Hartree Centre

Highlights 2024–2025

UKRI Science and Technology Facilities Council

Hartree Centre

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STFC Hartree Centre
Sci-Tech Daresbury
Keckwick Lane
Daresbury
WA4 4AD

hartree.stfc.ac.uk

hartree@stfc.ac.uk

STFC Hartree Centre

@hartreecentre

Note from our Director

As I reflect on another impactful year at the Hartree Centre, I'm incredibly proud of how our teams continue to deliver cutting-edge digital solutions that make a tangible difference to UK industry. Positioned at the forefront of applied digital research and innovation, our work directly supports the Government's ambitions for economic growth and leadership in advanced digital technologies.

Our mission – to equip UK organisations with the knowledge, skills, and compute power to harness technologies like supercomputing, AI, and quantum computing – remains central to the priorities outlined in UK government's AI Opportunities Action Plan. Our flagship Hartree National Centre for Digital Innovation (HNCDI) programme with IBM, now in its fourth year, was recently highlighted as a case study in the UK's Modern Industrial Strategy 2025: Digital and Technologies Sector Plan. Our HNCDI programme has also recently been awarded the IEEE Quantum Technical Community Distinguished Synergy Award for exemplary public-private collaboration that accelerates quantum technology adoption through impactful research, real-world applications, and global partnerships. To date, this collaboration has supported over 80 UK organisations in exploring and adopting transformative digital technologies.

We remain deeply committed to supporting businesses of all sizes. Through our regional SME Engagement Hubs in the North East, Cardiff, and Northern Ireland, we are expanding access to advanced digital tools and expertise, empowering over 450 SMEs to innovate and grow. Our partnership with Coventry University on the Digital AI & Skills Network further demonstrates our dedication to addressing regional and national digital skills gaps.

A major milestone this year was the completion and handover of our new supercomputing centre at STFC's Daresbury Laboratory. This state-of-the-art facility significantly enhances our capacity to host future UK compute infrastructure and lays the foundation for the next phase of our journey, scaling our impact and deepening cross-sector collaboration.

Our projects continue to deliver real-world impact from accelerating drug discovery through quantum computing to streamlining environmental assessments in construction using AI. Our work reflects the talent, dedication, and collaboration of our people, and our unique ability to combine expertise, technology, and infrastructure to solve meaningful challenges.

Looking ahead, we're excited to build on this momentum. Every collaboration reinforces our role as the UK's trusted partner in digital transformation, helping organisations unlock productivity, drive innovation and gain competitive advantage. With our deep technical expertise, world-class facilities, and strong industry relationships, we are uniquely positioned to turn national digital priorities into real-world outcomes that benefit society.

— Professor Kate Royse,
Director at STFC Hartree Centre

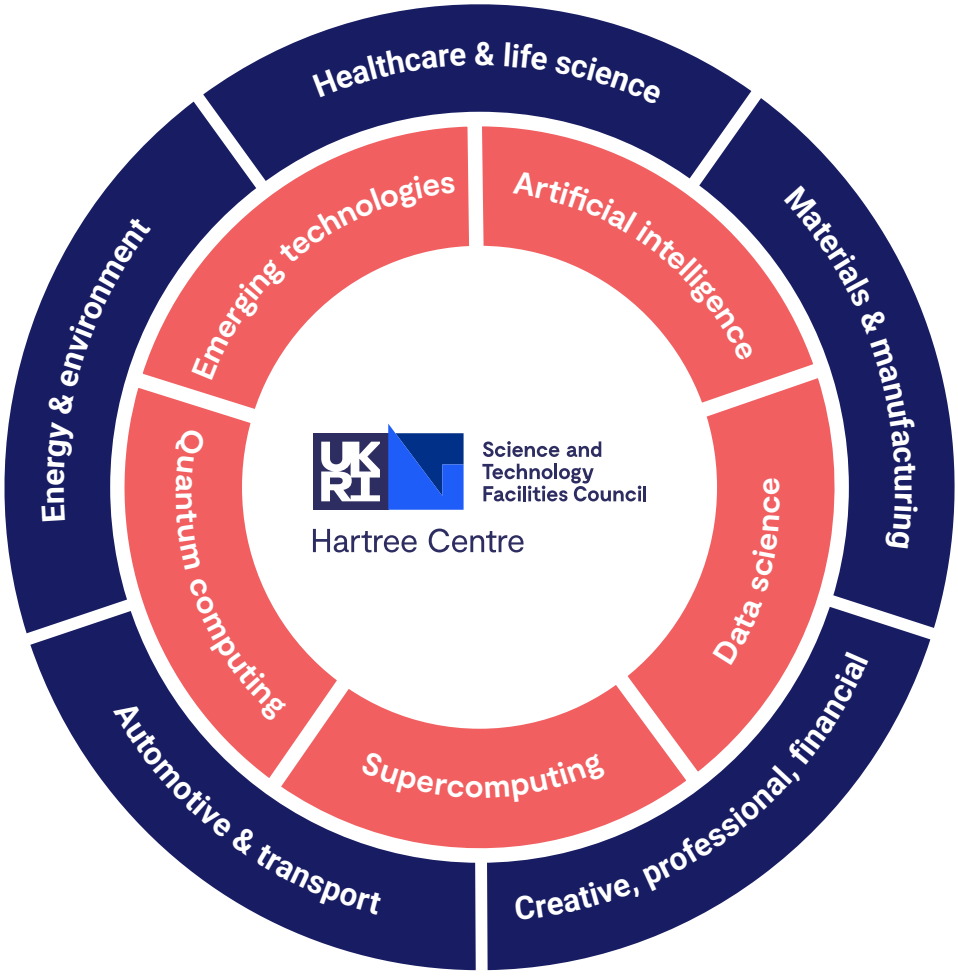
Powering UK digital innovation

The Hartree Centre has a clear vision to drive socioeconomic growth by enabling UK industry to explore and adopt advanced digital technologies. This directly supports and amplifies the UK Government's ambitions as laid out in the AI Opportunities Plan, the UK's Modern Industrial Strategy 2025, the National AI Strategy, and the National Quantum Strategy.

The Digital and Technologies Sector Plan, part of the Modern Industrial Strategy 2025, highlights our alignment to the Government's plans by featuring our flagship programme, the Hartree National Centre for Digital Innovation (HNCDI), as a case study. Delivered in collaboration with IBM, our HNCDI programme helps de-risk digital adoption across other growth-driving sectors such as clean energy, advanced manufacturing and life sciences.

With our strong track record in supporting UK organisations of all sizes in digital innovation, we are committed and well positioned to turn our national priorities into tangible outcomes. We achieve this through collaborative research and development, and by offering access to our state-of-the-art supercomputing infrastructure and free training courses.

We have accelerated digital adoption across a range of sectors, helping organisations to overcome complex challenges, boost productivity and enhance their competitiveness. In the pages ahead, we showcase some of our key achievements this year, demonstrating how our work explicitly contributes to the UK Government's strategic vision for innovation, industrial growth, and digital transformation.



Benefits we deliver:

- greater efficiency and productivity
- lower barriers to innovation with digital technologies
- workforce upskilled in digital technologies to adapt to the increasingly digital & AI-driven society
- increased investments in digital innovation to drive UK economic growth

AI Opportunities Plan	UK's Modern Industrial Strategy	National AI Strategy	National Quantum Strategy

Driving digital transformation across sectors through our programmes

To unlock the high growth potential of advanced digital technologies for UK industry, we have been delivering a range of programmes to support businesses across sectors nationwide. By providing collaborative R&D, offering access to our state-of-the-art supercomputing facilities and delivering training in digital technologies, we have collectively supported 844 businesses and upskilled over 1000 organisations across our key programmes, which include:

Hartree National Centre for Digital Innovation (HNCDI)

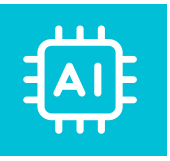
Facilitating digital adoption in industry across UK

In collaboration with IBM, we are creating digital assets, delivering training and working closely with UK businesses and the public sector to help them explore and adopt innovative new digital technologies to enhance productivity, innovation and economic growth.

Hartree Centre SME Hubs

Delivering regional support for SMEs

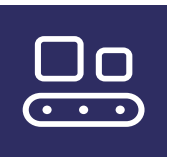
To democratise access to digital adoption support through HNCDI, we have been proactively expanding our focus beyond the North West to reach SMEs in the North East, Cardiff, and Northern Ireland.



BridgeAI

Promoting AI adoption in high-growth sectors

By delivering training and providing access to our expertise and supercomputing facilities, we have been supporting businesses with responsible and inclusive AI adoption across sectors such as agriculture, construction, creative industries, transport, and logistics.



Smart Manufacturing Data Hub (SMDH)

Using data to drive productivity in manufacturing

We have been supporting manufacturing SMEs in harnessing data to improve productivity and drive innovation.

Hartree National Centre for Digital Innovation

Our flagship Hartree National Centre for Digital Innovation (HNCDI) programme, delivered with IBM, recently received the IEEE Quantum Technical Community Synergy Award. It recognises our public-private collaboration in accelerating quantum technology adoption through impactful research, real-world applications, and global partnerships. To date, HNCDI has helped more than 500 organisations explore and adopt technologies such as artificial intelligence (AI), quantum computing, and high performance computing (HPC).

Our impact is driven by dedicated workstreams: Explore, Excelerate, and Emerging Technology, which help organisations apply digital technologies to industry challenges; Explain, which focuses on upskilling the workforce; and our regional SME Engagement Hubs, which extend innovation support.

Now in its fourth year, HNCDI has expanded its reach and deepened its impact across the UK. Its impact on UK organisations and society was independently evaluated in our final annual HNCDI progress report, prepared earlier this year by Technopolis. Through HNCDI, we have approved 179 collaborative R&D projects with 80 partner organisations, completing 96 projects. These collaborations have produced over 50 peer-reviewed publications, multiple patent submissions, 40 digital assets, and several minimum viable products and demonstrators. Our regional hubs have supported more than 450 SMEs across Northern Ireland, Cardiff, and the North East. Overall, HNCDI has generated £55 million in social value through training, in-kind contributions, and job creation.

Insights from our collaborators

66%
reported improved innovative capacity

57%
reported improved productivity and sales

72%
reported increased R&D investment

We are proud to have supported numerous organisations on their digital transformation journeys through HNCDI, driving economic growth, boosting regional productivity, and strengthening UK's leadership in critical technologies.

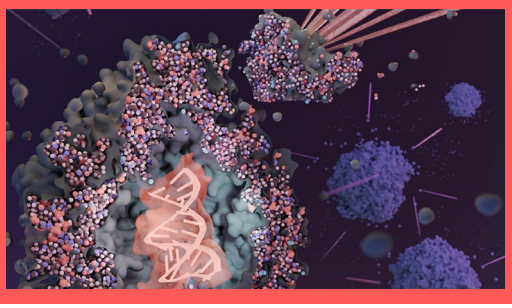
Delivering impact across sector: case studies

From healthcare to materials discovery and environmental resilience, our HNCDI programme has supported various organisations across sectors in their exploration of digital technologies to advance innovative solutions with the potential to create positive societal and economic impact across UK.

Enhancing drug delivery with synthetic virus-like particles

Delivering drugs precisely within the body is a major challenge. To explore safer and more efficient delivery methods, the National Physical Laboratory (NPL) aimed to harness synthetic virus-like particles that mimic how viruses target specific sites. Our team developed bespoke software that combines high performance computing with automated data analysis to model the behaviour of these particles at the atomic level. This has enabled NPL to extract key insights more quickly and accurately, accelerating progress toward innovative drug delivery systems that could improve patient outcomes.

> **"This work provides rare insight, showing theory and experiment in agreement and opening new opportunities for drug delivery."**
>
> — Max Ryadnov, National Physical Laboratory



Harnessing geospatial AI for environmental resilience

Detecting land surface changes is invaluable for disaster response and environmental monitoring. To improve the speed and accuracy of detecting events like flooding, our team worked with IBM to develop a geospatial foundation model tailored to the UK's landscape. The UK-optimised model allows for faster, more flexible detection of landscape changes and can be fine-tuned for applications ranging from flood mapping to wildfire tracking, urban planning, and crop monitoring, supporting more informed environmental and infrastructure decisions.

> **"This collaborative project with the Hartree Centre enabled us to develop a unique, open source "IBM Granite" geospatial foundation model which can be leveraged for a wide range of UK applications."**
>
> — Anne Jones, IBM Research

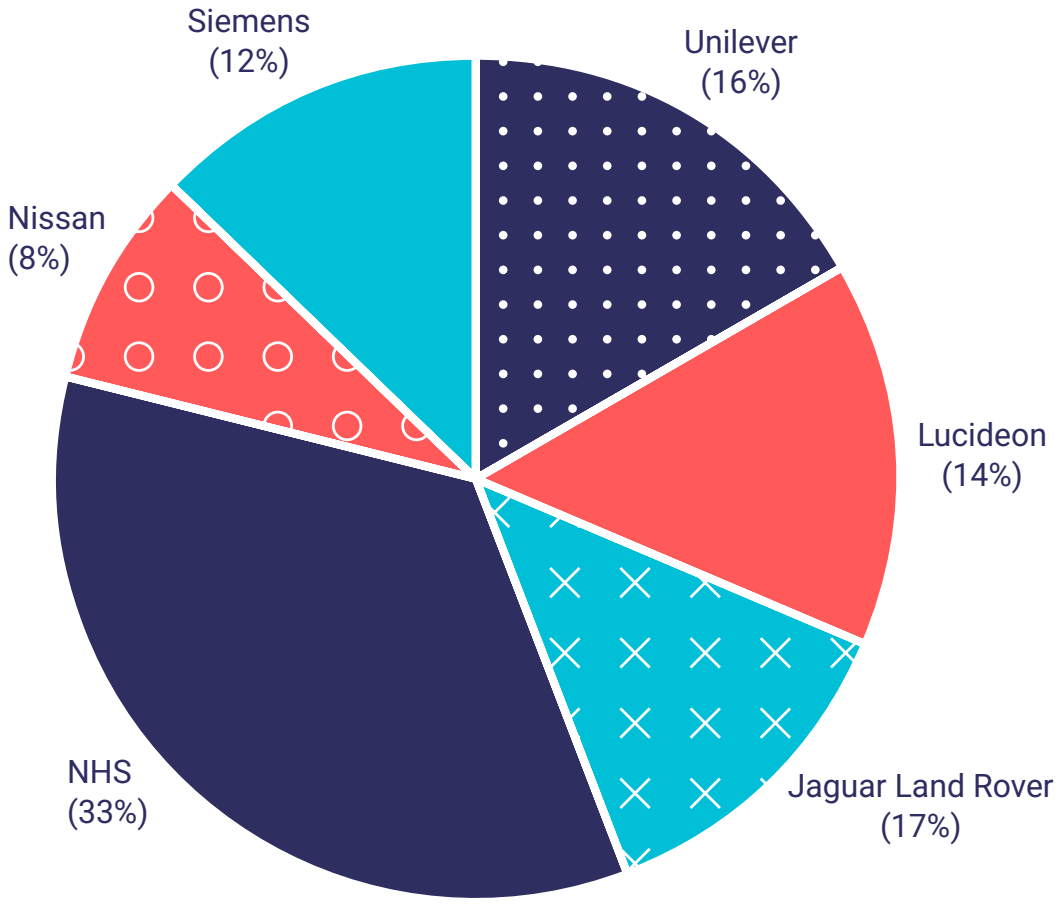
Image Credit: Adobe Stock

Enabling digital futures: accelerating innovation through training

Our HNCDI programme has also been supporting the UK workforce by providing training opportunities tailored to industry needs, featuring interactivity, skills assessments, and up-to-date best practices. We offer these free-to-access courses through our training portal, tailored to support learners at all experience levels, from beginners to experts.

Our courses have been and continue to be widely used by organisations seeking to understand how to apply digital technologies and explore new concepts. Notably, individuals and organisations from our other programmes have accessed our HNCDI training courses, including 558 attendees from BridgeAI and 44 from Smart Manufacturing Data Hub. This demonstrates the wide-ranging applicability of the courses we offer.

Organisations trained



3064
Attendees

76
Badges awarded

BridgeAI

We have also continued to support UK industry in unlocking the potential of AI through Innovate UK's BridgeAI programme. With the aim of driving productivity, efficiency and economic growth, we have been targeting high-growth sectors including agriculture, construction, transportation and the creative industries through this programme.

From predictive modelling for electric vehicle infrastructure to AI tools for plant disease detection, we have supported UK businesses across a wide range of industry applications. Of the projects that have been completed, 8 led to successful proof of concepts, 4 generated new knowledge and 1 resulted in new or improved code. 85% of the companies we worked with and surveyed said they were satisfied with the support we provided through BridgeAI.

Of the projects that have been completed:

21
BridgeAI Innovation Vouchers awarded

£290,000
of support delivered to UK businesses

Beyond the Innovation Vouchers, we have also awarded 7 High Performance Computing (HPC) vouchers to support AI development through access to our advanced computing infrastructure. Notably, 57% of those who applied for our HPC vouchers had previously received our support through the Innovation Vouchers, demonstrating both the value of our offerings and the continued progression of these businesses on their digital innovation journeys.

To ensure that organisations are equipped not only with digital tools but also the skills to use them, we have also delivered our Discover Digital Transformation training series. To date, we have welcomed 413 participants to this training series, which we designed to equip businesses with the knowledge, skills and confidence to explore and adopt digital and AI technologies, supporting long-term capability development across sectors.

> **"This has led to noticeable improvements in our products and services by increasing the efficiency and accuracy of our data-driven operations, benefits that our industry did not previously have access to."**
>
> — Altus group

Solving industry challenges with AI: case studies

We have supported UK businesses across sectors such as transport and construction through our BridgeAI Innovation Vouchers, assisting them in developing solutions to industry challenges using AI and data science.

Reducing aircraft system certification timescales with AI

Due to strict aviation safety standards, expert engineers are needed to identify and classify functional hazards during aircraft development. To speed up these assessments, Novel Engineering Consultants aimed to automate parts of this process using AI. By enhancing data context, refining model input and implementing rigorous evaluation processes, we developed a proof-of-concept automation pipeline. This helped Novel Engineering Consultants to create a functional tool that streamlines safety assessments, saving time and cost while maintaining high safety standards.

> "Collaborating with the Hartree Centre was very beneficial to our organisation, particularly in developing an in-depth understanding of AI technologies and our ability to deploy them effectively."
>
> — Alex Penny, Novel Engineering Consultants

Image Credit: Pexels

Streamlining Environmental Impact Assessments

The assessment of environmental impacts such as noise, air quality and biodiversity is essential when constructing new infrastructure. To streamline these labour-intensive and time-consuming assessments, planning consultancy Turley aimed to automate data extraction and summarisation of technical documents. Our team developed a chatbot prototype using multiple AI technologies to extract key information from PDF reports, reducing manual effort and accelerating assessment preparation. The collaboration also enhanced Turley's AI capabilities, laying the groundwork for future improvements such as image and table extraction to further boost productivity and support industry environmental targets.

> "AI isn't a magic wand. While powerful, it requires careful development to achieve meaningful results, as we've realised through our collaboration with the Hartree Centre."
>
> — Carol Maughan, Turley

Image Credit: Pexels

Smart Manufacturing Data Hub

With a dedicated focus on manufacturing SMEs, we have supported their digital adoption journey to enhance productivity through the Smart Manufacturing Data Hub (SMDH) programme. One of our key contributions was the development of the Manufacturing Data Exchange Platform (MDEP).

The secure cloud-hosted MDEP enables SMEs to analyse factory data, visualise insights and benchmark performance in a user-friendly and cost-effective way. This platform enables enhanced operational efficiency, decision-making and ultimately competitiveness for manufacturing SMEs.

Beyond developing MDEP, we actively engaged with businesses in the North West through 33 events, promoting the adoption of sensor technologies, data platforms, and data science to enhance manufacturing efficiency through SMDH projects. By the end of the SMDH programme, we had supported 780 individuals and 200 manufacturing SMEs, and delivered nine projects, several of which involved data streaming solutions integrated with MDEP.

Reducing 3D printing failures through temperature monitoring

Rapid Fluidics Ltd uses 3D printing to rapidly produce prototypes for applications like medical diagnostics. However, they experienced higher failure rates during overnight printing especially in winter, due to their temperature-sensitive resin. Working with us and the Institute for Manufacturing at the University of Cambridge, they obtained and installed six temperature sensors to monitor conditions across their workspace. These sensors provided them with information that enabled them to optimise heating schedules and stabilise printing conditions. This intervention helped to reduce print failures by 11%, saving 121 hours of printing time and £6000 in costs.

"Access to real-time data in our manufacturing facility helped us to optimise heating, ultimately enabling us to deliver parts to our customers more quickly and reliably."

— Martin Thompson, COO at Rapid Fluidics Ltd

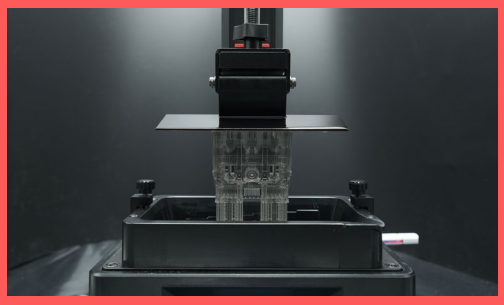


Image Credit: Adobe Stock

"We've successfully delivered a multi-tenant data streaming and analysis platform, supporting manufacturing SMEs to generate valuable insights from their data. We're proud that the project has been re-funded by Innovate UK for a further 12 months."

— David Meredith, Research Software Engineering Group Leader at STFC Hartree Centre

5G Ecosystem

To help businesses explore 5G to drive innovation and boost productivity, we joined forces with STFC's Campus Technology Hub (CTH) to deliver the 5G ecosystem at Daresbury Laboratory. By combining our software expertise with CTH's hardware capabilities, the program provides a low-risk, industry-relevant environment for experimentation and development.

We collaborated with seven companies to trial next-generation 5G applications, from drone-based railway monitoring to multi-user virtual reality training, harnessing 5G's potential to transform various industries. To help bring these innovations to market faster, we repurposed MDEP, our data platform from the SMDH programme, to support projects beyond SMDH and manufacturing.

Alongside supporting businesses, we have also been exploring 5G's potential within STFC's facilities, using the CTH 3D printing lab as a testbed for innovation. Our Research Software Engineering team applied 5G technology to enable 3D print failure detection, reducing printing errors and showcasing how 5G's high speed bandwidth can power 4K video for real-time computer vision to accurately detect 3D print failures as they happened.

93
organisations engaged

7
Grants awarded

"It's exciting to see how companies, from startups to scaleups, are using the environment we've built to unlock new possibilities across sectors beyond manufacturing."

— David Bogg, Manager at STFC Campus Technology Hub

Digital & AI Skills Network

Focusing on addressing regional and national gaps in digital skills, we have also launched the Digital & AI Skills Network. This year, we hosted the network's first workshop, bringing together training providers, educators, and industry to build a collaborative ecosystem for AI and digital skills. We identified barriers and developed practical ideas, building strong momentum to grow the network and enhance digital skills across the Midlands and beyond.

"The Network is expanding across the Midlands. We are uniting public and private training providers to deliver technical training that bridges the AI skills gap and drives digital innovation in industry across the UK."

— Nia Alexandrova, Training Manager at STFC Hartree Centre

Broadening reach and boosting impact through collaboration

Collaboration is central to how we deliver impact across industry and research organisations. By connecting leading organisations with cutting-edge digital technologies and expertise, we are helping our partners solve complex challenges and unlock new opportunities across sectors such as healthcare, aerospace, manufacturing and energy.

To support organisations in improving efficiency and driving product development, we are using AI and data visualisation technologies to transform production processes and accelerate innovation in materials discovery. In the advanced materials space, we have explored the use of quantum computing to enhance the simulation of high-temperature superconductors and speed up materials discovery through our collaboration with PsiQuantum. Combining both quantum and AI technologies, we are working with Cleveland Clinic on clinical data analysis to improve healthcare outcomes by enhancing personalised treatment and predicting surgical results. Our collaborations are not limited to materials and healthcare. We are also actively involved in the Climate Resilience Demonstrator (CReDo) project, working with utility providers to improve the security of digital infrastructure and support the UK's climate resilience.

Alongside industry, we maintain strong links with academic and research institutions, supporting them with advanced digital expertise and access to our supercomputing facilities. In collaboration with the UK Atomic Energy Authority through the Fusion Computing Lab, we are helping to make the commercialisation of fusion energy a reality by developing tools such as FreeGSNKE, which can help model fusion devices. These partnerships highlight our commitment to enabling innovation, accelerating discovery and building strong communities of practice through collaboration.

"By helping partners across sectors like healthcare and automotive to explore and adopt these technologies, we are revealing new ways to improve everything from electric vehicle batteries to manufacturing processes and drug discovery. Together, we are finding practical solutions to some of the most pressing industrial challenges."

— Tim Powell, Automotive Lead at STFC Hartree Centre

Building connections and amplifying impact through events

Over the past year, we have supported organisations of all sizes to explore and adopt emerging technologies by hosting over 142 onsite engagements and contributing to events across the UK and internationally. These ranged from technical workshops and national industry panels to international conferences, all aimed at sharing our expertise and building strong partnerships across sectors.

In the area of quantum innovation in healthcare, we hosted a joint quantum discovery day with Cleveland Clinic and NHS England, along with a design thinking workshop exploring quantum's role in preventative healthcare. To showcase our broader leadership in digital technologies, we also hosted a fringe event such as for the Liverpool City Region's AI Summit. During the visit, we shared our work on responsible AI and demonstrated our advanced visualisation capabilities, with support from IBM and PsiQuantum.

Internationally, we had a strong presence at major conferences such as the Supercomputing Conference (SC) and the International Supercomputing Conference (ISC). At ISC25, we held our annual quantum computing workshop and training Birds of a Feather session, bringing together experts from across Europe to discuss the future of hybrid quantum-HPC convergence and HPC education. This year we also explored the role of computing in sustainable innovation in a workshop we co-hosted with Lawrence Livermore National Laboratory and Argonne National Laboratory from the US.

Through these activities, we continue to shape conversations around digital transformation, deepen our engagement with key stakeholders and reinforce our reputation as a leader in advanced digital technologies.

Empowering our people to make a difference

With 177 experts spanning a wide range of disciplines, we are well positioned to drive growth and support the UK's digital adoption. Our broad experience and diverse skill sets enable our colleagues to work dynamically across varied projects, fostering professional growth while making a meaningful impact on UK industry and public organisations.

"After completing the STFC graduate scheme, I joined the Hartree Centre to work on the BridgeAI programme as a data scientist. I have now helped ten companies, offering data science and AI solutions to businesses across sectors. Several of these companies have even had follow-on projects with us, both through HNCDI and commercial funding. Through working on a variety of projects, I have developed my knowledge of AI and my understanding of different industries."

— Sarah Hanrahan, Data Scientist at STFC Hartree Centre

Sarah's experience shows that even our early career employees can make a meaningful impact, while gaining valuable professional development. This extends to our apprentices as well. Our Project Support Officer, Saffron Burrows, is a notable example.

Saffron completed her project management apprenticeship earlier this year, during which she gained experience managing projects across our portfolio. Throughout her apprenticeship, Saffron has been collaborating with teams across the centre, playing an active role within the project management process. Her increasing confidence and skills did not go unnoticed, as at the STFC annual apprenticeship award ceremony, Saffron won not one, but three awards. They include the "highly commended recognition", "first year rising star" and "peer support" awards, demonstrating not only her personal development, but also the clear impact she has had on those around her.

"Coming straight from college I didn't know much about project management. Throughout my apprenticeship, my team supported me and helped me develop more than I could've anticipated. From day one, I've been trusted and encouraged to try new things and learn by doing. I felt fully integrated into the team and centre from the outset and I've really come into my own — I couldn't have asked for a more supportive environment."

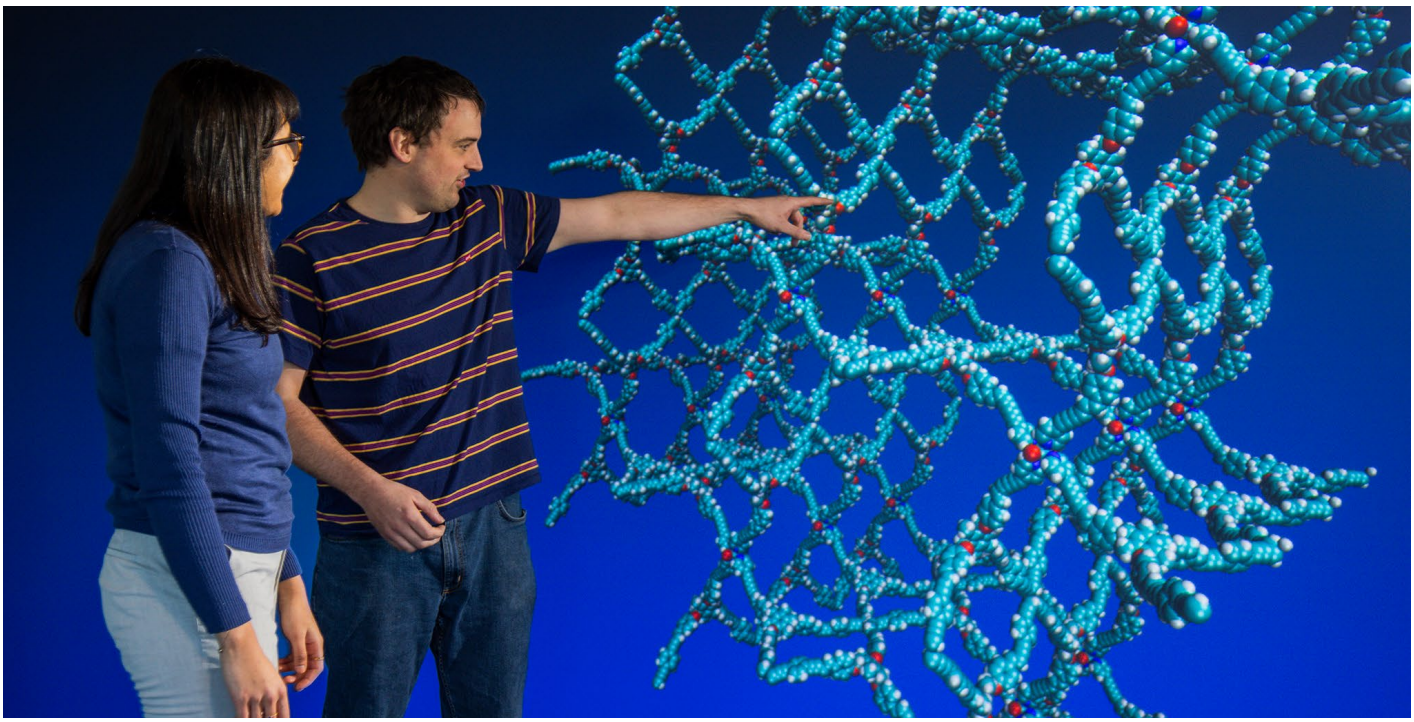
— Saffron Burrows, Project Support Officer at STFC Hartree Centre

To support our staff in driving continuous improvement, we offer the STFC Lean Six Sigma training, a practical guided course that enables them to identify and address challenges across the centre using structured problem-solving techniques. Many of our staff participate in this training every year to develop and implement their ideas to enhance the way we operate as a centre.

This year, our Events Manager Lou Pierce took part in the training and focused on how the Events team could work more efficiently with our Business Development team to support more effective information gathering and organisation. Drawing on the skills gained from the course, Lou successfully applied continuous improvement methods to develop a practical solution to the identified challenge. Her work has benefited both teams and created a positive impact across the centre. Since completing the training, Lou has continued to apply these problem-solving techniques to other challenges and has shared the principles with the wider Events team to support their ongoing development.

“The skills I’ve developed through the Lean Six Sigma training have enabled me to look at and approach challenges our team faces differently. The support throughout was fantastic, not just from those leading the training, but also from my managers and team. Everyone was so encouraging and really it’s been like that since I first started at the centre. The support I’ve had for my development has been continually apparent, and it’s enabled me to thrive whilst creating an environment where I can support the growth of those in my team too.”

— Lou Pierce, Events Manager at STFC Hartree Centre



Looking ahead

This year marked a major milestone for infrastructure development for STFC and Sci-Tech Daresbury, as the handover of the new supercomputing centre was completed. Commissioned as part of the £210 million HNCDI programme, the facility has been carefully designed to support the increasing scale and complexity of the challenges we help UK industry solve. It represents a huge step forward in expanding the UK's digital research infrastructure and our ability to support innovation through advanced digital technologies.

As the UK's only supercomputing centre dedicated to industry engagement, we now have the physical infrastructure to match the scale of our vision. The new centre will enable us to grow our impact, deepen collaborations with partners, and offer more powerful computing resources to businesses across sectors, from healthcare and energy to manufacturing and climate science.

The handover also represents a key achievement in delivering on our 2024–29 strategy. This milestone strengthens our commitment to our objectives by enhancing the UK's computing capability, providing us with the tools to test and scale future technologies with our partners. Crucially, the supercomputing centre plays a key role in helping us fulfil our mission to equip UK industry with the knowledge, skills and compute needed to fully unlock the potential of advanced digital technologies.

This new facility will serve as a vital foundation for the next phase of our journey. It allows us to expand what we offer, grow who we work with and accelerate the adoption of advanced computing across UK industry. We are proud of what we have achieved and even more excited about the opportunities that this new chapter will unlock.

"The facility will become home to high performance computing systems, supporting the Hartree Centre's rapidly expanding supercomputing and AI activities. Providing access to these technologies enables businesses to boost productivity and growth, benefitting the economy both in the North West and nationally."

— Professor Kate Royse, Director of the Hartree Centre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