

# Sabrina Henry

PHD RESEARCHER · EXPLAINABLE ARTIFICIAL INTELLIGENCE

Edinburgh

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## Education

### PhD, Explainable Artificial Intelligence

Edinburgh, UK

QUANTUM OPTICS AND COMPUTATIONAL IMAGING GROUP, HERIOT-WATT UNIVERSITY

Oct. 2024 – present

- Developing novel explainable AI (XAI) methods for interpreting and evaluating deep learning models in sensitive application domains such as healthcare and security.
- Applying data-driven approaches to addressing problems across scientific domains, including computational imaging, sensing, and neuroscience.
- Supervisor: Prof. Jonathan Leach
- Anticipated graduation: 2028

### MPhys, Physics (1st Class)

Edinburgh, UK

HERIOT-WATT UNIVERSITY

Sept. 2019 – Jun. 2024

- Awarded the Neil Forbes/Scottish Enterprise Prize for the best final-year MPhys research project, and a Merit Award for dedication to studies.
- Programme combined theoretical and experimental physics, with emphasis on photonics, biophysics, numerical modelling, and data analysis.
- Masters project: developed a time-resolved fluorescence spectrometer using a single-photon avalanche diode array for monitoring photosensitisers in cancer treatments.

## Publications and Preprints

- **Henry.S., Ruget.A., Scholes.S., & Leach.J.**, Self-Guided Integrated Gradient Method for Attribution., *TechRxiv (preprint)*, 2025.

## Skills

**Scientific** Mathematical modelling; data analysis and interpretation; optimisation; experimental design; signal and image analysis; sensor and imaging systems.

**Computational** Python, MATLAB, LabVIEW; TensorFlow and PyTorch (deep learning: CNNs, Vision Transformers); explainable AI (XAI) and attribution/saliency methods; scientific computing; CT and MEG data processing; data fusion; LaTeX.

## Research Experience

### Explainable AI for Clinical Magnetoencephalography (MEG) Applications

Edinburgh / Nottingham, UK

HERIOT-WATT UNIVERSITY (PROF. JONATHAN LEACH), UNIVERSITY OF NOTTINGHAM (PROF. MATTHEW BROOKES)

Jan. 2026 – present

- Developing and applying explainable AI (XAI) methods to support the interpretation of machine learning models used in MEG-based diagnostics.
- Assessing the reliability, faithfulness, and clinical suitability of model explanations for neuroimaging applications.
- Investigating how explainability can support trust, validation, and adoption of AI-based MEG analysis in clinical settings.

### Machine Learning for MEG Source Localisation in Lightly Shielded Environments

Edinburgh / Nottingham, UK

HERIOT-WATT UNIVERSITY (PROF. JONATHAN LEACH), UNIVERSITY OF NOTTINGHAM (PROF. MATTHEW BROOKES)

March. 2025 – present

- Collaboration through the UK Quantum Technology Research Hub in Sensing, Imaging and Timing (QuSIT).
- Applying machine learning models to the analysis of optically pumped magnetometer-MEG (OPM-MEG) data in cost-effective lightly shielded environments.
- Employing explainable AI techniques to interpret model predictions and assess their reliability and suitability for clinical neuroimaging applications.

### Developing Novel Algorithms for Explainable AI

Edinburgh, UK

HERIOT-WATT UNIVERSITY (PROF. JONATHAN LEACH)

Oct. 2024 – Oct. 2025

- Developed a novel feature attribution-based explainable AI method for interpreting deep learning models, addressing limitations of existing techniques.
- Extensively evaluated the method on real-world datasets, including medical CT imaging and X-ray security screening data, demonstrating improved robustness of explanations compared to standard attribution methods.
- Work submitted to The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2026.

## Development of a Time-Resolved Fluorescence Spectrometer for Applications in Cancer Treatment Monitoring

Edinburgh, UK

HERIOT-WATT UNIVERSITY, (DR. MIKE TANNER)

Sept. 2023 - May 2024

- Developed a time-resolved fluorescence spectrometer for applications in monitoring photosensitisers used in various cancer treatments.
- Integrated optics with a single-photon avalanche diode array to study photosensitisers interactions with their environment.
- Awarded the Scottish Enterprise Prize for most outstanding masters project.

## Data-Fusion Algorithm for High Resolution Fluorescence Lifetime Images

Edinburgh, UK

RANK PRIZE VACATION SCHOLARSHIP

Jun. 2023 - Aug. 2023

- Created a data-fusion algorithm that combined data from a high resolution intensity camera and a low resolution single-photon imaging array allowing for a 5x increase in resolution of fluorescence lifetime data.
- Awarded best report by the Rank Prize Optoelectronics Committee following the studentship.

## Fluorescence Lifetime Imaging with Single-Photon Avalanche Diode Arrays

Edinburgh, UK

HERIOT-WATT UNIVERSITY (PROF. JONATHAN LEACH)

Jun. 2022 - May. 2023

- Developed and experimentally validated numerical models for optimising time-correlated single-photon counting (TCSPC) parameters in SPAD-based fluorescence lifetime imaging.
- Performed widefield fluorescence lifetime imaging on biological and calibration samples, investigating low-photon performance limits of SPAD arrays.

## Awards and Scholarships

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|-----------|---|
| 2024      | <b>The Neil Forbes/Scottish Enterprise Prize</b> , Heriot-Watt University - Awarded for most outstanding 5th year MPhys project.  |
| 2024      | <b>MPhys Outstanding Merit Award</b> , Heriot-Watt University - Awarded for sustained academic excellence and commitment to studies.  |
| 2023      | <b>Rank Prize Vacation Scholarship</b> , Rank Prize - Awarded a competitive research scholarship in optoelectronics; received Best Final Report award.  |
| 2022      | <b>Athena Swan Scholarship</b> , Heriot-Watt University - Awarded Athena Swan Summer Research Scholarship to work on the development of a fluorescence lifetime imaging system using single-photon sensors. |
| 2019-2024 | <b>Deputy Principal's Award</b> , Heriot-Watt University - Awarded each year of university study for attaining grade A in 6 or more courses in an academic year.  |

## Professional Development

### Oxford Machine Learning Summer School (OX-ML)

Oxford, UK

AI FOR GLOBAL GOALS

June 2025

- Selected participant in the Oxford Machine Learning Summer School, covering modern machine learning theory and applications, including diffusion models and transformer-based architectures, with applications in healthcare and biology.

### Graduate Teaching Assistant

Edinburgh, UK

HERIOT-WATT UNIVERSITY

Oct. 2024 - present

- Demonstrator for third-year undergraduate physics laboratory sessions, assisting with experiments in microscopy, magnetostatics, laser physics, and computational simulations.
- Teaching assistant for a third-year LabVIEW course, delivering instruction on sensor-computer interfacing and basic data acquisition.

### Deep Learning Specialisation with Andrew Ng

Online

COURSERA (SELF-LED)

Dec. 2023 - Feb. 2024

- Gained proficiency in deep learning concepts and frameworks, including convolutional neural networks and recurrent neural networks.
- Hands-on experience with deep learning frameworks such as TensorFlow and Keras.

### Imaging in Medicine

Online

OPEN UNIVERSITY (SELF-LED)

Dec. 2022

- Certificated online course covering techniques used in biomedical imaging such as computed tomography, magnetic resonance imaging, electroencephalography and magnetoencephalography.