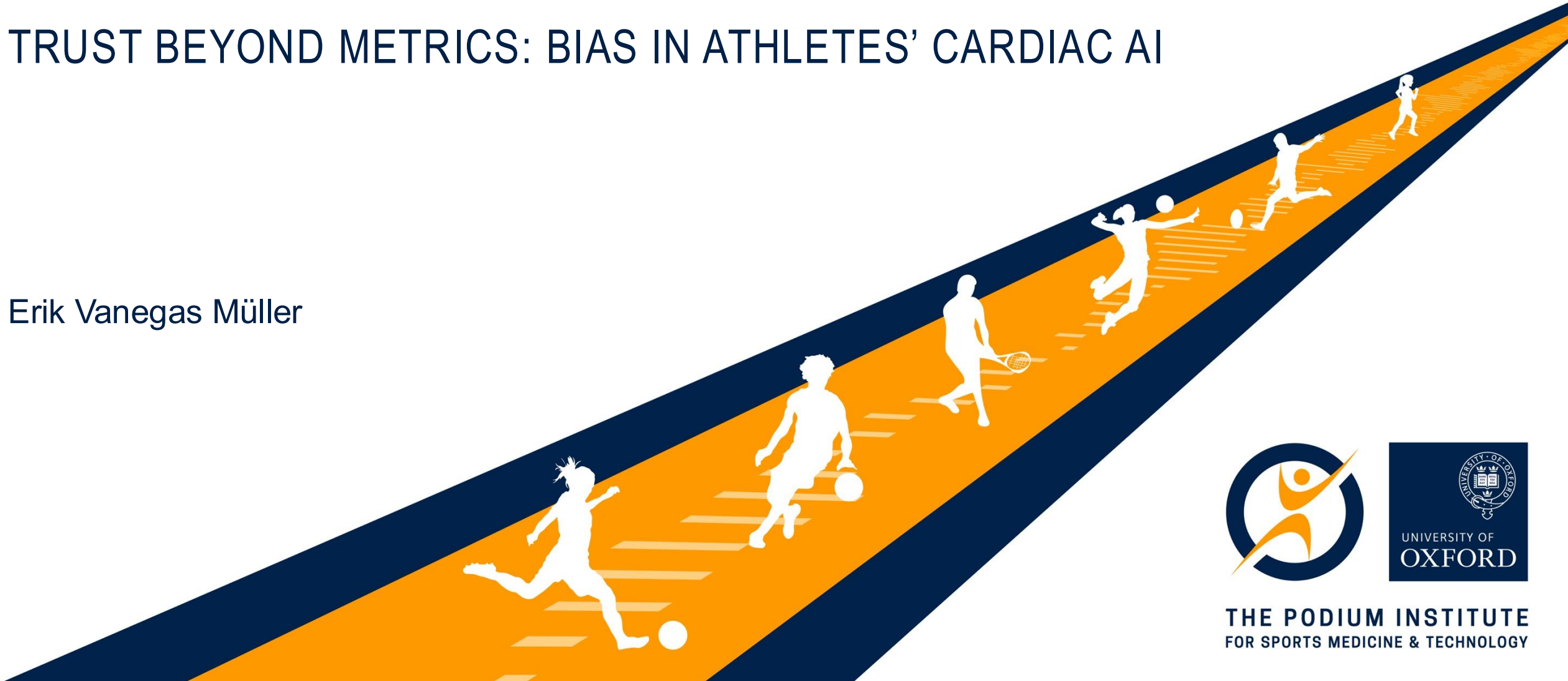


MPLS RESEARCHER CONFERENCE: AI & ETHICS 2026

TRUST BEYOND METRICS: BIAS IN ATHLETES' CARDIAC AI

Erik Vanegas Müller



THE PODIUM INSTITUTE
FOR SPORTS MEDICINE & TECHNOLOGY



SUDDEN CARDIAC ARREST (SCA) IN ATHLETES



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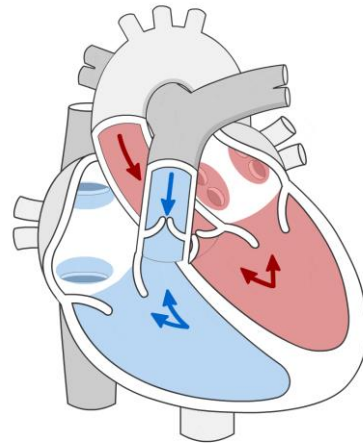
What?

- Unexpected cardiac arrest.



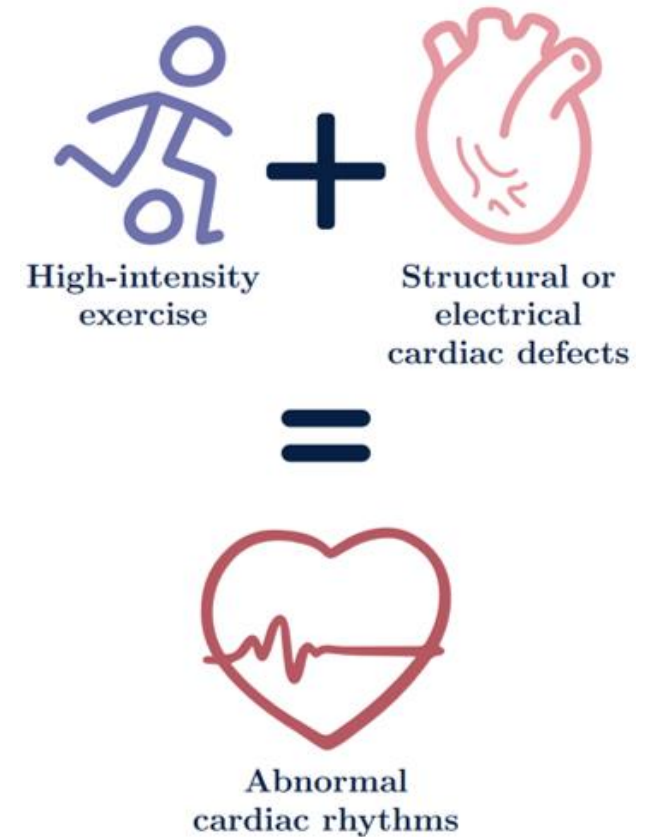
How?

- Heart changes into a rhythm not compatible with pumping blood through the body.

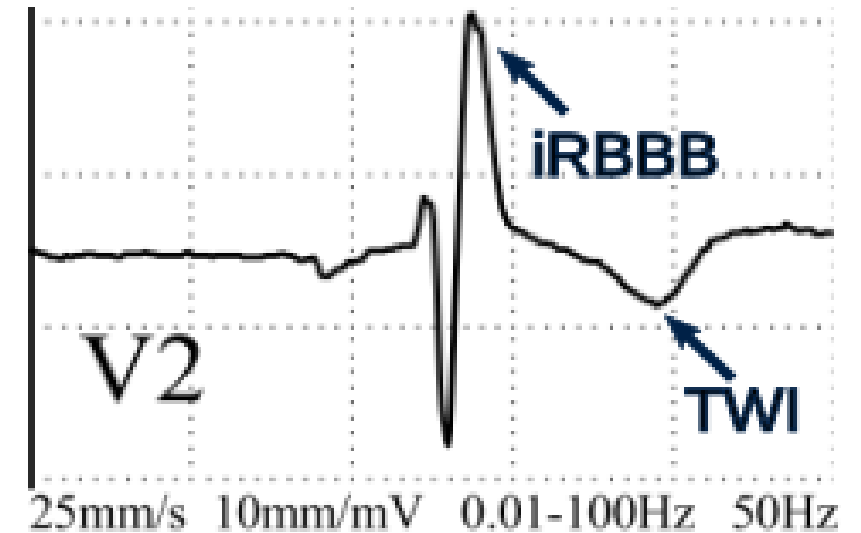
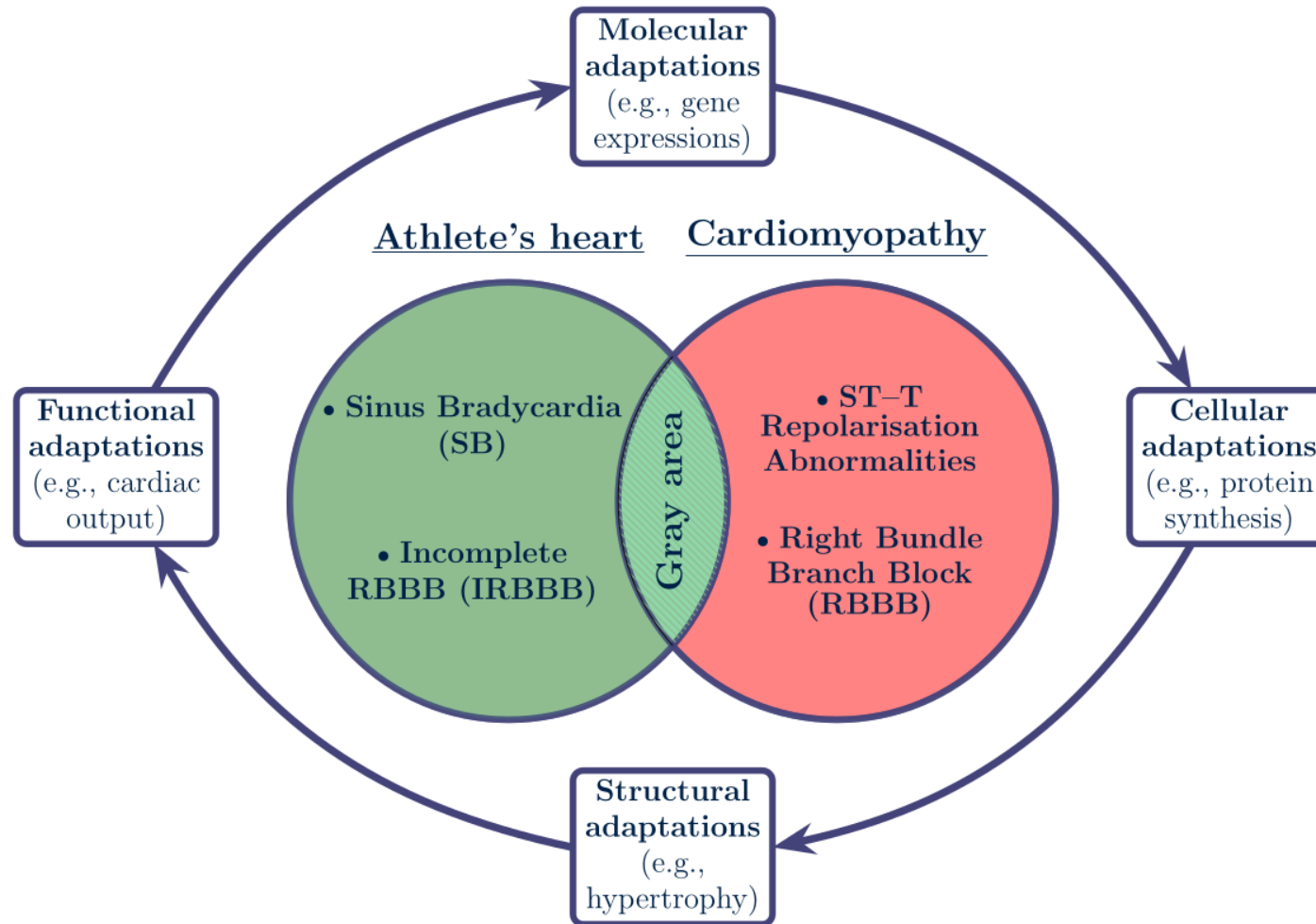


Why?

- Structural or electrical defects

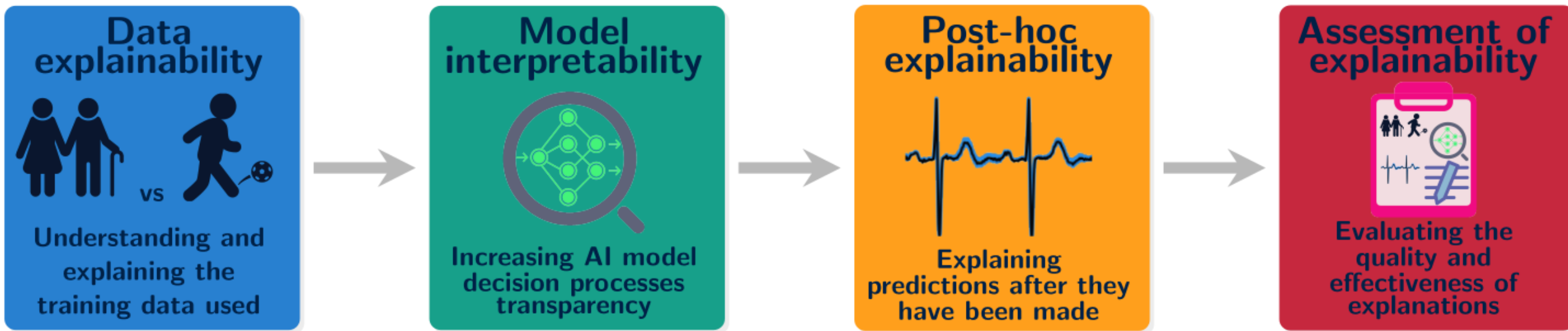


RESEARCH QUESTION



Does pathophysiology-aware training improve arrhythmia classification for athletes?

EXPLAINABILITY PIPELINE – AN ETHICAL REQUIREMENT IN MEDICINE

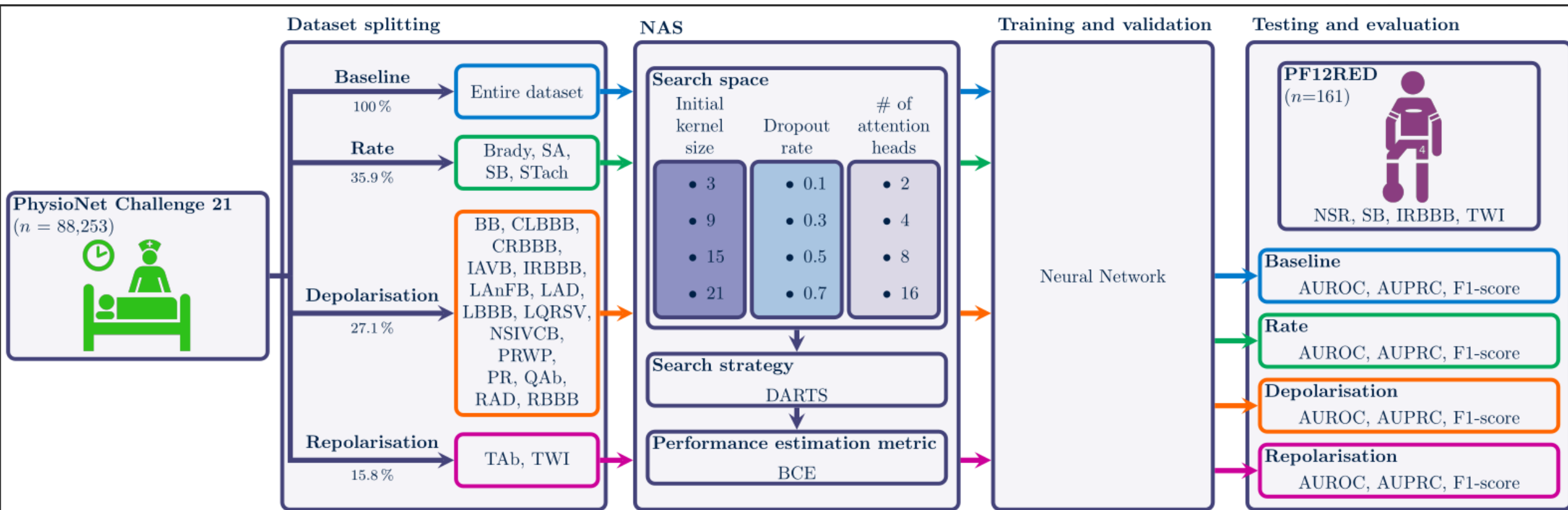
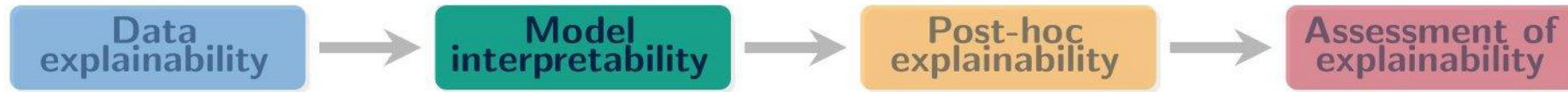


Vanegas Müller, E. *et al* (2026). Interpretable and explainable neural network to classify sports-related cardiac arrhythmias in professional football athletes. NJP DM – *Under review*

METHODOLOGY: DATASETS

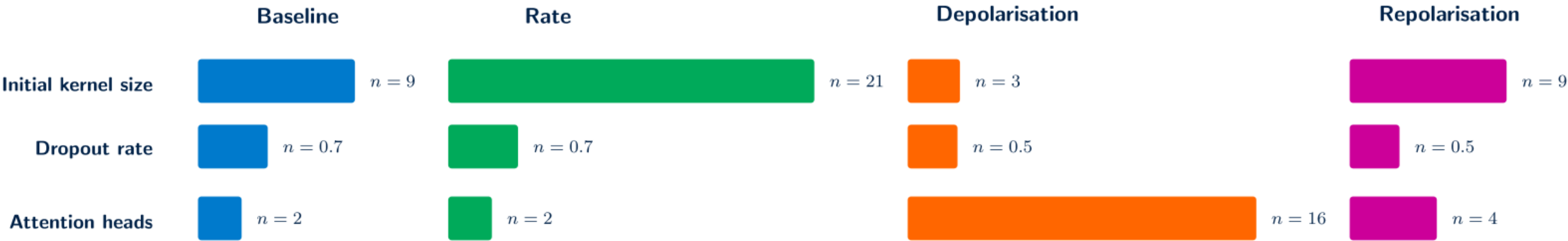
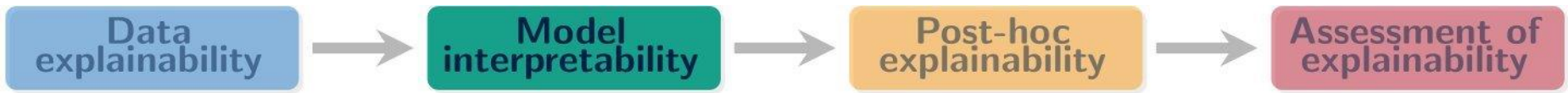
	Data explainability	Model interpretability	Post-hoc explainability	Assessment of explainability
PhysioNet Challenge 21	#			
	88,253	60 ± 22 years	44% / 56%	Over 30 different type of arrhythmias, including: • Normal Sinus Rhythm (NSR) • SB • IRBBB • T-wave Inversion (TWI)
PF12RED				
	161	26 ± 5 years	0% / 100%	• NSR • SB • IRBBB • TWI

METHODOLOGY: NEURAL ARCHITECTURE SEARCH (NAS) PIPELINE



Vanegas Müller, E. *et al* (2025). Deep Learning Optimisation for Sports Cardiology: Neural Architecture Search-driven Arrhythmia Classification. *CINC2025*

RESULTS: NAS PARAMETERS

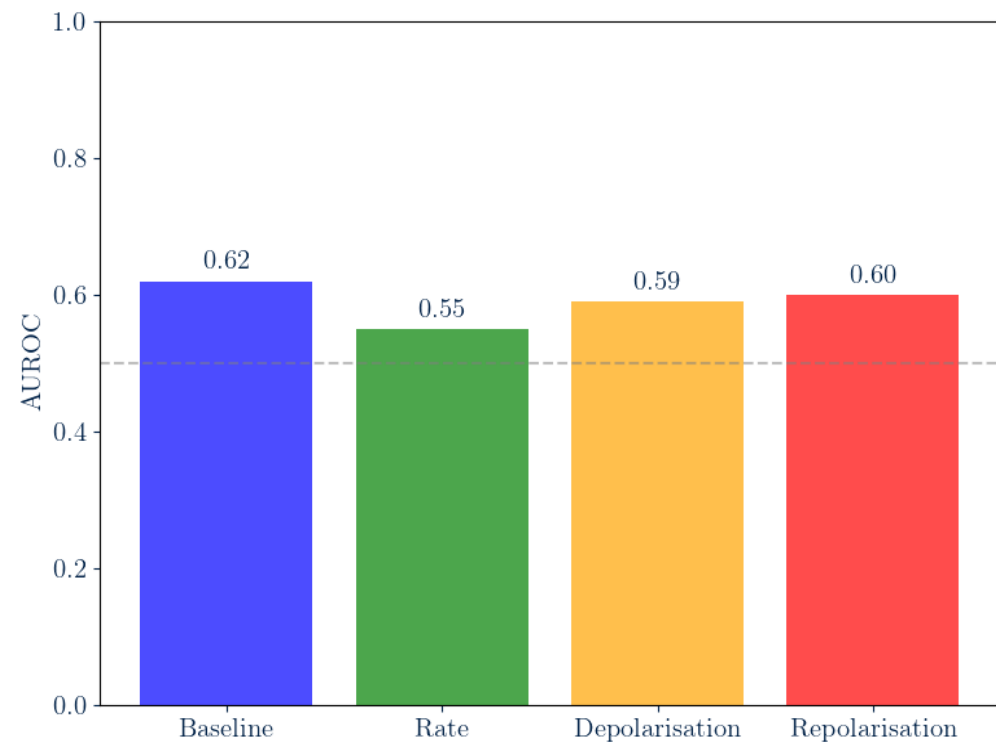


Vanegas Müller, E. *et al* (2025). Deep Learning Optimisation for Sports Cardiology: Neural Architecture Search-driven Arrhythmia Classification. *CINC2025*

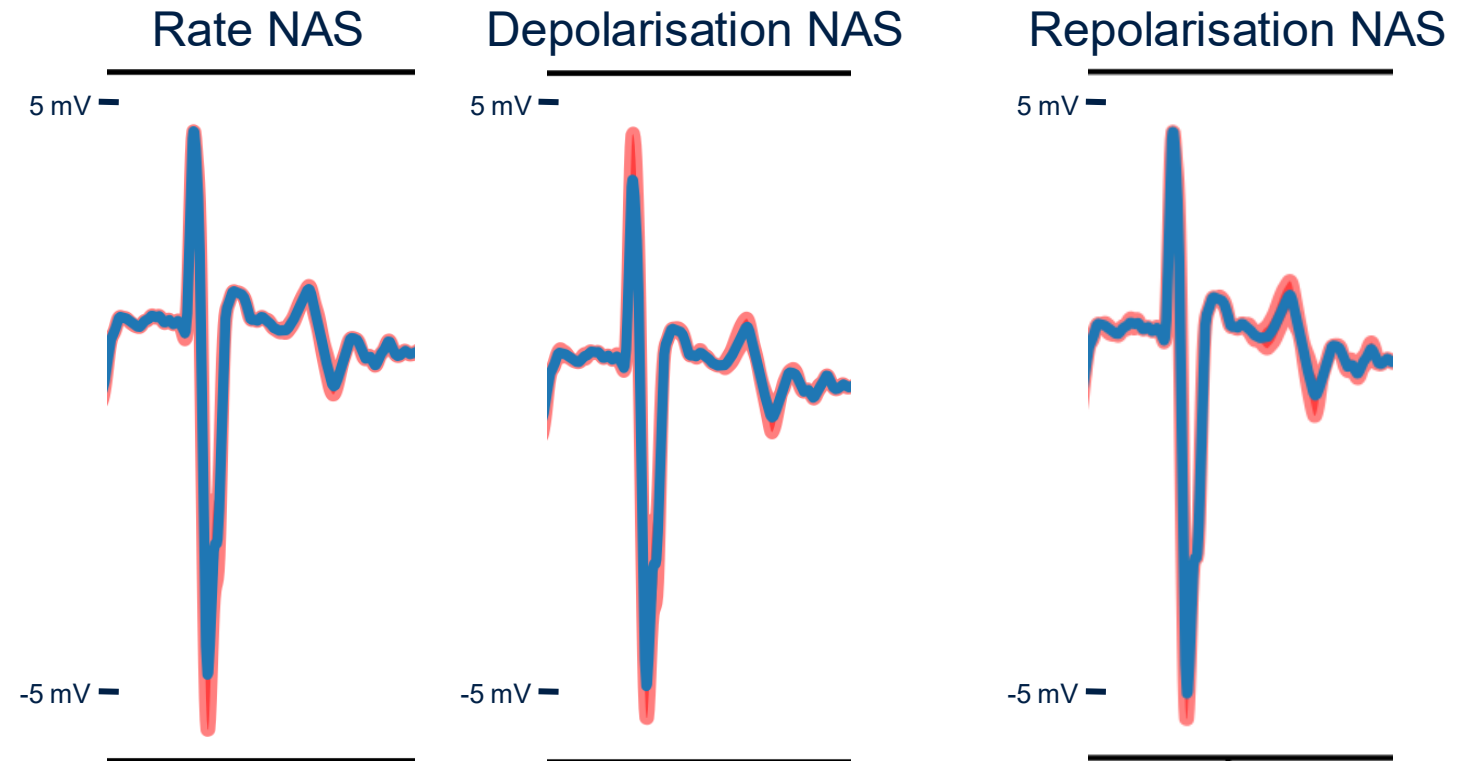
AVERAGED RESULTS: AREA UNDER THE RECEIVER OPERATING CHARACTERISTIC CURVE



Averaged AUROC

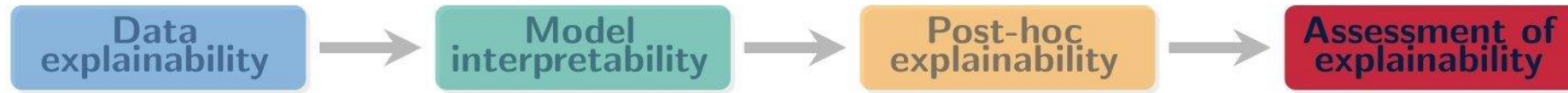


Lead V2 - Grad-CAM TWI



Vanegas Müller, E. *et al* (2025). Deep Learning Optimisation for Sports Cardiology: Neural Architecture Search-driven Arrhythmia Classification. *CINC2025*

CONCLUSION



- **Different arrhythmias need different network designs.**
- NAS identifies **physiologically meaningful parameters.**
- NAS models show **pathophysiology-specific** potential.

THANK YOU!

Erik Vanegas Müller, M.Sc.
DPhil Student
The Podium Institute for Sports Medicine & Technology
Department of Engineering Science
University of Oxford
erik.vanegasmuller@eng.ox.ac.uk