

Ocean Wong (Hoi Yeung Wong)
PhD student in physics (neutron spectrum unfolding)
Organizations: Culham Centre for Fusion Energy/ Sheffield Hallam University
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PhD student with specialist knowledge in machine learning, inverse problems, analytical error propagation, iterative algorithms, and neutron spectrum measurement; as well as a strong aptitude and a unique approach to problem-solving.

1 Research experience

Neutron spectrum unfolding suite developer (using Neural Networks) Jun—Sep 2019

- Developed a novel approach to the long-standing problem of inferring the neutron spectrum in a mathematically underdetermined system.
- Collaborated with other programmers on the same repository using Git.
- Developed and optimized a Neural Network using Google's TensorFlow framework, which is then incorporated into the unfolding suite along with the appropriate documentations.

Nuclear Physics Laboratory Oct—Dec 2019, Oct—Dec 2018

- Identified unknown elements using neutron activation analysis and gamma spectroscopy using a High Purity Germanium detector.
- Measured the neutron flux in neutron bath using a BF_3 detector.
- Analysed the results using Python's numerical processing capability; and then visualized them graphically via Python as well.

Systematic study of the effect of neighbours on the evolution of intragrain misorientation Jun—Dec 2018

- Extracted the simulation results from Abaqus, a commercial thermomechanical modelling software, using Python; and subsequently optimized the extraction speed.
- Researched and investigated various mathematical methodologies for finding the average orientation, which is a previously un-explored problem in material science.
- Reported simulation result and comparison with results in literature in a paper.
- Gained theoretical understanding of and practical experience with Finite Element Modelling.

Modelling of void collapse in 316L stainless steel (final year project) Jan—Mar 2018

- Developed the code for plotting (spatial and temporal) variation in grain orientation extracted from Abaqus and calibration of model parameters, as well as animation for the orientation evolution; all automated via Python.
- Collaborated with other group members to steer the course of the project using the plotting results, as well as explained the relevant results in the group project report and viva.

Nuclear Talent course on Machine Learning and Data Analysis for Nuclear Physics —Jul2020

- A 2 weeks course on machine learning techniques applicable to nuclear physics.
- Neural network: Universal approximation theorem, backprop, autoencoders, GANs
- Supervised learning techniques: Random forest, logistic regression
- Unsupervised learning techniques: PCA
- Reinforced learning
- Exercises include: Classifying the particle tracks found in a time projection chamber TPC, classifying the number and location of events in a detector

Culham Plasma Physics Summer School

Jun—Jul2017

- Learned about the relevant background knowledge in plasmas physics so to put the importance of fusion materials research in context.
- Allows me to take on projects that require background understanding in plasma physics in the future.

Summer Physics internship, School of Physics and Astronomy, University of Birmingham

Jul—Aug 2018

- Worked on a group project to produce a working prototype of a radiation detection drone.
- Gained relevant specialist knowledge about the workings of cyclotron, GPS and radiation detector, as well as radiation protection procedures.

Fusor Group Project, University of Birmingham

Oct 2015—Sep 2019

- Recruited as part of Fusor Project team, following from an interview selection process.
- Worked with 7 other more senior students to build a Farsworth nuclear fusor.
- Successfully applied for a grant of £2800 on behalf of the group to cover the cost of the power supply.

Formula Student member, University of Birmingham

Oct 2015—Jul 2016

- Manufactured, shaped and resized steel and aluminium components of the test car (including Catch can holder, chassis and aluminium arches) based on the technical specification.
- Researched the cost model and produced report to demonstrate manufacturing cost of a component.
- Produced the cost report (in Microsoft Excel) and collected data for planning to set up factories in Europe.

Light Pollution Surveyor (social study project)

Sep 2014—Jan 2015

- Surveyed and reported the light pollution situation in Hung Shui Kiu (a region of Hong Kong). It involved using a scientific instrument (luxmeter) on site to collect data about the brightness of the vicinity, and distributing and recollecting questionnaire.
- Gained valuable first-hand experience in designing and conducting a scientific investigation, building my positive attitude towards scientific investigation; and this gave me an intuitive understanding of how to operate scientific equipment with accuracy and consistency.

2 Software repertoire

- Programming languages: Python, Fortran, Bash, R, C++, PowerShell
- GIT: GitHub (@OceanNuclear) and GitLab(@OceanNuclear)
- Markdown language: LaTeX
- Proprietary software: Abaqus, Adobe Premiere Pro, Adobe InDesign, Vectr, Microsoft Excel, Word

3 Qualifications

PhD Physics, Sheffield Hallam University Oct 2019—Oct 2023

Title: ENFUSE: Effective Neutron Spectrometry for FUSion Environment

- Reviewed existing algorithms and developed new algorithms for neutron spectrum unfolding in underdetermined condition
- Selected foils to be used according their unfolding effectiveness and feasibility
- Expected to design a module for neutron activation foil irradiation inside fusion reactors as part of the degree.

MSc Physics and Technology of Nuclear Reactors, University of Birmingham Oct 2018—Oct 2019

Results: **distinction**; modules:

- Nuclear Instrumentation, Radiation Dosimetry and Protection
- Radiation Transport, Thermal Hydraulics and Reactor Engineering
- Reactor Materials, Reactor System and NDE
- Practical Skills
- Research Project

BSc Nuclear Science and Materials, University of Birmingham

Sep 2015—Jul 2018

Results: **2:1**; modules:

- Classical Mechanics and Relativity 1 & 2
- Electromagnetism I and Temperature and Matter (including Electric Circuits)
- Statistical Physics and Entropy
- Particles and Nuclei and Nuclear Physics
- Mathematics for Physicist 1A & 2
- Physics Laboratory 1 & 2
- Physics Communication Skills (including C++ Computing)

Shung Tak Catholic English College (Hong Kong)

Sep 2009—Jul 2015

HKDSE (Hong Kong Diploma of Secondary Education exam)

- Physics 5**, English 5*, Algebra and Calculus 5, Chemistry 5, Mathematics 4, Biology 4
- Equivalent to A*A*AABB in A levels

4 Other experiences

Secretary of Parkour Society at University of Birmingham

Sep 2017—Jun 2019

- As one of the three founding member of the society, built the foundation for the traceur community here at the University for through organizing the bi-weekly gatherings.

Library collection assistant, University of Birmingham Main Library

Jan—Sep 2017

- Carried out stock management tasks including re-locating stock, interfiling, re-boxing periodicals and searching for lost stock.
- Worked in a motivated manner with minimal supervision

Global Buddy (UoB Guild of Student scheme)

Sep 2016—Jan 2017

- Act as the mentor and point of contact for four, newly arrived international students, by assisting them to adjust into their new social and physical environment
- Received positive feedback from all four students

Student Librarian, Library club executive, Librarian Manager

Sep 2009—Aug 2014

- Helped students to borrow and return books, assisted students with using the photocopying machine, stocked and retrieved items from the shelf, collaborated with other student librarians to organise activities.
- Supervised other student librarians to perform their duties.

5 Extra courses and competitions taken outside of the curriculum

- Proactively taken, non-compulsory lecture courses

- Quantum Mechanics I & II
- Quantum Approach to Solids
- Lagrangian Mechanics
- Electromagnetism II
- Eigenphysics

- Hong Kong Biology Olympiad (First Honour)

—Dec 2014

- Mysteries in the Atomic World (CUHK Science Academy for Young Talents)

- Course on Quantum Mechanics held for elite high school students

- Genetic Engineering Workshop

—Apr 2014

- Learned biological labs skills and in-depth knowledge of genome

- ‘Nanomaterials and Renewable Energy’ (HKU one-day course)

—Apr 2014

- Out of curiosity and drive for self-improvement, took online courses on various topics to broaden my vision

- Learnt R and Python in my leisure time
- ‘Learning how to learn’ on COURSERA
- ‘Information Theory’ on Khan Academy
- ‘Nonlinear Dynamics and Chaos’ on MITOpenCourseWare