

# Thomas Jubb

## Curriculum Vitae

Durham, UK  
GitHub : TWJubb

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*Once a highly motivated published and well cited researcher, recipient of prestigious awards and scholarships with a track record of top grades at all levels of education. Now a leading scientist within a top innovation company; designing and building new algorithms and hardware to solve previously unsolvable problems and introduce disruptive technology into x-ray markets. Well developed coding and software skills whilst a consultant software developer. I am an advanced Python programmer and confident with C++ having written professional software with both. AI specialist in the use of CNNs, and the driving force behind the introduction of AI into the business. Specialist in spectral radiation detector technology.*

## Employment

- November 2018- present **Physicist**, *Kromek*, Sedgefield.
- It is hard to describe my current role! I lead the technical work on one of the largest revenue generating projects in the company; but have an involvement in most areas of project management and technical work. I develop algorithms, implement software, and characterise and analyse detectors for innovative new applications. I have developed several new techniques for material identification using x-rays; and have created 5 patent applications to date.
- Developing and using AI (primarily CNNs) to detect threat objects inside luggage.
  - Writing software in Python to speed up all areas of the project (automate equipment usage, simulation tools for x-ray scanning, AI related software).
  - Detector design and characterization using theoretical simulations (both advanced monte carlo and purpose built ray tracing codes).
  - Non science project work includes; interviewing, hiring and supervising staff on my projects, overseas travel to interface with customers and colleagues, training in radiation safety. Project management for the first six month of the project then transitioned into tech-lead role. Implementation of many new practices into the software pipelines.
  - Working with, repairing, and modifying hardware (detectors, generators, x-ray scanning equipment).
- March 2018- November 2018 **Associate Analyst Programmer**, *Tessella*, Abingdon-on-Thames.
- My role as a consultant software engineer and analyst was based at Rutherford Appleton Laboratories in Didcot. Developed new software for the Muon science facilities at the Diamond light source; working with the Mantid collaboration. A fantastic experience but I left to rejoin Kromek and pursue more research oriented projects.
- Confident C++ developer; developing software using multi-threading, Qt (GUI library), unit and system testing, small amount of network programming. I have developed many core algorithms for the Mantid software in C++.
  - Advanced Python development; using PyQt (GUI library), boost::python (exposing C++ code to python). I have developed a working software for muon scientists in Python.
  - Software Development : Agile development cycles, unit testing, system architecture, code design patterns, source control with Git (Git profile TWJubb).
  - Soft Skills : Developing staff training with weekly discussion meetings and tutorials, developing management skills by coaching and managing placement students.
  - Training courses in unit testing, negotiation, first aid, software development.

- December **Data Scientist**, *Kromek*, Sedgefield.
- 2017- March 2018 Working on a short term contract as a data scientist for a company specializing in X-ray detectors. With the algorithm I developed the project was later successfully delivered and led to further engagement and contracts from the customer.
- Developing a pipeline of machine learning algorithms to solve a difficult problem with a 96% accuracy in binary classification.
  - Coding in python using many data science libraries such as pandas, seaborn, tensorflow, keras, scikit-learn.
  - Designing and developing hardware which resulted in a patent application along with my collaborators.
  - Developing data collection practices.
  - Developing a set of software tools to enable automated evaluation of data and prototyping the core structure of a software product.

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## Education

- 2013-2017 **PhD (Theoretical Physics)**, *Durham University*, Durham, *Pass with no corrections (October 2017)*.

Received prestigious Durham Doctoral Scholarship Published three research papers. Research focussed on dark matter, astrophysics, particle physics, statistical treatment of data.

- **Papers** : Major contribution (produced all results) to three published papers in reputable journals, with 40 citations. Currently researching a project based on machine learning image recognition techniques.
- **Coding** : Large experience with coding skills : daily usage of Python, Mathematica, C++, minor usage Fortran. Using MacOS/Windows/Linux, LaTeX for typesetting papers and thesis. Visualization using Gimp/InkScape. **Machine learning** : BDTs, neural networks etc. using scikit-learn/Keras/seaborn/pandas in python.
- **Outreach** : Wrote and delivered a 1 hour long talk (2 consecutive days) to post-application A-level students on the subject of "time", as part of the "Particle Physics Masterclass". I frequently help out during open-days at the Department, giving tours and talks to prospective students.
- **Talks/conference** : Several formal research seminars to colleagues in the IPPP. Chaired the Dark Matter session in the YETI meeting of 2014. Attended several conferences and schools; Invisibles 2015 (Madrid), presenting work at ISAPP 2014 (near Turin, Italy), BUSTEPP 2016, Multi-Dark 2016.

- 2009-2013 **MPhys**, *Durham University*, Durham, *1st Class (with honours)*.

Achieved highest mark in degree program, both overall and in several individual modules. Received Vice Chancellor Scholarship and other awards.

- **Thesis**, 87% : Contribution to arXiv::1307.1347 (959 citations). Awarded over 80% for an assessed seminar presenting MPhys thesis, subsequently invited to the "Rising Stars Research Symposium 2013" presenting a poster of my work. Received graphical excellence prize for poster presentation in 2nd year.
- **Industrial Experience (3.5 months)** : Superconductivity group, Durham University. Sole person responsible for setting up a lab testing superconducting wires as part of a £3M contract (organising a lab space, acquiring ~£20,000 worth of equipment, running the lab to produce large sets of data to tight time constraints). Developed new method to take results, increasing efficiency  $\times 10$ .
- **Summer Bursary (6 weeks)** : Institute for Computational Cosmology, Durham University. Starting from a blank canvas, produced animations and CGIs from scratch of a new space telescope, Euclid, due for launch in 2019. 3D rendering using Autodesk 3DS max software.

- 2007-2009 **A-level**, *Arnewood School*, Hampshire, 5 A grades .

High A grades (> 90%) in Physics, Maths, Further Maths, Chemistry, Biology. Several modules passed at 100%.

- Sea Scouts (sailing or kayaking in and around the Solent). Air Cadets (Lymington Squadron) visiting operational air bases, flying a plane. Expedition to Siberia to watch a total solar eclipse, training on the Exmoor plains. Hike between Munich and Venice, a considerable personal challenge which took around 3 weeks to complete.

## Non Academic Experience

- 2013–2017 **Personal Tutor (Paid)**, *Self Employed*.  
Paid tutor for GCSE/A-level/Degree physics and maths. All students (> 10) have improved their grades, with several top marks. Advanced CRB certificate, full driving licence (no points).
- 2013–2016 **Undergraduate Demonstrator (Paid)**, *Durham University*.  
Undergraduate workshops throughout PhD, 5-6 hours per week during term. Marking summative weekly problems and collections exams, providing written feedback.

## Awards & Prizes

- 2014–2017 **Durham Doctoral Scholarship**, *Durham University*.  
Full PhD funding paid by Durham University awarded to a few students from the Faculty of Science each year, based on merit and a strong research proposal.
- 2014 **Vice Chancellor Scholarship**, *Durham University*.  
A significant monetary award for outstanding academic achievement.
- 2014 **J.A. Chalmers Prize**, *Durham University*.  
Graduation prize for academic results (top grade overall).

## Interests

- Photography I am a keen photographer, mostly macro, of wild flowers and mineral specimens.
- Mineral Collecting An avid mineral collector since childhood amassing a sizeable world-wide collection. Often found collecting in mines and quarries, and an active Russell Society member.
- Cooking Constantly trying to improve my recipes. Cook a 10/10 carrot cake.

## Patents

- Design New tray design for use in X-ray screening products (pending).
- X-Ray Physics New variant on method to produce materials information from x-ray detectors (in writing).
- AI Techniques for generating neural network training data for X-ray images containing explosives (3 patents in writing).

## Publications

- [1] T. Jubb *et al.*, JHEP **05**, 118 (2016), arXiv:1604.01025 [hep-ph].
- [2] T. Jubb *et al.*, Nucl. Phys. **B915**, 431 (2017), arXiv:1603.07770 [hep-ph].
- [3] T. Jubb *et al.*, (2017), arXiv:1709.01930 [hep-ph].
- [4] J. R. Andersen *et al.*, (2013), arXiv:1307.1347 [hep-ph]