EU funding programmes in support of data-driven innovation in healthcare

Saila Rinne

European Commission
CNECT.H3 – eHealth, Well-Being and Ageing
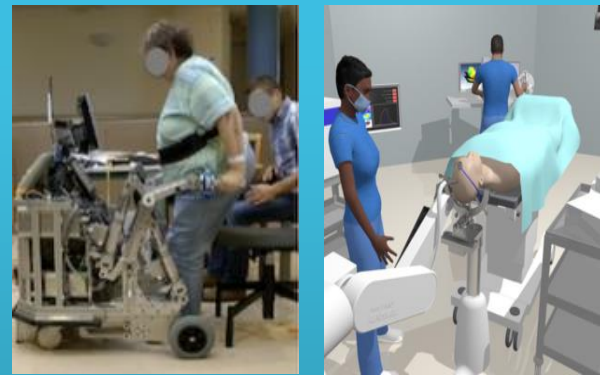Acting Head of Unit
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RESEARCH TO REALITY

EU funding for AI in healthcare sector

Research funding under Horizon Europe

AI & Robotics

- **Operating rooms**
- **Support in Hospitals**
- **Exoskeleton & Rehabilitation**
- **Support at Home** *(Assistive living)*

Data and computing technologies

New tools, technologies and digital solutions for a healthy society

- **personalised medicine and personalised clinical decision making**
- **AI for risk-prediction and patient-stratification**
- **data-driven decision-support tools**
- **clinical validation of artificial intelligence solutions for treatment and care**
- **...**

Deployment-focused funding under DIGITAL

Health data spaces

- **Federated infrastructure for genomic data**
- **Federated infrastructure for cancer imaging data**
- **Federated infrastructure for intensive care units' data**

Bringing AI solutions from the lab to the market

Testing and Experimentation Facilities for Health

Fostering uptake

- **European Digital Innovations Hubs**
- **Digital Health Uptake**
- **Fostering efficient pathways for AI in healthcare**

European Genomic Data Infrastructure

Secure cross-border access to genomic and health data, *for research, personalised healthcare and public health policy*

2018 2019 2020 2021 2022 2023 2024 2025 2026 2027

Design & Framework

Deployment & Sustainability

1+MG Declaration

European Commission
Horizon 2020
European Union funding
for Research & Innovation

B 1MG Beyond one Million Genomes

European Genomic Data Infrastructure

DIGITAL EUROPE PROGRAMME

Population Genomics
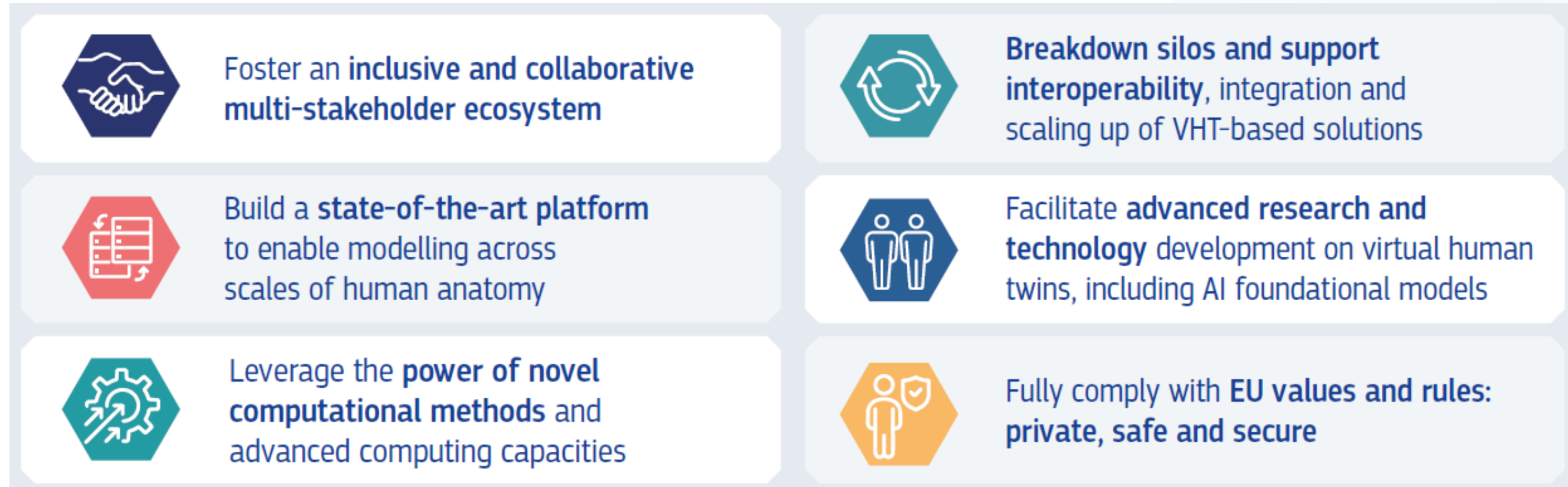
Genome of Europe
(under evaluation)

DIGITAL EUROPE PROGRAMME

The European '1+Million Genomes' (1+MG) initiative facilitates signatory countries to realise a practice of personalised medicine and health, based upon a shared 'framework' and the infrastructure to safely access and integrate high quality genomic data and other health data across borders.   *[1+MG Roadmap 2023-2027]*

European Commission

The European Virtual Human Twins Initiative

The initiative aims to:

Foster an **inclusive and collaborative multi-stakeholder ecosystem**

Breakdown silos and support interoperability, integration and scaling up of VHT-based solutions

Build a **state-of-the-art platform** to enable modelling across scales of human anatomy

Facilitate **advanced research and technology** development on virtual human twins, including AI foundational models

Leverage the **power of novel computational methods** and advanced computing capacities

Fully comply with **EU values and rules:** private, safe and secure

The initiative includes:

- the European Virtual Human Twin **EDITH project**, DIGITAL EUROPE (€5MIO)
- eight actions on **integrated, multi-scale VHTs for personalised disease management**, HORIZON EUROPE (€80MIO)
- state-of-the-art **digital platform for advanced VHT models integration and validation**, DIGITAL EUROPE (€24MIO)
- **pan-European infrastructure for intensive care units' data** and computational model-based tools, DIGITAL EUROPE (€5MIO)
- actions on comprehensive stroke management including predictive computational models, IHI (€20MIO)

The European Cancer Imaging Initiative

- Builds on substantial research efforts and EU funding on **AI and cancer imaging** by leading European researchers

- **AI4HI Cluster of H2020 projects**

EUCAN IMAGE · CHAIMELEON · INCISIVE · ProCAncer-I · PRIMAGE (Medical imaging, Artificial intelligence, Childhood cancer research) → EUCAIM CANCER IMAGE EUROPE

The European Cancer Imaging Initiative will:

Capitalize on the recent advances and successes of Artificial Intelligence systems in helping medical professionals to detect and diagnose cancers

Support the piloting and development of innovative computer-aided solutions to achieve greater accuracy and reliability in cancer imaging and personalised care, in line with the objectives of the Europe's Beating Cancer Plan

Showcase how medical images can be accessed, used and/or pooled while ensuring a high level of ethics, trust, security and personal data protection in full compliance with EU values and rules

2023
Design completed
- Requirements analysis
- Design
- Collaboration mechanisms
- Early release of the Data Federation Framework

2024
First version of platform
- Platform validated and populated for external production
- Data providers connected
- Prototype for federated learning
- Benchmarking platform

2025
Final release of platform
- Federated learning
- Final version of tools and services
- Federation of new cancer images databases through open calls
- Implementation of clinical use cases

2026
Full operation of federated repository
- Integration with other data infrastructures
- Piloting of the business model
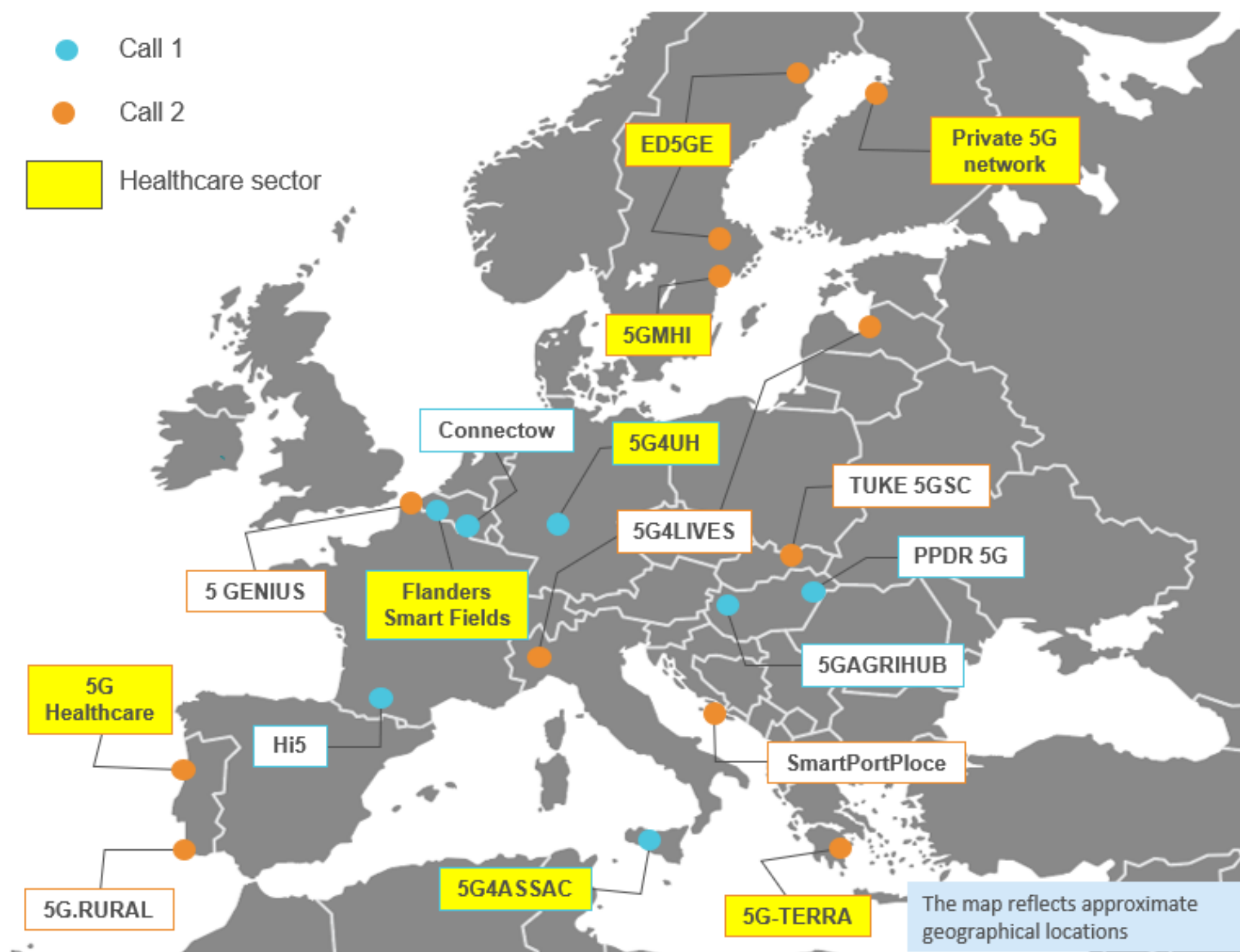- Legal and operational model finalized

2027
Expansion

Testing – experimentation – benchmarking – interoperability – ethics, trust, security – stakeholder engagement

Connecting Europe Facility – Digital
5G for Smart Communities

- **8 CEF Digital 5G for Smart Communities projects are related to the healthcare sector**

- **Implementing 5G networks will enable for example:**

  - ➤ **e-health services**
  - ➤ **video consultations**
  - ➤ **real-time remote assistance**
  - ➤ **connectivity in emergency vehicles (e.g. ambulances and helicopters)**

Call 1
Call 2
Healthcare sector

ED5GE
Private 5G network
5GMHI
Connectow
5G4UH
TUKE 5GSC
5G4LIVES
PPDR 5G
5 GENIUS
Flanders Smart Fields
5GAGRIHUB
5G Healthcare
Hi5
SmartPortPloce
5G.RURAL
5G4ASSAC
5G-TERRA

The map reflects approximate geographical locations

EUCAIM

Two Axis of EUCAIM

EUCAIM will power up AI & imaging to beat cancer
Provide a research platform for the **development & benchmarking of AI tools** toward Precision Medicine and a federated data warehouse approach for deploying observational studies.
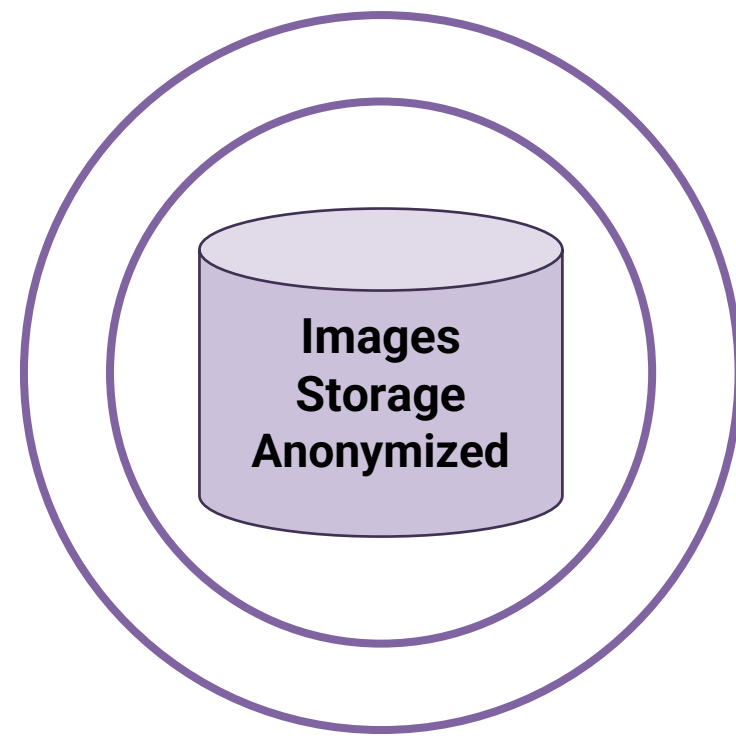
Address the fragmentation of the existing cancer image repositories by building a **distributed Atlas of Cancer Images** (>60M cancer images)
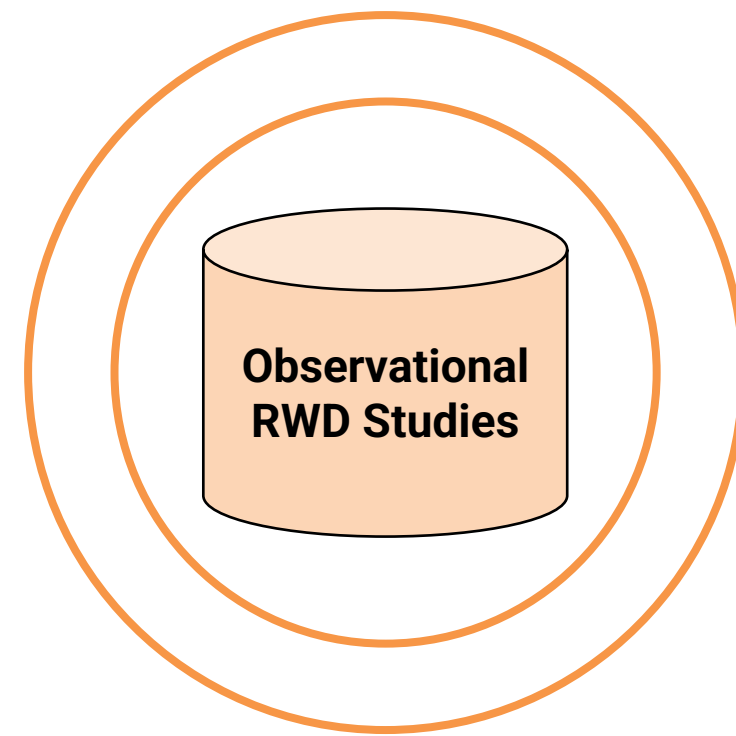
Create a **Federated Datawarehouse** approach for deploying fast Observational Studies and populate the centralized Image Repository

Co-funded by
the European Union
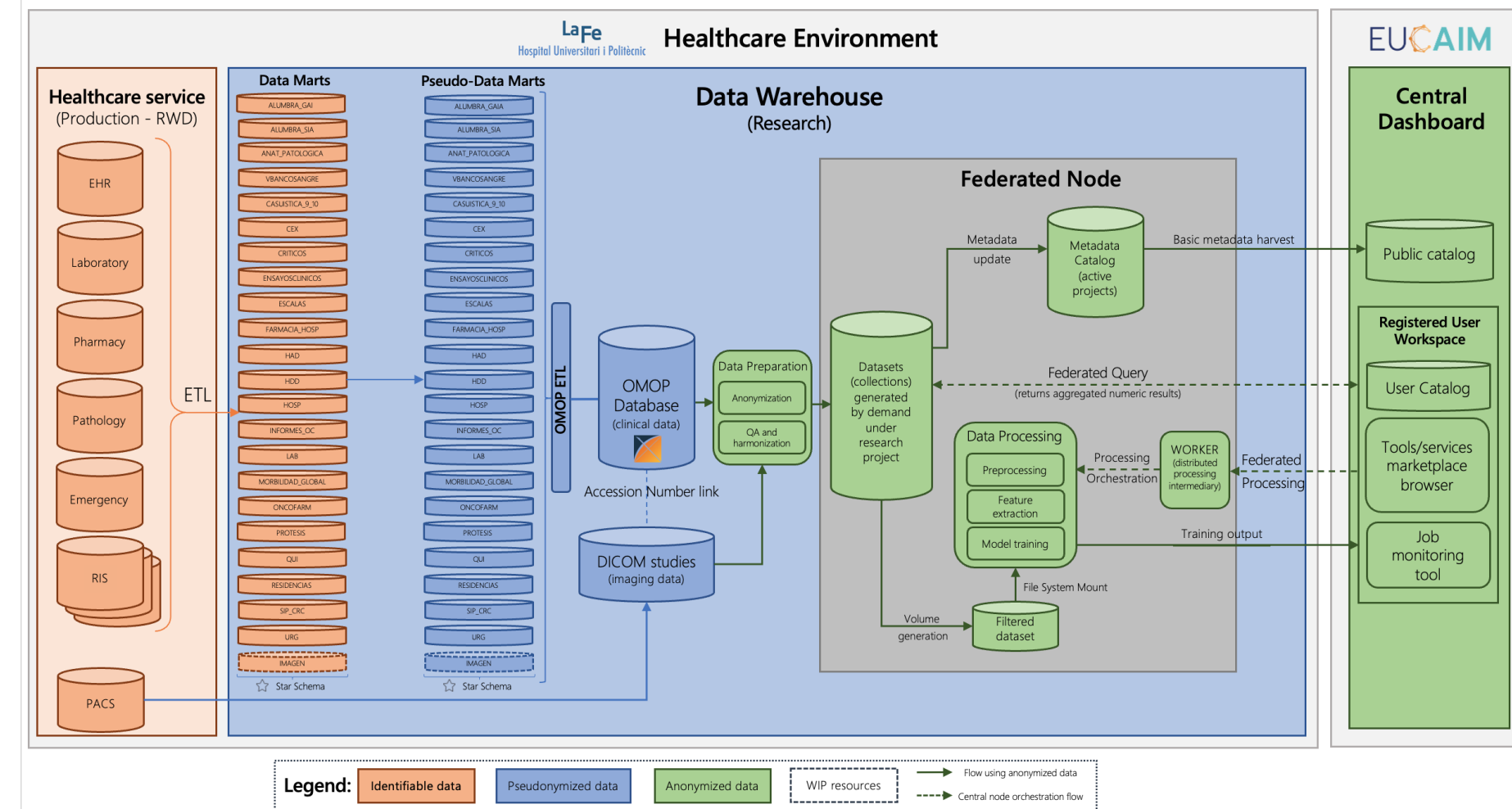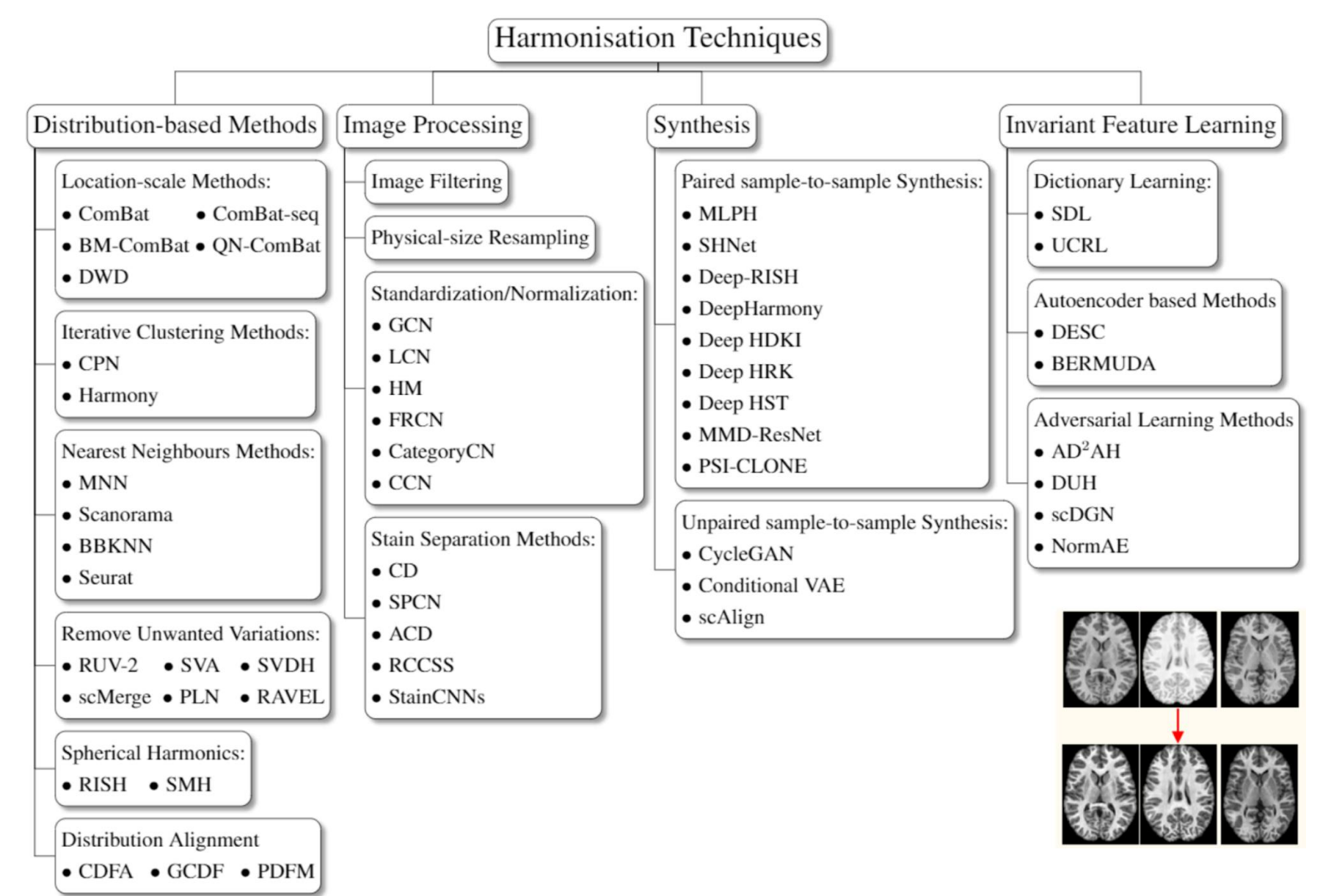
Atlas and Observational Platform

EUCAIM
CANCER IMAGE EUROPE
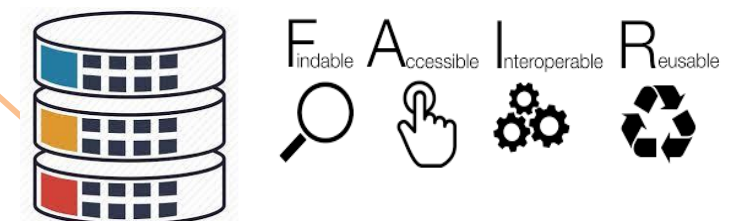
Hybrid Platform

Distributed RW Data Warehouses
Extract, Transform and Load
ML Federated Learning

Metadata Catalogue
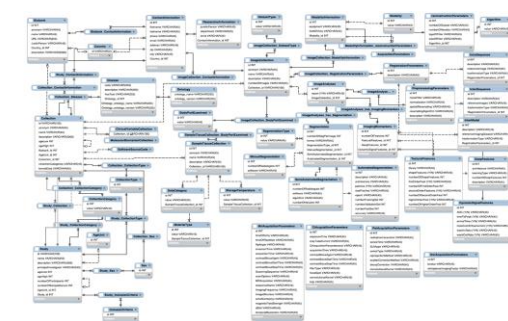Annotated Structured Data
AI Experimentation Platform

AI4Health Imaging

Atlas of Cancer Images

ERIC
EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM

Primary & Secondary Use Area

Central HUB Platform

Observational RWD Studies → Central Storage

Open Challenge

CLINICAL TRIALS

Secondary Use Area

CDM hyper-ontology

Findable Accessible Interoperable Reusable

DICOM-MIABIS
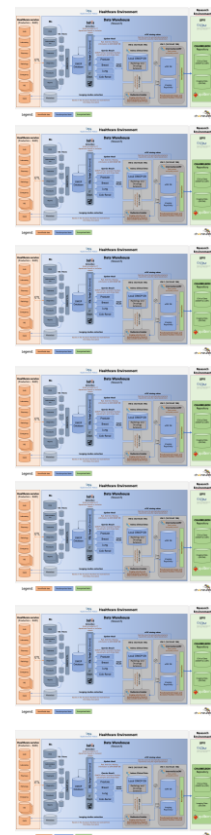
Cancer Screening Programs

Cancer screening in the European Union

Data altruism: how the EU is screwing up a good idea
By Winfried Veil

Data Altruism

Target Users

Data Holder

Definition: Any natural or legal person, including entities, bodies, and research organisations in the health or care sectors, as well as European Union institutions, bodies, offices, and agencies, who has the right, obligation, or capability to make certain data available, including registering, providing, restricting access, or exchanging the data.

Two options for joining the federation:
- Become a federated node
- Upload data to repository.

Tool Provider

Definition: Entity (startups, enterprises, research institutions, government agencies, non-profit organisations) that would like to contribute with processing tools, services, or applications they have developed to the EUCAIM's marketplace for use in the federated processing module of the platform.

Both batch and interactive applications, following rules for participation and technical compliance.

Data User-Researcher

Definition: A person or entity that wants to explore the public catalogue and eventually request access to data and process them using either the tools available in the platform or their own AI tools to conduct studies, research, or analysis with the intention of generating new knowledge in the field of medicine and publishing the findings.

A data access request should be made through a R&D project that will be evaluated by the Access Committee.

Sustainability

Main result available beyond the lifetime of EUCAIM
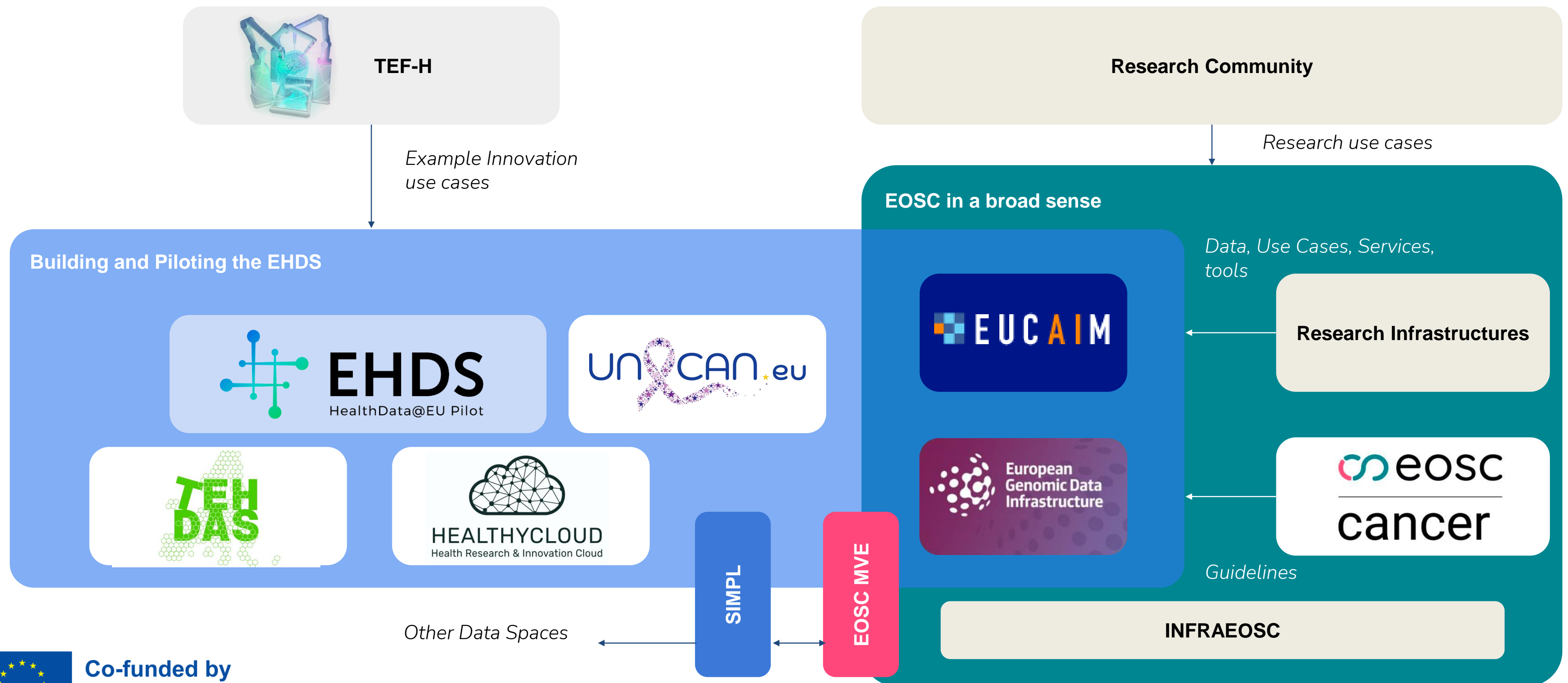
- Cancer Image Europe EDIC

Sustainability plan

- Research projects (data, software, storage, research communities)
- Companies' involvement (validation, regulatory, clinical trials)
- Advisory to standards and guidelines

Cancer Image Europe

Introducing the future
European Digital Infrastructure Consortium (EDIC)

TEF-Health

EU-wide one-stop shop

Closing the gap in the innovation chain for AI & Robotics

- Idea
- Research
- Data, Knowledge

Lab

- Data-driven innovation and validation
- Testing
- Certification

Bed

- Marketable product

Single EU-wide entry point through Ebrains.eu (ESFRI RI)

EHDS2 Pilot

Certification
FAIR
Infra
Conform
Certify
Data

Health Data
GDPR

Quality & Regulation
Protocol
Ethics
Standards
Law

Building Competence
Innovate
AI/Robotics
Reseach

Validtation & Testing
Testing
Environ.

Sustainability
Metrics
Equipm.
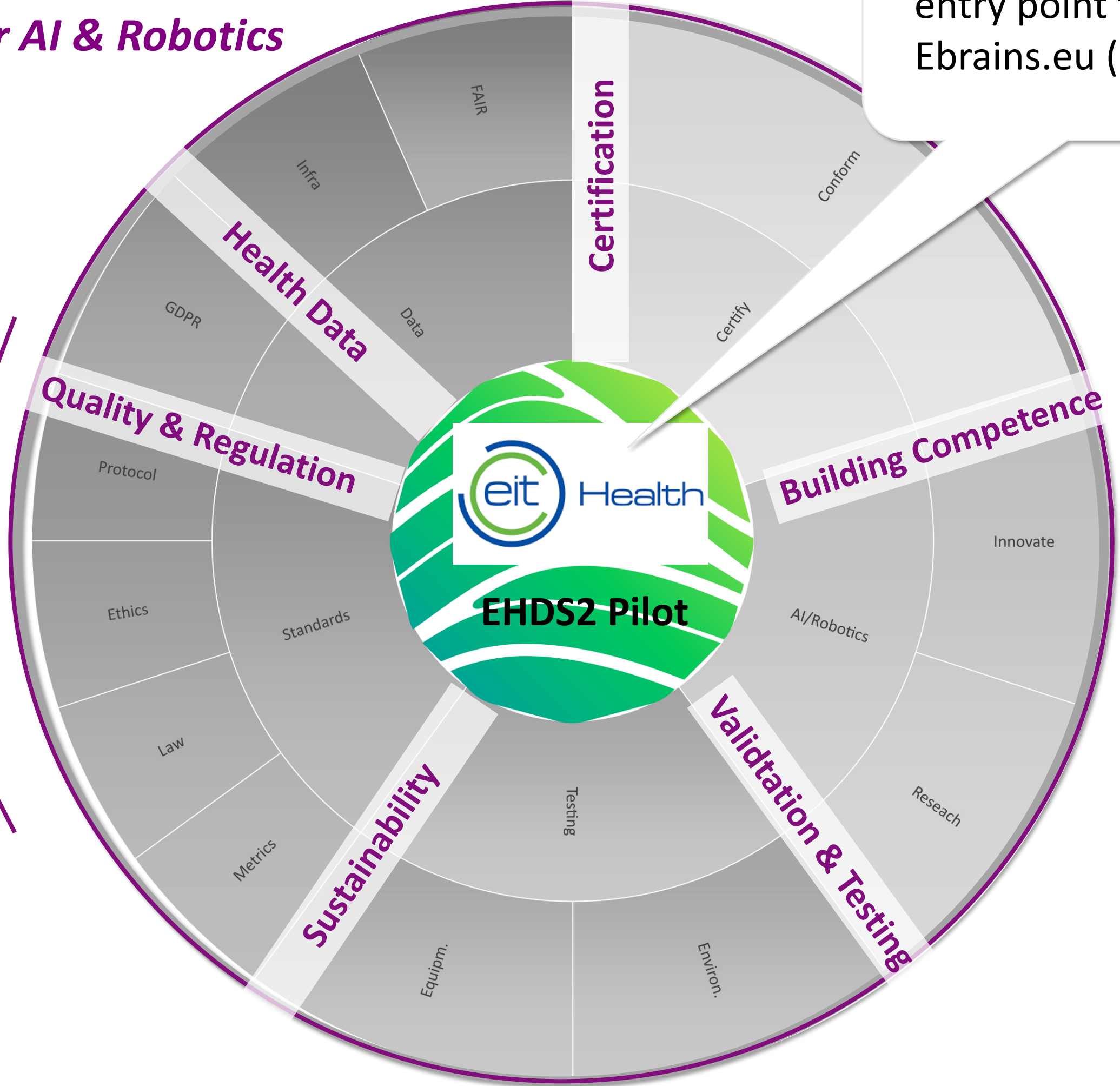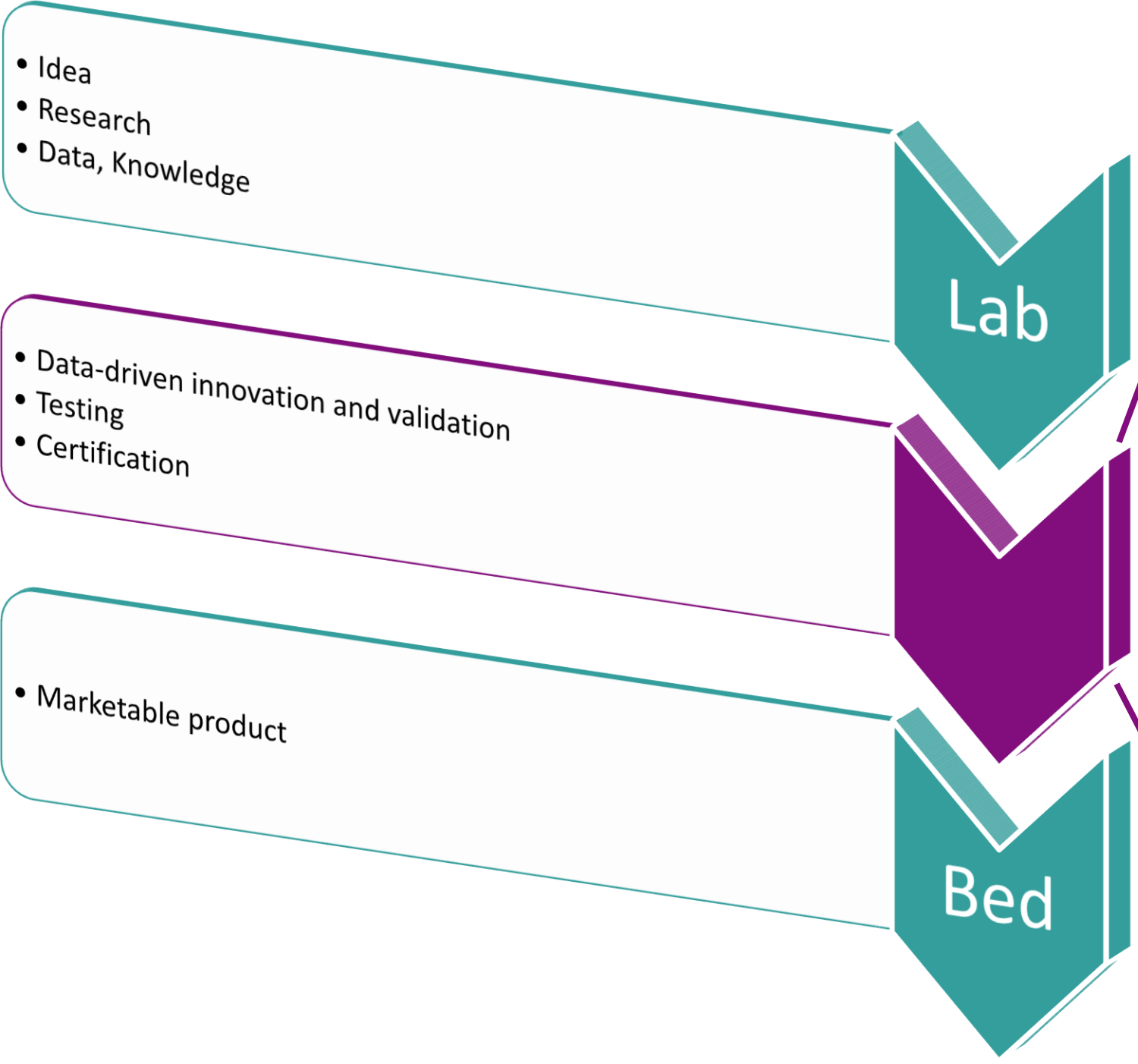
Service Categories:
- Data
- Standards
- Testing
- AI/Robotics
- Certify

www.tefhealth.eu

The TEF-HEALTH consortium - € 60 million, 2023-2027

GERMANY

Berlin	**CHARITÉ***, BPWT°, VdTÜV˙, KI Park˙
Braunschweig	PTB*
Erlangen	FAU*
Heidelberg	EIT H SI GmbH°
München	TUM*, FHG˙,EIT HEALTH EV°

BELGIUM

Charleroi	**ISPPC**°, CETIC˙, BIOWIN˙
Liège	WSL°
Mol	VITO°
Mons	MULTITEL˙
Namur	UNamur˙

SLOVAKIA

Bratislava	UK BA*, STUBA*
Martin	UHM*
Zilina	UNIZA*

SWEDEN

Boras	RISE˙
Stockholm	KI*

PAN-UE

Brussels	EBRAINS˙

52 parties:
node partners &
associates

LOI from > 40 SMEs and
organizations

> *"We make unique real-world imaging and omics infrastructures, data, clinical expertise, and AI-expertise available to SME:s in the Health domain"*

ITALY

Genova	IGG*, IIT˙
Lecce	INNOVAAL˙
Milano	POLIMI*
Pavia	UNIPV*
Povo	FBK˙
Roma	**ISS***

PORTUGAL

Coimbra	IPN˙, CHUC EPE*
Lisboa	SPMS*,InnoStars ˙
Porto	CHSJ*, HCP˙

FINLAND

Helsinki	**HELSINGFORS***, HUS*, METROPOLIA˙

■ Node & Node Lead
■ Associated & Associated Lead

* Public, Non-profit
· Private, Non-profit
° Private, Profit

The TEF-HEALTH services – each node provide several forms of testing

Virtual testing facility

- Data
- Expertise in AI
- Legal and ethical compliance
- Certification

The **European Brain ReseArch INfrastructureS (EBRAINS)** is unique worldwide in providing access to the most comprehensive set of brain data, along with tools to share, analyse and store data, and to run virtual experiments. It is also unique in making High Performance Computing available to brain research, which it does through the Fenix and PRACE networks, enabling data and compute-intensive research.

https://roadmap2021.esfri.eu/

VRE Virtual Research Environment

Physical testing facility

- Real-world environment - hospital platforms
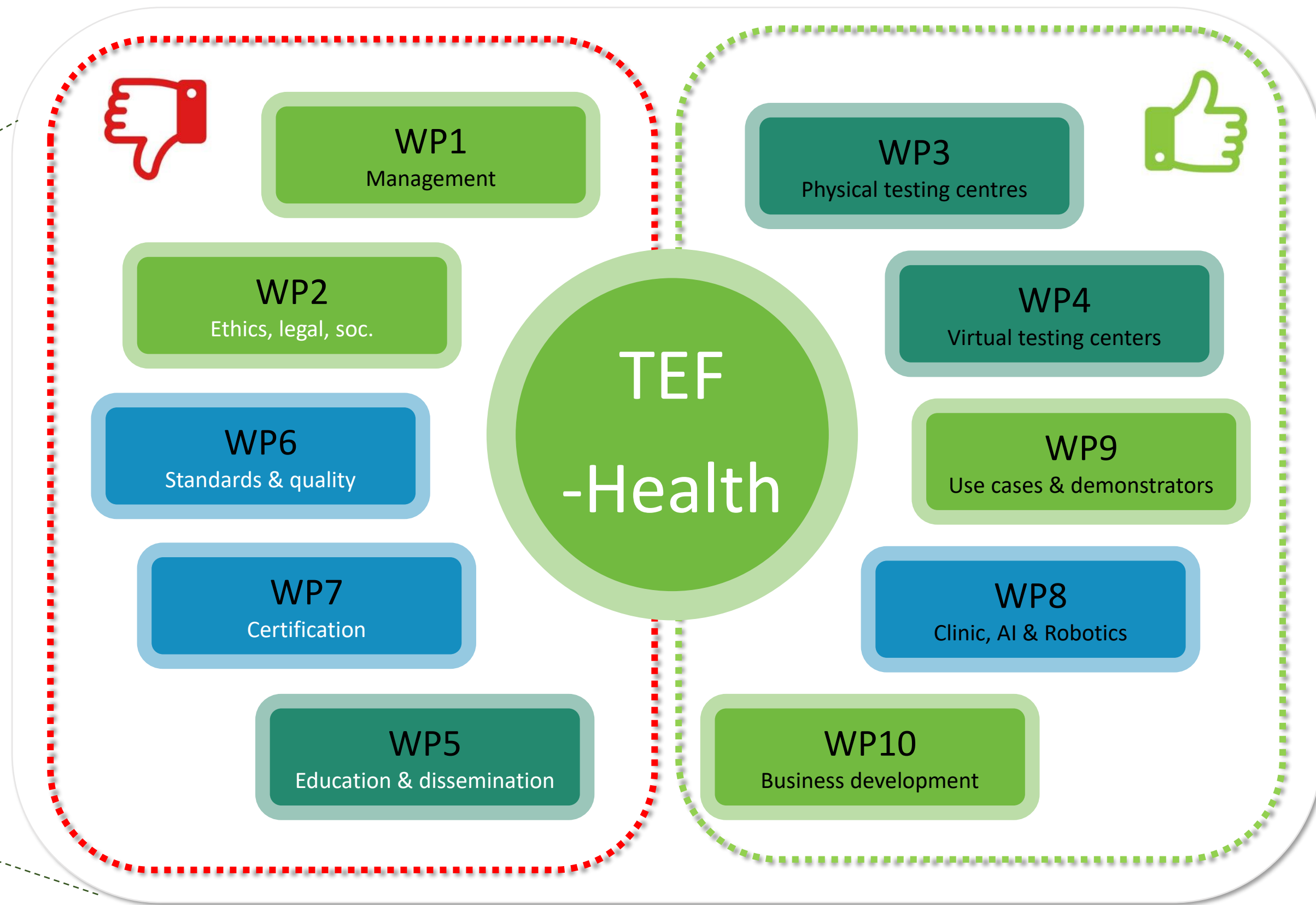- Infrastructures and instruments - laboratory testing facilities
- Clinical expertise

GDPR READY

Neurotec – Cancer – Cardiovascular - Intensive Care

Interlinking 10 Work Packages (WPs) to reach our goal

www.tefhealth.eu

WP1 Management

WP2 Ethics, legal, soc.

WP6 Standards & quality

WP7 Certification

WP5 Education & dissemination

TEF -Health

WP3 Physical testing centres

WP4 Virtual testing centers

WP9 Use cases & demonstrators

WP8 Clinic, AI & Robotics

WP10 Business development
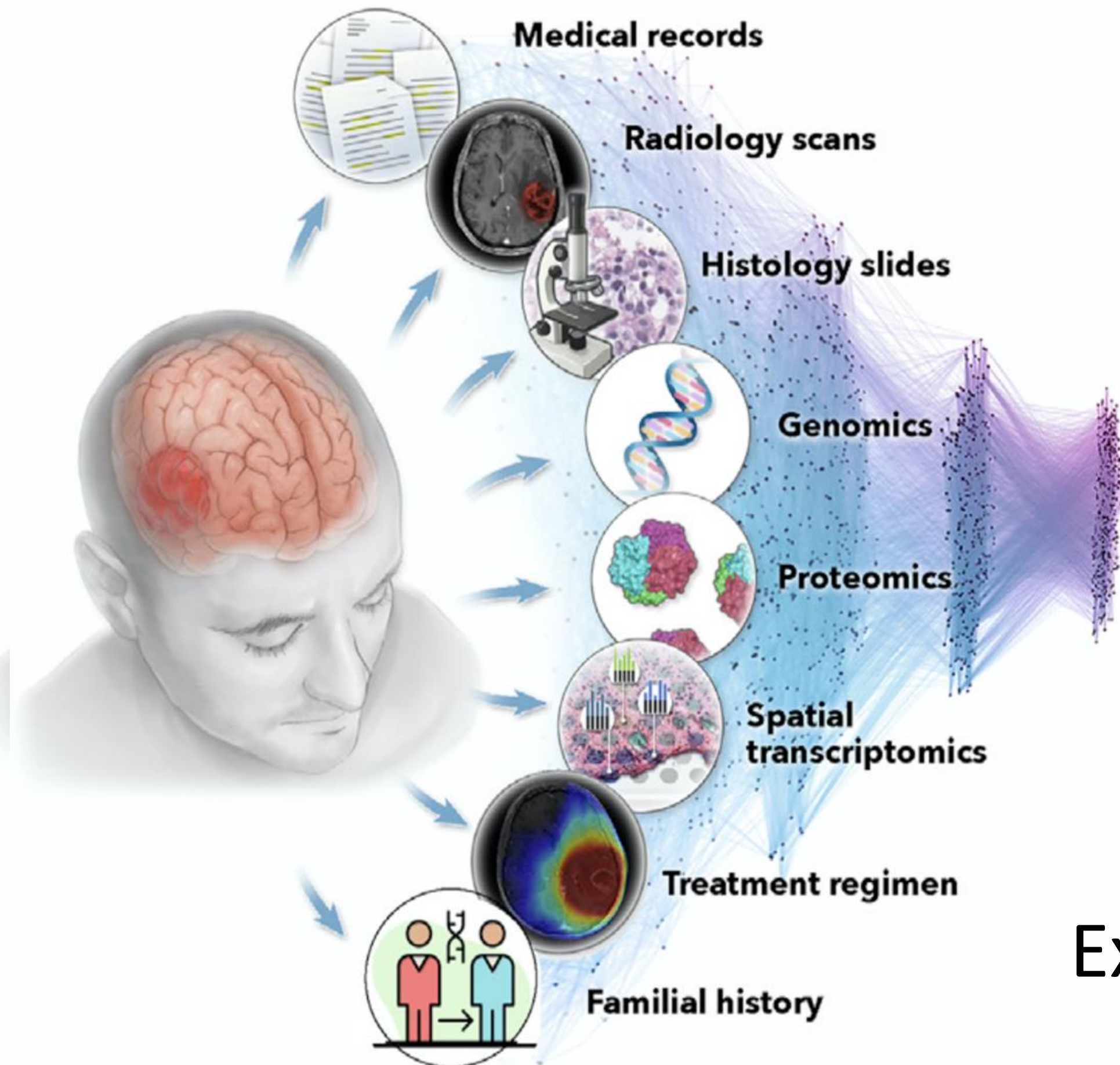
Mitigating risks by guiding:
Ethics & legal,
Standardization, Validation, Certification,
Education/training

Paving for Trustworthy AI by accessibility to:
Physical sites, Data,
Needs & offerings, Demonstrators,
Direct-contact to clinicians, Hospitals,
End-users

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Foster state-of-the-art AI and robotics in healthcare

Medical records
Radiology scans
Histology slides
Genomics
Proteomics
Spatial transcriptomics
Treatment regimen
Familial history

Predictions

- Diagnosis
- Prognosis
- Survival
- Treatment response
- Treatment toxicity
- Recurrence
- Risk stratification
- Side effects
- ...

Jana Lipkova,[1,2,3,4] Richard J. Chen,[1,2,3,4,5] Bowen Chen,[1,2,8] Ming Y. Lu,[1,2,3,4,7] Matteo Barbieri,[1] Daniel Shao,[1,2,6] Anurag J. Vaidya,[1,2,6] Chengkuan Chen,[1,2,3,4] Luoting Zhuang,[1,3] Drew F.K. Williamson,[1,2,3,4] Muhammad Shaban,[1,2,3,4] Tiffany Y. Chen,[1,2,3,4] and Faisal Mahmood[1,2,3,4,9,*]

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[4]Data Science Program, Dana-Farber Cancer Institute, Boston, MA, USA
[5]Department of Biomedical Informatics, Harvard Medical School, Boston, MA, USA
[6]Harvard-MIT Health Sciences and Technology (HST), Cambridge, MA, USA
[7]Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA
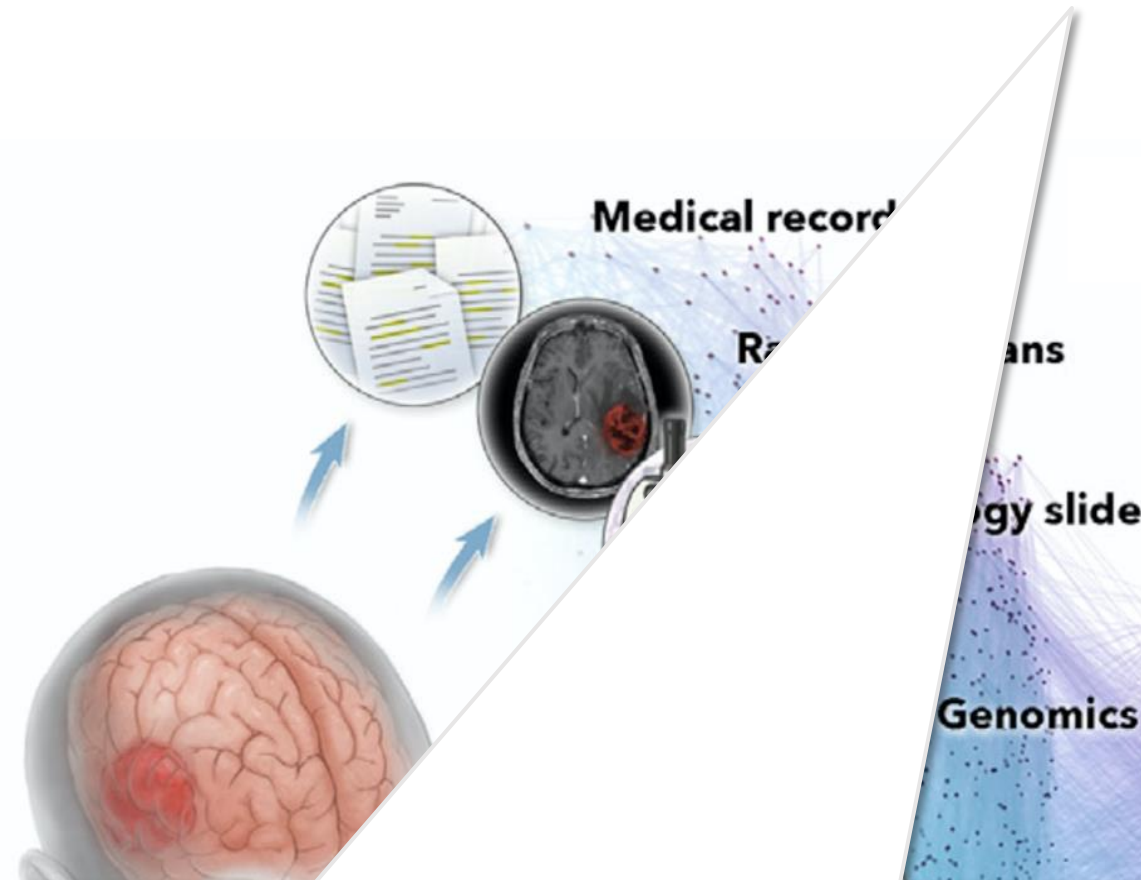[8]Department of Computer Science, Harvard University, Cambridge, MA, USA
[9]Harvard Data Science Initiative, Harvard University, Cambridge, MA, USA
*Correspondence: faisalmahmood@bwh.harvard.edu
https://doi.org/10.1016/j.ccell.2022.09.012

Example Precision Cancer Medicine

https://doi.org/10.1016/j.ccell.2022.09.012

WP9: Demonstration of Feasibility (Pilots)

Technology platforms

1. Patient samples /data & meta-data

2. Data generation & quality assurance

Physical testing facility

Virtual testing facility

Predictions

- Diagnosis
- Prognosis
- Survival
- Treatment response
- Treatment toxicity
- Recurrence
- Risk stratification
- Side effects
- ...

"Change how we generate data,
how do we make data interoperable and accessible
for AI-development in research, clinics and SME:s
in the Health domain"

3. Data analysis, integration and sharing

4. Validation, Standardization, Certification

5. Clinical implementation

Disease focus:
Neurotec
Cancer
Cardiovascular
Intensive Care

The Panel

Luis Martí Bonmatí from La Fe University Hospital in Valencia, Spain – Coordinator of the EUCAIM project.

Gianna Tsakou, Senior Project Manager/Analyst at Gruppo Maggioli, Athens, Greece – Coordinator of the H2020 INCISIVE Project, Data Federation & Interoperability WP Co-Leader of the EUCAIM project

François Roucoux from Réseau HUmani – University hospital of Charleroi, Belgium – Coordinator of the Walloon node from the TEF-Health project

Päivi Östling from Science for Life Laboratory, Department of Oncology-Pathology, Karolinska Institutet, Sweden – Associate Professor, co-Principal Investigator, member of TEF-Health consortium.

RESEARCH TO REALITY

Thank you!

RESEARCH
TO REALITY