Data-Centric Engineering @ The Alan Turing Institute

The Alan Turing Institute was founded in 2015 with a clear and compelling purpose: 'To make great leaps in the development and use of data science and artificial intelligence (AI) in order to change the world for the better.' That purpose remains unchanged. Our aim is that ten years from now, the Turing will be internationally recognised as a centre of research and innovation that harnesses the power of data science and artificial intelligence to make a lasting impact on the world's most pressing societal issues. To deliver this we have selected 3 grand challenges which align with national priority areas: Environment & Sustainability, Defence & Security and Health.

The Data-Centric Engineering (DCE) Programme was born from the partnership between The Alan Turing Institute and Lloyd's Register Foundation (LRF). DCE brings together world-leading academic institutions and major industrial partners to address the evolving challenges of data-driven engineering. By integrating AI, machine learning, and advanced data science, the programme develops innovative solutions to enhance safety and sustainability across four key themes (Humanities, Arts, and Social Sciences; Digital Manufacturing; Critical infrastructure; Marine and Maritime).

Vision for 2030: Data-Centric Engineering for a Sustainable Future

DCE will drive change by: Pull-through to adoption; Generating standards, regulation and policy to support innovation; Development of skills and training and Building a global community.

1. Humanities, Arts, and Social Sciences

The rapid evolution of AI demands multidisciplinary collaboration to address complex societal challenges such as decarbonisation and safety.
We will drive change by:

- Embedding technological advances within ethical and social frameworks.
- Aligning AI innovations with human values and cultural contexts.
- Fostering interdisciplinary problem-solving approaches.

By 2030, we will have achieved a fairer, safer, and more sustainable future by integrating insights from engineering and the humanities.

2. Digital Manufacturing: AI for Resilient and Sustainable Industry

AI adoption in manufacturing remains fragmented, requiring system-level approaches that integrate supply chains and product lifecycles.
We will drive change by:

- Developing scalable, privacy-preserving AI solutions.
- Providing ethical AI deployment frameworks.

By 2030, AI will enable resilient, responsible, and sustainable manufacturing with traceable, safe, and ethical AI adoption.

3. Critical Infrastructure: Data-Driven Resilience

Critical infrastructure requires efficient, data-driven management to extend lifespan while minimizing environmental impact.
We will drive change by:

- Improving real-time asset monitoring and predictive maintenance.
- Advancing AI-driven degradation models for condition-based management.

By 2030, data-centric engineering will underpin national infrastructure management, ensuring safe, efficient, and sustainable service delivery.

4. Marine and Maritime: A Smarter, Sustainable Future for Our Oceans

Oceans are vital to modern society as well as to the health of the planet. The maritime sector is a complex, evolving ecosystem, critical to global trade and environmental sustainability.
We will drive change by:

- Innovating across cyber-physical and socio-technical systems.
- Enhancing safety, efficiency, and cybersecurity in maritime AI applications.

By 2030, AI-driven maritime solutions will optimize ocean resource use, making it safer, more efficient, and sustainable.

By 2030, DCE will have demonstrated the ability for data-centric engineering approaches to help solve a range of societal problems across the world.