# A pipeline for developing digital cardiac twins integrating cardiovascular magnetic resonance and electrocardiographic imaging: Results from the *MyoFit46* study

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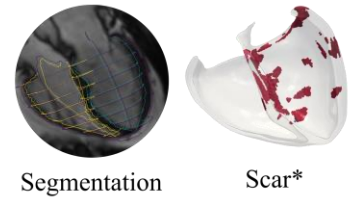
## INTRODUCTION & PURPOSE

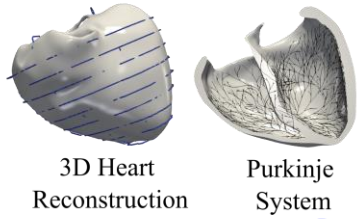
- Use of supercomputer modelling-based **digital cardiac twins** as a framework **to integrate multimodal** clinical data and exploit its predictive behaviour for non-invasive personalised **arrhythmogenic risk** evaluation.
- **Proof-of-concept pipeline** to generate **personalised** electrophysiological **cardiac models at scale** from CMR and ECGI data.

## METHODS

***MyoFit46* dataset**: 510 CMR + ECGI from UK participants aged 75+ years.

**BASELINE PIPELINE**




**ECGI2MODEL**

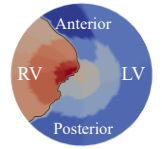
- **Activation**: correction of ECGI activation map based on wall thickness and fibre orientation.
- **Repolarization** properties ($IK_S$) are locally adapted based on the difference with the ECGI repolarization times.

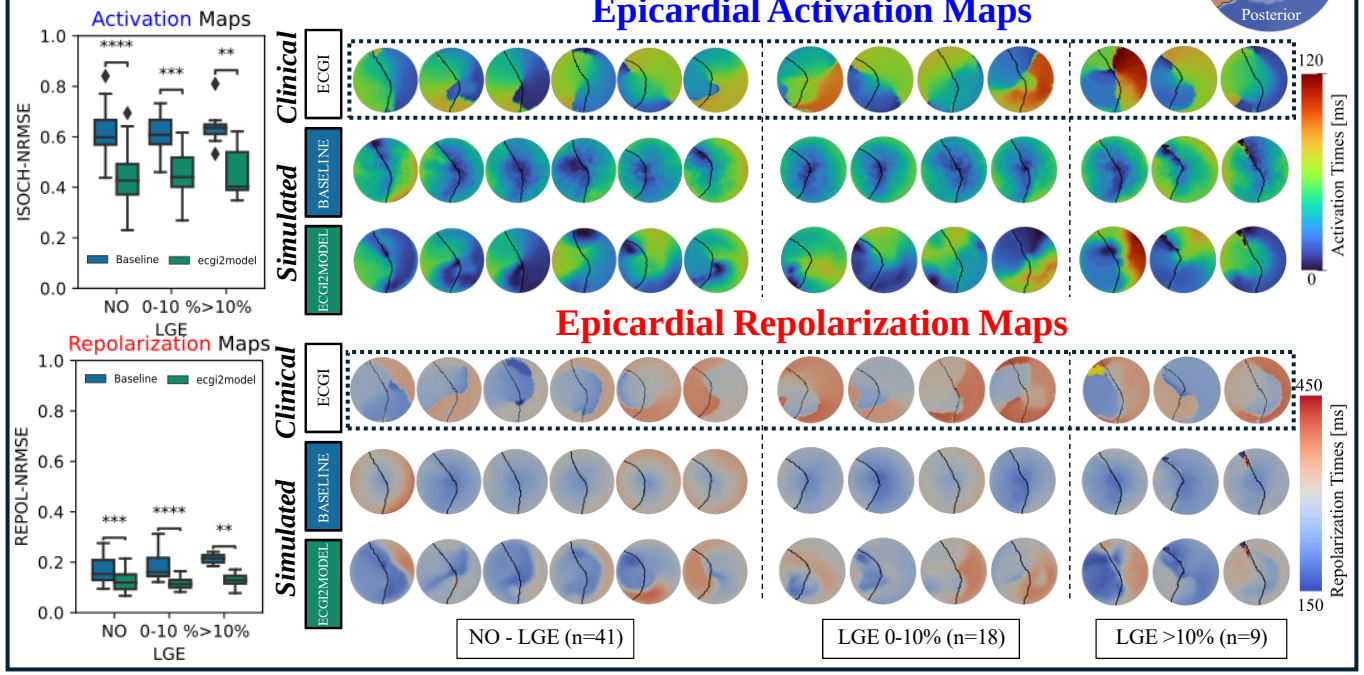
**Late gadolinium enhancement (LGE) by CMR*

## RESULTS

A total of **68 digital hearts** were built and run using **Baseline** and **ECGI2model** pipelines, taking, on average, **5.5 hours per case** (i.e., 4h for digital heart pipeline and **1.5 for ECGI2model** pipeline).

Results are evaluated by computing **point-to-point normalized root mean square error (NRMSE)** between the **ECGI** and the **digital epicardial activation and repolarization** times (**Baseline** and **ECGI2model**).




## CONCLUSION

Proposed preliminary pipeline **can** construct **personalized** digital **cardiac twins** from **CMR** and **ECGI** data.

## FUTURE WORK

- Increase pipeline **accuracy.**
- **Clinical data** integration.
- Applicability for **arrhythmogenic risk.**