Lau Pak To (Ryan)

CONTACT INFORMATION

Email: ryanlaupakto2000@gmail.com Website: https://savitarrl.github.io/

EDUCATION

University College London (UCL) September 2022 - Present
MSc Physics

- Master's Project: Quantum Error Correcting Codes in Topological Time Crystals
- Modules taken: Quantum Computation and Communication, Research Computing with C++, Advanced Quantum Theory, 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)

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)

RELEVANT RESEARCH EXPERIENCE

Quantum Error Correcting Codes in Topological Time Crystals Oct 2022 - Present
Theoretical condensed matter & Quantum Computation (Master's Project) UCL, CMMP, UK
Supervisor: Dr. Arijeet Pal
Following the recent works on topological time crystals, we aim to find error correction codes in such exotic phases of matter. This work will introduce a novel solution to fault tolerant quantum computation and information processing.

Quantum Modelling, Simulations and Algorithms for Biological systems Sept 2022-Present
Quantum Biology & Quantum Technologies UK & HK
A long-term, collaborative project, exploring the intersections of fundamental quantum physics and biology, and aiming to apply quantum probability models to understand biological systems.

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

Q-Wave: Simulating sound waves using Quantum Algorithms June 2022 - Sept 2022
Computational Physics & Quantum Technologies UCL, UK
Supervisor: Dr. Reza Haqshenas
Reviewing and applying quantum algorithms to simulate sound-wave propagation by solving the Helmholtz equation and developing subsequent software package in Python for future therapeutic applications.

Classifying Topological Phases of Quantum Matter using Tensor Networks Sept 2021 - March 2022
Literature Review on Theoretical Condensed Matter & Computational Physics UCL, UK
Supervisor: Professor Andrew Green
Research and 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
Supervisor: 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
Supervisor: Hatem Elshatlawy & Stephen Wolfram
Cellular automata was reviewed and used to describe phase transitions. A computational essay was written in a Mathematica Notebook 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 - Present
Notebook Tutors — Online, UK
Tutoring and supporting students with IGCSE and A-Level 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

TECHNICAL SKILLS

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

Quantum Technologies/Platforms: Qiskit, Cirq, QASM 2.0, IBM Quantum Composer & Quantum Lab, D-Wave (Quantum Annealer)

Tools: Visual Studio Code, Visual Studio Community, Linux (Ubuntu), Docker Desktop, CMake, Jupyter Notebook, Google Colab, GitHub, GitHub Desktop, Git Bash, Compiler-Explorer, Powershell, Overleaf, Wolfram Notebooks, Wolfram Mathematica, Wolfram Alpha, MATLAB R2021a, LAMMPS, WebMO, Avogadro

Typesetting Documents: LaTeX, Microsoft Office, Google Docs

CONFERENCE ATTENDED

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

SUMMER SCHOOLS

Qiskit Global Summer School 2022: Quantum Simulations — July 2022
Quantum Technologies, Quantum Simulations — IBM, Online
https://qiskit.org/events/summer-school/

Participated in lectures and coding sessions, operating with IBM Qiskit and focusing on quantum simulations.
Activities and Skills: Quantum dynamics, simulations and methods, Noise in Quantum Hardwares, Quantum Chemistry; Quantum computational labs with Python

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

Selected to participated in lectures, coding workshops and laboratory sessions, gaining theoretical and practical knowledge on quantum technologies

Activities and Skills: Quantum Circuits and Error Correction, Quantum Algorithms, Software and Architechtures, Quantum Cryptography and Architectures, Laboratory work on quantum technologies and applications, coding workshops on IBM Quantum and D-Wave Quantum Annealer

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

Selected to participate in lectures of Physics and Mathematics, joined Mathematica training workshops and conducted a research project. (Title: The 3-Colored Distributive Consensus Problem)

Activities and Skills: Wolfram Language Training, Machine Learning & Neural Networks, Data Science, Theories, Computations & Philosophies in Mathematics & Physics, Cellular Automata, Wolfram Science models and methods, Research project

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

ADDITIONAL RESEARCH EXPERIENCE

Machine Learning in Stock Markets January 2021 - May 2021
UCL Connect.ed Mentorship Research Assistant/Mentee UCL, UK
Supervisor: Dr. Ava Lee
Learnt 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
Supervisor: Dr. Peter Bratby
Our team aimed to identify different bird species by performing Fourier Transforms on bird song audios. We also attempted a Principal Component Analysis. https://github.com/SavitarRL/NatSci-Computing/tree/master/Group%20Project/NSCI0007_Group_Project

Molecular and Business Modelling June 2020 - September 2020
NatSci Innovation Lab 2020 UCL, UK
Our team used LAMMPS to gain knowledge about molecular modelling with an aspect of business modelling with the help of Python. https://mminnovationlab2020.blogspot.com/search/label/Project%20Updates.

Quantum Chemistry with an application on Drug Design Sept 2019-March 2020
Interdisciplinary Research Skills Module UCL, UK
Our team reviewed how quantum chemistry and quantum computing techniques can aid the different stages of drug design.

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)

COMMUNICATION AND OUTREACH

Arts for Mental Health (ARTSMH) October 2020 - June 2022
https://www.artsmentalhealth.org/
I am the Co-chairman , co-founder and treasurer of ARTSMH. ARTSMH is a student-led non-profit association. We hope to provide students who are interested in both the arts and mental health the opportunity to explore, experience, and learn together, as well as raising awareness of mental health issues.

UCL ChangeMakers X ARTSMH April 2021 - September 2021
UCL ChangeMakers, Project Leader *UCL, UK*
Specific Role: Treasurer and data management

Student-Led Volunteering Programme April 2021 - June 2022
UCL Student Union, Project Leader *UCL, UK*
Specific Role: Treasurer and data management