Lau Pak To (Ryan)

CONTACT INFORMATION

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EDUCATION

University College London (UCL) September 2022 - Present

MSc Physics

- Research Project: Topological Edge Modes in Non-Hermitian 1D Fermionic Spin Chains
- Literature Review Project: On the potential of Topological Time Crystals for Quantum Error Correction (82.5%)
- Intensive training on C++, computer science and advanced C++ concepts for high performance and parallel computing
- Modules taken: Quantum Computation and Communication, Research Computing with C++, Advanced Quantum Theory (92%), Theoretical Condensed Matter, Quantum Field Theory, Mathematics For General Relativity
- Associate Member of the Institute of Physics (IOP)

University College London (UCL) September 2019 - June 2022

BSc Natural Sciences (Major: Physics, Minor: Physical Chemistry)

- Overall: High Second Upper Class Honours
- Recipient of the Brian Duff Summer studentship to conduct Theoretical Condensed Matter Physics research
- Final Year Project (Literature Review): Classifying Topological Phases of Quantum Matter using Tensor Networks(1st)
- Silver-medalist of the University Physics Competition 2020
- Associate Member of the Institute of Physics (IOP)
- Co-founder and Treasurer of Arts for Mental Health (ARTSMH)
- Module Highlights: Concepts in Computational Chemistry (Electronic Structure Methods, Molecular Mechanics Methods, Monte Carlo & Multiscale Methods), Advanced Topics in Physical Chemistry (Soft Condensed Matter Physics, Electrochemistry, Surfaces and Adsorption), Quantum Mechanics, Solid State Physics, Atomic & Molecular Physics, Chemical Dynamics (Reaction Dynamics, Lasers, Photophysics)

Ardingly College (UK) September 2017 - June 2019

Sixth Form

- A-Levels: Mathematics (A*); Physics (A); Chemistry (A)
- Competitions: British Physics Olympiad: Commendation (2019); RSC Chemistry Olympiad: Silver (2019), Bronze (2018); Google Science Fair 2018 (Certificate of Recognition); Internal & external sports and music competitions
- Academic Awards: Distinctions & Academic Awards in Physics & Mathematics; Maureen McDonnell Prize (Scholarship)

TECHNICAL SKILLS

Languages: Intermediate: Python, Wolfram Language (Mathematica), MATLAB, C++; Novice: C, Julia, HTML, CSS

Quantum Technologies: Platforms and Tools: Qiskit, QASM 2.0, IBM Quantum Composer & Quantum Lab, D-Wave (Quantum Annealer), QuSpin

Tools: Visual Studio Code, CMake, Jupyter Notebook, Google Colab, GitHub, Git Bash, Powershell, Overleaf, Wolfram Notebooks, Wolfram Mathematica

Typesetting Documents: LaTeX, Microsoft Office, Google Docs

SUMMER SCHOOLS

Qiskit Global Summer School 2023: Theory to Implementation July 2023

Quantum Technologies IBM, Online

https://qiskit.org/events/summer-school/

Qiskit Global Summer School 2022: Quantum Simulations July 2022

Quantum Technologies IBM, Online

UCLQ Quantum Tech Summer School July 2022

Quantum Technologies UCL & London Centre for Nanotechnology (LCN)

https://www.ucl.ac.uk/quantum/study-here/uclq-quantum-tech-summer-school

Wolfram Summer School June 2021 - July 2021
Fundamental Physics Track Wolfram Research / Wolfram Physics Project
https://education.wolfram.com/summer-school/programs/physics/

RELEVANT CERTIFICATIONS & COURSES

Certificates:
Google: IT Automation with Python; LinkedIn: C++ Essential Training; JuliaAcademy: Introduction to Julia; Microsoft: Azure AI Fundamentals (AI-900); IBM: Qiskit Global Summer School 2022 - Quantum Excellence (Advanced)
Courses: IOP Workshops: C++ & Julia; Wolfram Research Workshops: The Wolfram Language: Programming Fundamentals, Introduction to Machine Learning
UCL Innovation & Enterprise: Explore your entrepreneurial idea workshops

RELEVANT RESEARCH EXPERIENCE

Topological Edge Modes in Non-Hermitian 1D Fermionic Spin Chains Oct 2022 - Present
Theoretical condensed matter & Quantum Computation (Master's Project) UCL, CMMP, UK
Reporting to: Dr. Arijeet Pal
Conducted research and identified topological majorana edge modes in two 1D non-Hermitian fermionic spin chains. The non-Hermiticity simulates real-world, open systems and the work demonstrates that qubits can be shielded from decoherence, protecting its information stored.

Quantum Simulations of Antigen-Antibody reactions Aug 2022 - Sept 2022
Computational Biophysics & Quantum Technologies Imperial College, UK
Reporting to: Dr. Henry Lee
Assisting a company to understand the interactions between antigen-antibody reactions on a gold nanoparticle surface using density matrix methods via reviewing literature and weekly discussions as a team.

Q-Wave: Simulating sound waves using Quantum Algorithms June 2022 - Sept 2022
Computational Physics & Quantum Technologies UCL, UK
Reporting to: Dr. Reza Haqshenas
Developed a software package in Python for future therapeutic applications by reviewing and applying quantum algorithms to simulate sound-wave propagation.

Classifying Topological Phases of Quantum Matter using Tensor Networks Sept 2021 - March 2022
Literature Review on Theoretical Condensed Matter & Computational Physics UCL, UK
Reporting to: Professor Andrew Green
Conducted a rigorous literature review on using tensor network techniques to classify topological phases of matter.

Topological phase transition in S=$\frac{1}{2}$ spin chains with alternating ferromagnetic (FM) and antiferromagnetic (AFM) couplings and exchange anisotropy June 2021 - August 2021
Theoretical Condensed Matter Physics UCL, CMMP, UK
Reporting to: Dr. Frank Kruger
Conducted theoretical research on topological phase transitions of the suggested model and constructed its topological phase transition diagram numerically using Python after deriving coupled self-consistent equations, with secured funding.

The 3-Coloured Distributive Consensus Problem June 2021 - July 2021
Wolfram Summer School Fundamental Physics Track Wolfram Research / Wolfram Physics Project
Reporting to: Hatem Elshatlawy & Stephen Wolfram
Reviewing cellular automata and how it is used to describe phase transitions. Developed code in Mathematica and have written a computational essay as a contribution to the Wolfram Physics Project: https://community.wolfram.com/groups/-/m/t/2312007 (with a Staff Picked Featured Contributor Badge and more than 2000 views)

WORK EXPERIENCE

Private Tutoring September 2022 - June 2023
Notebook Tutors Online, UK
Reporting to: Marilyn Brydges
Tutoring and supporting students with IGCSE and A-Level Maths, Physics, Chemistry and Natural Sciences Admissions Assessment entrance exam.

Research Intern July 2022 - Sept 2022
Quantum Simulations Internship Imperial College, UK
Research Topic: Quantum Simulations of Antigen-Antibody reactions

Research Assistant June 2022 - Sept 2022
MAPS Summer Research Internship UCL, MAPS, UK
Research Topic: Q-Wave: Simulating sound waves using Quantum Algorithms

Research Intern June 2021 - August 2021
Brian Duff Summer Studentship (Theoretical Condensed Matter Physics) UCL, CMMP, UK
Research Topic: Topological phase transition in S=$\frac{1}{2}$ spin chains with alternating ferromagnetic (FM) and antiferromagnetic (AFM) couplings and exchange anisotropy

Undergraduate Research Assistant/Mentee January 2021 - April 2021
UCL Connect.ed Mentorship Project UCL, UK
Research Topic: Machine Learning in Stock Markets

Private Tutoring Summer 2019, 2020
Self-employed (through recommendations) Hong Kong
One on one tutoring on topics of A-Level Physics and Mathematics

CONFERENCE ATTENDED

Quantum.Tech Europe 2022 September 2022
Quantum Technologies https://www.quantumtechdigital.co.uk/ UK

ADDITIONAL RESEARCH EXPERIENCE

Machine Learning in Stock Markets January 2021 - May 2021
UCL Connect.ed Mentorship Research Assistant/Mentee UCL, UK
Reporting to: Dr. Ava Lee
Studied and implemented Machine Learning models on large, collected datasets of stock markets to predict its trends.

Birdsong Audio Signal Analysis March 2021
Scientific Programming Module (Python) UCL, UK
Reporting to: Dr. Peter Bratby
Utilised Python packages and developed code to identify different bird species by performing Fourier Transforms on bird song audios, while attempting a Principal Component Analysis as a team. https://github.com/SavitarRL/NatSci-Computing/tree/master/Group%20Project/NSCI0007_Group_Project

COMPETITIONS

Explore your entrepreneurial idea Pitching Competition Oct 2022
1st Runner Up *UCL Innovation & Enterprise*
Collaborated and presented my partner's and my business idea to a lay audience, securing a funding of £500.

The University Physics Competition November 2020
Quadcopter Stability in Wind: Silver Medal http://www.uphysicsc.com/
https://www.ucl.ac.uk/mathematical-physical-sciences/news/2021/jan/ucl-natural-sciences-students-win-silver-medal-2020-university-physics-competition
Supervisor & Team Sponsor: Dr. Frank Kruger
Solved a real-life problem by implementing classical mechanics and computation simulation in a team of 3 representing UCL. A formal paper was written in LaTeX within 48 hours. https://drive.google.com/drive/folders/1zf8b-X1uo8PzFvZiwtYG0lvUieJ02r5p?usp=sharing

LANGUAGES

English (Proficient) Cantonese (Native) Mandarin (Fluent)