

Issue 06 | November 2025

At the Heart of the UK's Innovation Agenda

LIV.INNO continues to demonstrate how collaborative, data-intensive R&D delivers real impact.

The UKRI Innovation Summit on 24 November 2025 underscored national priorities in mission-driven innovation, advanced skills, and responsible AI - areas where LIV.INNO is already leading.

From breakthroughs in 3D X-ray imaging (presented by our partner Adaptix at the summit!) to environmental monitoring, our work aligns strongly with these national and indeed global ambitions.

As new students join us, I have no doubt that we will continue to shape the UK's innovation landscape.



Prof Carsten P. Welsch
LIV.INNO Director

Liverpool-developed monitor now operational in the Large Hadron Collider

A novel beam diagnostic instrument developed by researchers in the University of Liverpool's [QUASAR Group](#), including LIV.DAT CDT student [Ondrej Sedláček](#), has achieved a major milestone: full operational approval for use in the Large Hadron Collider (LHC) at CERN.

The instrument, known as the Beam Gas Curtain (BGC) monitor, has now been cleared for continuous operation (~2,000 hours per year) in the world's most powerful particle accelerator.

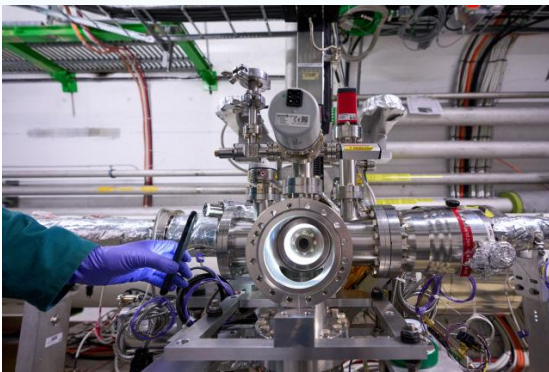
"This is a tremendous achievement for our collaboration," said Professor Carsten P. Welsch, Head of the QUASAR Group who has led this development for almost 20 years. "Seeing a device that began as a concept explored by several generations of our PhD students now operating at the heart of the LHC is truly inspiring. It demonstrates the power of long-term innovation, teamwork, and persistence."

The BGC monitor was conceived, developed, and refined over a decade within the QUASAR Group, part of the University's Department of Physics and the Cockcroft Institute. The system was designed to meet one of the toughest challenges in modern accelerator physics: how to measure the properties of very high-energy particle beams without disturbing them.

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In a paper just published in [Physical Review Research](#), Liverpool physicists and their GSI and CERN collaborators report the first-ever full-cycle, non-invasive beam emittance measurements at the LHC using the Beam Gas Curtain technique. The instrument works by creating an ultra-thin, supersonic sheet of neon gas - a “curtain” - that interacts with the circulating proton or lead ion beam. The resulting faint flashes of fluorescence light are captured by a sophisticated optical system, revealing precise information about the beam’s size and quality throughout the full acceleration cycle.



The installed Beam Gas Curtain on the LHC. (Image: CERN / Maximilien Brice)

Unlike existing instruments that require dedicated calibration time or interrupt normal operation, the BGC can continuously monitor the beam profile and emittance from injection at 450 GeV up to the LHC’s top energy of 6.8 TeV - all while physics experiments are running.

The system was tested extensively at the Cockcroft Institute before installation at CERN. Its performance has exceeded expectations, delivering high-precision,

non-invasive measurements for both proton and heavy-ion beams. As the Physical Review Research paper shows, its results agree closely with independent LHC diagnostics such as the Beam Synchrotron Radiation Telescope and emittance scans at the ATLAS and CMS experiments.

“Having our monitor now fully integrated into daily LHC operations is a real ‘wow’ moment,” said Dr Hao Zhang, one of the leading experts in the team. “It is the culmination of years of development, from vacuum compatibility studies and optical design to software integration and on-site commissioning.”

With the BGC now approved as a permanent part of the LHC’s beam instrumentation, it paves the way for similar systems in other major research facilities, including the European Spallation Source in Sweden, the Electron Ion Collider in the USA, and even medical accelerator applications.

The research has been supported by the Science and Technology Facilities Council (STFC) through the High-Luminosity LHC (HL-LHC) UK programme and the LIV.DAT and LIV.INNO Centres for Doctoral Training, as well as the Cockcroft Institute.

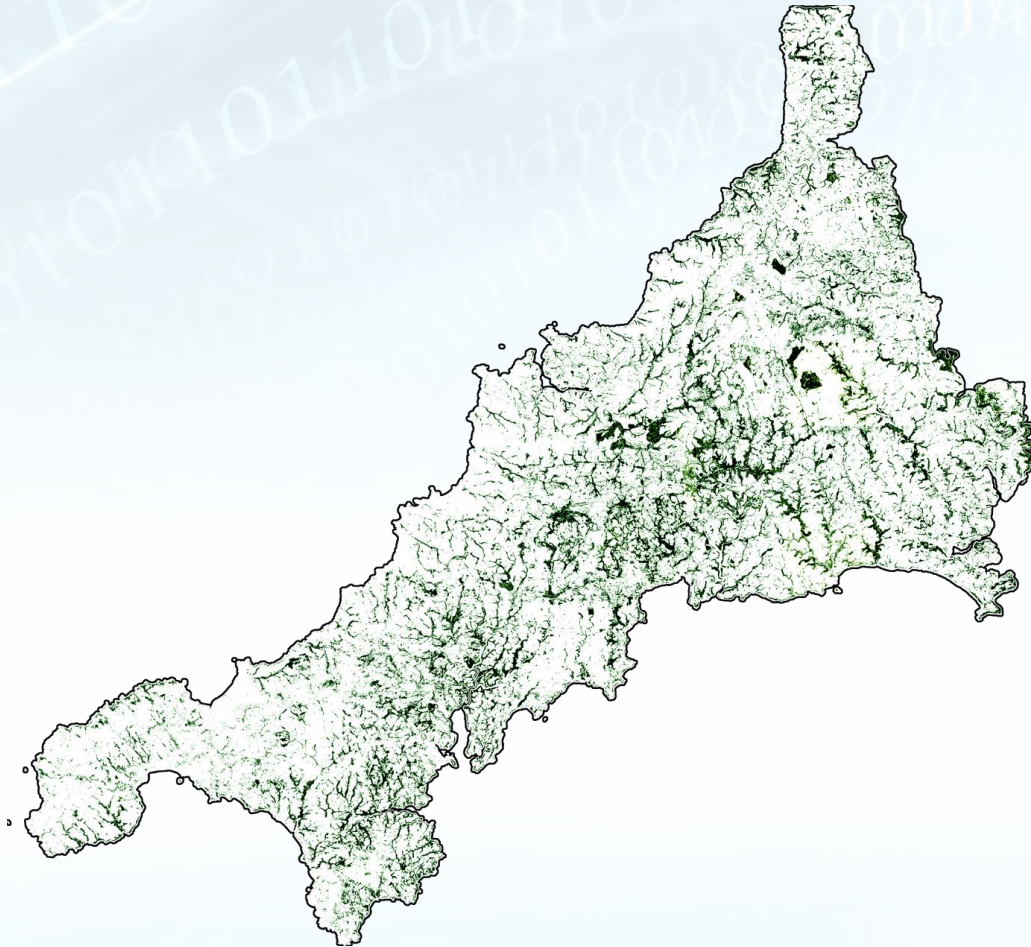
“This achievement shows how university-based innovation can directly shape the tools that keep the world’s largest scientific instruments running,” added Professor Welsch. “It is a very proud moment for Liverpool and for all the students and researchers who contributed to this remarkable journey.”

More information:

‘Full-cycle, noninvasive emittance monitoring with the beam gas curtain monitor at the LHC’

O. Sedláček et al., Physical Review Research **7**, 043144 (2025). DOI: [10.1103/5ggy-f8lm](https://doi.org/10.1103/5ggy-f8lm)

AI Breakthrough 'Dargana' Maps Earth's Tree Canopies with Unprecedented Precision



Shaded pixels indicate where Dargana identified the presence of trees across Cornwall, UK on 31st December 2023.

A new era of environmental monitoring is emerging with the unveiling of Dargana, an advanced AI model capable of mapping global tree canopy cover in remarkable detail. The paper, "[Dargana: fine-tuning EarthPT for dynamic tree canopy mapping from space](#)," was presented at the ICLR 2025 workshop on Tackling Climate Change with Machine Learning, marking a major advance in the use of satellite data for conservation and climate research.

Developed by researchers at Aspia Space, led by first-author Michael J. Smith

and including LIV.INNO student [Ryan Roberts](#), Dargana is a fine-tuned variant of the EarthPT time-series foundation model. EarthPT is a "Large Observation Model" (LOM) pre-trained on vast amounts of Earth-observation data, analogous in concept to how Large Language Models (LLMs) like GPT are trained on massive text corpora. By fine-tuning this foundational model, the team has created a specialised tool for accurately identifying tree canopy cover and distinguishing between conifer and broadleaved types.

The researchers fine-tuned EarthPT using less than 3% of its original pre-training data and only 5% of the compute required for its initial training. This efficiency demonstrates how general-purpose AI observation models can be rapidly adapted to complex environmental challenges without the cost or time traditionally associated with training models from scratch. Such scalability opens the door to broader, high-resolution monitoring for conservation initiatives worldwide.

Dargana produces classifications of tree canopy cover at a 10-meter resolution and can track temporal changes, providing near real-time predictions. Tested on tile SX36 - a geospatial coordinate corresponding to Cornwall, UK - the model achieved a pixel-level ROC-AUC of

0.98 and PR-AUC of 0.83 on unseen satellite imagery, underscoring its robustness and generalisability. Beyond its accuracy, Dargana can detect fine structures such as hedgerows and coppice - linear or patch features that play an important role in ecological connectivity - even when these fall below the size of its original training samples.

By proving that Large Observation Models like EarthPT can be efficiently specialised, the Dargana research paves the way for a generation of scalable, AI-driven tools. These tools promise to provide conservationists, policymakers, and scientists with the dynamic, granular data necessary to make informed decisions, ultimately strengthening the world's defences against biodiversity loss and the accelerating effects of climate change.

SCIMITAR: A New Simulation Tool Paves the Way for Next-Generation 3D X-ray Imaging

Researchers from the University of Liverpool's QUASAR Group, including LIV.INNO fellow Dr Alexander Hill and 4th Year LIV.INNO PhD student [Lauryn Eley](#), have published a major development in their pursuit of portable, low-dose 3D X-ray imaging. The study, "[SCIMITAR: Optimising Chest Digital Tomosynthesis Devices Using Geometric Simulations and Genetic Algorithms](#)", led by Dr Hill and recently published in Biomedical Physics & Engineering Express, presents a powerful new framework for optimising digital tomosynthesis (DT) systems using computational modelling and data-driven optimisation.

The work marks a significant milestone within the OptiX project, a £400k initiative funded in 2024 by the Science and Technology Facilities Council (STFC) under UKRI's Late-Stage Commercialisation Scheme. [OptiX](#) aims to deliver advanced 3D chest imaging

directly at the patient's bedside through Flat-Panel Source (FPS) technology, a novel approach developed in collaboration with Oxford-based company [Adaptix Ltd](#). Unlike conventional CT systems, which rely on mechanical movement and relatively high radiation doses, FPS technology uses electronically controlled X-ray emitters embedded within a stationary panel. This enables rapid 3D image acquisition in a compact, low-cost device, a potential game-changer for medical diagnostics in both hospital and community settings.

To bring this vision closer to reality, the SCIMITAR framework (Simulating Complete Irradiation Maps and Improving Tomosynthesis in X-ray Radiography) was developed to virtually design and optimise FPS-based imaging systems. Built on VTK-based geometric simulations and guided by a genetic algorithm, SCIMITAR models how X-ray beams

interact with the patient and detector to generate irradiation maps, which are then optimised for coverage uniformity and dose efficiency.

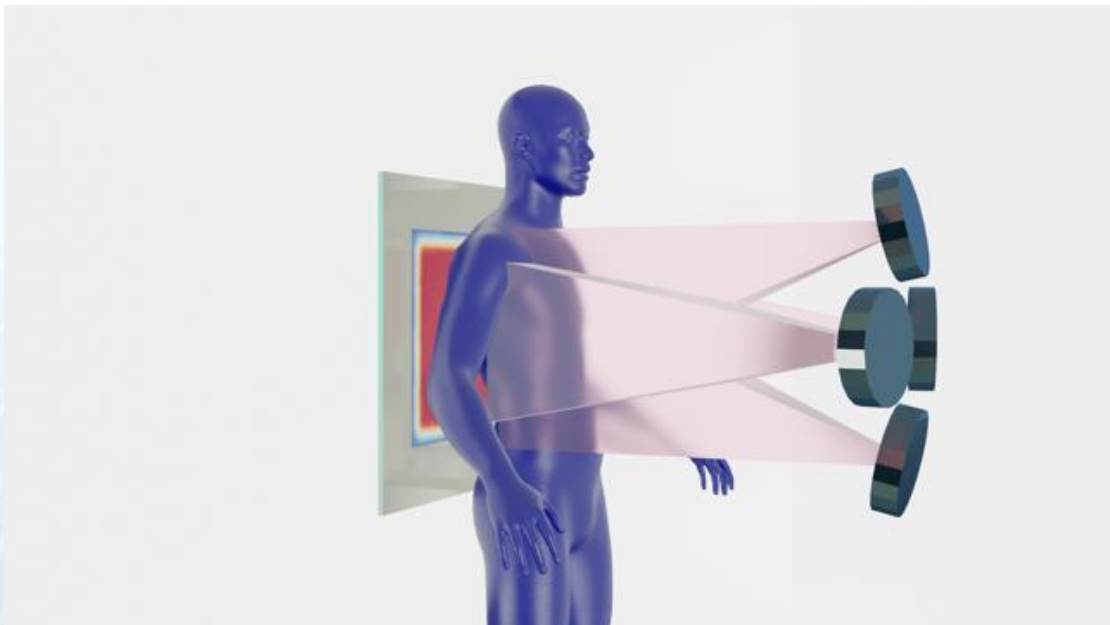
This approach allows researchers to explore and refine array geometries far more efficiently than traditional experimental methods, reducing development costs and accelerating progress toward a clinically viable device. Importantly, SCIMITAR provides a generalisable platform that can support future system design guided by improved optimisation criteria and external design considerations.

Dr Hill explains: "This work wouldn't be possible without the excellent collaboration and diversity of skills we have within the QUASAR group, as well as with our partners in industry. There's more work to be done; however, SCIMITAR is a promising step towards the development of a transformational low cost and low dose 3D X-ray imaging

device. With our LIV.INNO PhD student, Lauryn Eley, currently working on-site at Adaptix, our simulations and experimental campaigns are quickly reaching maturity. It's a very exciting time for the project!"

The paper reflects the latest achievement in a decade-long collaboration between Adaptix Ltd and the QUASAR Group, supported by the LIV.DAT and LIV.INNO Centres for Doctoral Training. Together, these programmes have fostered a unique environment for training researchers at the interface of physics, data science, and cross-sector applications.

With SCIMITAR now providing a validated computational foundation, the OptiX team will continue to validate the design through experiments using synthetic anatomical phantoms and more sophisticated simulations. The long-term goal remains clear: to deliver a clinically deployable 3D X-ray imaging solution that is safer, faster, and more accessible than ever before.



Visualisation of a chest digital tomosynthesis device, simulated by the QUASAR Group.

Third place poster prize at AI Discovery Day

Third-year PhD student [Qiyuan Xu](#), from the QUASAR Group and the LIV.INNO Centre for Doctoral Training, was awarded third place in the poster competition at “[AI Discovery Day: Powering Research & Innovation with NVIDIA and Dell Technologies](#),” held on 22 October 2025 at The Spine Building, Liverpool.

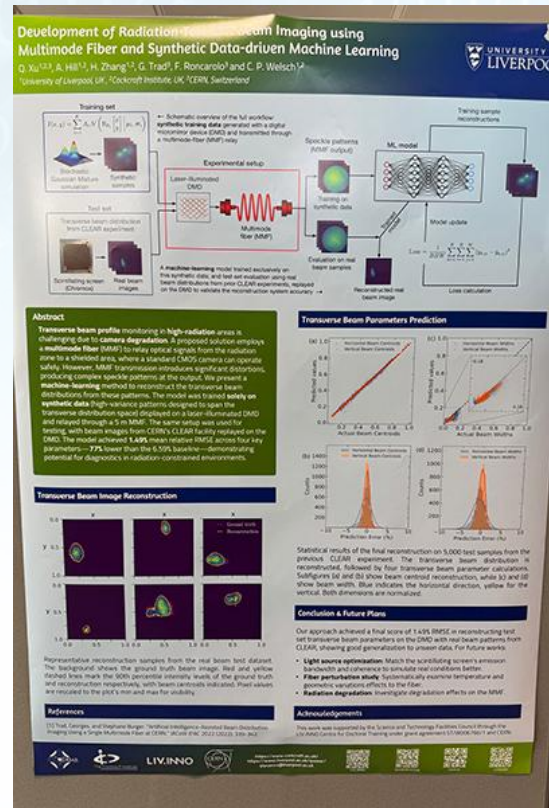


Announcement of the poster prize winners at the AI Discovery Day.

The event brought together researchers and industry specialists to explore practical, high-impact uses of AI and high-performance computing in areas such as simulation, robotics and generative AI. Participants were invited to present their work in a way that is directly relevant to industry, with posters judged by industry professionals and academic leads, and prizes awarded to the top three entries.

Qiyuan's poster presented ongoing work on multimode-fiber-based, machine-learning reconstruction of transverse beam distribution for beam diagnostics. The aim is to recover high-quality transverse beam information from fiber-delivered optical signals and move toward radiation-tolerant diagnostics that can operate in harsh accelerator environments. This work is being developed in collaboration between the University of Liverpool and CERN. On site, the poster was set up and presented

by QUASAR Group colleagues Debdeep Ghosal and Alex Hill.



Qiyuan's poster on multimode-fiber-based, machine-learning reconstruction of transverse beam distribution for beam diagnostics.

Qiyuan commented: “This was a very encouraging result for me. Industry experts were not only interested in the approach we’re developing for accelerator diagnostics but also gave useful feedback on how similar techniques could be transferred to wider industrial monitoring and inspection. That perspective is very valuable for shaping the future direction of the work.”

Congratulations!

Final cohort of LIV.INNO students begin their PhDs in Liverpool



The final cohort of LIV.INNO funded students have started studying for their PhDs at the University of Liverpool and Liverpool John Moores University. Another four [students](#) from across the world have come to Liverpool to study a wide range of topics which have Data Intensive Science at the core of them. While some of the students will remain in Liverpool for the duration of their studies others will spend time at other institutions such as CERN and FBK.

The students will commence their training in data science as well as subjects relevant to their projects including accelerator physics, particle physics and theoretical physics. As well as continuing their studies in these subjects the students will receive training in research skills and techniques, project management, networking, communication and presentation skills, with the aim to provide all students with the skill set required for a future career in academia or industry.

Each student is also required to undertake

a six-month industrial placement as part of their PhD. This gives them the opportunity to apply their data science skills to real world challenges while gaining knowledge and experience working outside academia.

The projects the new students are working on are from across the three LIV.INNO work packages. The projects include work on diagnostics for the High Luminosity LHC, quantum technology, lattice QCD and high resolution radiation sensors. More information about the students and their projects can be found [here](#).

The LIV.INNO model of training students will continue beyond this year, with the training of future cohorts including a stronger element of AI and machine learning techniques, reflecting the strategic shift in research priorities across the centre.

We wish all the students well in their studies and welcome them to the LIV.INNO project!

LIV.INNO student completes placement at Mae & Mitchell Bespoke Management

As part of his studies in data science, LIV.INNO student [Luke Detraux](#) has completed a placement at Mae & Mitchell Bespoke Management (MMBM), investigating how science and technology could revolutionise the care sector.



Over the past 50 years, there has been a trend of moving care-receivers out of hospitals and into community care. During this time, treatments for learning disabilities and mental health illnesses have shifted from pharmaceutical to occupational therapy, with increasing focus on person-centred care, to reflect the current medical understanding of treatment and rehabilitation. However, implementation of new technologies has been slow to keep up with these new techniques. With an ever-increasing dependence on data driven methods, the care sector is ideal for implementing new and creative digital solutions.

Measuring the effectiveness of treatment in the care sector is complex and data-intensive process, with many metrics needing to be considered. This data is essential as it determines future

approaches to a supported person's care and has a measurable impact on their lives. However, with many care providers reportedly overworked and underfunded, often this crucial evaluation is neglected. MMBM recognise that this is not good enough and aim to take a much more scientific, pragmatic approach to care.

Luke's work at MMBM aimed to efficiently compile many different metrics to measure the performance of the care provider and the effectiveness of treatment. One of the main challenges in this work was that much of the data in this industry isn't standardised in terms of format or contents. Moreover, due to a cycle of previous placement breakdowns, much of the historic data on service users is missing.

The second biggest challenge was that many support workers do not have a background in computer science, therefore any implemented program would need to be user friendly if it was to be implemented. Despite this, Luke was able to find a reliable methodology to produce a quantitative score measuring the effectiveness of treatment of service users in the care system. This work will go towards improving the quality of life of the service users and can be expanded easily even as MMBM grows.

Luke said: "I am very grateful to MMBM for my time there and I have learned a lot about how computing techniques can bolster even the most person-centred services. MMBM is truly at the cutting edge of research in the care sector and have outstanding standards of care because of this."

AI & Eyes Sparks Creativity in Local Youth with Hands-On Workshop



LIV.INNO student Saransh Malhotra giving his presentation at the workshop.

LIV.INNO and QUASAR students have taken part in two workshops with UK Unplugged at OOMOO Open Door Charity, teaching participants about the way AI is used in medicine, specifically in eye scans, as well as how they use it in their own research.

The activity is based on the PhD research project conducted by LIV.INNO student [Robert McNulty](#). Robert, together with several undergraduate students from different departments, played a key-role in shaping the ideas for the activity.

UK Unplugged, an organization focused on helping families to unplug, create & explore is led by founder and CEO Dr. Diana Powell. The event called "AI & Eyes" offers a series of interactive and hands-on activities designed to demystify AI for the next generation. Participants engage in a range of creative tasks,

including learning to spot art generated by AI, painting their own "pixel eyes," and crafting "dazzling eyecatchers."

The workshops featured contributions from QUASAR PhD student Angus Jones and [Saransh Malhotra](#), a LIV.INNO student who is also in the QUASAR group, who shared their knowledge with the young attendees. Saransh said: "Big thanks to Dr Diana Powell for making this happen! Loved sharing AI & Eyes with young people at OOMOO. It was creativity, science, and fun all in one."

The event was made possible through the support of the British Science Association and was held in the lead-up to British Science Week, helping to build excitement and knowledge around science and technology among local youth.

Art forgery to astrophysics: LIV.INNO showcases data science at the British Science Festival

A team of LIV.INNO staff and students have run an event to showcase the wide range of data science research that the centre undertakes at the British Science Festival on Sunday 14th September at the Museum of Liverpool. Over 2000 people came to visit the museum that day and many hundreds of them interacted with the fourteen researchers from LIV.INNO who were in attendance.



Rosie Bartlett demonstrating the VR experience to a visitor. Photo by Gavin Trafford and Gareth Jones, via British Science Association.

A team from Liverpool John Moores University Astrophysics Research Institute which included LIV.INNO supervisor Andreea Font and LIV.INNO students [Rosie Bartlett](#) and [Khang Nguyen](#) as well as ARI staff member Rob Grand were showcasing VR projections of the Milky Way and dark matter. Mark Lovell from Durham University also joined the team at the event as he had created the VR experience. Visitors were able to use a VR headset to look around the Milky Way as if they were suspended in space and were able to observe areas of dark matter. Visitors of all ages had a great time taking part in this experience!

LIV.INNO deputy director Ian McCarthy, Director of the Astrophysics Research Institute at LJMU, said: "The British Science Festival is one of those special events that brings together scientists and

the wider public to share in the latest developments and to highlight the many positive impacts that science has on everyday life. Our LIVINNO team of PhD students and staff put together an amazing array of data science-themed exhibits that were a real hit with the public."

The DiRAC consortium kindly contributed some of the VR headsets for this activity. LIV.INNO has links to the DiRAC consortium through Professor Simon Hands who is LIV.INNO Partner Liaison Manager as well as Community Development Director for DiRAC.



Archie Hanlon and Saransh Malhotra talking to visitors about AI and Eyes. (Credit: LIV.INNO)

The AI and Eyes activity got another outing with LIV.INNO students [Archie Hanlon](#) and [Saransh Malhotra](#) talking to the visitors about how AI is used in detecting eye disease, and whether this can be done reliably. A game where you had to roll dice was used to show how sometimes the AI gets it wrong (but this also true of people as well). However, AI can analyse scans much faster than people can, so it is a useful tool to help in diagnosis. Archie and Saransh also spoke about how they use data science and AI in their own research into developing sensors for particle physics experiments and developing improved photocathodes.



David Schaich talking to visitors about Bell states.
(Credit: LIV.INNO)

LIV.INNO supervisor David Schaich was at the event to talk to visitors about quantum computing, which can exploit the fundamental phenomena of superposition, interference and entanglement to carry out certain calculations far more efficiently than ordinary computers. An on-screen demonstration illustrated these concepts by constructing and measuring simple entangled Bell states. In particular, live diagnostic information from IBM's 127-qubit 'Brisbane' quantum computer was used to highlight the impact of errors in existing quantum devices. Reducing error rates and mitigating or correcting errors that do occur is a key component of current quantum computing R&D.



Pavel Buividovich talking about AI and Art Forgery.
(Credit: LIV.INNO)

The uses of AI in the world of Art was represented by two separate activities delivered by LIV.INNO supervisor Pavel Buividovich and PhD student [Ben Hind](#). Pavel was talking to visitors about how AI

can be used in detecting art forgery, but also looking at how good AI was at making art forgeries. Visitors were shown several copies of the same picture. One by the original artist, one a copy by a human and the other an AI copy. Visitors had to work out which was which. While it was clear AI made some mistakes which humans would not AI was otherwise very good at forgery!

A related activity by Ben Hind looked at how AI can be used to classify street art. Ben had written an app for this event, with assistance from fellow LIV.INNO students [Salma Louhaichy](#) and [Qiyuan Xu](#), where visitors were given a set of street art pictures and asked which two they considered to be the most similar in style. Their answers were then compared with the answer AI gave for the same set of pictures. There were no right or wrong answers in this case, but it was interesting to see how well AI can be trained to think like a human.



Jonathan Tinsley demonstrating the interferometer.
(Credit: LIV.INNO)

LIV.INNO supervisor Jonathan Tinsley, together with colleague Andrew Carroll, built an interferometer to bring to the event to talk about his work towards detecting gravitational waves as part of the MAGIS and AION collaborations. The interactive light interferometer demonstrated the working principles of an interferometer and how the team at the University of Liverpool is developing interferometers based on the wave-like

properties of atoms. These atom interferometers represent quantum sensors offer the chance to probe the intersection of general relativity and quantum mechanics, search for gravitational waves and dark matter, plus real-world applications like climate monitoring and advanced inertial sensing. The LIV.INNO team were joined at this British Science Festival event by some colleagues from the Computer Science Department who ran a series of activities about how algorithms work and be used to solve problems. These two activities had been joined by the organisers of the British Science Festival, and they worked well together to showcase the many uses of data science.

The activities offered by the LIV.INNO team were busy throughout the day, and

all the researchers involved had many fruitful conversations with the people from a wide variety of backgrounds who attended this event. The activities produced will be used again at future outreach events for both LIV.INNO and other projects which the individual researchers are involved in.

LIV.INNO Centre Manager Naomi Smith, who co-ordinated the inputs to the data science event said: 'Seeing so many people interacting with such a wide range of LIV.INNO research was wonderful to see. The data science showcase highlighted the impact that the LIV.INNO CDT has in a way which was accessible to people from a wide variety of backgrounds.'

LIV.INNO at the International Beam Instrumentation Conference

The largest-ever European edition of the [International Beam Instrumentation Conference](#) (IBIC 2025) was hosted at The University of Liverpool from the 7th - 10th September 2025. This 14th edition of the conference brought together more than 300 world-leading experts to discuss developments in and share knowledge on beam instrumentation.

Over the week, delegates took part in keynote and invited talks, contributed presentations, an industry exhibition and poster sessions. With more than 200 scientific posters on display during the conference, LIV.INNO colleagues had the opportunity to showcase their work, providing opportunities for the discussion and dissemination of important work relating to the LIV.INNO projects.

Highlights included LIV.INNO student [Alex Jury](#) who was invited to give a talk about 'Performance Analysis of the LHC BSRL

and Possible Improvements' and a special session chaired by LIV.INNO student [Lauryn Eley](#) which included a panel session discussing 'Breaking boundaries: Innovation and Inclusion in Instrumentation Science' with Prof Dame Jocelyn Bell-Burnell as keynote speaker and panel member.

Naomi Smith, Centre Manager for LIV.INNO hosted a booth to promote LIV.INNO as part of the industry exhibition, alongside the EuPRAXIA project with which the CDT has organized a number of joint events.

The LIV.INNO booth enabled delegates to discuss the many ways they and their organisation could work with LIV.INNO in the future. This includes joint PhDs, hosting student placements and delivering training and seminars which are offered to all our students. The booth attracted lots of visitors, acting as a key location for

networking and information sharing. Additionally, booth visitors had the opportunity to participate in a Liverpool-themed quiz with a unique Liverpool-themed goody bag on offer as the prize. Congratulations to Alexander Gottstein of the University of Bern, who won the prize!

Professor Carsten P. Welsch, Director of LIV.INNO and Chair of IBIC 2025, said: "Hosting IBIC 2025 in Liverpool

allowed us to shine a spotlight on the latest beam instrumentation advances, and to strengthen the international collaborations that drive real progress in beam diagnostics, medical accelerators, and frontier physics. It was wonderful to have such engaged discussions with research leaders from around the world."

More information can be found on the event website: <http://www.ibic2025.org>



Naomi Smith, Centre Manager for LIVINNO (left) and her colleague Hannah Acton at the booth.

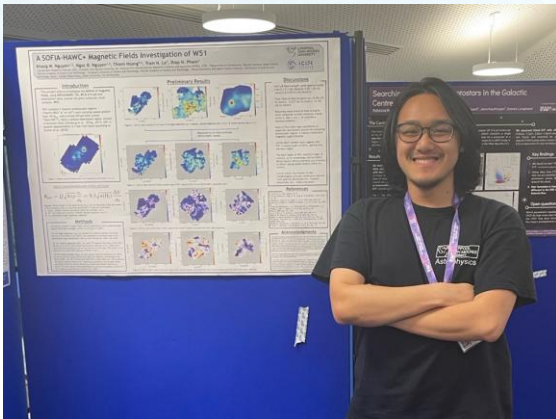
LIV.INNO presence at the largest UK astronomy conference

The summer conference season peaked during the month of July with the [2025 National Astronomy Meeting](#) (NAM) being held at Durham University from 7th - 11th July. This year's conference saw several LIV.INNO personnel attending with various forms of contributions. The number of registered participants for this NAM was almost 1000, one of the largest ever in the history of this conference series.

The annual week-long NAM conference is regarded as one of the major conference

events for astronomers across the British Isles. It has a long history with the Royal Astronomical Society (RAS), the founder and the main organising body of this series since 1948. Every NAM includes a variety of academic events including big plenary lectures about a variety of topics in astronomy, alongside a plethora of parallel sessions that are more specialised. Not only that, but there are also plenty of community sessions, public lectures and workshops aimed at a more general audience who can also attend.

[Khang Minh Nguyen](#), current second-year LIV.INNO student, presented a poster on 'A SOFIA-HAWC+ Magnetic Fields Investigation of W51'. His poster looks at the magnetic field properties of the massive star-forming molecular cloud called W51, using dust polarisation data obtained from the SOFIA-HAWC+ polarimeter, to investigate how the magnetic fields affect how young stars are supported and suppressed from forming in a region of rich & dense molecular material.



Khang Minh Nguyen and his poster on the magnetic fields of the W51 massive star-forming cloud.

Final-year LIV.INNO student, [Jonah Conley](#), was the most active with both a talk and poster to show at the conference. His talk for the 'A multi-scale and multi-tracer view of the cosmic web' session comprised an up-to-date summary of his ongoing project into studying the 'patchy screening' effect (a potential new probe of the cosmic microwave background) using the FLAMINGO cosmological simulations.

Jonah's poster gave an overall summary of the emulator he is developing from the upcoming suite of simulations as a sister project to FLAMINGO (tentatively called BAHAMAS-XL). The emulator will look at supporting the theoretical analysis of cosmological simulations by using machine-learning methods to predict summary statistics, using only a set of simulation input values to probe a wide parameter space.

Fellow second-year LIV.INNO student, [Sakirçan Beyazıt](#), also presented a talk in a session called 'Illuminating the Faintest Galaxies: Dwarf Galaxies as Probes of Dark Matter, Feedback, and the First Stars'. His research talk was on the populations of low-mass dwarf galaxies, specifically on how to better describe the star-forming population via analyses of different distribution functions.

First-year LIV.INNO student [Rosie Bartlett](#) also made her debut at NAM with a poster flash presentation in the only astronomy-oriented code development session of the conference. Her poster topic is on utilising machine learning techniques to find and identify stellar tidal streams within Milky Way-type galaxies.

LIV.INNO's deputy director, Dr Andreea Font was involved by co-organising a session titled 'Forging the elements: Understanding chemical evolution and stellar populations across cosmic time', which ran throughout the whole of Wednesday.

Overall thoughts from our LIV.INNO participants about the NAM experience are very positive. 'It was a great chance to network with primarily UK-based astronomers' said Jonah. For a few, this was their first chance to introduce themselves to the wider astronomy community. 'It was my first conference and I had so much fun. Also being my first talk as well I was both a bit excited and nervous', noted Sakirçan. The conference upheld its reputation and proved to be a huge success with great organisation throughout, and an engaging and friendly environment.

The next edition of NAM has been officially announced to take place at the University of Birmingham in July 2026.

WoNDRS conference takes place at University of Liverpool



Delegates at the WoNDRS conference 2025. Photo credit: Maksymilian Roman

The [Women and Non-Binary Doctoral Researchers in STEM](#) (WoNDRS) Conference was held for a second consecutive year on Monday 7th July 2025 at the University of Liverpool. The conference is organised by a group of postgraduate and academic researchers from the University of Liverpool who are studying a range of STEM fields including LIV.INNO students [Katie Ferraby](#), [Lauryn Eley](#) and [Marina Maneyro](#). Researchers attended from over 25 different national universities during the day; a huge success being as 2025 was the first year the conference was opened countrywide. Attendees arrived to a welcoming community and there was an air of excitement to begin the day's events for a second year running.

Professor Rachel Bearon began the days itinerary with an interesting presentation on her fortuitous career journey to becoming the current Executive Dean of the Faculty of Natural, Mathematical and

Engineering Sciences at King's College London. Her journey showed the audience that not all career paths need a structured plan. As the co-founder of HydRegen, Dr Holly Reeve showcased how project management is an important skill that can be learned when commercialising her technical knowledge; how sometimes you must go against the grain to achieve what you believe in. Sustainability was at the forefront of delegates minds when listening to Diane Hardy, a developmental chemist at Beckers Industrial Coating Ltd, to understand the importance of sustainable choices when producing a universal paint product.

Attendees were encouraged to network and join conversations with others during the lunch break; fostering a sense of community among like-minded people as the main initiative for starting the WoNDRS conference

Dr Dominika Vasilkova kickstarted the afternoon presentations by not only showcasing her passion for physics and undiscovered particles but her work on investigating the muon and the importance of reviewing results and previous experimental plans; it was truly an inspiration to be an onlooker to a person's life dedication. Next Professor Tracey Berry highlighted her career path to becoming the Vice-Dean of EDI for School of Engineering, Physical and Mathematical Sciences at Royal Holloway, University of London. Highlighting the need to have hobbies outside of your research to keep your brain ticking. Dr Esther Garcia-Tunon Blanca closed the day's talks by presenting her multidisciplinary research on 3D printing of advanced materials alongside juggling motherhood; emphasizing how sometimes careers can be a balancing act to be able to achieve everything you want.

After the day's talks, the judged poster session began featuring over 45 presentations. The breadth of knowledge across the STEM field that was being developed by early career researchers was clear to see this was a highlight of the day that is often not seen at conferences that have a stricter disciplinary scope. Two prizes were on offer to a judge's winner and an attendee's winner. This allowed the conference attendees to fully engage with the posters on display and interact with other researchers who came from different backgrounds.

The panel session then began hosted by Dr Laura Gardiner, Dr Esther Garcia-Tunon Blanca, Professor Tracey Berry and, Dr Mara Chiricotto. After the success of the panel session at the WoNDRS conference 2024, it was exciting to see how the audience engaged with the

panellists. Questions were constantly being asked that included how to bridge the gap between finishing a PhD and your next steps, dealing with imposter syndrome and, the proudest moments for the panellists, career based or personal. We were privileged to have panellists who were so open minded to answering any questions; it strengthened the community that the WoNDRS conference was built on and we hope it made attendees feel less alone in their struggles. The panel session was rounded off by announcing the results for the two poster winners who went home with a little piece of Liverpool to remind them of their achievements.

The day ended with a fun and relaxed networking event set to a backdrop of the University of Liverpool while atop the Physics building. The WoNDRS conference would not have been possible without the sponsorship of The Institute of Physics, The Royal Society of Chemistry, The London Mathematical Society, The Postgraduate Researchers Wellbeing Ambassadors and The University of Liverpool. They allowed the creation of a safe and welcoming environment for all attendees.

The WoNDRS Conference 2025 was a huge success in celebrating the achievements of women and non-binary researchers in STEM. Though only established in 2024, the community is already expanding in creating an environment where individuals feel safe to discuss the highs and lows of research. The organisers hope that this conference and community grow for years to come, to continue to celebrate the achievements of those underrepresented in the STEM field and allow people to showcase their work between different interdisciplinary subjects.

Meet the LIV.INNO students

In each edition of this newsletter, we will introduce some of the students who are studying as part of LIV.INNO CDT

Luke Detraux (3rd year LIV.INNO student)

Project title

Efficient classification of heterotic-string vacua

Where are you from?

I am from Huddersfield.

What degree did you study?

I studied an integrated Master's degree in Natural Sciences at University of Cambridge.

What do you do in your free time?

In my spare time I enjoy working out and travelling.



Sakircan Beyazit (3rd year LIV.INNO student)

Project title

Modelling low-mass star-forming galaxies

Where are you from?

I am from Istanbul, Turkey.

What degree did you study?

I studied Theoretical Physics at the University of Manchester before my PhD.

What do you do in your free time?

I love football so in my free time I will most likely be watching or playing football.



Salma Louhaichy (2nd year LIV.INNO student)**Project title**

A Digital Twin Model of the Milky Way

Where are you from?

I'm from Rabat, Morocco.

What degree did you study?

I studied a Msc in Data Science in Liverpool John Moores University.

What do you do in your free time?

In my free time, I like playing volleyball , watching k-dramas and hanging out with my friends.

**Matthew Ockleton (2nd year LIV.INNO student)****Project title**

Developing Machine Learning methods to constrain the properties of the Quark-Gluon Plasma

Where are you from?

I'm from Utttoxeter, England, UK..

What degree did you study?

I studied an integrated Master's in Physics (MPHYS) at the University of Liverpool.

What do you do in your free time?

In my free time, I enjoy playing and watching sports, including football, golf, and rugby league.



RL4AA'26 Workshop Announced in Liverpool – Registration now open



Machine learning and accelerator physics is set to converge in Liverpool from 30th March – 1st April 2026 with the announcement of [RL4AA'26](#), the fourth Reinforcement Learning for Autonomous Accelerators workshop. Hosted as a LIV.INNO Workshop by the University of Liverpool and the Cockcroft Institute, this event will be a forum for experts exploring the application of Reinforcement Learning (RL) to complex, real-world control systems.

RL4AA'26 is specifically designed to bring together the reinforcement learning community and the accelerator physics community, facilitating the exchange of practical insights and research results. The workshop will address the big questions facing the implementation of real-world RL, moving algorithms from simulation to practical deployment on complex, sensitive systems like particle accelerators.

The workshop promises a highly engaging and practical agenda, featuring:

- **Keynote Address:** Samuele Tosatto from the University of Innsbruck will deliver a keynote speech on machine learning techniques for autonomous robot learning.
- **Contributed Talks:** A mix of invited and contributed talks, with dedicated slots reserved for student presentations.
- **Hands-on Challenge:** Attendees can

participate in a coding challenge focused on a real-world accelerator problem, featuring mixed-experience teams, a live Kaggle leaderboard, and awards for the top three teams.

- **Facility Visit:** The event will conclude on the final day with a visit to the Cockcroft Institute and the CLARA accelerator facility.

- **Networking:** A dedicated lunch poster session will offer ample opportunity for collaboration and discussion.

The program includes tracks for talks and posters across three main areas:

- RL for Accelerators
- RL for Other Systems
- Other (covering foundational topics like sequential decision-making, RL/control theory, surrogate modelling, MLOps, adaptive control, MPC, system ID, tuning and optimisation).

Dr. Andrea Santamaria Garcia, Lecturer in AI for Particle Accelerators at the University of Liverpool and workshop chair looks forward to welcoming participants: "We are excited to host the fourth instalment of RL4AA, which has become an essential meeting point for researchers and engineers applying advanced control to autonomous systems. The blend of high-level research and hands-on problem-solving ensures a productive and inspiring three days."

Attendance is free, but places are limited. The deadline for registration and the submission of abstracts is 31st December 2025.

For more information and to register, please visit

<https://indico.ph.liv.ac.uk/e/rl4aa26>

Dates for your Diary

9 December 2025	15:00 GMT	Machine Learning for tuning and control in Particle Accelerators	Andrea Santamaria Garcia (University of Liverpool)
10 February 2026	15:00 GMT	Towards improving neutrino telescopes with machine learning	Felix Yu (Harvard University)
30 Mar – 1 Apr 2026	All day	4th Reinforcement Learning for Autonomous Accelerators Workshop (RL4AA'26)	
10 July 2026	All day	Innovations for a Sustainable Tomorrow Symposium, Liverpool, UK	

Notice Board

Liverpool Virtual Seminar Series on Data Intensive Science

The seminars in this series cover R&D outside of the LIV.INNO centre's core research areas and give an insight into cutting edge research data intensive science.

To register to attend these seminars please visit
https://indico.ph.liv.ac.uk/e/data_science_seminars

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