rabi oscillation between seven-level system and two-level approximated system. Compared with the experimental data and used MATLAB to optimize the fit from simulation. Also optimized the experimental data with Ramsey pulse in MATLAB.

<b>DAMTP, University of Cambridge</b> <i>Undergraduate Research Student</i>	<a href="#">Dr.Sergii Strelchuk</a> , Centre for Mathematical Sciences Jan 2023 – May 2023
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- Investigated quantum verification from literature, e.g. Gottesman, Urmila Mahadev.

- Summarized different circuit models as well as code for fault tolerant model and wrote an [review](#).
- Studied Knill's resilience technique and Aharonov's review on constant overhead bound.
- EXplored CSS code as well as polynomial codes.

**AMOP group, University of Cambridge**     [Prof.Mete Atature](#), Cavendish, [Prof.Dorian Gangloff](#), Oxford  
*Undergraduate Research Student*     Mar 2023 – May 2023

- Solved the 1D-Poisson equation in quantum dot based diode using Aestimo. Used it to compare with experimental data at different temperatures to tackle the computing issue at low temperature
- Optimized wavelength fitting in diode sample with embedded DBR using python and the transfer matrix method.
- wrote a [research review](#): 'Integrated Quantum Photonics with Semiconductor Single Photon Sources' mainly on quantum dots.

**MRI group, University of Cambridge**     [Prof.Chris Rodgers](#), Wolfson Brain Imaging Centre  
*Undergraduate Research Assistant* [Github](#)     Agu 2022 – Oct 2022

- use deep learning to accelerate parallel transmit pulse design
- Investigated spin dynamics. Compare quaternion's approach with rodrigue's approach to make the simulation of spin orientation prediction faster. Starting with initially 3 layer neural network with Shinnar-Le Roux algorithm written in both python and MATLAB, expanded the architecture with concatenated layers with different experimental parameters.
- Finally with the nested architecture, predicted spin operation with composite pulse

## PROJECTS

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**Physics in Lenia** | [GitHub](#)     Advisor: [Prof.Austen Lamacraft](#)

- My Bachelor project on cellular automata lenia. Achieved the highest score 95/100 over whole class
- Starting from Conway's game of life, investigated the updating algorithm, especially FFT. Compared the execution time on different hardware as well as using different packages like scipy with error analysis.
- With particle dynamics implemented, e.g. energy & momentum conservation, made lenia creature more physical.
- Explored from a computational perspective, e.g. float type to experiment with the survival rate of different creatures.
- Implemented quantum mechanics in lenia with algorithm inspired from literature

**Computer! Sort Out my PDF** | [Kaggle](#)     Advisor: Dr.Aldo Lipani (University College London)

- Project selected from [Hackbridge](#)
- Performed unsupervised clustering of documents to detect similarities between each PDF with OCR implemented. Use graph neural network model with packages from DGL library to resort randomly shuffled pdfs nodes to represent pages and links to represent their order

**Bridges for Enterprise** | [Template](#)     Advisor: [Kevin Huang](#) (Gatsby Computational Neuroscience, UCL)

- Build a GitHub-page based website template for chapters in the company to create their own website (non-programmer), involving javascript, html, css, Ruby, because of the increasing need for sites to cater to different audiences and different geographical locations. The key achievements are that they could be easily modified by people with limited tech knowledge. I also partially completed the incorporation of storybook.js html with BfE's standard UI system.

## AWARDS & ACHIEVEMENTS

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**The Henry Cavendish Scholarship in Natural Sciences for 2023/24:** An undergraduate who takes a First in the fourth year £300. A starred First will attract a further £125.

**Bruckmann Award 2023:** Peterhouse Scholarship Awarded to undergraduate students related to conferences and research

**Peterhouse College Scholarship 2023:** Awarded to Undergraduates who take a First in a Tripos

**Donald Higham Award 2022:** Peterhouse Scholarship Awarded to undergraduate students who does excellent research in summer.

**International Physics Tournament 2020 (YKS):** Ranked 7<sup>th</sup> representing the UK team. Worked on the topic of 'Distant Thunder'.

**Xanadu Coding Challenge 2023:** Ranked 20<sup>th</sup> out of 413 in quantum computing problems with pennylane. Completed all Challenges.

**Meta Bug Bounty 2022:** Top 10 in Asian-Pacific region in Meta BountyCon CTF, awarded conference attendance.

## SKILLS

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**Programming:** Python, MATLAB, C, Java, MySQL; Webmaster for both college and [Kelvin Club](#) at Peterhouse

**Technologies:** Cyber security, Git, Arduino, ROS, CAD, Rasperry Pi

**Languages:** Chinese (Native), English (Professional), German (Elementary)

## RESEARCH INTEREST

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**Quantum Physics:** Quantum information, Quantum computing, Quantum simulation, Hardware quantum device