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P17

# Spatio-Temporal Graph Representation of Cardiac Dynamics

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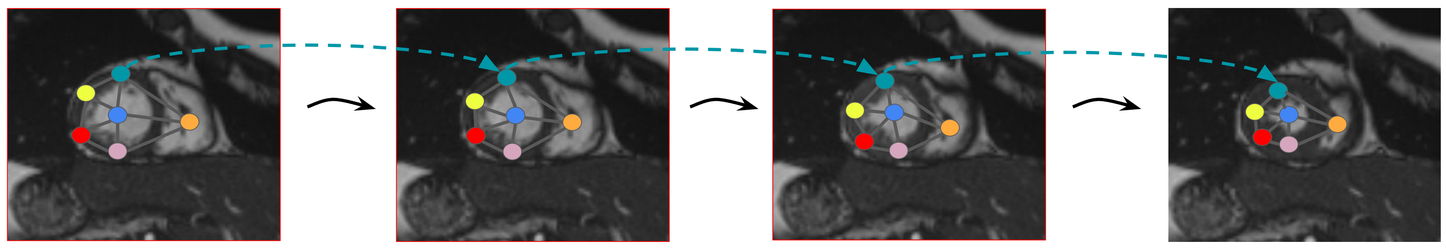
## BACKGROUND

**Motivation:** Cardiovascular diseases (CVDs) are the leading cause of mortality globally. Understanding the spatio-temporal dynamics of the heart is crucial for better diagnosis and treatment.
**Problem:** Traditional approaches struggle to capture both spatial and temporal cardiac patterns.

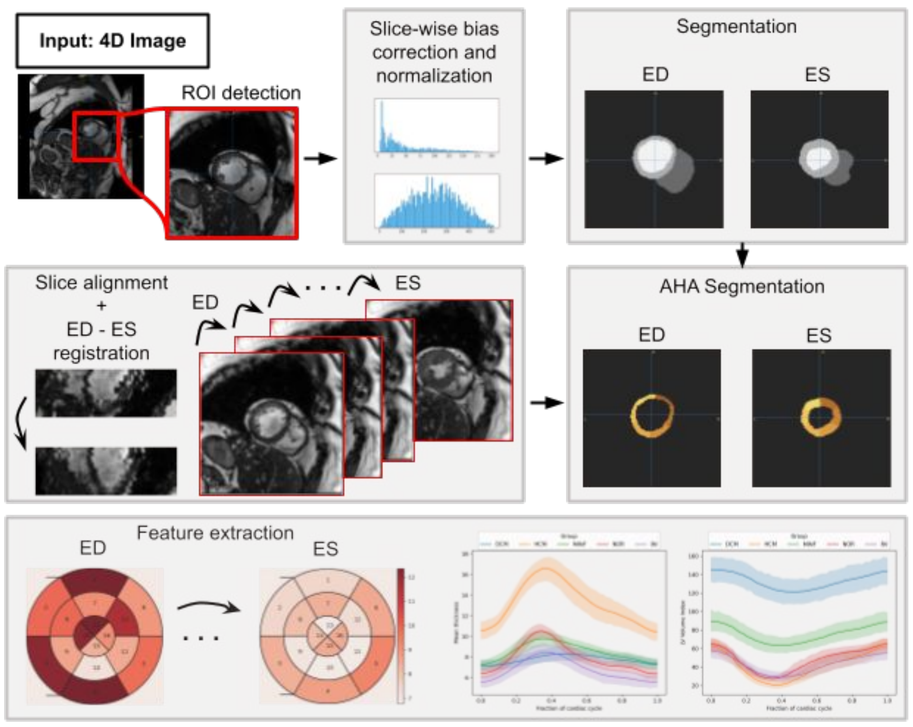
## AIMS

**1.** Represent the heart a spatio-temporal graph for a comprehensive spatio-temporal representation to capture complex dynamics.



**2.** Obtain a low-dimensional representation that can:
- Reconstruct cardiac trajectories
- Offer interpretability in a clinical context
- Support classification of different cardiac conditions

## METHODS

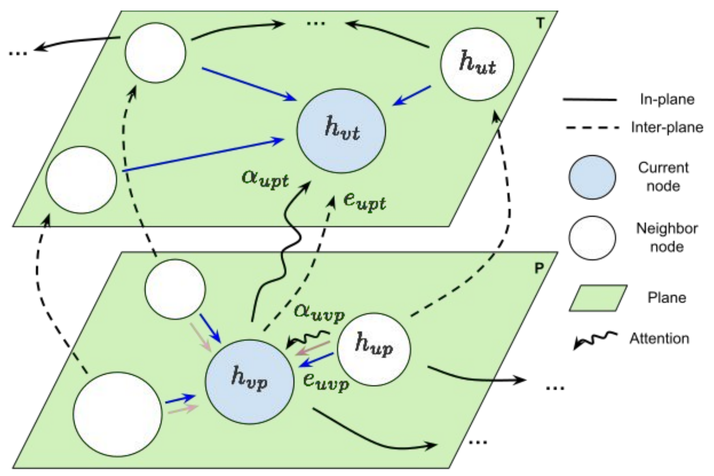


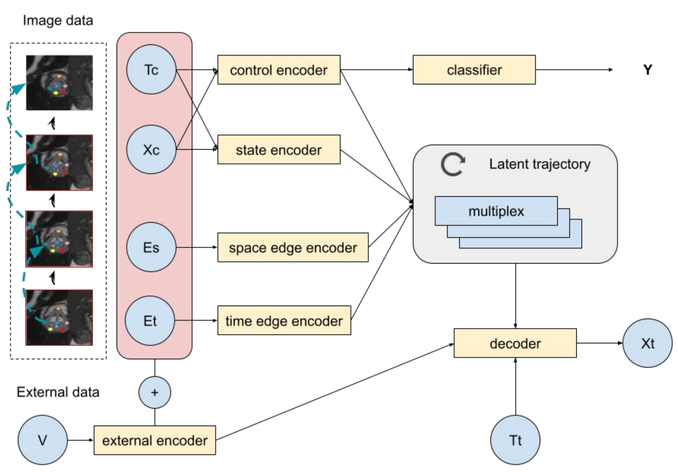

### Data processing

Utilized the publicly available ACDC (Automated Cardiac Diagnosis Challenge) dataset.
Provides images of 150 subjects evenly distributed in 5 different conditions.

### Modelling

Use Graph Neural Networks (GNN) to model spatio-temporal relationships.
Leverage latent ODEs (Ordinary Differential Equations) to model temporal dynamics.

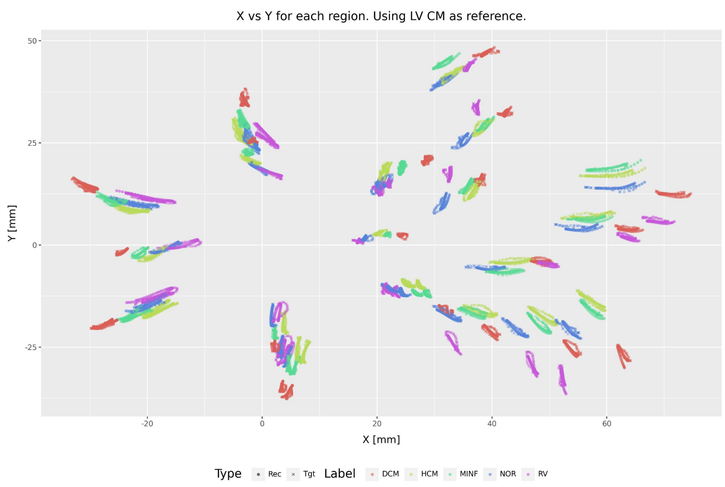


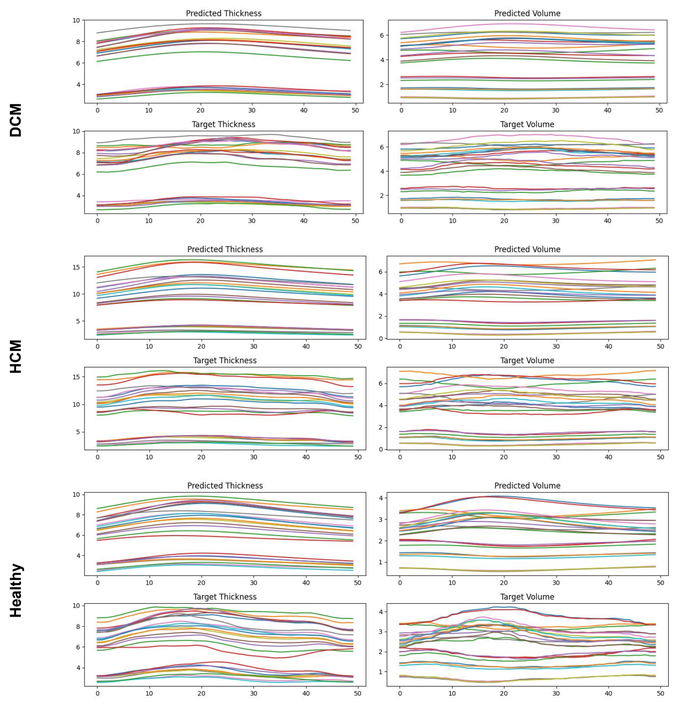




Trained the model to optimize both reconstruction and classification tasks.

- Accurate reconstruction of thickness, volume and movement trajectories
- Differential movement patterns for each heart condition
- Latent features associated with specific cardiac dynamics, i.e: thickness and strain (deformation) of different cardiac regions.

## RESULTS




## CONCLUSION

**Conclusion:** The proposed model captures both spatial and temporal dynamics enabling trajectory reconstruction and classification.
**Implications:** Provides a potential tool for aiding in diagnosis and monitoring by representing heart dynamics in a lower-dimensional space.

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