Ocean Wong (Hoi Yeung Wong)
Dr in physics (neutron spectrum unfolding)
Organizations: Culham Centre for Fusion Energy/ Sheffield Hallam University
Supervisors: Dr Robin Smith &Dr Chantal Nobs
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Physicist 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

PhD project: Modernising neutron spectrum unfolding for fusion applications Oct 2019—Sep 2023

- Developed a software to systematically select foils for activation foil neutron spectrum unfolding experiments, to replace the current *ad hoc* approach of foil selection. Oversaw the complete software development lifecycle, beginning from stakeholders engagement to software quality control.
- Derived more mathematically rigorous algorithms for unfolding, which were implemented into an unfolding code suite.
- Developed a new visualization technique for presenting gamma-ray spectra based on the statistics underlying their noise distributions (Poisson distribution).
- Performed an activation experiment, using GENIE to perform the nuclide identification and analysis, and then using the neutron spectrum unfolding suite developed at UKAEA to perform the unfolding.
- Collaborated with other organizations to perform neutron spectrum measurements and unfold their neutron spectra to satisfactory quality.
- Presented at various physics conferences, including the IoP and FuseNet.

Master's project: 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 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.

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

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.

2 Software repertoire

- Programming languages: Python, Fortran, Bash, R, C++, PowerShell
- GIT: GitHub (@OceanNuclear) and GitLab(@OceanNuclear)
- Markdown language: LaTeX
- Propreitory 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