Akeem Hart

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Education

PhD - Physics — *London, UK*
Queen Mary University of London — *Sep. 2022 - Present*

MSc - Physics — *London, UK*
King's College London — *Sep. 2019 - Jul. 2021*

BSc with Honours - Physics — *Durham, UK*
Durham University — *Oct. 2016 - Jun. 2019*

Various A-Levels and GCSEs — *Birmingham, UK*
King Edward VI Aston School — *2009-2016*

Research Experience

Experimental Particle and Astroparticle Group, King's College London — *London, UK*
Group Member — *Sep. 2019-Jan. 2021*

- Utilised Geant4 and WCSim, a Geant4 based framework to simulate the operation of the world's largest precision measuring instrument for nucleon-decay and neutrino studies and one of the largest physics experiments in the world, Hyper-Kamiokande.
- Developed a novel machine-learning clustering algorithm to address the weaknesses of existing methods (See Projects & Portfolio).

Optics Labs, Durham University — *Durham, UK*
Group Member — *09/2018 - 04/2019*

- Performed both led and unled optical investigations.
- Gained practical experience with a variety of different equipment and techniques, including but not limited to:
  - Cryogenic Cooling
  - Laser Handling
  - Cleanroom use

AstroLab, Durham University — *Durham, UK*
Group Member — *09/2017 - 04/2018*

- Captured & processed telescope imagery of distant galaxies.
- Gained practical experience in astronomy and experimental astrophysics.

Projects & Portfolio

Development of a novel clustering algorithm for particle physics detectors
King's College London, London, UK — *09/2019 - 01/2021*

- Developed a novel clustering algorithm for use at the upcoming neutrino detector, Hyper-Kamiokande.
- Simulated the experimental operation and associated particle physics phenomena using WCSim and ROOT.
- Utilized several different programming languages, predominantly C++, writing optimised code.

Investigation of the presence of dark matter in NGC-3198
Durham University, UK — *09/2017 - 04/2018*

- Captured and processed telescope imagery of elliptical galaxy NGC-3198.
- Gained experience in telescope operation and developed experimental and observational astrophysics skills.
- Used the processed imagery to develop rotation curves and then a mass distribution of the galaxy by using the virial theorem.
- Demonstrated that the observed mass distribution is inconsistent with only the visible matter but very consistent with a model incorporating dark matter indicating that this galaxy may be predominantly dark matter.

Simulation of soliton collisions in a Bose-Einstein condensate
Durham University, UK — *09/2018 - 01/2019*

- I used analytical and mathematical methods to solve the Gross-Pitaevskii equation, which describes the behaviour of a Bose-Einstein condensate, using the split-step Fourier method.
- Wrote code in Python to iterate this solution for a variety of starting conditions.
- Verified my simulated results through comparison with experimental results found in available literature.

Investigation of the optical properties of plant-based dyes

Durham University, UK *09/2018 - 04/2019*

- Collaborated with another student to plan and executed a series of investigations into the optical properties of anthocyanin, betalain and chlorophyll to ascertain the feasibility of their use in organic solar cells.
- Extracted and purified said organic compounds from readily available plants, gaining experience in chemical processing & handling.
- Deepened existing experience of conducting precision-sensitive optics experiments.

Open-Source Contributions

AstroPy

- AstroPy is an astronomy & astrophysics package for Python.
- I conducted maintenance work and bug fixes within the cosmology modules in this package.
- Contributed to a paper submitted to the Astrophysical Journal and the Journal of Open Source Software

Gala

- Gala is a Python package for simulating and calculating galactic and gravitational dynamics.
- I implemented a faster approach to determining the apoapsis & periapsis of a given orbit.

ROOT

- ROOT is a C++ based data analysis program and library used in many areas of experimental and theoretical physics.
- I am currently in the process of resolving minor bugs.

SciPy

- SciPy is a scientific computing package at the core of Python's scientific computing capabilities.
- I performed bug fixes and maintenance work within the statistics modules in this package

SciKit-Learn

- SciKit-Learn is a widely used machine learning package for Python.
- I am currently in the process of resolving minor bugs

Technical Skills

Programming & Scripting Languages, Bash, Python, C, C#, C++, Java, JavaScript, TypeScript

Operating Systems, Linux, Windows

Software and Tools, Microsoft Office, LaTeX, SQL, LabView, Geant4, ROOT, Git, SVN

Languages, English - Native

Other Professional & Volunteer Experience

Software Engineer *Cambridge, UK*

Siemens Industry Software Ltd *Jan. 2022 - Sep. 2022*

Sales Team Member *Birmingham, UK & London, UK*

Clarks Ltd *Jun. 2018-Mar. 2020*

Stockroom Assistant *Birmingham, UK*

Nutters Fastenings Ltd *Jun. 2014-Jul. 2016*

Customer Service Assistant *Birmingham, UK*

British Heart Foundation *Jun. 2015-Jul. 2015*

Miscellaneous Information

- Institute of Physics Affiliate Member 2015-2019
- Institute of Physics Member 2021-Present
- Nationality: UK

Publications

- Astropy Collaboration et Al "The Astropy Project: Sustaining and Growing a Community-oriented Open-source Project and the Latest Major Release (v5.0) of the Core Package" The Astrophysical Journal, Volume 935, Issue 2, id.167, 20 pp. August 2022. DOI: 10.3847/1538-4357/ac7c74.