

# Systemising the adoption of Artificial Intelligence in public healthcare systems: the Catalan approach



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## Contents

### Context

### Main axes of the AI Strategy of Catalonia

#### 1. Research and Innovation

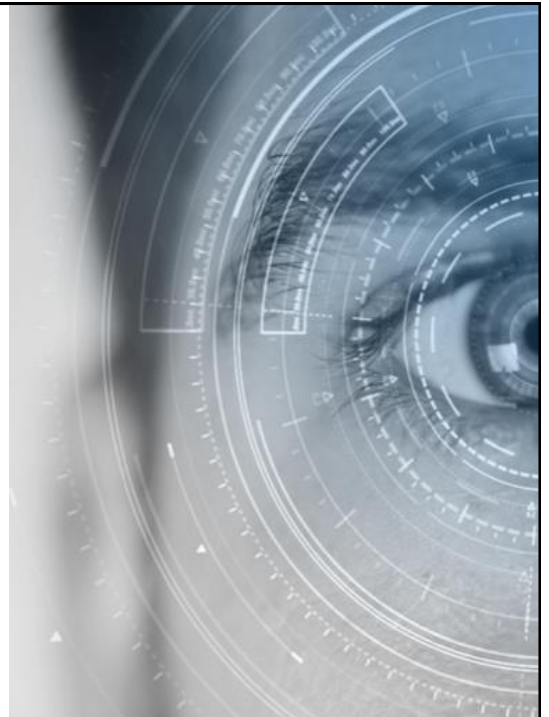
AI Challenges

Supporting local AI initiatives

Health AI Observatory

#### 2. Evaluation

#### 3. Implementation



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## Context: Health/AI Program creation



### MISSION

Creation of an enabling environment for innovation in the field of Health through the development and implementation of AI solutions to **improve care for citizens and support Healthcare Professionals**



### VISION

Lead the implementation of AI solutions to contribute to the improvement of **Healthcare Quality** and the **Sustainability** of the Healthcare system, valuing the generated knowledge.



### VALUES

Transparency, efficiency, innovation, commitment, participation, respect, sustainability.



Generalitat de Catalunya

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## Context: Benefits



### ECOSYSTEM

Promote the AI ecosystem in Health by fostering research and innovation and facilitating the transfer of knowledge to the Healthcare System



### EFFICIENCY

The development of these solutions at the systemic level will make it possible to look for efficiencies between all the centers of the System



### DATA QUALITY

Participate in the promotion of the improvement in the quality of the information of the Health System



### ALIGNMENT

It allows a strategic alignment of all medical centers in response to global health policies



### EQUITY

Guarantee access to AI solutions by all citizens, avoiding inequalities between centers and homogenizing the quality of care



Generalitat de Catalunya

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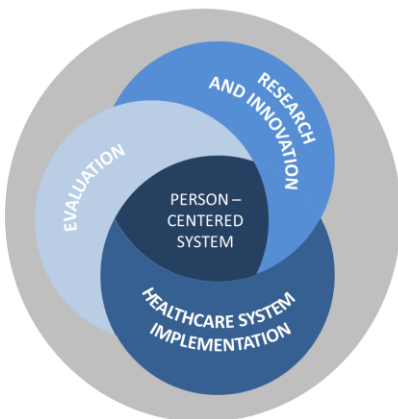


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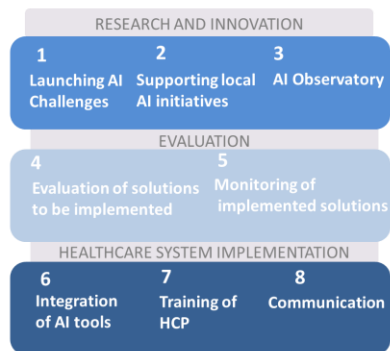
## Main axes of the AI Strategy of Catalonia

The Program embraces the entire life cycle of AI tools; from its conceptualization to its implementation:

### Main axes



### Strategic actions



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## HEALTH/AI PROGRAM - INNOVATION



### Launching AI Challenges

Cover the needs of the Healthcare System, expressed through the Ministry of Health, that can be solved through the application of AI.

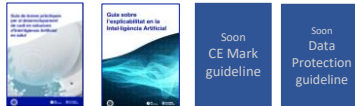
- Diabetic Retinopathy** classification
- Identification of main findings in **Chest X-Ray** radiographs
- Identification of main findings in imaging tests in **Dermatology**
- Provision of reliable information in the scope of **drug prescription and medicines**



### Supporting local AI initiatives

Promoting those initiatives in the Catalan ecosystem that represent a high value for the Health System.

- Mentoring during **project definition and execution**
- Definition of technical, ethical and legal requirements.
- Publication of **good practices guidelines**



### Health AI Observatory

Observing the deployment of AI for Health and act as a radar of the latest innovations in the field.

- **Register of AI tools** to analyse the level of implementation of AI, the maturity of the solutions and identify solutions that could become systemic
- **Radars of the latest innovations in AI** in the field of Health at an international level: trends, regulations, reference documentation, dissemination of knowledge...



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## Challenges of the Salut/IA program

### 1. S/ Needs identification

### 2. Challenge proposal development

- State-of-the-art review
- Use case definition
- Data identification
- Expert team definition
- Planning and budget estimation

D1-D2

### 3. Proposal approval and definition of the procurement process and executing entity.

### 4. Working group and experts constitution

#### Responsible entities:

- AQUAS
- Salut/IA Program Executive Committee.
- Fundació TIC Salut Social
- S/ Catalonia Healthcare System
- Other possible entities based on the challenge

### 5. Procurement process

- Preliminary market consultation
- Tender Planning
- Preparation of the specifications
- Publication of the specifications

D3-D5

### HEALTHCARE SYSTEM DATASETS

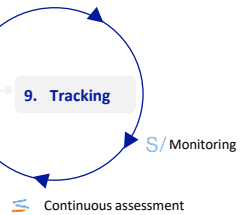
The solutions will be validated and subsequently retrained on the datasets.

### 6. Evaluation of the proposals and validation of the algorithms

#### Associated documentation:

- D1 State-of-the-art study
- D2 Challenge proposal
- D3 CPM guidelines
- D4 CPM final report
- D5 Tender specifications
- D6 Tender resolution

S/ Evolution of the solutions



### 8. S/ Definition and initiation of deployment

### 7. Adjudication

D6



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## HEALTH/AI PROGRAM - INNOVATION



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Guia de bones pràctiques per al desenvolupament de codi en solucions d'Intel·ligència Artificial en salut

Guia sobre l'explicabilitat en la Intel·ligència Artificial

Soon CE Mark guideline

Soon Data Protection guideline



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## HEALTH/AI PROGRAM – INNOVATION

### Supporting local AI Initiaves



#### Mentoring during project definition and execution

- Identification of projects that represent a high value for the Health System
- Main needs identification
- Solution proposals
- Project's evolution tracking.



#### Publication of Good practices guidelines

Published guidelines  
<https://iasalut.cat/en/suport-a-iniciatives/>



Good Practices for code development in AI for health

Explainability in Artificial Intelligence Guideline



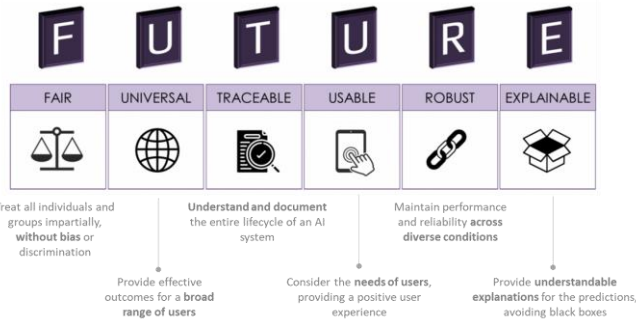
HEALTH/AI PROGRAM – INNOVATION

Supporting local AI Initiatives. Trustworthy AI framework



Definition of requirements for the implementation of trustworthy AI tools (ethical, legal and robust).

Definition of the technical, ethical and legal requirements: FUTURE principles



- Data scientists
- Clinicians
- Ethicists
- Social scientists
- Legal experts

[www.future-ai.eu](http://www.future-ai.eu)



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HEALTH/AI PROGRAM - INNOVATION



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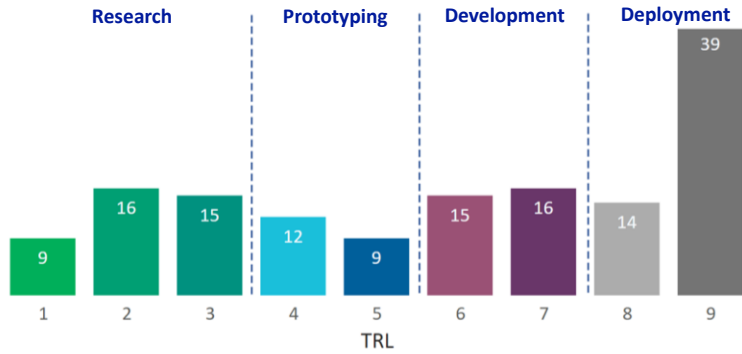
### AI Observatory Indicators

**145** AI tools registered

**79** different entities



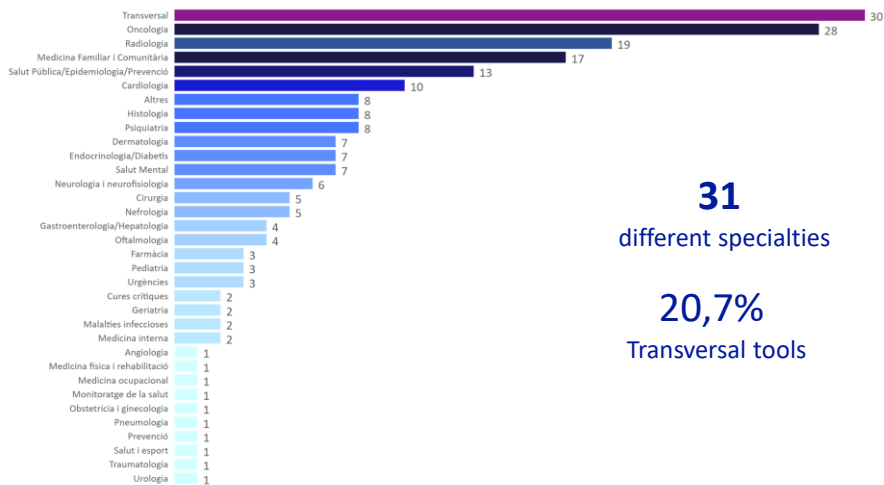
**Technology Readiness Level (TRL)**



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### AI Observatory Indicators

#### Medical specialties



**31**  
different specialties

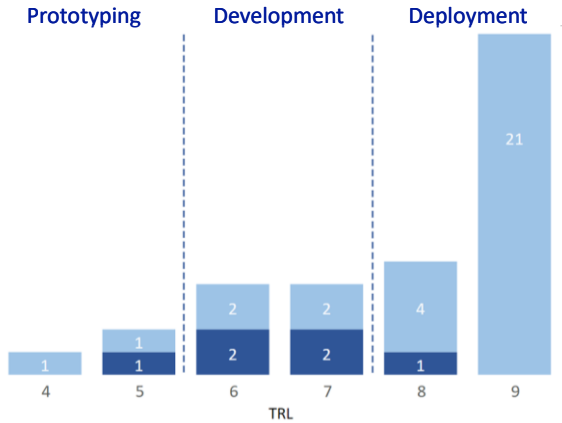
**20,7%**  
Transversal tools



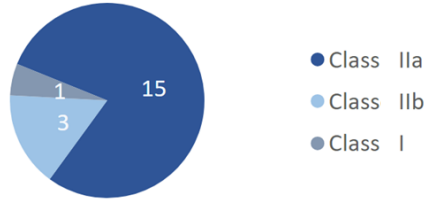
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## AI Observatory Indicators

### Interoperability and standards



### CE marking



**19**  
CE marked tools

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## AI Observatory Indicators

**42%** of the tools use  
**Explainability techniques**

Combinations	Variable importance	CAM or similar	LIME	SHAP	Others	Number of tools
1	X					10
2		X				3
3	X		X	X		1
4	X				X	1

Most tools use **images** as input data  
and some of them combine them with  
**tabular data**

Combinations	Image	Tabular data	Text	Sound	Other	Number of tools
1	X					11
2	X	X				11
3					X	8
4		X				7
5		X	X			2
6	X		X			2
Other combinations						4

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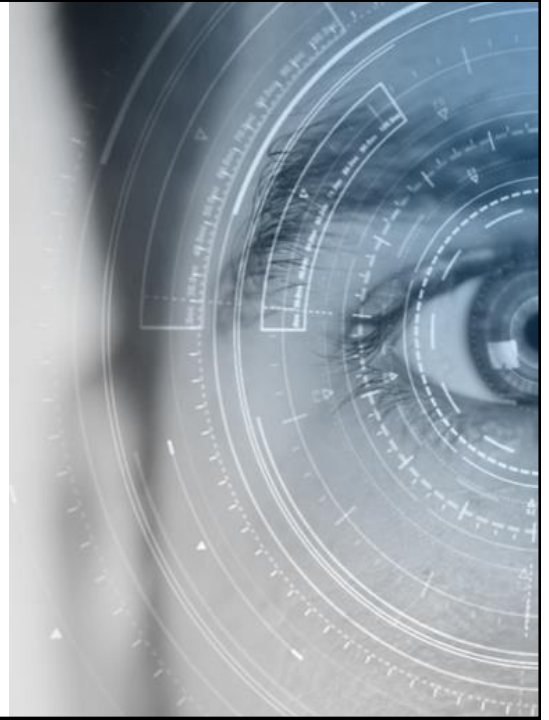
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## HEALTH/AI PROGRAM - EVALUATION



### Evaluation before implementation

*Methodology for AI tools evaluation*

**Evaluation** of tools before implementation at a systemic level

- Descriptive evaluation
- Impact evaluation
- Technical evaluation



### Monitoring

*Continuous evaluation of the implemented AI tools in the Catalan Healthcare System*

- Design of a **monitoring system** for the implemented tools via AI Challenges.
- **Indicators report** for each implemented solution
- **Periodical retraining** of implemented tools



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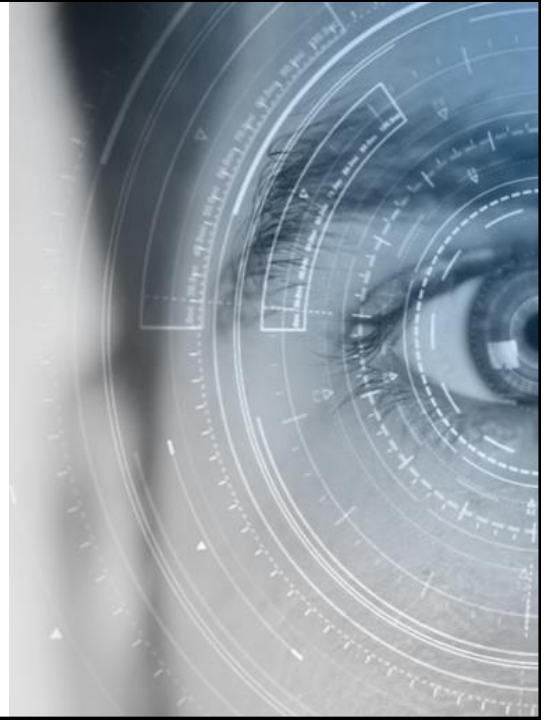
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## HEALTH/AI PROGRAM - IMPLEMENTATION



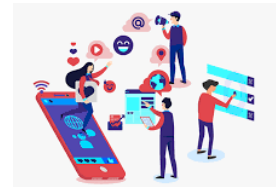
### Technological Integration

- > Integrate solutions into healthcare professionals workstations and into Information Systems
- > Data Governance



### Training of Healthcare Professionals

- > Development of an AI Training Plan depending on the needs and the profile: physicians, managers, researchers, patients...
- > Change management



### Communication

- > New website design for the Health/AI Program
- > Visual identity design
- > Participation in Congresses
- > Events organization



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