

# Introduction to the AI4HF project



**AI4HF**

Trustworthy Artificial Intelligence  
for Personalised Risk Assessment  
in Chronic Heart Failure



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# AI4HF: Advancing Trust in AI for Heart Failure Care

Until now, existing AI solutions remain a far distance from clinical adoption due to a key limitation: trustworthiness and acceptance by cardiologists and patients has not been achieved. AI4HF is the first project to implement a human-centred, multi-stakeholder, inclusive approach to improve awareness, acceptance and promotion of trustworthy artificial Intelligence (AI) solutions in cardiovascular risk assessment for heart failure (HF) patients.

Clinicians, patients, researchers and regulators will combine their efforts to develop a framework for the development of AI-solutions to assess personal HF patient's risk profiles to optimise clinical outcomes. The AI solutions will be developed and evaluated using multi-source cardiovascular data across Europe, South-America and Africa to ensure applicability across populations, clinical settings and ethnic groups.

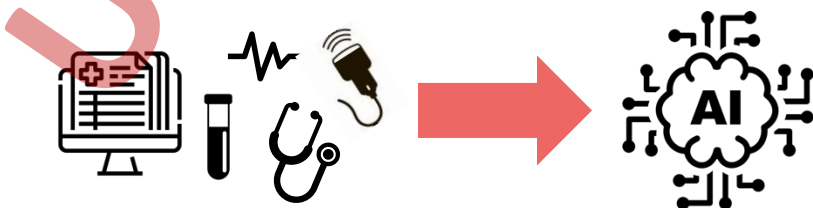


# A brief introduction in AI

Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks typically requiring human intelligence and learning from experience. Examples are understanding of natural language (retrieving diagnosis codes from clinical notes) or recognizing patterns in data (X-thorax pneumonia diagnosis).

Overall, the goal of AI is to create systems that can mimic human abilities, such as reasoning, problem-solving, perception, and learning. With the application of AI techniques in health-care, valuable insights, trends, predictions, correlations, or abnormalities in the data can be uncovered that may not be immediately apparent. Such knowledge discovery can lead to new insights and improve clinical decision-making and recommendations.

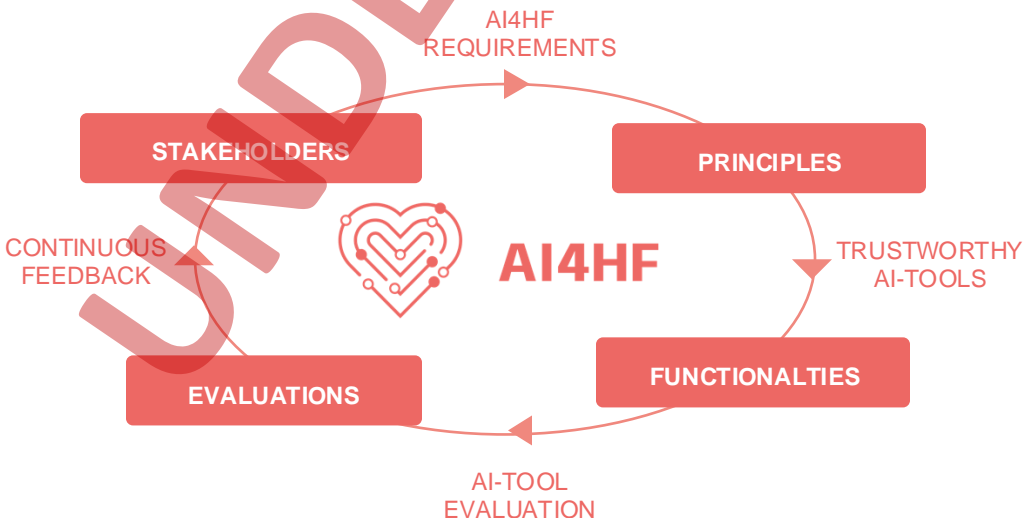
To train AI-models, access to relevant and high-quality data is required, specific to the AI-task. Depending on the type of algorithm to be trained, the amount of data can differ. Overall, the quality, quantity, and diversity of the data available play a crucial role in the success of AI systems for knowledge discovery and generalizability.



# The aim and structure of AI4HF

The aim of the AI4HF project is, together with patients and healthcare professionals, to co-design, develop, evaluate and exploit an integrative and trustworthy AI-model for tailoring the management of HF. The largest-ever dataset of HF patients across Europe, South America and Africa will be harnessed to develop and evaluate AI4HF tools to ensure application across populations, clinical settings and ethnic groups.

All project partners collaborate in a multidisciplinary framework, thereby making use of the feedback loop displayed in the figure below. The stakeholders consists of patients, healthcare professionals, researchers and regulators and based on the feedback of the different stakeholders, requirements are derived to inform the development of trustworthy AI tools.



# Trustworthy AI by design

Clinical implementation of AI-tools is currently limited. Within AI4HF trustworthiness and acceptance are key aspects. To address this, the AI4HF project focusses on the following aspects:

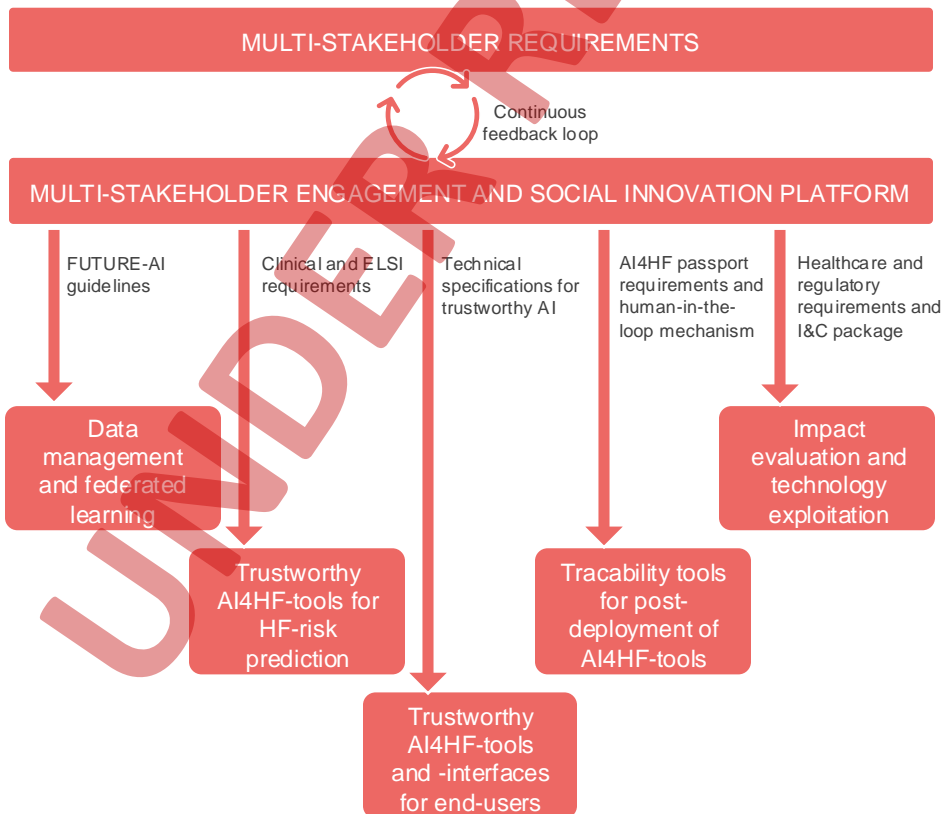
- **Internal and external validation** to ensure accuracy and relevance of discovered knowledge across diverse patient cohorts, clinical settings, and geographic regions to assess generalizability and robustness.
- Methods to provide model **explainability** focussing on improving clinician and patient trust in developed AI-models.
- Thorough **multi-disciplinary evaluation** prior to clinical implementation, focussing on effectiveness, safety, acceptance and potential impact on patient outcomes and clinical practice.
- Adequate **integration** of novel AI-tools in the existing work-flows by evaluating usability, integration within existing digital tools.

The FUTURE-AI guidelines provides the consortium with best practices and concrete recommendations for building trustworthy AI tools.



# AI4HF will develop requirements

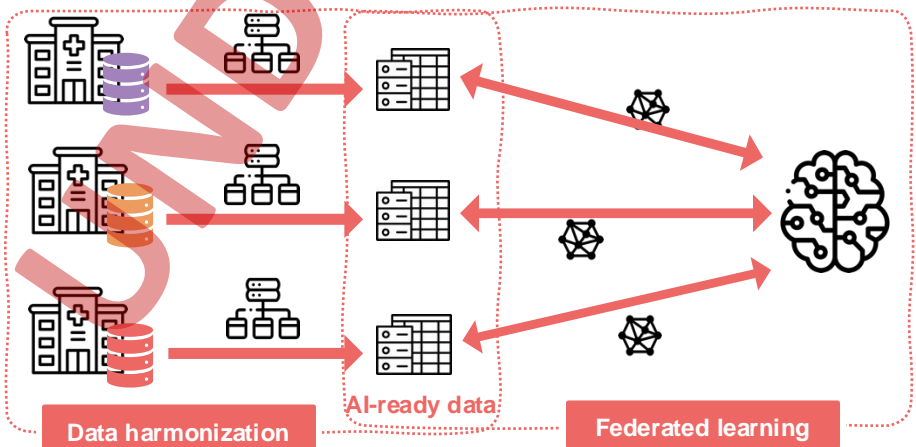
AI4HF will enhance inclusion by ensuring that AI tools are developed, validated and implemented in full alignment with the diversity of real-world needs and contexts through multi-stakeholder co-creation sessions. Functional, organisational, ethical and regulatory requirements are collected and a direct emphasis is placed on pathways, barriers and solutions for real-world implementation to produce practical insights to move AI tools from localised research to clinical implementation.



# AI4HF will develop AI-tools

The AI4HF consortium will use a Federated Learning strategy to develop multi-centre AI4HF-tools with increased robustness and generalisability. Federated Learning allows to collaboratively train AI-models across hospitals without the need to exchange any patient data. All patient data will be kept at their respective clinical site to ensure local patient privacy and are required to be harmonized according to the HL7-FHIR data format.

When performing Federated Learning, a global model is created and send to each local site. Then each site updates the model using local data, which is send back to the central server. All locally updated models are aggregated a new global model, which is send back to the locals sites for further training. The global model is iteratively updated to improve global model performance.



# AI4HF will deliver tools to enhance trustworthiness

Within the project, a human-centered approach will be applied in the development of trustworthy AI-tools.

The first step includes setting requirements for AI-tools by the different stakeholders through **continuous patient and clinician involvement**. Through continuous testing and end-user evaluation, developed AI-algorithms will be tailored towards end-user preferences and needs.

A strong focus is placed on developing **inclusive end-user interfaces** design by iteratively updating interfaces based on input from respective AI4HF-tool end-users (patients, health-care professionals and data managers). On top of this, user-manuals and training materials will be tailored for specific end-users.

**AI-passports** will be developed for AI developers, manufacturers, researchers, health organisations and regulators to inform on capabilities and important characteristics of AI4HF-tools. The AI-passport will provide key information about the AI's production and maintenance, including model characteristics, training and testing datasets, evaluation metrics and results, biases and other limitations, ethical approvals and data governance, as well as monitoring and continuous evaluations.





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