

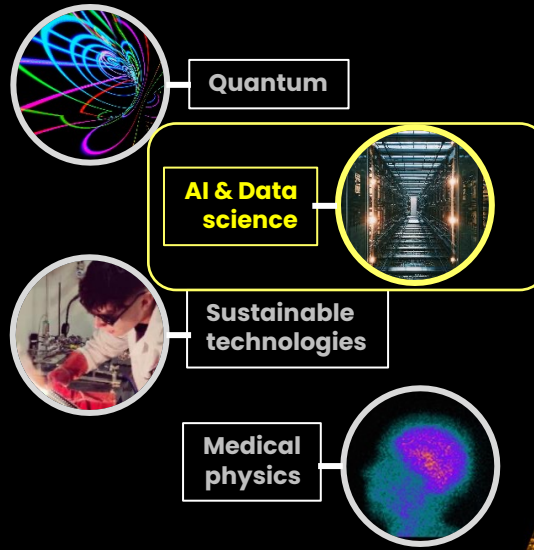


UNIVERSITY OF
LIVERPOOL

Introduction

Monica, Carsten

9/7/2025





International Events since last meeting

- **EU CAIF** (16-20, June 2025): <https://agenda.infn.it/event/43565/>
 - Direct and indirect contributions from Liverpool:
 - Andrea Santamaria – talk presented on ML in [accelerator physics](#)
 - Monica D'Onofrio – talk presented by collaborator on [recent paper](#)
 - Discussions around working groups and activities, see [closing report](#)
 - <https://eucaif.org/> - people can subscribe to working groups
- **European Strategy for Particle Physics**, [Symposium Venice 23-27 June 2025](#)
 - Preparatory group on computing highlighted several aspects of [common relevance](#):
 - Sustainable computing and AI
 - Efficient software – [contribution](#) from Eduardo Rodriguez
 - New technologies: quantum computing and neuromorphic processors
 - Scalability and resource needs → different if want to focus on ML tools or more general AI tools (i.e. LLM). There seems to be preference of the former... conservative view?
- **International Particle Accelerator Conference (IPAC'25)** in Taiwan
 - Andrea Santamaria – talk and discussion group on ML
- Horizon Europe **ARTIFACT** initiative in accelerator science now being developed into portfolio of EU projects (IRIS, TWINRISE, IFAST2, ARTIFACT-DN, etc.) by CPW

•WG 1: Foundation models
•WG 2: Co-Design
•WG 3: FAIR and sustainable AI
•WG 4: JENA WP4 (ML and AI infrastructure and resource needs)
•WG 5: Building bridges - Community, connections and funding



National events since last meeting

- Computing collaboration partnership initiatives – existing in multiple fields

STFC Scientific Computing

- A department within STFC's National Laboratories
- Provides direct computational infrastructure, science and engineering support to STFC's national facilities and users
- Also working externally with researchers across UKRI and internationally
- 300+ Research Technical Professionals (RTPs) based at both STFC's Daresbury and Rutherford Appleton Laboratories



Daresbury Laboratory
Warrington, Cheshire

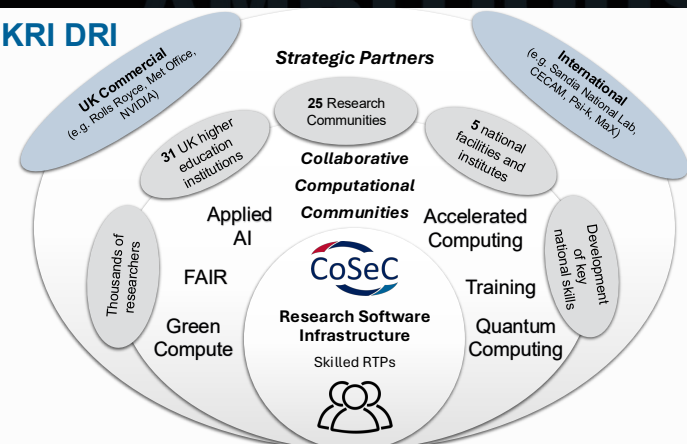


Rutherford Appleton Laboratory
Chilton, Oxfordshire

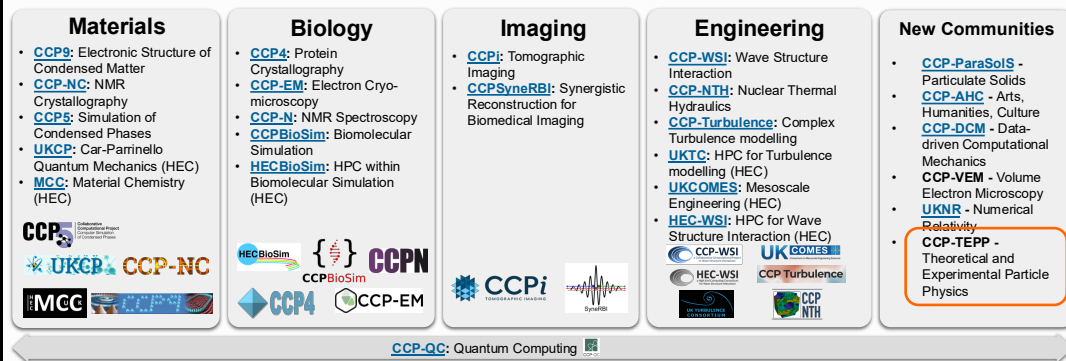


A Part of the UKRI DRI

- ✓ Sharing of expertise
- ✓ Shared aims and strategy
- ✓ Community driven research software development
- ✓ Shared approaches to data
- ✓ Greater value from research



- CoSeC directly funds and supports 13 CCPs and 6 EPSRC funded HECs
- From 2025 CoSeC funds and supports 6 scoping projects to develop new communities



Are you familiar with these funding schemes? Could they be helpful ?

Now forming CCP in PP (theory and experiment)

- Helping to identify practical technical objectives (computational research)
- Creating a team of Research Technical Professionals with complimentary research aims and capabilities



National and local events since last meeting

- AI for Innovation (May 2025): organized by LIV.INNO, gave context for recent AI developments, offering insights from data scientists, and sharing real-world industry experience from those who have started their journey. **See next slides**
- AI NVIDIA (May 2025): contributions from Alex Hill and participation from the department (see also John's brief)
 - NVIDIA ambassador at Liverpool
 - Training opportunities
- Data Science in Healthcare and Health Technologies workshop (LIV.INNO) – see earlier report



Institutional frontier: AI for LIFE. “Advancing human potential through AI innovation to improve health, strengthen communities, and drive inclusive economic prosperity”.

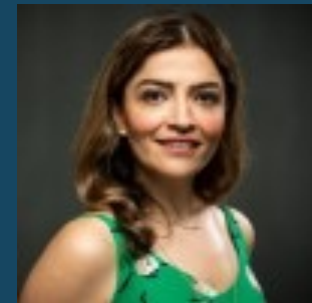
→ Case studies presented – **provide one or two from Physics?**

AI for Innovation Summit



Speakers included:

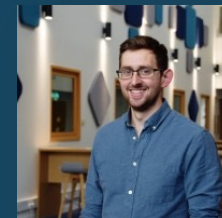
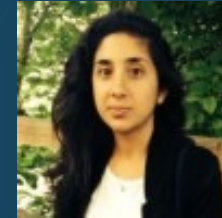
- Andy Walker, Head of Commercial for Deep Tech at TTP
- Ben Scowen, Vice President and UK and Ireland Cloud and Core Leader, Kyndryl
- Steve Rotherham, Mayor of the Liverpool City Region
- Robert G. Cooper, Professor Emeritus at McMaster University's De Groote School of Business
- Sana Khareghani, Former Head of the UK Government's Office for AI and Professor of Practice at KCL



AI for Innovation Summit

Breakout groups on:

- Physical AI for product development (James Zickefoose (Mirion) and Douglas Boubert (PhysicsX))
- AI for improving processes (Adam Ruby (KPMG) and Marya Bazzi (sea.dev))
- AI for agent development (Boris Bolliet (Cambridge University) and Michalis Smyrnakis (Hartree Centre))
- AI in highly regulated and safety critical environments (Richard Cannon (NATS) and Rob Firth (Hartree Centre))



AI for Innovation Summit

Used the Zoom events platform hosted by STFC to run this event.

194 registered participants.

- Event was accessible to anyone anywhere in the world
- Website creates a lasting platform for anyone interested to reach out
- Many interesting, relevant and often new contacts established

Excellent opportunity to follow up on Kyndryl launch event the week before – potential for important strategic partnership.



LIV.INNO
www.livinno.org

AI for INNOVATION

“What impact will AI have on my business, and where is the biggest opportunity for gain?”

These are the big questions challenging those tasked with innovation strategy and new product development across all industry sectors.

The interactive format will enable you to explore the potential of AI for your organisation, talk to practitioners and develop an action plan.

This pragmatic conference aims to provide context for recent AI developments, offer insights from data scientists, and share real-world industry experience from those who have started their journey.

You have the option to select a virtual exhibitor stand to showcase your company and network with others at the conference.

Join us for free!

REGISTRATION

bit.ly/ai-for-innovation-summit



Wednesday, 7th May 2025
11am – 5pm (BST)

ONLINE CONFERENCE

LIV.INNO

Podcast and news coverage

Podcast recorded with the IoP

Carsten and Andreea Font discussing the LIV.INNO CDT and future AI training needs and opportunities.

You can listen to it [here](#)



International News Coverage

DIGITAL BUSINESS
EXPERTENRATUNGEN FÜR DIGITALE TRANSFORMATION

Start Digitale Transformation Cloud Computing Quantencomputing Security Technologie KI Digital Health HR Geschäftsstrategie mehr...

40 Wie KI Prozesse und Produkte neu formt

Beschleunigung der Innovationszyklen Die unsichtbare Revolution: Wie KI Prozesse und Produkte neu formt

21.05.2025 · Das Gespräch führte Heiner Slegner · 6 min Lesedauer

Ob in der Medizin, Materialforschung oder Produktion – KI ist der stille Motor einer neuen industriellen Ära. Im Gespräch erklärt Prof. Dr. Carsten Welsch, wie Daten und Algorithmen Innovationszyklen beschleunigen und ungeahnte Partnerschaften ermöglichen.

ANBIETER ZUM THEMA

- ESKER
- xSuite
- ESKER



(Bild: © Benjamin Stock/adobe.com - generiert mit KI)

Wie verändert der Einsatz von künstlicher Intelligenz aktuell Prozesse und Innovationszyklen in datenintensiven Forschungsbereichen und der Industrie?

Professor Dr. Carsten Welsch: Künstliche Intelligenz hat die Innovationszyklen in vielen Bereichen drastisch verkürzt. Mein ursprüngliches Forschungsgebiet ist die Teilchenbeschleunigung, also Großforschungsanlagen, die sowohl in der Grund- als auch in der medizinischen Anwendung – etwa bei der Protonenstrahltherapie – werden. Diese Anlagen liefern permanent riesige Datenmengen, weil wir wissen, sich der Teilchenstrahl befindet, wie energetisch er ist und wie er sich bewegt. Um effizient zu nutzen, ist es essenziell, sie zu kombinieren und auszuwerten.

Der Umgang mit großen Datenmengen war für uns immer eine Grundvoraussetzung, solche Anlagen überhaupt betreiben und optimieren zu können. In den vergangenen Jahren haben wir beobachtet, dass sich die Konzepte, die wir in der Teilchenphysik entwickelt haben, sehr gut auf industrielle Anwendungen übertragen lassen – unabhängig davon, ob es um Teilchenbeschleuniger geht. Der Umgang mit Daten, wie wir ihn praktizieren, ist auch für industrielle und klinische Anwendungen hochinteressant. KI ermöglicht es, riesige Datenmengen zu verarbeiten, die für Menschen unüberschaubar wären. Dadurch lassen Innovationen mit deutlich weniger personellen Ressourcen umsetzen.

Das **Medizinprodukt**
Das Magazin der AUSTRONED



Solidarische Versorgung Investition in die Zukunft

Wirtschaftswunder 07 KI bringt Innovation und ein Plus an Wohlstand
AUSTRONED-Branchengruppen 10 Realisiert ganz Hand in Hand mit innovativen Produkten
Forschungsstandort 18 Wer Innovationen will, muss jungen Talenten Raum lassen

ndortpolitik

Das Medizinprodukt 2/25

Innovationsfähigkeit sichern

Die europäische Forschungslandschaft steht vor großen Aufgaben: globale Wettbewerb um Talente, die rasante technologische Entwicklung und der wachsende Bedarf an interdisziplinären Lösungen fordern neue Ausbildungsansätze – besonders in innovationsgetriebenen Feldern wie der Medizinprodukte-Branche.

Wie es Europa gelingen kann, seine Innovationsfähigkeit langfristig zu sichern, insbesondere im Spannungsfeld zwischen Grundlagenforschung, praxisnaher Ausbildung und wirtschaftlicher Verwertung, beschreibt Prof. Carsten Welsch, Leiter der Beschleunigerforschung an der Universität Liverpool, Direktor des LIV INNO STFC-Zentrums für Doktorandenausbildung im Bereich datenintensive Wissenschaft und Koordinator des gesamteuropäischen EuPRAXIA Doktorandennetzwerks. Der international vernetzte Wissenschaftler gibt Einblick in aktuelle Herausforderungen, gelungene Ausbildungsmodelle und notwendige politische Rahmenbedingungen, um Forschungskarrieren zu stärken und Innovationen schneller in die Anwendung zu bringen.

Wie gut sind junge Wissenschaftlerinnen und Wissenschaftler ihrer Meinung nach auf die Anforderungen der heutigen Forschungs- und Innovationslandschaft vorbereitet?

Wir erleben derzeit einen der dynamischsten Wandlungsprozesse in der Geschichte der Forschung und Innovation. Um diesen Herausforderungen gerecht zu werden – etwa der Integration von künstlicher Intelligenz (KI), der strategischen internationalen Zusammenarbeit oder der zunehmenden Bedeutung psychischer Gesundheit – müssen wir unsere strukturierten Ausbildungsprogramme entsprechend weiterentwickeln. Besonders hilfreich sind für mich regelmäßige Gespräche mit Studierenden, deren Betreuenden sowie internationalen Partnerinnen und Partnern. Ein prägendes Erlebnis war für mich die Antwort eines Industriepartners auf meine Frage, welche Kompetenzen unseren Promovierenden beim Einstieg fehlen. Seine Antwort: „Alle – wir müssen sie sechs Monate lang neu einlernen.“ Das war für mich ein Weckruf. Daraufhin haben wir gemeinsam mit dem Unternehmen grundlegende Änderungen an unserem Ausbildungsansatz vorgenommen, zum Vorteil für die Studierenden, die Betreuenden und die zukünftigen Arbeitgeber. Junge Forschende sind oft stark in der Theorie, aber es fehlt an praktischen und übertragbaren Kompetenzen. Die Ausbildungspro-

Prof. Dr. Carsten Welsch, PhD
Leiter der Beschleunigerforschung
Direktor des LIV INNO STFC-Zentrums
Koordinator des gesamteuropäischen EuPRAXIA Doktorandennetzwerks

Prof. Dr. Carsten Welsch, PhD
Leiter der Beschleunigerforschung
Direktor des LIV INNO STFC-Zentrums
Koordinator des gesamteuropäischen EuPRAXIA Doktorandennetzwerks

R&D TODAY

Home About Themes RADMA The Pentathlon Framework Knowledge Hub R&D Management Conference

DIGITALISATION OF EXISTING COMPANIES IS KEY TO ECONOMIC REVIVAL

The potential of the 'Great North' to drive the digitalisation of the UK's economy has been underestimated, according to Professor Carsten P Welsch, Director of the Liverpool Centre for Doctoral Training for Innovation in Data Intensive Science (LIV.INNO). The centre has a team of researchers working on innovation projects with companies across health, retail, transport, finance, and utilities to increase their competitiveness.

Professor Welsch argues that increasing skills in digitalisation – the use of digital technologies to change business models and generate new revenue – offers the opportunity to increase prosperity, sustainability, and resilience in the economy.

LIV.INNO



UNIVERSITY OF
LIVERPOOL

For discussion

- Infrastructure
- Career developments
- Public engagement



CHALLENGING
INSPIRING
AMBITIOUS
SPIRITED
INSPIRING
CHALLENGING
AMBITIOUS
SPIRITED
INSPIRING
CHALLENGING
AMBITIOUS
SPIRITED



Follow ups from previous discussion

We discussed in the past about having a common platform to share tools and knowledge, for interdisciplinary collaboration, staff-student engagement, and open science principles. How-to?

Enabling Collaborative AI Research Infrastructure in the Physics Department

- **Internal Collaboration Platform (GitLab / Gitea / similar):** *Est. cost: £5k – £8k*
 - On-premises or cloud-hosted instance for secure, university-wide version control and collaboration
 - Enables sharing of code, models, data, and documentation
 - Optional CI/CD pipelines for reproducible workflows
 - User management, integration with Single Sign-On (SSO) or LDAP
- **Initial Software Licenses, Support and Setup:** *£3k – £5k*
 - Includes security configuration, containers (Docker/Singularity), and user support
 - Optional ML/AI tools for education research (e.g., analytics dashboards)

Would this be a good starting point? Exploring options ...



Follow up from previous discussion

- Could be also extended to infrastructure – an example:
 - **High-Performance AI Server** — *Estimated cost: £35k – £40k*
 - 2–4 GPUs (e.g., NVIDIA A100, H100, or RTX 6000 series) for machine learning and data processing
 - 256–512 GB RAM
 - 2 TB SSD + high-speed storage for datasets
 - Redundant power supply and networking capability
 - Pre-installed ML software stack (e.g., PyTorch, TensorFlow, JAX, etc.)

This could also come with training and Onboarding Workshops (i.e. NVIDIA trainings)

 - For staff and students across different research clusters
 - Sessions on using the AI infrastructure, best practices for ML/AI, reproducibility, and open science
 - Customised material for physics education and interdisciplinary use- **Storage and Backup for Shared Research Data** – *£5k*
 - Dedicated storage array (e.g., 50–100 TB) for datasets and trained models
 - Daily backups and versioning for reproducibility

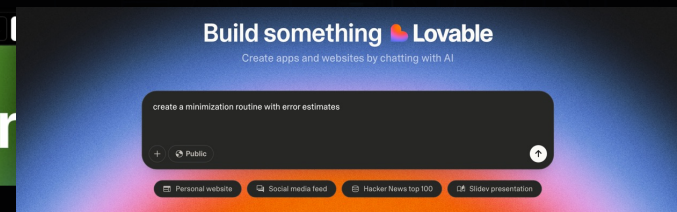
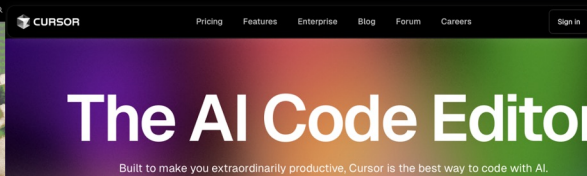
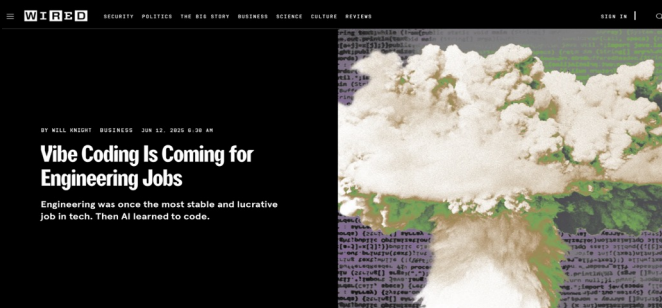
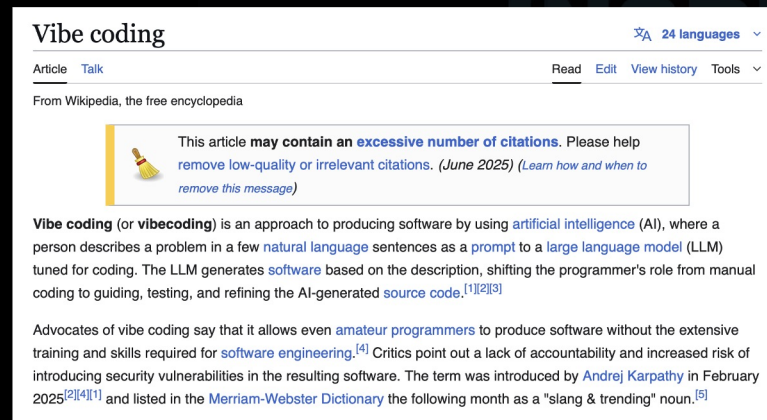


Reflection: The use of ML and AI – impact on jobs ?

[from ES PP computing summary:]

It is hard to guess how transformative AI will be in the future years:

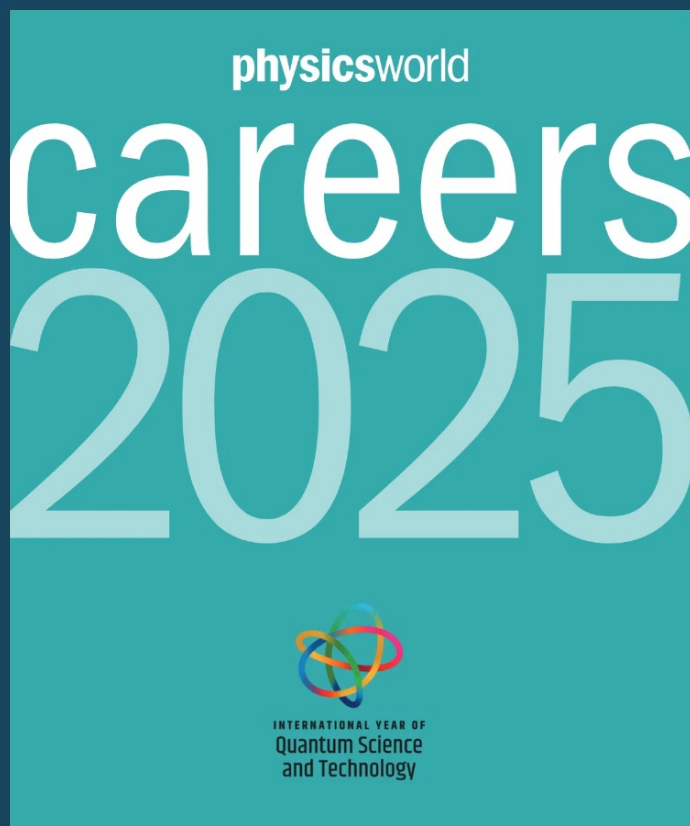
A good example is the impact of **vibe coding** in industry in the last 6 months:



What are the risks and opportunities for our students?

Physics world careers brochure

physicsworld.com/p/magazine/archive/physics-world-careers-2025/



LIV.INNO

LIVERPOOL CENTRE FOR DOCTORAL TRAINING FOR INNOVATION IN DATA INTENSIVE SCIENCE (LIV.INNO)



The Liverpool Centre for Doctoral Training for Innovation in Data Intensive Science (LIV.INNO) is an inclusive hub for training diverse cohorts of excellent students in data-intensive science. The centre has a focus on addressing the data challenges presented by research in astronomy, nuclear, theoretical, particle and accelerator physics.

Why study with us
Recent years have witnessed a dramatic increase of data in many fields of science and engineering, due to the advancement of sensors, mobile devices, biotechnology, digital communication and internet applications. If you are interested in working on some of the most advanced research and development challenges in data-intensive science with the UK's top experts in this field, then a PhD within LIV.INNO might be right for you.

Training and development
LIV.INNO offers its PhD students comprehensive training in data-intensive science through cutting-edge interdisciplinary research projects and a targeted academic training programme,

complemented by secondments to national and international research partners and strong industry contributions. This framework will provide you with an ideal basis for driving science and innovation, as well as boost your employability.

The centre is supported by the Science and Technology Facilities Council (STFC) and hosted by the University of Liverpool and Liverpool John Moores University/ Astrophysics Research Institute.

What we are looking for
We are looking for dynamic, proactive PhD students who have a passion for data-intensive science with ideally with coding skills and experience in data analysis. We encourage in particular applications from women and other STEM minority groups. LIV.INNO actively helps overcome barriers to access; qualifying students can receive additional funding for research-related travel costs. It is also possible to realise many of our PhD projects part-time, over a longer total period.

Profile can be viewed at physicsworldjobs.com

LOCATION Liverpool, UK
NUMBER OF RESEARCHERS Around 12 per cohort
MAIN AREAS OF RESEARCH Astronomy, nuclear, theoretical and particle physics, accelerator science, mathematics, computer science
POSITIONS RECENTLY RECRUITED FOR We have successfully trained 36 students in our first CDI in data-intensive science (LIV.DAI), and the first LIV.INNO cohort started in October 2022
DESIRED DEGREE DISCIPLINES/CLASS All engineering and science subjects: 2.1 honours degree (or equivalent)
PRE-REQUISITES Eligible to study in the UK
HOW TO APPLY For information on how to apply please visit our website www.liv.inno.org
CLOSING DATE All year round
CONTACT Liverpool Centre for Doctoral Training for Innovation in Data Intensive Science Prof. Dr Carsten P. Welsch LIV.INNO Director Oliver Lodge Building Liverpool L69 7ZE UK Tel +44 79732 47982 E-mail c.p.welsch@liverpool.ac.uk www.liv.inno.org

In association with Physics World Jobs

83

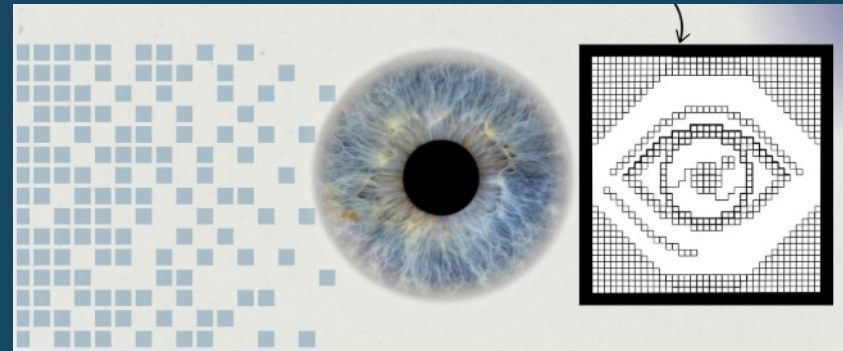
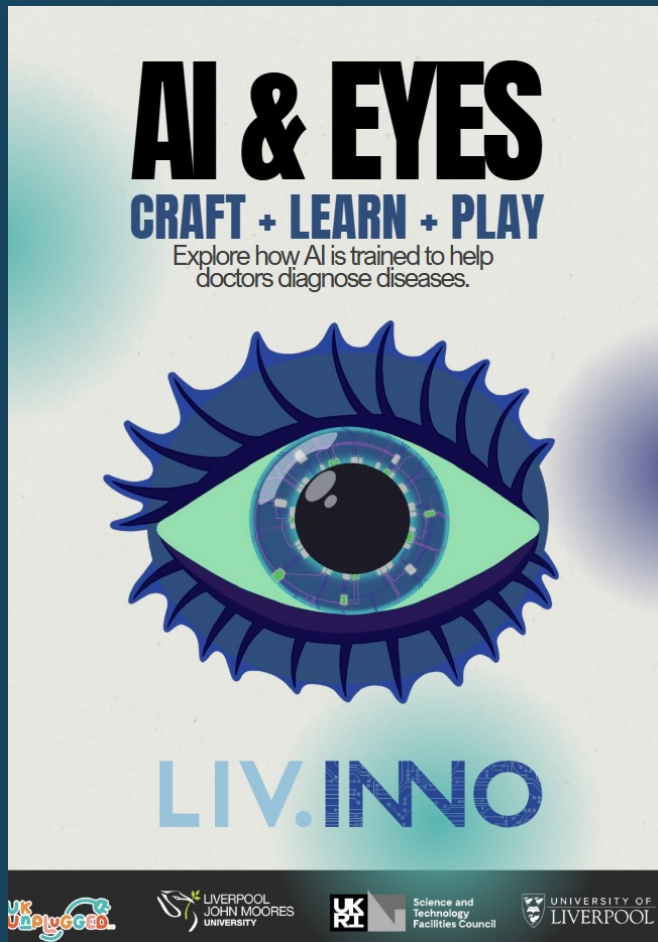
Physics World Careers 2025

LIV.INNO

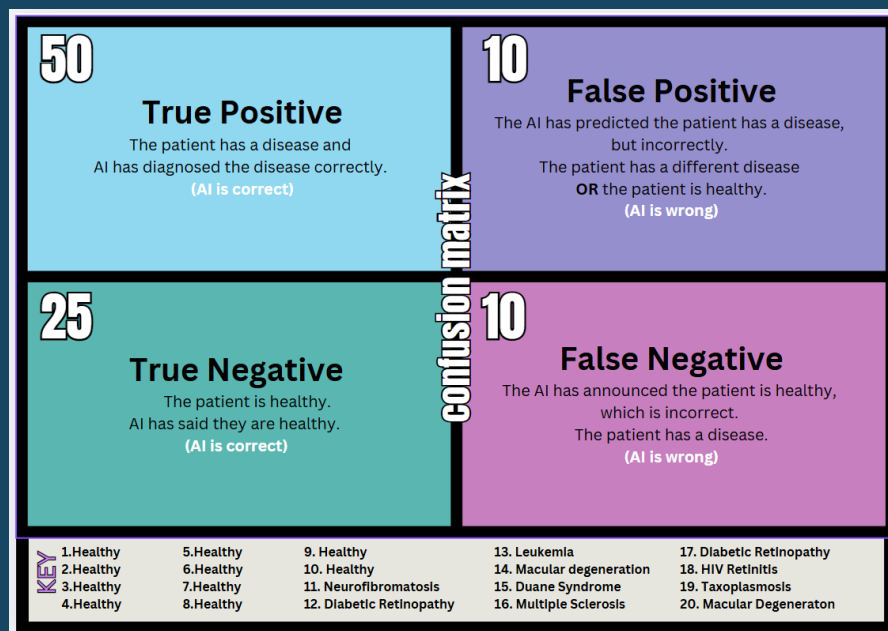
A lot can be done for public engagement and promote how AI in physics can be relevant for general public. An example:

AI & Eyes

With contributions also from one of our PhD LIV.INNO student (Rob McNaulty)



AI & Eyes



- Best AI Doctor - game
- How to train your AI – insights into our R&D
- Eye suncatcher – hands-on activity
- Eating for your eyes - Nutrition advice.

Activity box will now be used more widely, including BSF and music festivals in UK and abroad.