

# JOSEPH EATSON

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## EDUCATION

**University of Leeds** ..... 2013-2022  
Ph.D. in Astrophysics - *Numerical Simulations of Dusty Colliding Wind Binaries* ..... In progress  
MPhys in Physics & Astrophysics ..... 2:1  
BSc in Physics ..... 2:1  
**Enfield Grammar School** ..... 2006-2013  
A Level ..... A in History & Mathematics, B in Physics  
GCSE ..... 13 graded C or higher, with 6 graded A

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## RESEARCH PROJECTS

**Numerical Simulations of Dusty Colliding Wind Binaries** ..... [Thesis - in progress](#)  
*Ph.D. Research Project - University of Leeds* ..... 2017-2022

- Project centred around the creation of a highly performant numerical code for performing analysis of dust formation in Colliding Wind Binary systems.
- Performed extensive modification to existing Athena++ and MG hydrodynamical codes to achieve this goal, co-ordination with developers of both projects, as well as general debugging and reporting.
- Performed parameter space exploration on requirements for dust formation in Colliding Wind Binary Systems, varying wind momentum ratio, cooling parameters and separation distance.
- Simulations on observed systems such as WR140 and  $\eta$  Carinae performed, with particular focus on the impact of orbital eccentricity on dust formation rates.
- During this time developed a novel passive scalar model for simulating dust growth, destruction and cooling within a numerical simulation. Model is highly extensible and potentially applicable to a range of other hydrodynamical codes.

**A Comedy of Uncertainties - Mapping Stellar Clusters Using Spatial & Multi-Stage Sub-Clustering Methods** ..... [Project Report](#)  
*MPhys Research Project - University of Leeds* ..... 2016-2017

- Experimentation with sub-clustering methods for application in open clusters and OB associations.
- Used the R statistical language to perform sub-clustering, provisional parallax data from Hipparcos-Gaia catalog was used to map stellar clusters in 3D, with the long-term goal of resolving kinematics.
- Initial results were promising, but conclusive results were dependent on 2<sup>nd</sup> Gaia data release that was not available until a year after project submission.

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## SKILLS

### Programming

- Significant experience in several programming languages, from statistical languages such as Python, R and Julia, to low-level systems development languages such as C, C++, Fortran90 and Rust.
- Particularly fluent in C, C++, Python and R, having more than 6 years of daily usage of each language.
- Writes lean, well-documented code on-time with an emphasis on readability and parallel performance.
- Experience in modern development techniques and version control systems such as Git and Mercurial.
- Ph.D. required the understanding of HPC concepts such as shared memory and message passing parallelism, in particular the OpenMPI and OpenMP libraries.
- Familiar with other HPC concepts such as GPGPU accelerators, and have written programmes using CUDA for personal projects.

- Daily usage of IDEs such as Spyder, Rstudio, JuPyter and VSCode.

### Research Skills

- High degree of knowledge in writing academic papers for peer review.
- Familiarity with modern documentation and static analysis methods such as Doxygen.
- Very proficient in the  $\text{\LaTeX}$  typesetting language as well as the Bib $\text{\TeX}$  and Bib $\text{\LaTeX}$  citation formats.
- Quick study for new concepts and technical jargon.
- Postgraduate level background in physics & mathematics, IOP-accredited degree in astrophysics, with additional knowledge in numerical methods, fluid dynamics, quantum computing and computer science.

### Computing

- Extreme proficiency with all operating systems and desktop environments, with years of experience in Windows, MacOS & multiple Linux distributions.
- Personal experience in server maintenance and network management, as well as general technical support, typically the first point of call for most people in my department with a computing issue.
- Proficiency in office suites such as Microsoft Office, iWork and Google Workspace, as well as their open source counterparts.

### Teaching & Collaboration

- Experience teaching students in a wide range of age groups, from primary school to university level.
- Able to write, explain and defend concepts clearly and concisely to audiences ranging from students to seniors, educators to executives.
- Proficient in teams of any size, I work well with others, and above all else pride myself in being an asset to those that I work with.

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## OVERVIEW

**Teaching** ..... 5 years teaching & assessing lab skills and Python to undergraduates  
**Fluent Programming Languages** ..... C, C++, Python 2.7-3.9, R  
**Additional Programming Languages** ..... Fortran90, Julia, Rust  
**Libraries & APIs** ..... OpenMP, OpenMPI, Numba, Cython  
**Practical Knowledge** ..... Telescope operation, server maintenance  
**Tools & Environments** ..... VSCode, JuPyter, RStudio, GNUPlot, Athena++, SGE,  $\text{\LaTeX}$   
**Programming Strengths** . Highly-optimised, multi-threaded code for use in HPC environments

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## REFERENCES

**Dr. Julian Pittard** ..... *Ph.D. supervisor - University of Leeds*  
 ..... 0113 343 3805, [J.M.Pittard@leeds.ac.uk](mailto:J.M.Pittard@leeds.ac.uk)  
**Dr. Stuart Lumsden** ..... *Masters project supervisor - University of Leeds*  
 ..... 0113 343 6691, [S.L.Lumsden@leeds.ac.uk](mailto:S.L.Lumsden@leeds.ac.uk)