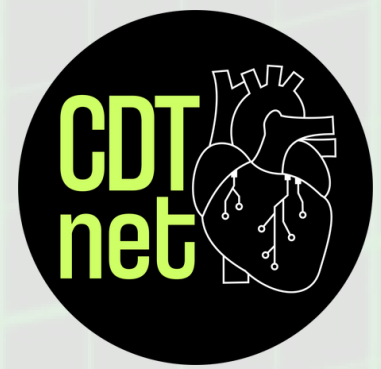


# F8 Digital Twin for Planning Valve Heart Interventions



## HOST ORGANISATION

FEops NV,  
Ghent, Belgium

## PHD AWARDING INSTITUTION

Ghent University  
(UG), Belgium

### Supervisory Team

Lead Supervisor

- Dr. Sofie Van Cauter (FEops)

Co-Supervisors

- Prof. Patrick Segers (Ghent University)
- Dr. Marta Sitges (IDIBAPS / Hospital Clínic Barcelona)

### Project Description

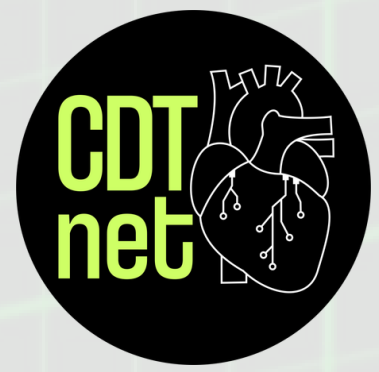
Transcatheter aortic valve implantation (TAVI) has revolutionised the treatment of aortic valve disease and is increasingly used in younger patients. As a result, a growing number of patients are expected to outlive their first implanted valve and require a second intervention, known as a redo TAVI procedure. These repeat procedures are technically challenging and can carry additional risks, such as the risk of obstructing access to the coronary arteries.

This project aims to extend and enhance FEops HEARTguide digital twin technology for the planning of redo TAVI procedures. FEops HEARTguide combines medical imaging, artificial intelligence and computational modelling (finite element analysis) to predict how a specific device will interact with an individual patient. Using pre- and post-procedural CT imaging data, the doctoral candidate will develop and validate new patient-specific computational models that provide insights to guide safe and effective redo TAVI planning.

As medical image analysis (e.g., reconstructing the anatomy and first valve implant) and computational modelling can be related with long processing/computing time, traditional tools may limit scalability. Therefore, the doctoral candidate will also investigate if surrogate models (e.g., AI-based) can serve as a viable alternative or can complement the existing tools. The project will investigate how different intervention parameters (e.g. valve type, size, position) can influence procedural outcomes and how this digital twin technology can support clinicians in selecting the most appropriate intervention strategy for individual patients.

The project benefits from FEops' extensive collaborations with leading cardiovascular centres across Europe, providing access to unique imaging datasets and real-world clinical cases.

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By combining engineering, computational modelling and clinical cardiology, the research will contribute to the development of safer and more personalised structural heart interventions.

## **Planned Secondments**

- University of Zagreb School of Medicine, Croatia (short visits in Years 1 and 2): observation of valve intervention procedures and analysis of the complete patient pathway from diagnosis to follow-up.
- IDIBAPS, Barcelona, Spain (short visits in Years 1 and 2): clinical exposure to valve disease management and structural heart interventions.
- Ghent University, Belgium (1 month in Year 1 and 1 month in Year 3): advanced training in computational fluid dynamics and cardiovascular modelling.

## **Desirable Project-Specific Qualifications and Skills**

- Strong background in engineering or mathematics
- Experience with computational modelling (finite element analysis) is required (Abaqus software is advantageous)
- Experience with scientific programming (e.g., Python) is desirable
- Experience with medical image analysis, machine learning techniques and neural networks is advantageous