Conan Murgatroyd | PhD

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Postgraduate PhD Researcher specializing in space instrumentation at the University of Leicester: experienced in advanced data analysis, machine learning, and hardware control of analytical instruments.

Through applied research experience in data visualization, simulation modelling and scientific instrumentation, I have cultivated technical expertise in programming and hardware, and an advanced knowledge of Python and C++. I have been engaged in key project deliveries for the European Space Agency ("ESA"), including: (i) the characterization of state-of-the-art X-ray detectors for the Einstein Probe and THESEUS missions, and (ii) the delivery of a novel handheld instrument for future astronaut exploration missions to the European Astronaut Centre ("EAC") in Germany.

With experience in applying my physics and software engineering to real-world challenges, I am now interested in developing my data analysis skill set through industry experience within the insurance sector, with a reputable firm such as First Central.

Education

University of Leicester **2022–Present**

PhD, Physics Leicester, Leicestershire, UK

Development and Optimization of Combination Handheld Analytical Instruments to Aid Astronaut Exploration. Expected thesis submission date: Feb. 2026.

Research Overview

- Developed a Python/C++ software package for operating a novel handheld instrument for astronauts under a European Space Agency ("ESA") contract.
- Created a Monte Carlo simulation in C++ to model and optimize the performance of X-ray Fluorescence ("XRF") spectrometers.
- Characterized flight-spare CMOS X-ray detectors from the Einstein Probe ("EP") mission (launched 2024).
- Characterized prototype next-generation CMOS sensors for ESA's proposed THESEUS mission, developed software for X-ray event extraction and analysis.
- Relevant Skills: Python, C/C++, Data Analysis, PCB Design, XRF and IR Spectroscopy, and Problem Solving.

University of Leicester **2018–2022**

Master of Physics ("MPhys") Leicester, Leicestershire, UK

- Result: First Class Honours.
- Award: Samuel and Rachel May Prize (2022). *
- Award: Will Marshall Prize (2021). **
- Relevant Modules: Scientific Data Analysis, Statistical Physics, Mathematical Physics, Literature Review Project, Experimental Physics, Specialist Research Project, Research Project, Group Industry Project.

St Andrew's International School **2016–2018**

International Baccalaureate ("IB") Diploma Nassau, The Bahamas

- Result: 31 Points.
- GPA: 4.11 (Penultimate Year).

* *Annual Physics course award for outstanding performance in final undergraduate year.*

** *Annual Physics course award for outstanding performance in the Physics Challenge Module.*

Research Experience

University of Leicester **2021–2022**
Master of Physics (“MPhys”) Leicester, Leicestershire, UK

What Effect Does a Black Hole Have on the Higgs Mechanism in the Standard Model?

- Fourth Year Specialist Research Project: Nov. 2021–Nov. 2022
- Derived the mathematics behind the Higgs mechanism in the standard model before incorporating the black hole vacuum state into the Higgs Lagrangian to create a “toy model” to find the possible effects of gravity on particle mass in the vicinity of a black hole.

Are AGN Accretion Discs Non-Standard?

- Fourth Year Literature Review Project: Sep. 2021–Nov. 2021.
- Supervised literature project to prepare a report and present the results of the independent study and research on accretion disc size estimates in active galactic nuclei found using reverberation mapping techniques.

Thermal Control System.

- Student Internship: July 2021–September 2021.
- Worked as a member of a professional research group to commence the integration of a thermal control system onto the Compact Raman Spectrometer Instrument (“CIRS”), proposed to go on-board NASA's future Europa Lander mission.

Europa: Life in the Ice.

- Third Year Research Project: January 2021–March 2021.
- Developed thermal control circuitry for a Raman spectrometer, and authored a report outlining its integration onto the Europa Lander's spectrometer, in line with the mission's strict requirements before presenting findings to NASA and JPL members.

Publications

- Murgatroyd, Conan, Ian B. Hutchinson, Hannah N. Lerman, Melissa McHugh, Howell G.M. Edwards, Andoni Moral, Carlos Pérez, Olga Prieto-Ballesteros, Andrew Ball, Igor Drozdovskiy, Loredana Bessone, and Cedric Malherbe (2024). “Optimizing Handheld Instrumentation for Future Astronaut Missions”. In: *Journal of Raman Spectroscopy*.

Qualifications

HarvardX/EdX **March 2024**
CS50x Introduction to Computer Science Virtual

- 11-week course to enhance computer science understanding and improve programming skill set. Languages covered include: C, Python, SQL, and JavaScript plus CSS and HTML.

Software

- Programming (Python, C++, C, SQL, HTML, and R).
- Software (VS Code, Visual Studio, Git, M365, LaTeX).
- Microsoft Office tools (Outlook, Teams, Excel, Word, Powerpoint, OneNote, Sharepoint).
- Google Workspace tools (Drive, Docs, Sheets, Slides).