

Lau Pak To (Ryan)

CONTACT INFORMATION

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

University College London (UCL)

September 2019 - June 2022

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

- Overall: 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)

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 Achievements: Distinctions & Academic Awards in Physics and Mathematics; Maureen McDonnell Prize (Scholarship)

RELEVANT RESEARCH EXPERIENCE

Quantum Annealing simulation of a $S=\frac{1}{2}$ spin chain with alternating ferromagnetic (FM) and antiferromagnetic (AFM) couplings and exchange anisotropy July 2022 - Present

Theoretical Condensed Matter Physics & Quantum Technologies

Self-motivated project

As a continuation of the previous theoretical research on topological phase transitions of the suggested model, we hope to use quantum annealing via the D-Wave quantum processor to construct an exact topological phase diagram and compare previous mean-field theory results.

Q-Wave: Simulating sound waves using Quantum Algorithms

June 2022 - Present

Computational Physics & Quantum Technologies

UCL, UK

Supervisor: Dr. Reza Haqshenas

Developing quantum algorithms to simulate sound-wave propagation by solving the Helmholtz equation 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.

The 3-Coloured Distributive Consensus Problem

June 2021 - July 2021

Wolfram Summer School Fundamental Physics Track

Wolfram Research / Wolfram Physics Project

Supervisor: Hatem Elshatlawy

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

Research Intern

June 2022 - Present

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
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

SUMMER SCHOOL

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

Wolfram Summer School June 2021 - July 2021
Fundamental Physics Track Wolfram Research / Wolfram Physics Project
<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)

COMPETITION

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>

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 (FT) on bird song audios. 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>.

RELEVANT CERTIFICATIONS & COURSES

Certificates: Google: IT Automation with Python; LinkedIn: C++ Essential Training; JuliaAcademy: Introduction to Julia; Microsoft: Azure AI Fundamentals (AI-900)

Courses: 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

TECHNICAL SKILLS

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

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

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

Typesetting Documents: \LaTeX , Microsoft Office

LANGUAGES

English (Proficient)

Cantonese (Native)

Mandarin (Fluent)

COMMUNICATION AND OUTREACH

Arts for Mental Health (ARTSMH)

October 2020 - Present

<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