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DATA-DRIVEN MODELS AND DIGITAL TWINS: ENHANCING DECISION-MAKING IN BIOMEDICINE

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ABSTRACT

In the last years, the combined use of data-driven techniques and computational mechanics models has led to a plethora of techniques to be used as decision-support tools in biomedicine. Examples include image-based prediction of the fractional flow reserve (FFR) in cardiac patients [1], surgical planning of endovascular interventions or forecast of cancer progression via magnetic resonance imaging [2]. However, bringing these tools to clinical practice presents significant challenges, requiring efforts at multiple levels: basic research (modelling highly complex physics, developing precise and fast surrogates, ensuring robustness), applied research (modelling complex real-life scenarios, in lab validation, extensive exchange with clinicians) and final technology development and implementation with large scale clinical studies.

This mini-symposium aims to present the latest advancements in any of the stages mentioned above. We invite talks on the following topics:

- Development of image pre-processing techniques for computational modelling in biomedical applications.
- Non-intrusive reduced order modelling and machine learning techniques for fast decision making in medicine.
- Experimental and/or clinical validation of digital twins / data-driven decision support systems for biomedicine.
- Use cases in medical devices, cardiovascular system, cancer treatment, traumatology, ophthalmology, respiratory system, among others.

REFERENCES

[1] Taylor, C. A., Fonte, T. A., & Min, J. K. (2013). Computational fluid dynamics applied to cardiac computed tomography for noninvasive quantification of fractional flow reserve: scientific basis. Journal of the American College of Cardiology, 61(22), 2233-2241.

[2] Gomez, G, et al. "Personalized MRI-informed forecasting of prostate cancer progression during active surveillance." Cancer Research 84.6_Supplement (2024): 6223-6223.