

Lau Pak To (Ryan)

CONTACT INFORMATION

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GitHub: <https://github.com/SavitarRL>
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EDUCATION

University College London (UCL)
MSc Physics

Starting in late September, 2022

University College London (UCL)
BSc Natural Sciences (Major: Physics, Minor: Physical Chemistry)

September 2019 - June 2022

- 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
- 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)
Sixth Form

September 2017 - June 2019

- 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 Simulations of Antigen-Antibody reactions
Computational Biophysics & Quantum Technologies

July 2022 - Present
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
Computational Physics & Quantum Technologies

June 2022 - Present
UCL, UK

Supervisor: Dr. Reza Haqshenas

Applying the HHL algorithm to simulate sound-wave propagation by solving the Helmholtz equation and developing subsequent software for future therapeutic applications.

Classifying Topological Phases of Quantum Matter using Tensor Networks
Literature Review on Theoretical Condensed Matter & Computational Physics

Sept 2021 - March 2022
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
Theoretical Condensed Matter Physics

June 2021 - August 2021
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.

The 3-Coloured Distributive Consensus Problem
Wolfram Summer School Fundamental Physics Track

June 2021 - July 2021
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)

WORK EXPERIENCE

Private Tutoring
Notebook Tutors

September 2022 - Present
Online, UK

Tutoring and supporting a student with the Natural Sciences Admissions Assessment (NSAA) on Mathematics and Chemistry.

Research Intern
Quantum Simulations Internship

July 2022 - Present
Imperial College, UK

Research Topic: Quantum Simulations of Antigen-Antibody reactions

Research Intern
MAPS Summer Research Internship
Research Topic: Q-Wave: Simulating sound waves using Quantum Algorithms

June 2022 - Present
UCL, MAPS, UK

Research Intern
Brian Duff Summer Studentship (Theoretical Condensed Matter Physics)
Research Topic: 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
UCL, CMMP, UK

Undergraduate Research Assistant/Mentee
UCL Connect.ed Mentorship Project
Research Topic: Machine Learning in Stock Markets

January 2021 - April 2021
UCL, UK

Private Tutoring
Self-employed (through recommendations)
One on one tutoring on topics of A-Level Physics and Mathematics

Summer 2019, 2020
Hong Kong

TECHNICAL SKILLS

Languages: Intermediate: Python, Wolfram Language (Mathematica), MATLAB; Novice: C++, C, Julia, HTML, CSS, QASM 2.0, C#

Quantum Technologies/Platforms: Qiskit, Cirq, myQLM, IBM Quantum Composer, IBM Quantum Lab, D-Wave Leap (Quantum Annealer)

Tools: Visual Studio Code, Visual Studio Community, Jupyter Notebook, Overleaf, Wolfram Notebooks, Wolfram Mathematica, Wolfram Alpha, MATLAB R2021a, GitHub, GitHub Desktop, Git Bash, Compiler-Explorer, Powershell, LAMMPS, WebMO, Avogadro, Unity Hub

Typesetting Documents: \LaTeX , Microsoft Office, Google Docs

SUMMER SCHOOL

Qiskit Global Summer School 2022: Quantum Simulations

Quantum Technologies, Quantum Simulations

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

Participated in lectures, coding workshops and laboratory sessions on various quantum technologies.

July 2022
IBM, Online

UCLQ Quantum Tech Summer School

Quantum Technologies

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

Participated in lectures, coding workshops and laboratory sessions on various quantum technologies.

July 2022
UCL & London Centre for Nanotechnology (LCN)

Wolfram Summer School

Fundamental Physics Track

<https://education.wolfram.com/summer-school/programs/physics/>

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

June 2021 - July 2021
Wolfram Research / Wolfram Physics 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: IBM Qiskit Global Summer School 2022: Quantum dynamics, simulations and methods, Noise in Quantum Hardwares, Quantum Chemistry; Quantum computational labs with Python; UCLQ Quantum Tech Summer School: Quantum Circuits and Error Correction, Quantum Algorithms, Software and Architectures, Quantum Cryptography and Architectures, Laboratory work on quantum technologies and applications, coding workshops on IBM Quantum and D-Wave Quantum Annealer; IOP Workshops: C++ & Julia; Wolfram Research Workshops: The Wolfram Language: Programming Fundamentals, Introduction to Machine Learning;

Wolfram Summer School: Wolfram Language Training, Theories, Computations & Philosophies in Mathematics & Physics, Wolfram Science models and methods, Cellular Automata, Machine Learning & Neural Networks, Data Science

ADDITIONAL RESEARCH EXPERIENCE

Machine Learning in Stock Markets

UCL Connect.ed Mentorship Research Assistant/Mentee

Supervisor: Dr. Ava Lee

Learnt and implemented Machine Learning models on large, collected datasets of stock markets to predict its trends.

January 2021 - May 2021
UCL, UK

Birdsong Audio Signal Analysis

Scientific Programming Module (Python)

Supervisor: Dr. Peter Bratby

Our team aimed to identify different bird species by performing Fourier Transforms (FT) on bird song audios. https://github.com/SavitarRL/NatSci-Computing/tree/master/Group%20Project/NSCI0007_Group_Project

March 2021
UCL, UK

Molecular and Business Modelling

NatSci Innovation Lab 2020

June 2020 - September 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

Interdisciplinary Research Skills Module

Sept 2019-March 2020

UCL, UK

Our team reviewed how quantum chemistry and quantum computing techniques can aid the different stages of drug design.

COMPETITION

The University Physics Competition

Quadcopter Stability in Wind: Silver Medal

November 2020

<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)

<https://www.artsmentalhealth.org/>

October 2020 - Present

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

UCL ChangeMakers, Project Leader

April 2021 - September 2021

UCL, UK

Specific Role: Treasurer and data management

Student-Led Volunteering Programme

UCL Student Union, Project Leader

April 2021 - June 2022

UCL, UK

Specific Role: Treasurer and data management