

A Multimodal AI Framework for Spatiotemporal and Molecular Mapping of Cardiomyocyte Ageing and Early Functional Decline

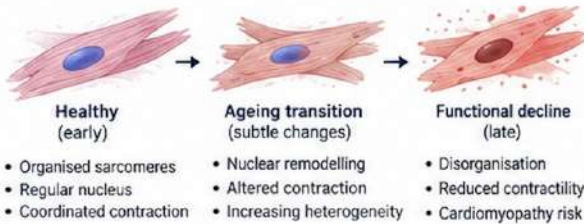
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Cell Press Symposia
Hallmarks of Aging
Seville, Spain | 4–6 October 2026
Abstract #19



1 Background & Motivation

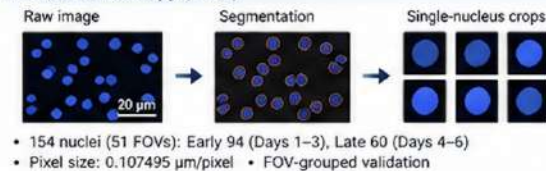
Cardiomyocyte ageing alters cellular structure and function before overt cardiac disease becomes detectable.



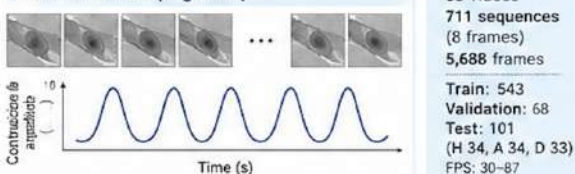
Can multimodal AI detect this transition before overt functional failure?

4 Representative Input Data

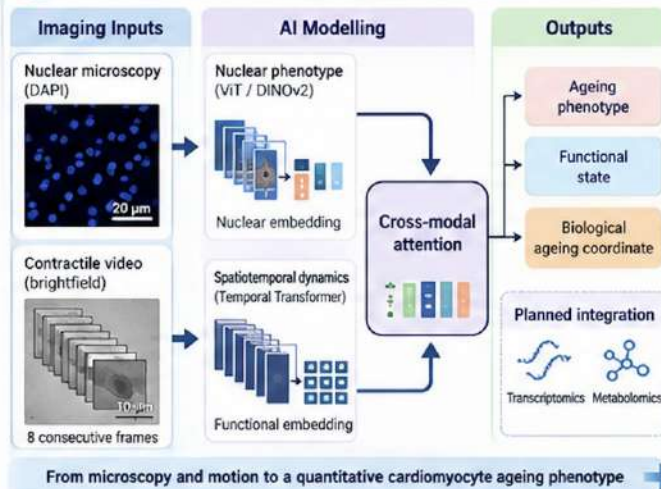
Nuclear microscopy (DAPI)



Contractile video (brightfield)



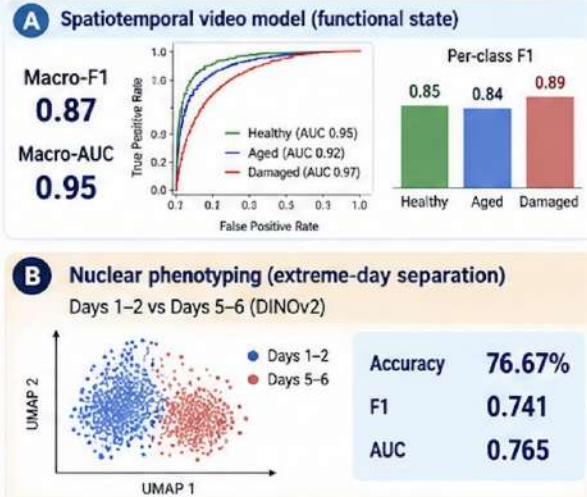
2 Multimodal AI Framework



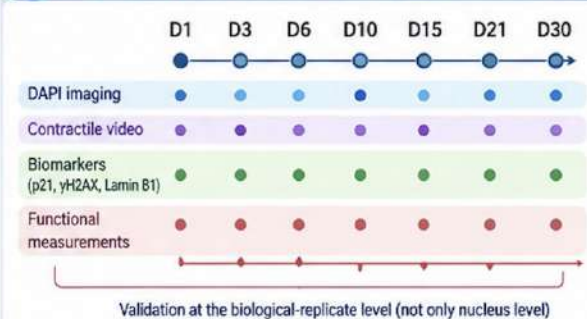
5 Potential Contributions

- 1. Hierarchy-aware nuclear phenotyping**
Quantitative nuclear features from microscopy with FOV-grouped validation.
- 2. Spatiotemporal functional modelling**
Temporal Transformer to detect age-related changes in contractile dynamics.
- 3. Multimodal fusion framework**
Cross-modal attention to integrate nuclear and functional information (with planned molecular data).
- 4. Ageing continuum and biological insight**
Evidence supports a heterogeneous ageing trajectory rather than a single discrete senescence state.

3 Key Results



6 Next Step: Longitudinal Biological Validation



Take-home message

AI detects structured changes in cardiomyocyte nuclear morphology and contractile dynamics, but current evidence supports a heterogeneous ageing continuum rather than a simple discrete senescence state.

Multimodal imaging + temporal modelling + independent biological validation = a pathway toward quantitative cardiomyocyte ageing phenotypes.



Family Support Awards



Further details

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Further details

