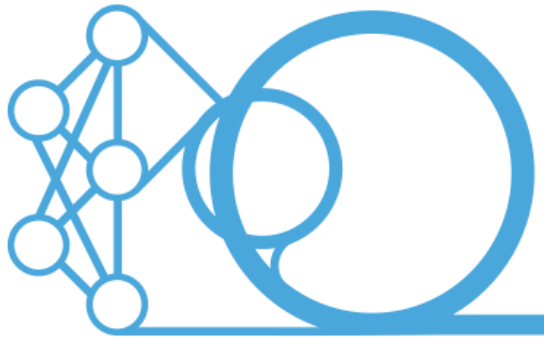


artifact

Artificial Intelligence for Advancing Particle Accelerators

Dr Joseph Wolfenden

on behalf of the artifact collaboration

Successful R&I in Europe 2025, 12th European Networking Event

Düsseldorf, 6th March 2025

Global Accelerator Landscape

>40,000 accelerators in operation worldwide[1]

>99% for industrial and medical applications

<1% for research and discovery science

Main Challenges

Beam improvements and control

Impact on the environment and sustainability

Knowledge transfer and societal impact

Including design and the full machine lifetime

How can AI help?

Operation

Reliability

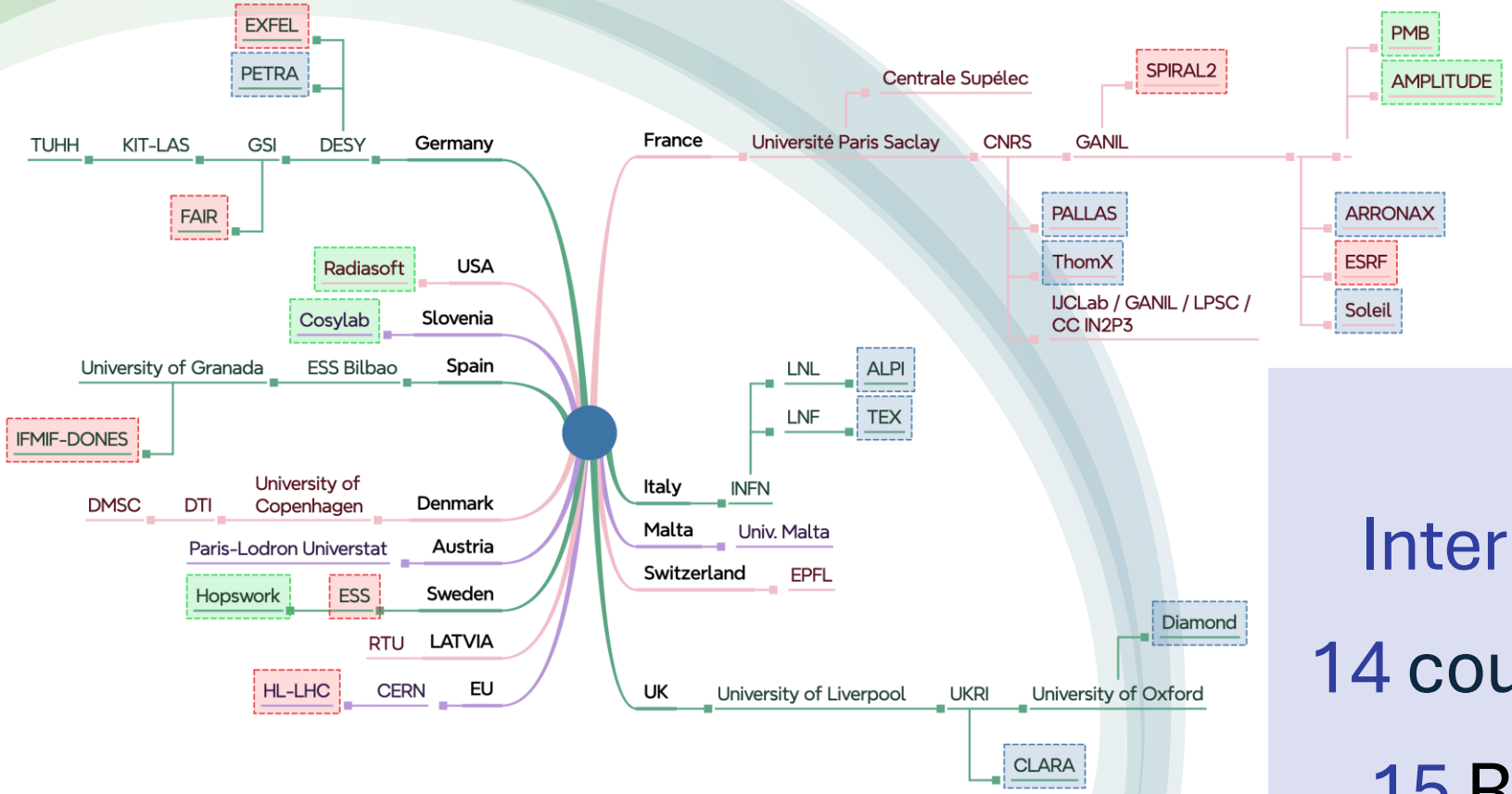
Anomaly prevention

Optimisation

Simulation

Modelling

1 - Chou, Weiren, and Alexander Wu Chao. 2019. *Reviews of Accelerator Science and Technology-Volume 10: The Future of Accelerators*. World Scientific.



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Who?

International collaboration

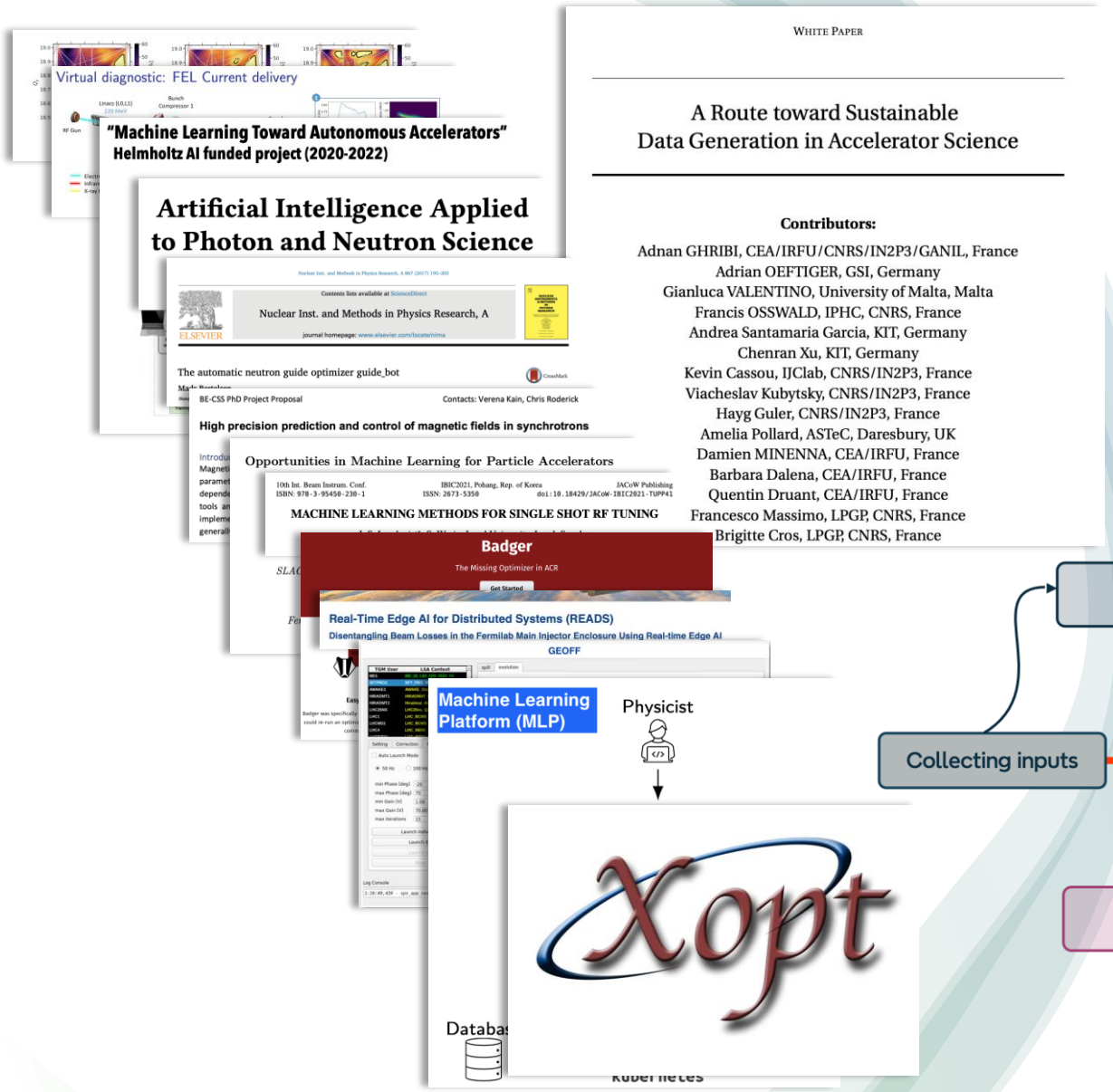
14 countries and 30 institutes

15 RI facilities, 7 on ESFRI

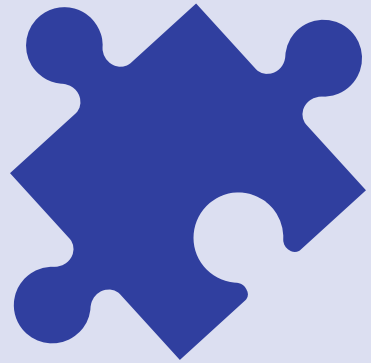
5 private companies

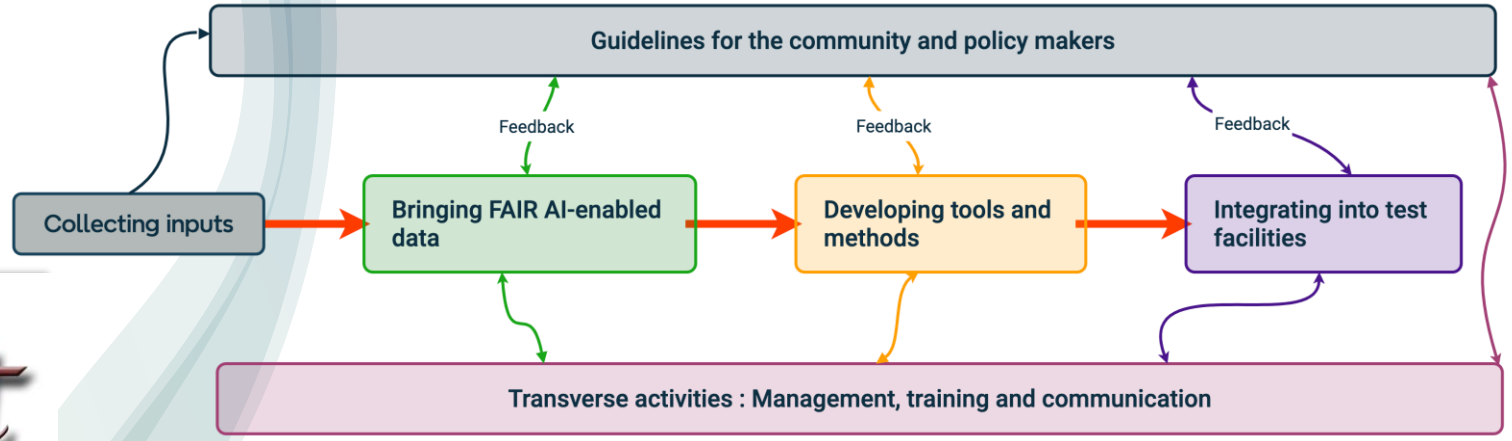
Extensive experience running large-scale EU-funded projects

Deep Knowledgebase



Findable
Accessible
Interoperable
Reusable





2 - A Route toward Sustainable Data Generation in Accelerator Science" ; doi:10.5281/zenodo.10685243

Objectives

1. Reduce downtime and optimize operation
2. Develop adapted tools and methods
3. Ensure sustainable development

Outcomes

1. Extensive cross-sector networks
2. Energy efficient operation
3. Agnostic AI-enabled control system
4. EU industry/RI roadmap

How to get involved?

Horizon Infrastructure calls (~10M€)

Help develop and build the AI-enabled accelerators of the future

E.g. HORIZON-CL4-2025-03-DIGITAL-EMERGING-07 – **Nov. 2025**

MSCA Doctoral Network

Help develop and train future leaders in AI-enabled accelerators

Get in touch: Prof. Carsten P. Welsch
welsch@liverpool.ac.uk

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