

Breakout: EU-AM-AP collaboration

Outline

- EU – Liesbet Geris
- AM – [US initiative]
- AP – Thiranjia Prasad Babarenda Gamage
- Example: the immune digital twin – Anna Niarakis & Garry An

EU

Liesbet Geris



#HorizonEU

THE EU RESEARCH & INNOVATION PROGRAMME 2021 – 27

This presentation is based on the political agreement of 11 December 2020 on the Horizon Europe. Information on some parts is pending revision.

19 March 2021

Research and
Innovation

HORIZON EUROPE

EURATOM

SPECIFIC PROGRAMME: EUROPEAN DEFENCE FUND

*Exclusive focus on
defence research
& development*

Research
actions

Development
actions

SPECIFIC PROGRAMME IMPLEMENTING HORIZON EUROPE & EIT*

Exclusive focus on civil applications



Pillar I EXCELLENT SCIENCE

European Research Council

Marie Skłodowska-Curie

Research Infrastructures



Pillar II GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS

Clusters

- Health
- Culture, Creativity & Inclusive Society
- Civil Security for Society
- Digital, Industry & Space
- Climate, Energy & Mobility
- Food, Bioeconomy, Natural Resources, Agriculture & Environment

Joint Research Centre



Pillar III INNOVATIVE EUROPE

European Innovation
Council

European Innovation
Ecosystems

European Institute of
Innovation & Technology*

WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA

Widening participation & spreading excellence

Reforming & Enhancing the European R&I system

Fusion

Fission

Joint
Research
Center

* The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

HORIZON EUROPE

SPECIFIC PROGRAMME IMPLEMENTING HORIZON EUROPE & EIT*

Exclusive focus on civil applications



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WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA

Widening participation & spreading excellence

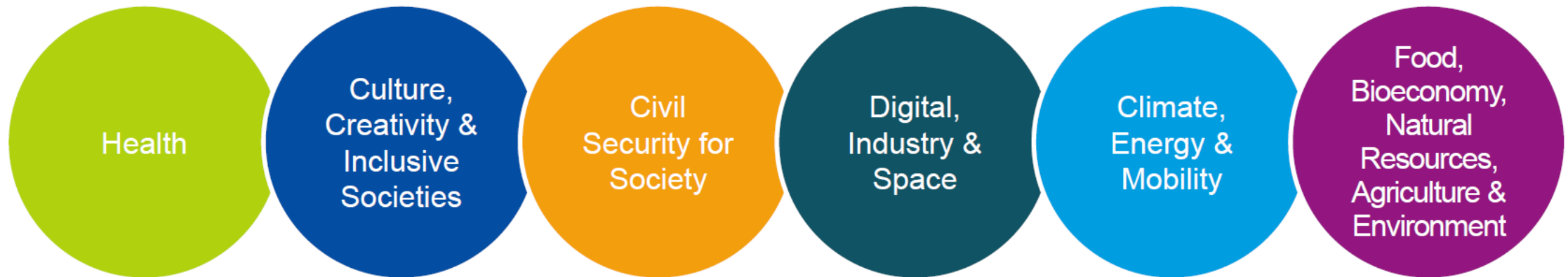
Reforming & Enhancing the European R&I system

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Pillar II - Clusters

GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS:

boosting **key technologies** and solutions underpinning **EU policies & Sustainable Development Goals** (6 clusters and JRC – non-nuclear direct actions)



€53.5 billion



International Cooperation

International Cooperation

Tackling together global societal challenges; access to the world's best talents, expertise and resources; enhanced supply and demand of innovative solutions

Association to Horizon Europe

- Third countries with good capacity in science, technology and innovation
- Taking into account objective of driving economic growth in Europe through innovation
- Intensified targeted actions
- Strengthened support to multilateral cooperation
- Openness to international participation balanced with the promotion of EU strategic autonomy



Open Science across the programme

Open Science

Mainstreaming of open science practices for improved quality and efficiency of R&I, and active engagement of society

Mandatory immediate Open Access to publications: beneficiaries must retain sufficient IPRs to comply with open access requirements;

Data sharing as 'open as possible, as closed as necessary': mandatory Data Management Plan for FAIR (Findable, Accessible, Interoperable, Reusable) research data

- Work Programmes may incentivize or oblige to adhere to **open science practices** such as involvement of citizens, or to use the **European Open Science Cloud**
- Assessment of open science practices through the **award criteria** for proposal evaluation
- Dedicated support to **open science policy actions**
- **Open Research Europe** publishing platform



European
Commission

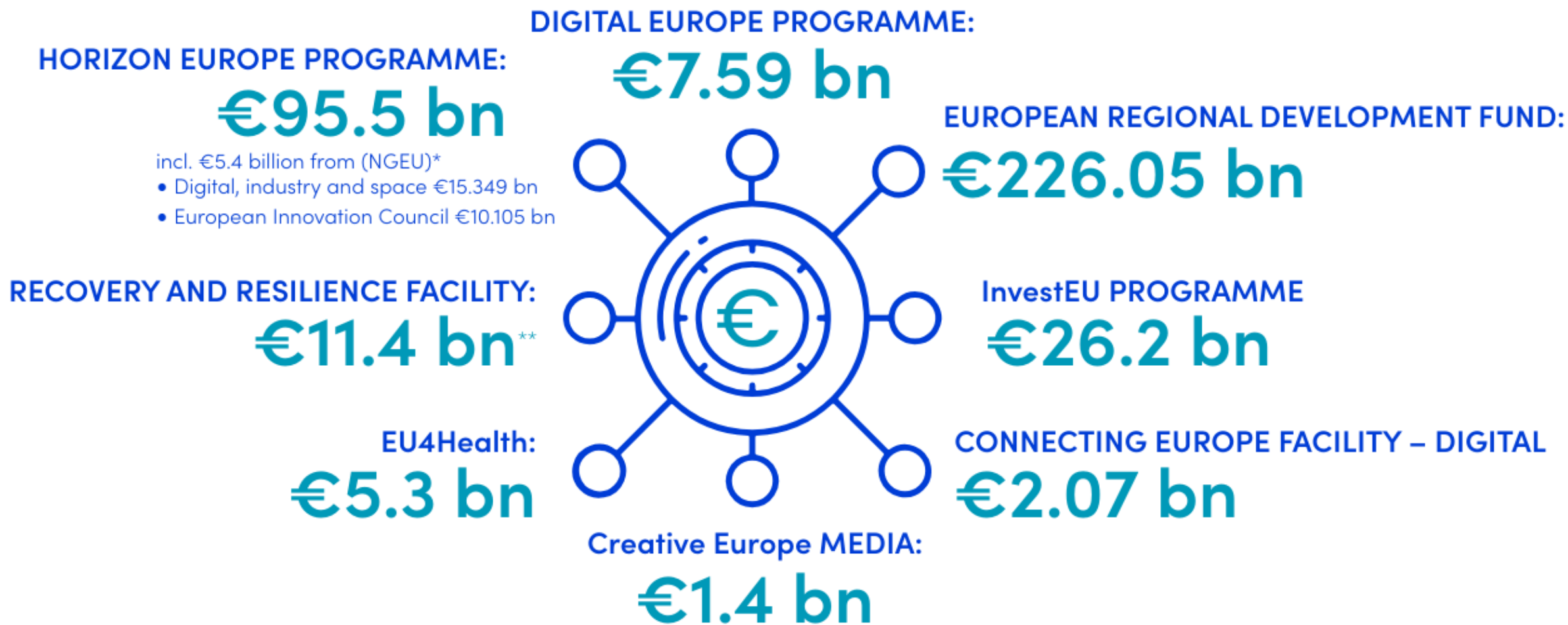


**DIGITAL
EUROPE
PROGRAMME**

**DIGITAL
EUROPE PROGRAMME**

#DigitalEUprogramme #DigitalEU

State of play : Funding for Digital in MFF 2021-2027



New Zealand

Thiranja Prasad Babarenda Gamage

Links Between SPARC, 12 LABOURS, VITAL, and EDITH

July 15 2024



Thiranja Prasad **Babarenda Gamage** (tp.babarendagamage@auckland.ac.nz)

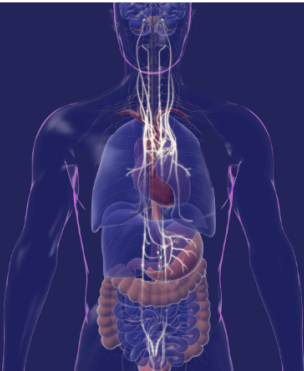


[Data & Models](#) [SPARC Apps](#) [Tools & Resources](#) [News & Events](#) [About](#) [Submit to SPARC](#)

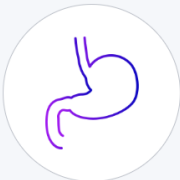
Visit: sparc.science

SPARC — bridging the body and the brain

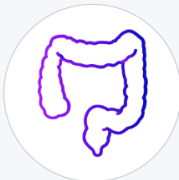
The SPARC Portal is an open neuroscience and systems physiology platform containing multi-species data, knowledge, computational modeling and spatial mapping. Share your data and models to drive development of treatments that change lives.



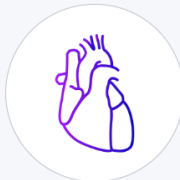
Find Data by Category



Stomach



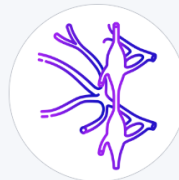
Colon



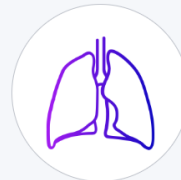
Heart



Urinary System



Nerves & Ganglia



Lung



The Common
Fund

2015-2025

60+ Research Groups around the world

90 Institutions and companies

>15 organ systems

8 Species

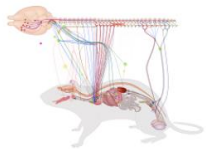
>200 Curated datasets (now accepting non-SPARC datasets)

**SPARC Dataset
Structure***

Findable Accessible Interoperable Reusable

*Bandrowski et al biorxiv

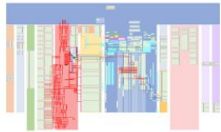
Anatomical Connectivity



The Anatomical Connectivity (AC) flatmaps show physical connectivity derived from SCKAN in an anatomical schematic context.

[View AC Map](#)

Functional Connectivity



The Functional Connectivity (FC) flatmap provides a visualization of semantic connectivity for a mammalian body.

[View FC Map](#)

3D Whole Body



The 3D whole-body shows physical connectivity derived from SCKAN in an anatomically realistic context.

[View 3D Body](#)

Functional Connectivity Map - Modelling Interface

Systems

- ☒ All
 - ☒ MSK_SYSTEM
 - ☒ NERVOUS_SYSTEM
 - ☒ CARDIORESPIRATORY_SYSTEM
 - ☒ DIGESTIVE_SYSTEM
 - ☒ URINARY_SYSTEM
 - ☒ IMMUNE_SYSTEM
 - ☒ SPECIAL_SENSES
 - ☒ ENDOCRINE_SYSTEM
 - ☒ REPRODUCTIVE_SYSTEM_MALE
 - ☒ REPRODUCTIVE_SYSTEM_FEMALE

Alert

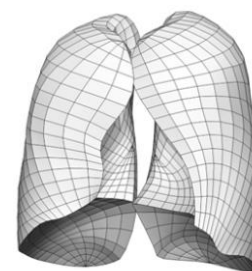
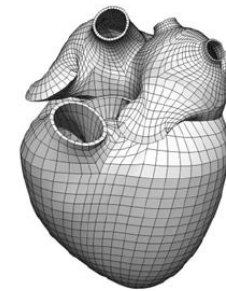
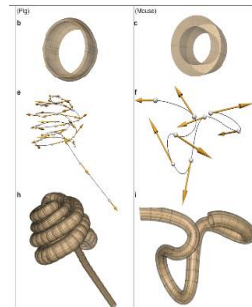
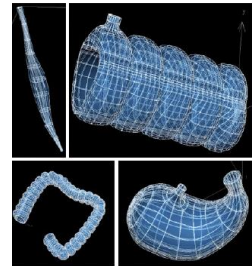
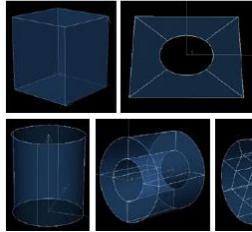
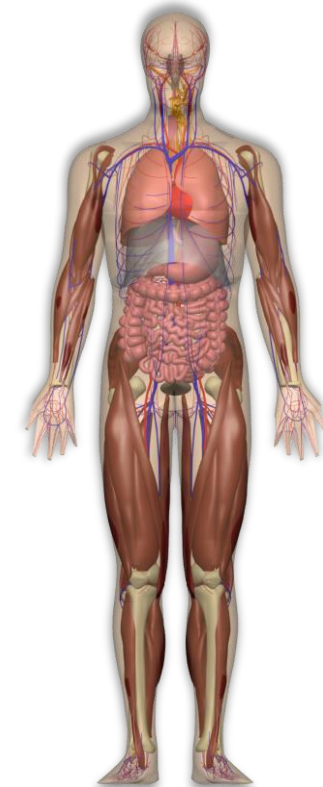
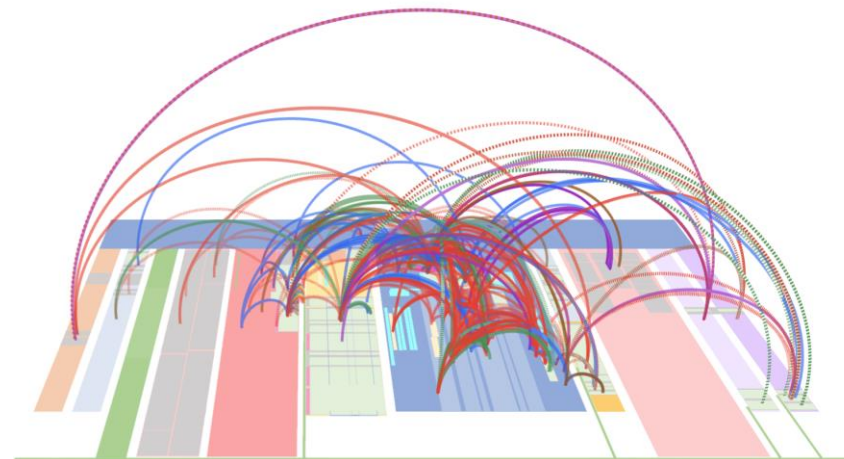
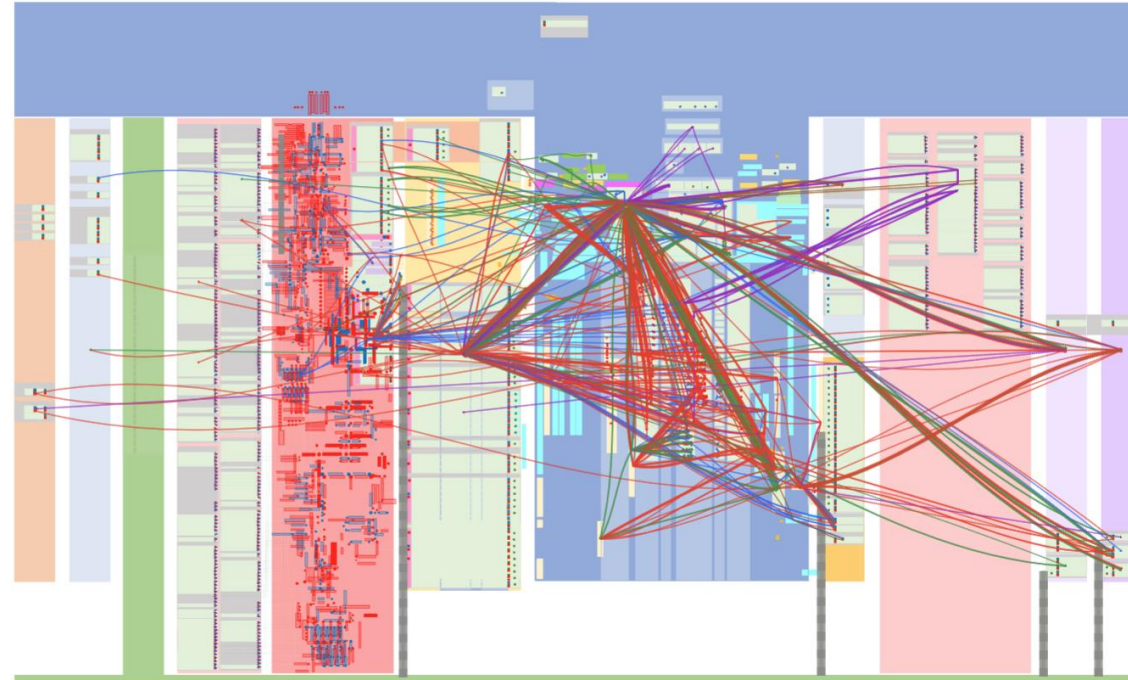
☒ Display all

- ☒ Display Path With Alerts
- ☒ Display Path Without Alerts

Pathways

☒ Display all

- ☒ CNS
- ☒ Local circuit neuron
- ☒ Parasympathetic pre-ganglionic
- ☒ Parasympathetic post-ganglionic
- ☒ Sensory (afferent) neuron
- ☒ Somatic lower motor
- ☒ Sympathetic pre-ganglionic
- ☒ Sympathetic post-ganglionic
- ☒ Other neuron type
- ☐ Arterial blood vessel
- ☐ Venous blood vessel



12 Labours - Translation of Digital Twins

2021-2025



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HIKINA WHAKATUTUKI

12 Labours – Platform 1 – FC Map Modelling Interface

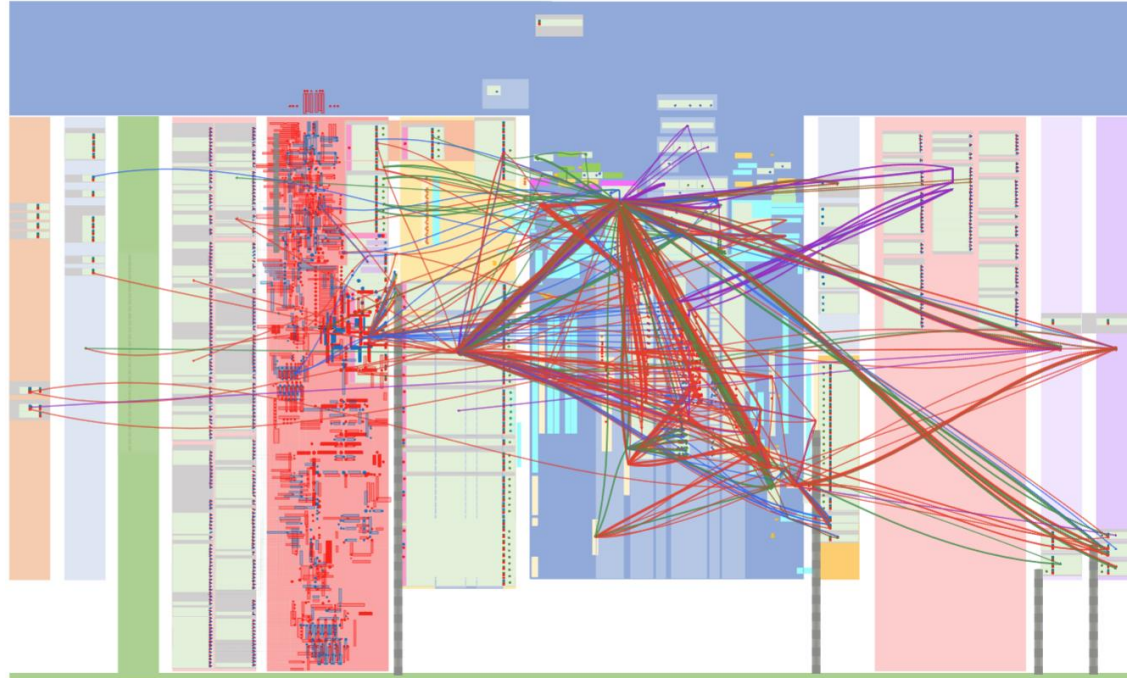
2021-2025



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Tech Platform 1



Physiology
Pathophysiology
Anatomy
Physics

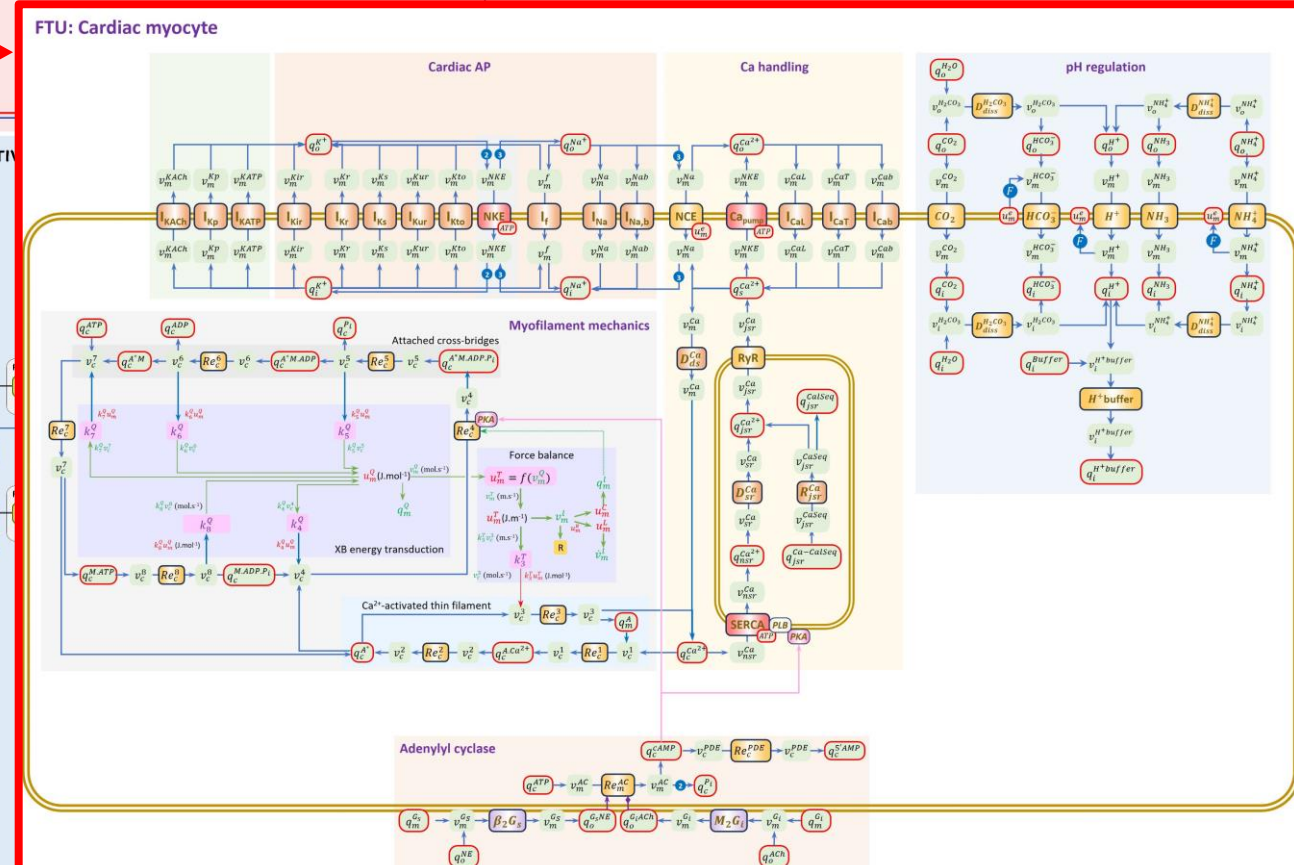
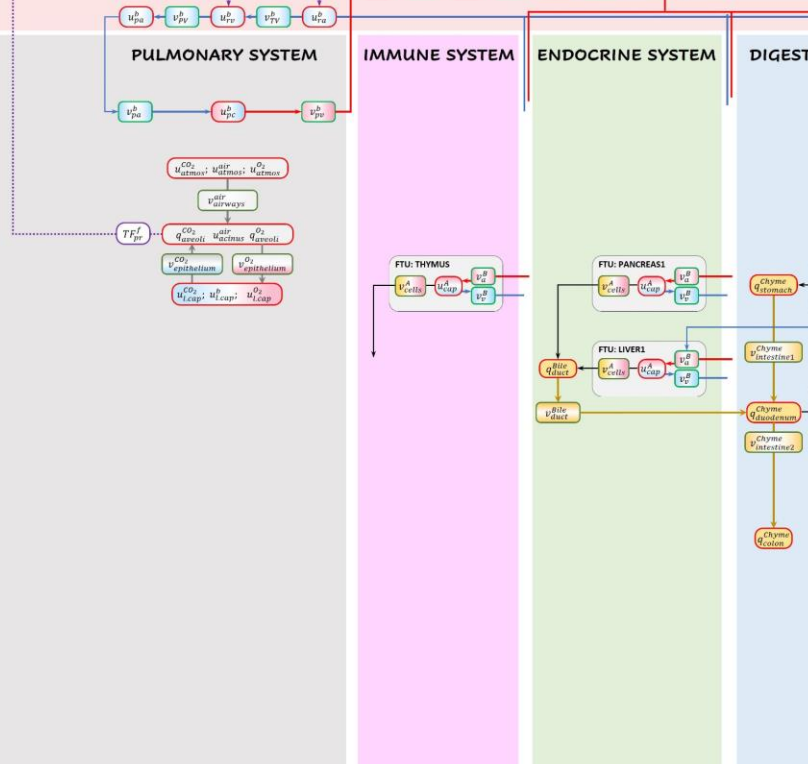
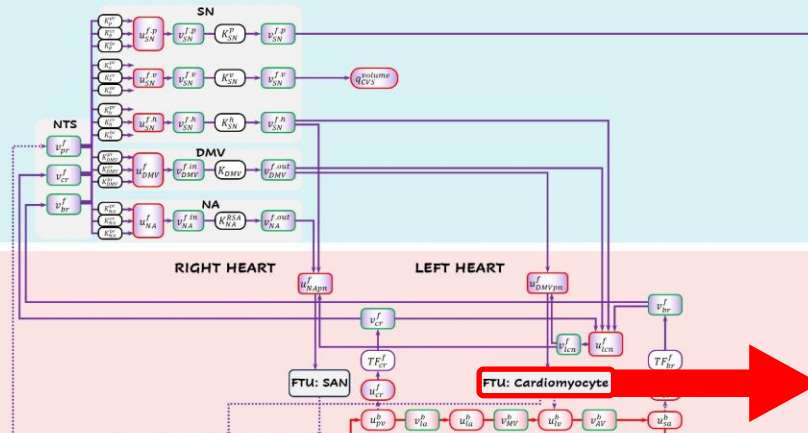
12 Labours – Platform 1 – FC Map Modelling Interface

BRAIN & NERVOUS SYSTEM

CARDIOVASCULAR SYSTEM

VE SYSTEM

Horizon Europe



12 Labours – Platform 2 and 3

2021-2025

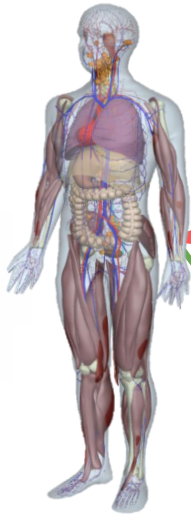


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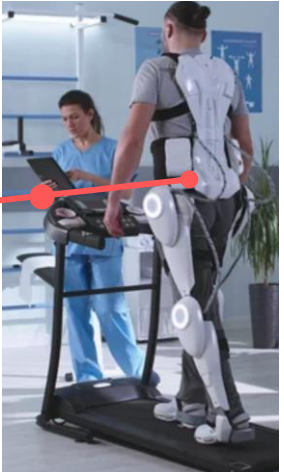


Tech Platform 1

Personalisation Workflows



Personalised
Digital Twin
Tech Platform 2



Clinical Healthcare



Home-based Healthcare



Implantables Wearables
Tech Platform 3

Surface
Imaging

Clinical
Recordings

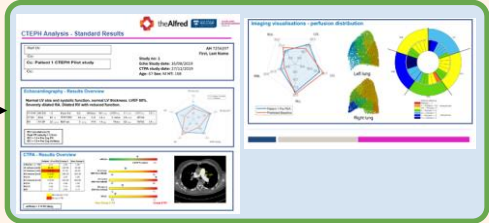
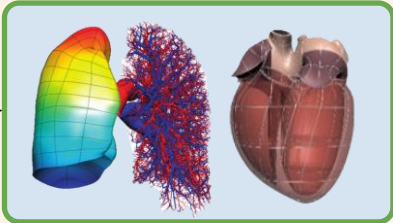
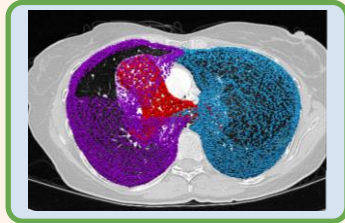
Lab
Tests

12 Labours – Exemplar Projects

Personalisation

Application

Biomarkers for pulmonary hypertension

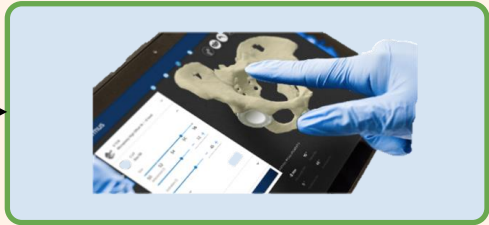
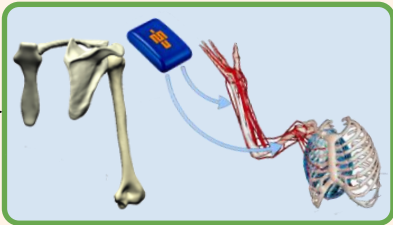


Merryn
Tawhai



Martyn
Nash

Personalised rehabilitation of upper limb disorders

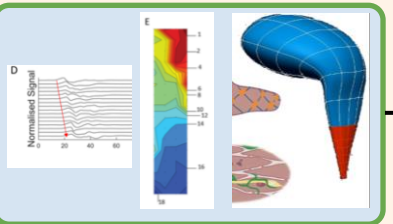
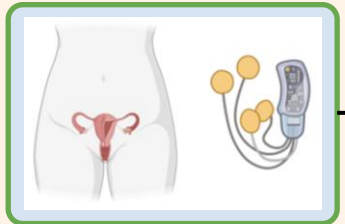


Thor
Besier



Julie
Choisne

Uterine health (fertility)

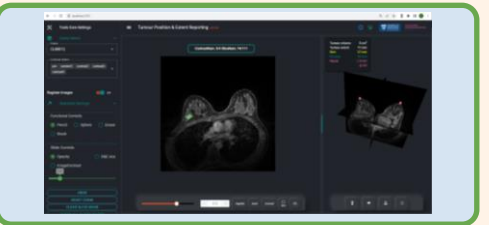
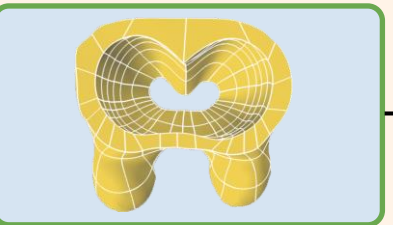


Alys
Clark



Leo
Cheng

Automated reporting of breast cancer



Prasad
Babarenda
Gamage



Martyn
Nash



Poul
Nielsen

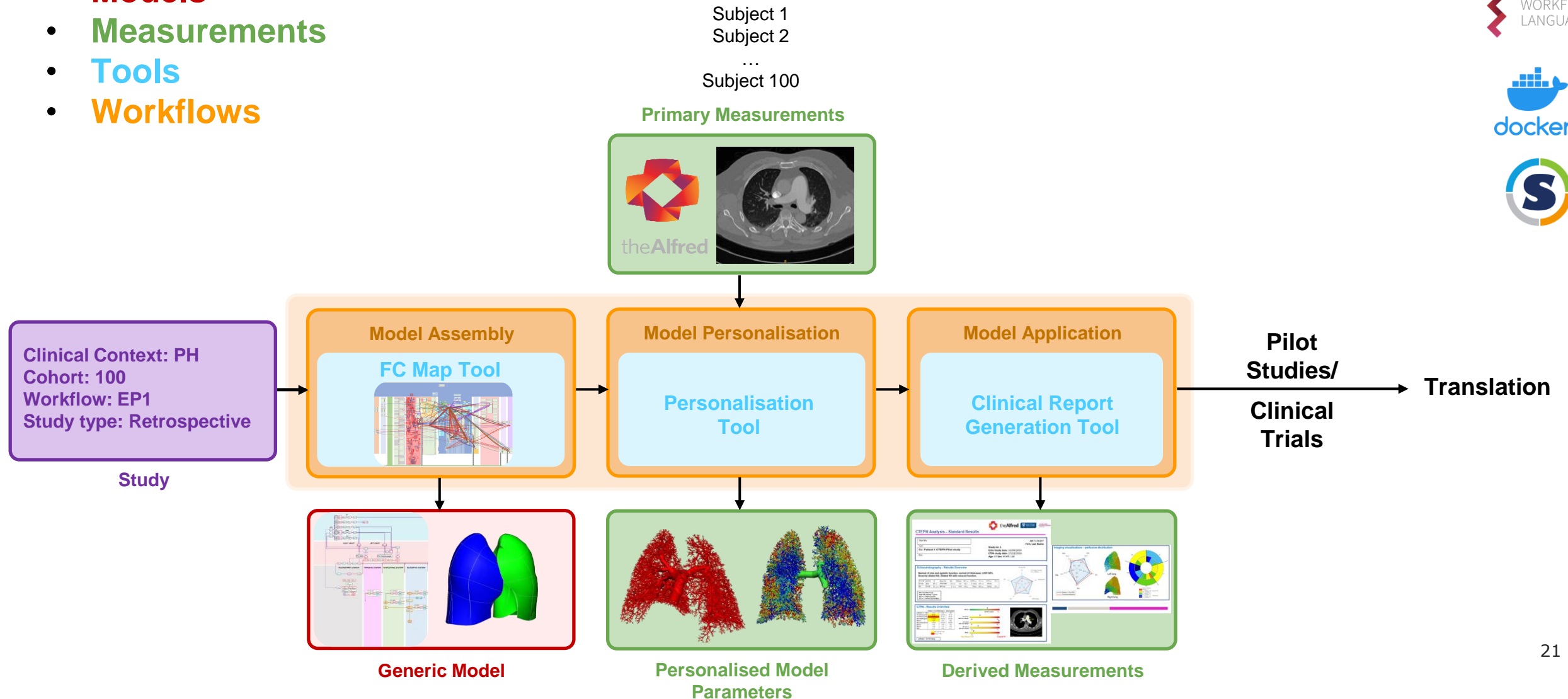
Adopt across 300 ABI researchers/30 research groups & NZ & AU (UNSW)

12 Labours - Standardising Workflows

Data Objects

- **Models**
- **Measurements**
- **Tools**
- **Workflows**

FAIR



Data Objects

- **Measurements** →
- **Models**
- **Tools**
- **Workflows** →

Wrappers (Adapters)



REPOSITORY

- Data from 200 patients to be harmonised/curated in VITAL
 - Clinical data
 - Wearable data
- 1. Predicting blood pressure response to renal denervation in patients with resistant hypertension (**VITAL-RDN**)
- 2. Predicting clinical response to Finerenone in patients with HFpEF with chronic kidney disease resistant hypertension (**VITAL-HFpEF/CKD**)
- 3. Predicting clinical response to Tafamidis in patients with HFpEF with ATTR cardiac amyloidosis (**VITAL-HFpEF/AMY**)
- 4. Predicting clinical response to cardiac resynchronisation therapy (CRT) in patients with HFrEF with dyssynchrony (**VITAL-HFrEF/DYS**)
- 5. Predicting hemodynamic response in patients with hemodynamically complicated atrial septal defects (ASD) (**VITAL-ASD**)



- Vision: Align standards so workflows & tools can be shared & run between platforms (EDITH, SPARC, 12L)

12 Labours – DigitalTWINS Platform

DigitalTWINS Platform

Harmonised Database

Repositories



Models

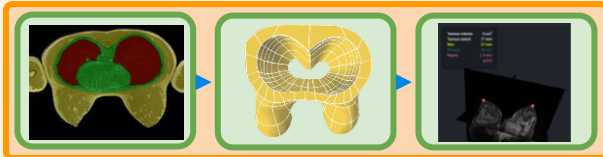
Tools

Measurements

Workflows

Workflow Execution

EP 1,2,4 Clinical Workflows

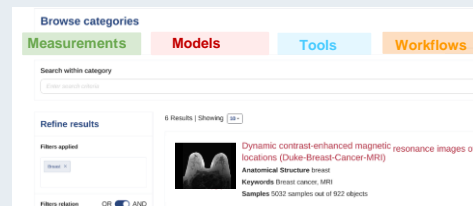


EP 3 Pre-Clinical Workflow

Data Ingress



Data Catalogues



- Physiome **Model** Repository (PMR) (2000-ongoing)
- 12 L DigitalTWINS **Measurement** Repository (2025-)
 - Study submit ethics
 - Use 12 Labours ethics templates for sections of ethics application
 - Secondary use
 - Linking to health data
 - Future contact for further linking
 - Study collects consent/data
 - Study contributes data to repository
 - Others can then:
 - Reuse existing data
 - Approval from governance board
 - Ethics approval
 - Collect new data & link to existing data
 - Future contact -> collect consent/data -> contribute
- Tiered structure
 - Sensitive tier in **Secure Research Environment**
 - Deidentified tier with study specific identifiers
 - Public metadata tier
- Data deidentification/contribution/access protocols

12 Labours – Interoperability with Healthcare Standards

- Using HL7 FHIR standard to link data & results from multiple workflows to the same patient

DigitalTWINS Platform

Harmonised Database

Repositories



Models

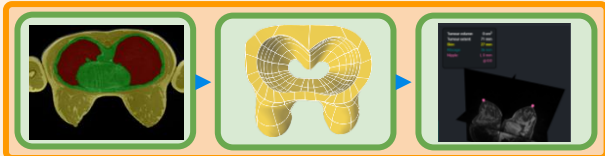
Tools

Measurements

Workflows

Workflow Execution

EP 1,2,4 Clinical Workflows

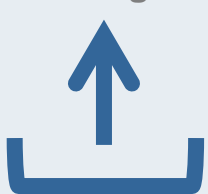


EP 3 Pre-Clinical Workflow

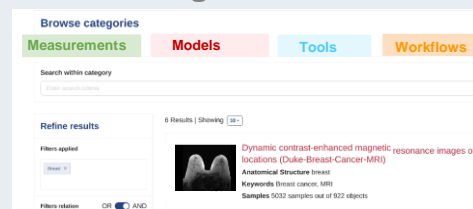
DigitalTWINS on FHIR



Data Ingress



Data Catalogues



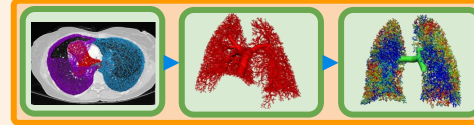
Measurements

Imaging Study (PH)
(FHIR Imaging Study Resource)



Workflow & Tools

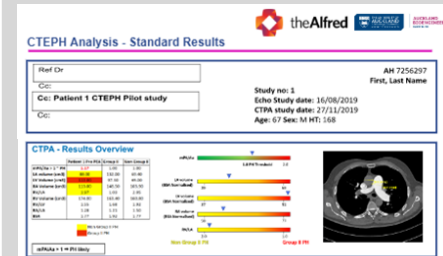
Pulmonary Hypertension
(FHIR Condition Resource)



Exemplar Project 1 Pulmonary Hypertension Workflow

Remodelling Level
(FHIR Risk Assessment Resource)

Pulmonary Hypertension
Report
(FHIR Diagnostics Report Resource)



Coding (Definitions of Concepts)

- Coding System: LOINC

1. Stroke Volume Calculation:

- LOINC Code: 20328-1 <https://loinc.org/20328-1/>
- Description: Stroke Volume by US.2D+Calculated

2. Left Ventricular Ejection Fraction (LVEF):

- LOINC Code: 18043-0 <https://loinc.org/18043-0>
- Description: Left ventricular Ejection fraction by US modified Simpson method

Units (Stored in Value Sets)

- Coding System: measure.org
- Code: UCUM (Unified Code for Units of Measure)
 - Stroke Volume: mL
 - Ejection Fraction: %
 - Cardiac Output: L/min

- Caters for persistent VHT, or application-specific DTs & assign credibility (in silico, retrospective, prospective trials)
- Populate with synthetic EHR to create virtual cohorts (with images)
- Automated workflow assembly for clinical problems

12 Labours Platform 2 - Clinical Translational Technologies (CTT) Group



AUCKLAND
BIOENGINEERING
INSTITUTE



Prasad Babarenda Gamage (lead)
David Chinchien Lin
Jiali Xu
Ayah Elsayed
Linkun Gao

Research/Community Collaborators & Advisors



Diana Siew (ABI)
Koray Atalag (GALATA DIGITAL)
Alistair Young (KCL)



Tom Gillespie (UCSD)



Nick Jones



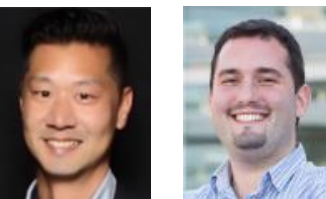
Claire Rye



Nathalie Giraudon

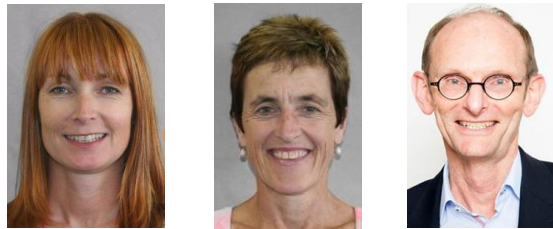


Jun Huh



Kent Lee
Pau Medrano-Gràcia

Clinical Collaborators & Advisors



Robyn Whittaker
Penny Andrew
Anthony Doyle



MANATŪ HAUORA



Pranil Singh
Jonathan Rawiri



Misty Edmonds



Cris Print



Annette Lasham



Nick Knowlton



- ABI Research Groups
 - ABI Software Team
- Centre for eResearch

Funding



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Iwi United Engaged Limited



MEDICAL AND
HEALTH SCIENCES

12 Labours Platform 1 Team



Peter
Hunter



David
Nickerson



Alan
Garny



Richard
Christie



Hugh
Sorby



Dave
Brooks



Mabelle
Lin



Finbar
Argus



Vickie
Shim



Jagir
Hussan



Tommy
Yu



Alan
Wu



Massoud
Alipour



Elias
Soltani



Niloofar
Shahidi



Naz
Ebrahimi



Weiwei
Ai

Funding:



NZ Govt *12 Labours project.*

SPARC NIH *SPARC MAP-Core.*

Questions – Discussion (after presentations)

Discussion points

- Communication
 - Success stories to help show progress: IDT
 - Find relevant project calls > overview?
- Facilitate collaborations across continents
 - Find relevant partners across the globe
 - Find collaborative platform

Discussion points

- Sharing roadmaps & recommendations
 - Strategic documents
 - Key learnings, knowledge base,
 - Aligning on vision & key-elements > interoperability-by-design
 - Mapping between standards
- For all stakeholders : Industry, academia, clinicians, patients, policy makers, regulatory, HTA, payers
 - Patients as drivers? Rare diseases, pediatrics,...