RESEARCH TOPIC PRIME6

Combined Biomechanical and Immunological Profiling for Prediction of Post-TAVI Outcomes

Thematic field of the project

Biomedical Sciences

Research Supervisor

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Main facility

Chemistry, Materials and Chemical Engineering Department, Politecnico di Milano

Other facility

Department of Biomedical Sciences, Humanitas University, Pieve Emanuele

Main field of interest

Computational modeling, computational learning, and artificial intelligence in healthcare

Abstract

The aim of the research project is to develop a predictive model for the treatment of aortic valve pathologies in the presence of transcatheter aortic valves. In particular, patients suffering from severe aortic valve stenosis and treated with transcatheter aortic valve implantation (TAVI) will be virtually reconstructed from pre-operative CT scans.

Virtual TAVI procedures will be modeled in order to assess implant-related biomechanical features as well as hemodynamic characteristics. Blood samples will be analyzed to reconstruct the immunological profile of the patients.

A data-driven machine learning model will be used to correlate both biomechanical and immunological profiles with post-TAVI complication events, such as paravalvular leakage, conduction disturbances, and coronary obstruction.

Main technical approaches

The PhD student will develop skills in clinical image analysis, segmentation and meshing, finite element modeling for both structural and fluid dynamics applications, and machine learning modeling. The student should also be proficient in data analysis and problem-solving.

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Scientific references

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Type of contract

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