

LIV.INNO



Training programme

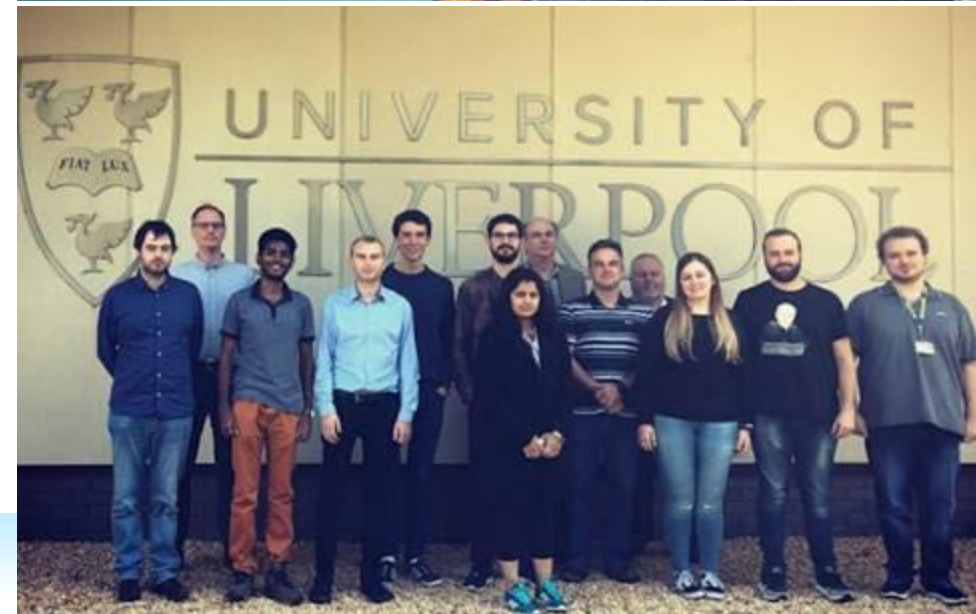
David Hutchcroft

Why train students?

- The PhD training programme is designed to give the students
 - Subject specific training
 - General training in data intensive science
 - Preparation for working in teams, writing reports and networking skills

This is to make the graduates have the best opportunities

- STFC wants to show that the fundamental science it funds has wider societal benefits



Main topics of training

- **Focused research skills and techniques**
 - Cutting edge R&D projects
- **Broader scientific experience**
 - Placements, workshops and Schools
- **Research project management, communication and presentation skills**
 - A complementary skills School in the first year
 - Outreach activities
- **Understanding of the benefits of an inclusive environment**
 - integrating Equality, Diversity and Inclusion (EDI) in all aspects of the CDT



- **Interpersonal skills, accepting responsibility, working in teams, networking**
 - Project work, a student-organized charity event, and involvement in events
- **Awareness of private sector constraints and Intellectual Property rights**
 - Industrial mentors and secondments, the Business Development Manager (BDM) based in UoL Physics
- **Career management, CV writing, interview techniques, proposal preparation and entrepreneurship**

Inclusivity and Diversity









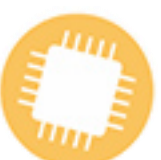
- All PhD activities should be available to all
 - Every scheduled activity will be recorded for students unable to attend in person or at the delivered time
- The staff at both universities are signed up for the national HE and Institute of Physics charters on inclusion and diversity
 - <https://www.advance-he.ac.uk/equality-charters/athena-swan-charter>
 - <https://www.iop.org/about/IOP-diversity-inclusion/project-juno>
- This is an ongoing process and we applied to get recognition of our improved status in both earlier this year
- All of our PhD students will be trained in and held to the same high standards around EDI

IOP | Institute of Physics
Juno Practitioner

Subject specific training

- The students need to be good researchers by the end of their PhDs



- | | | | |
|------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------|---------------------|
|  | Condensed matter |  | Particle Physics |
|  | Accelerator Science |  | Nuclear Science |
|  | Astrophysics |  | Theoretical Physics |
|  | Computer Science | | |

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Student specific training

- There is always subject specific knowledge and only the experts in the field can deliver that
- They will be integrated with the training of the other PhD students in their fields
 - Trips to international laboratories
 - National and international summer schools
 - Delivering conference talks on their results
- This is training we deliver to all PhD students, not just on CDT members

Using Masters courses in Computer Science

- Both UoL and LJMU have suitable courses to which are apposite:
from:



- Data Science and Artificial Intelligence MSc

- <https://www.liverpool.ac.uk/study/postgraduate-taught/taught/data-science-and-artificial-intelligence-msc/overview/>

- MSc Data Science

- <https://www.ljmu.ac.uk/study/courses/postgraduates/data-science-msc>

- Modules from these courses will be the main taught components for the students



All cohort training

Compulsory 90 credits

Semester 1

Data Science

Learn about current challenges and opportunities in Data Intensive Science and expand research skills in key areas. Connect with other students and staff through Forum

Big Data Computing

Develop skills in computing techniques for high performance analysis of large data sets and understanding of how to translate analysis problem to best exploit such techniques

C++ programming, MC techniques and group project

Hands-on C++ programming and MC training, single project undertaken by entire cohort

Semester 2

Data Mining

Develop a critical awareness of current problems and research issues in Data Mining and the ability to address Data Mining research issues in an original manner

Transferable skills training

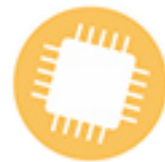
Students will be joined by others from the faculties and receive training in project management, scientific writing, presentation skills and IPR with Fistral.

Individual data skills project

Individual project addressing a data intensive science challenge set by supervisors.

Project specific training

Project-specific choice of one 15-credit module	Data-science choice of one 15-credit module
Particle Physics Nuclear Physics Accelerator Science Astrophysics Theoretical Physics Computer Science	Multi-core Programming Applied Algorithmics Theoretical Physics + other Computer Science MSc and Physics MPhys modules



The PhD thesis topics will determine which of the courses is most useful for each student

Data science schools

- Intensive week long schools on specific topics are a cornerstone of PhD training with almost all of the students in a national cohort together, typically attending two over a PhD
 - In 2020 LIV.DAT put on the STFC Data Intensive Science School, 12-16 October 2020, online only due to the pandemic
 - <https://indico.ph.liv.ac.uk/event/103/overview>
 - Now used as the basis for a MOOC (massively open online course)
 - <https://liverpool.instructure.com/courses/44542>
- As part of the commitment to providing training to all potential data scientists

LIV.DAT summer school timetable 2020

Monday	HEP NN training	ScikitKeras	Introduction to ML
	Posters		
Tuesday	Big Data Python ecosystem for HEP	Demystifying "Big Data"	Preparation of large datasets for machine learning
	Posters		
	Public talk on Health data science		
Wednesday	Git Demystified	Virtual universes vs. the real thing	
	Live astronomy with the Liverpool telescope		
Thursday	Big data case studies		
	Project management		
	International collaboration		
	Industry careers workshop		
	Online Escape Room		
Friday	Kaggle competition: www.kaggle.com/competitions/lhcb-jet-data-separation		
	Talk by previous student on their experience		
	Prize giving & Close		

LIV.INNOS events

The full programme of events will evolve over the seven years of the initially CDT funding

- Seminars
 - Speakers from industry, research and computing: drawn from around the world
 - [LIV.DAT Virtual Seminar Series - Spring 2022](https://indico.ph.liv.ac.uk/event/589/)
[indico.ph.liv.ac.uk/event/589/]
- LIV.INNO student seminars
 - 2nd and 3rd year students will present their work to the cohort, staff and interested undergraduate students



Recent & upcoming LIV.DAT seminars

The Crystal Isometry Principle

- Dr Vitaliy Kurlin
Reader in the Computer Science Department and Materials Innovation Factory,
University of Liverpool

How computers have changed science and predictions on how that will continue

- Dr Joanna Leng
Senior Research Software Engineer, University of Leeds

Physics-informed neural networks for solving Gray-Scott systems

- Prof Salvatore Cuomo
Associate Professor of Numerical Analysis, University of Naples Federico II
Tuesday 14 June 2022 at 14:00 BST
<https://indico.ph.liv.ac.uk/event/589/page/27-physics-informed-neural-networks-for-solving-gray-scott-systems>

2 day charity hackaton each year

- Inspired by a student-led initiative started during lockdown
- Using the charity's own data
- Students will be involved from the start with
 - organization of the event
 - selection of charity partners
 - advance preparation of the data
- Gives experience in dealing with real-world noisy and incomplete data, privacy issues, and client relations
- Under the STFC DataAid programme:
 - https://data-intensive-cdt.ac.uk/?page_id=607



Contributions from partners all activities

- We are looking for speakers and workshops from our partners
- For all of the previously discussed activities we would welcome events lead by you
 - Seminars
 - Workshops
 - MOOC classes
 - DataAid suggestions and support
 - Symposiums on public engagement



- Nvidia have already committed to giving a workshop and we welcome other contributions

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Thank you for listening

Questions?