



# Bedeutung der künstlichen Intelligenz in der Herzinsuffizienzbehandlung

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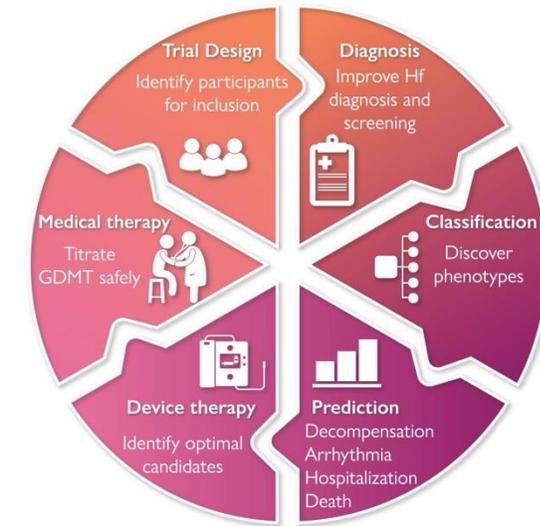
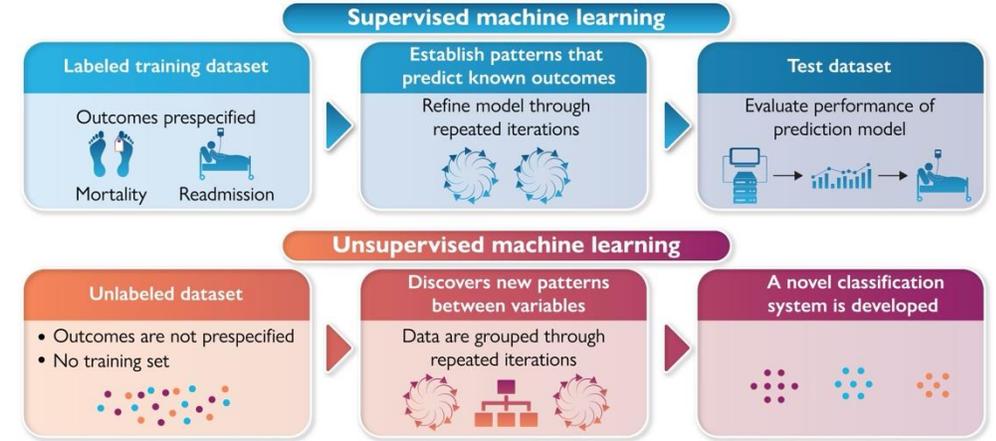
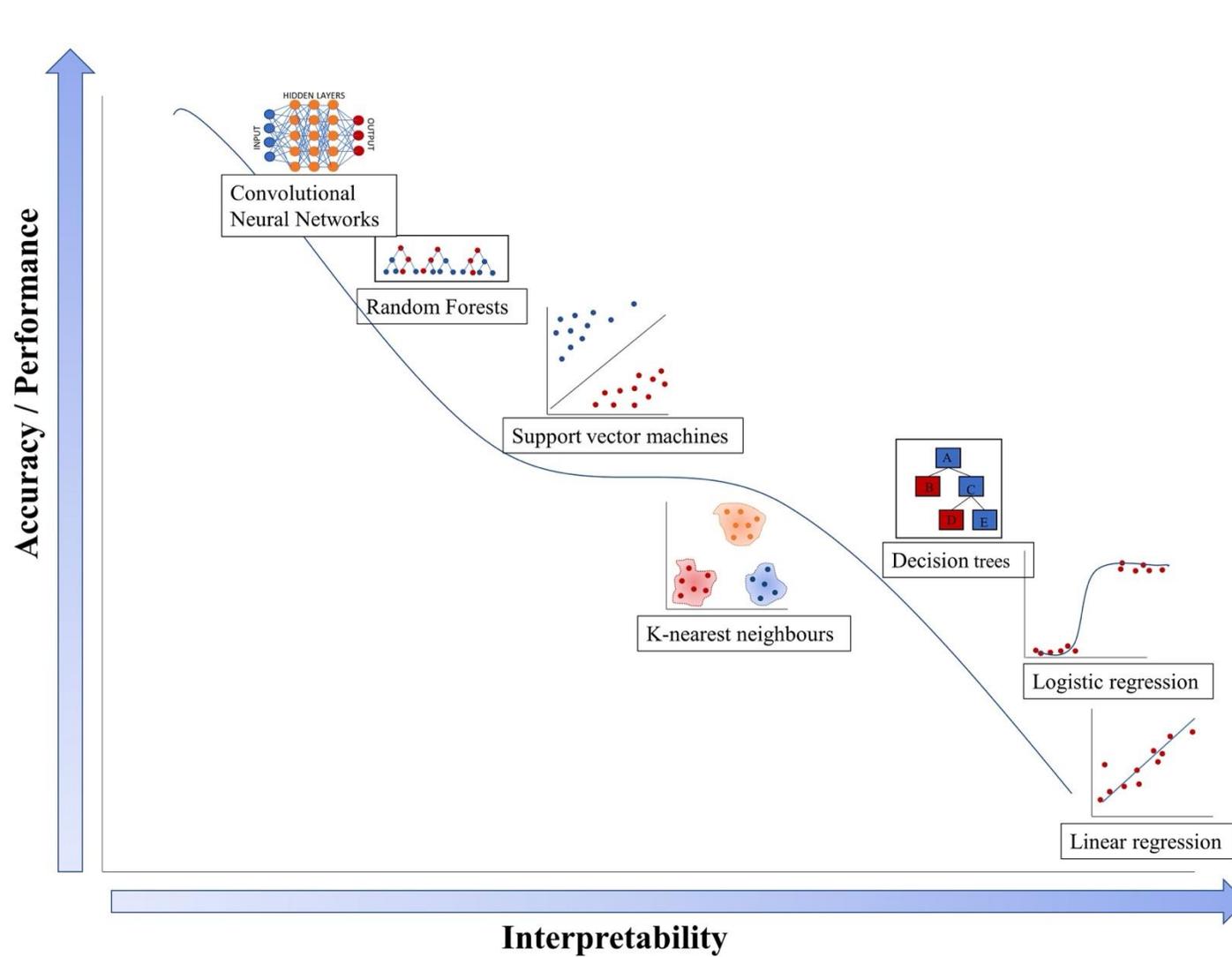
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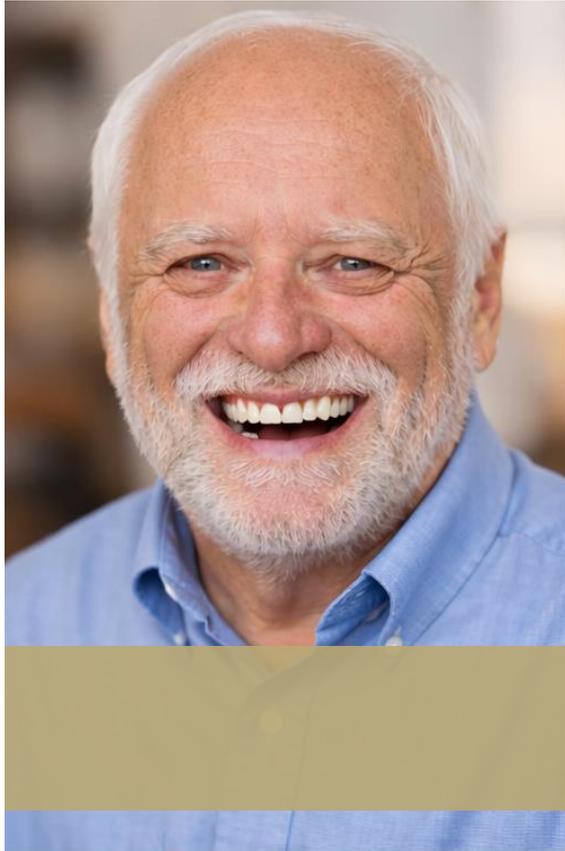


# Künstliche Intelligenz

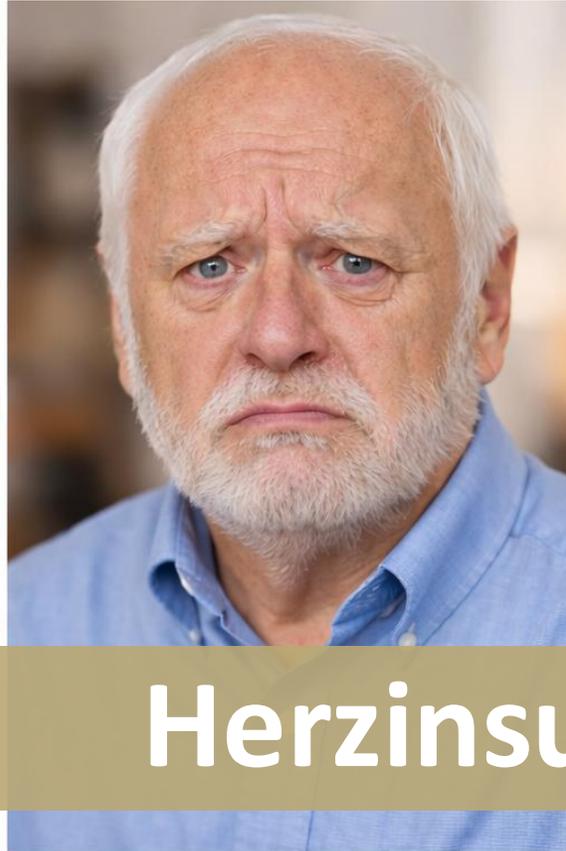


# Künstliche Intelligenz – Bedeutung für die Herzinsuffizienz

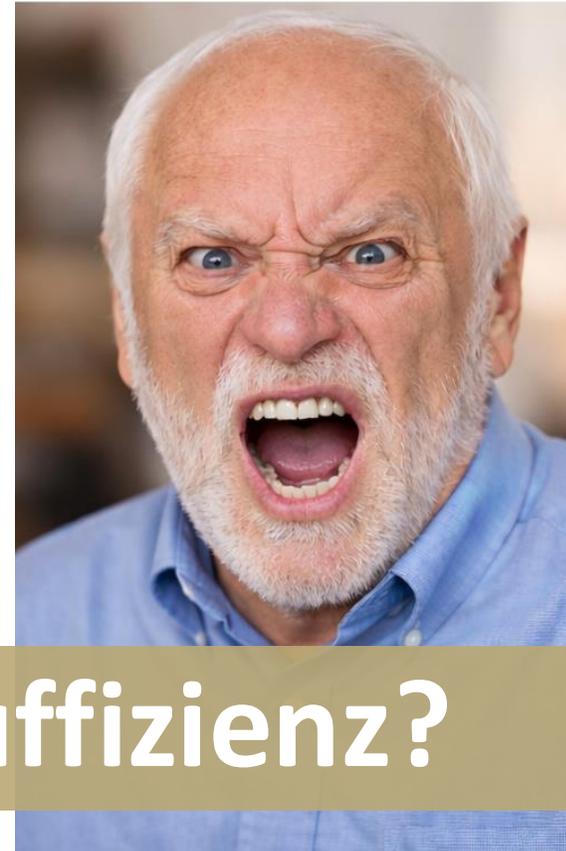




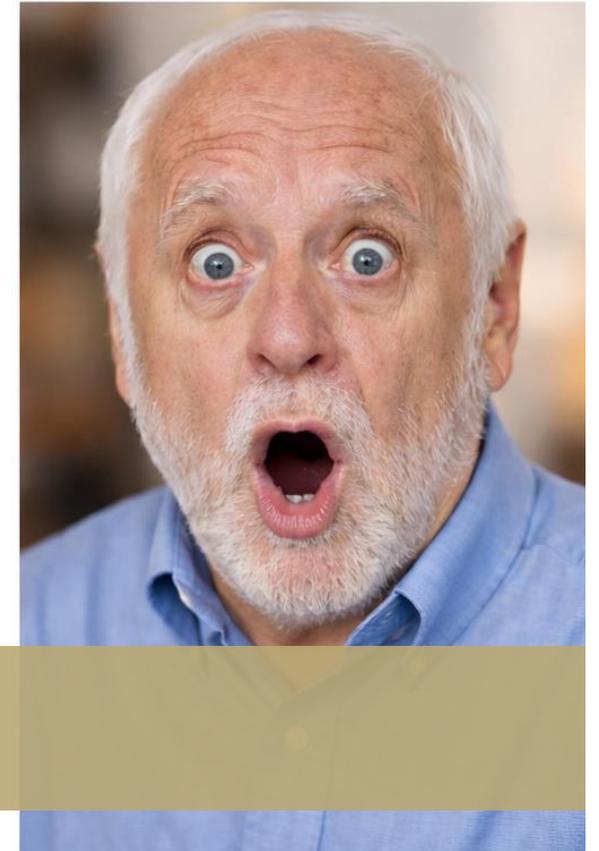
Freude



Trauer



Wut



Überraschung

Herzinsuffizienz?



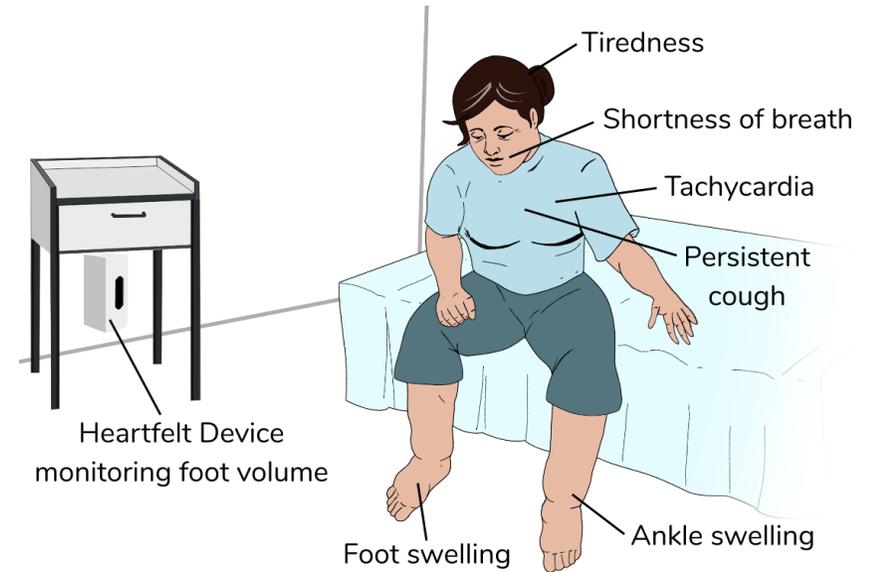
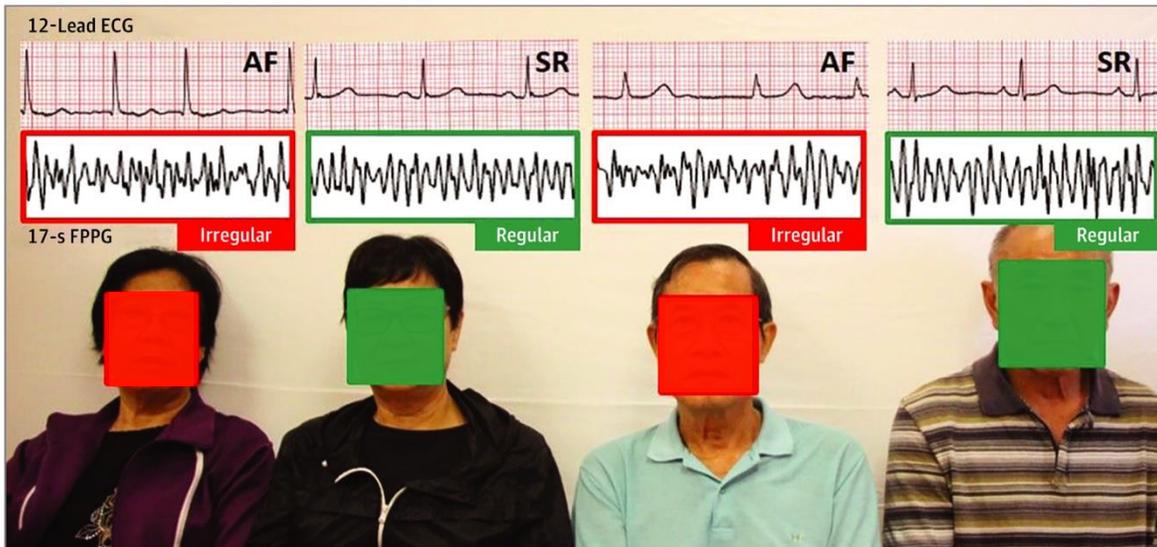
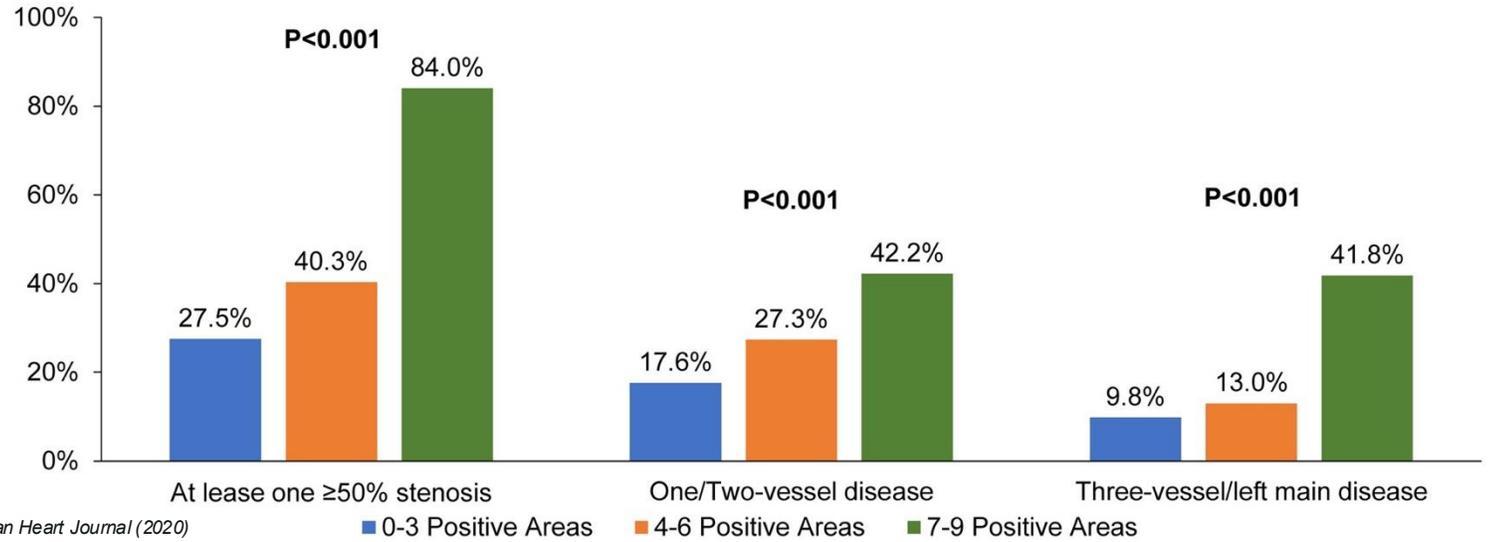
# Künstliche Intelligenz in der Herzinsuffizienzdiagnostik

## Occluding Facial Region

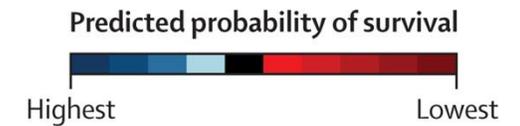
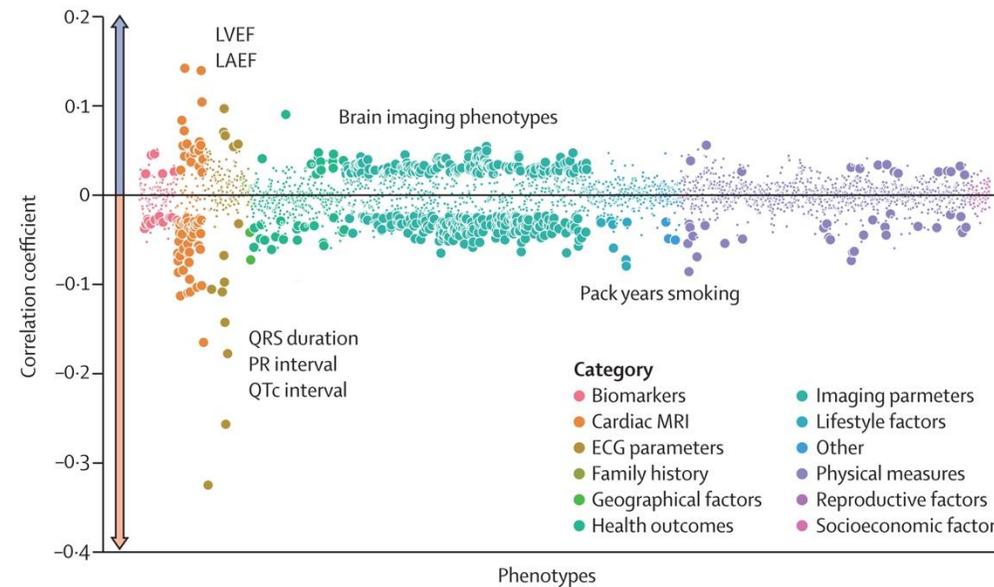
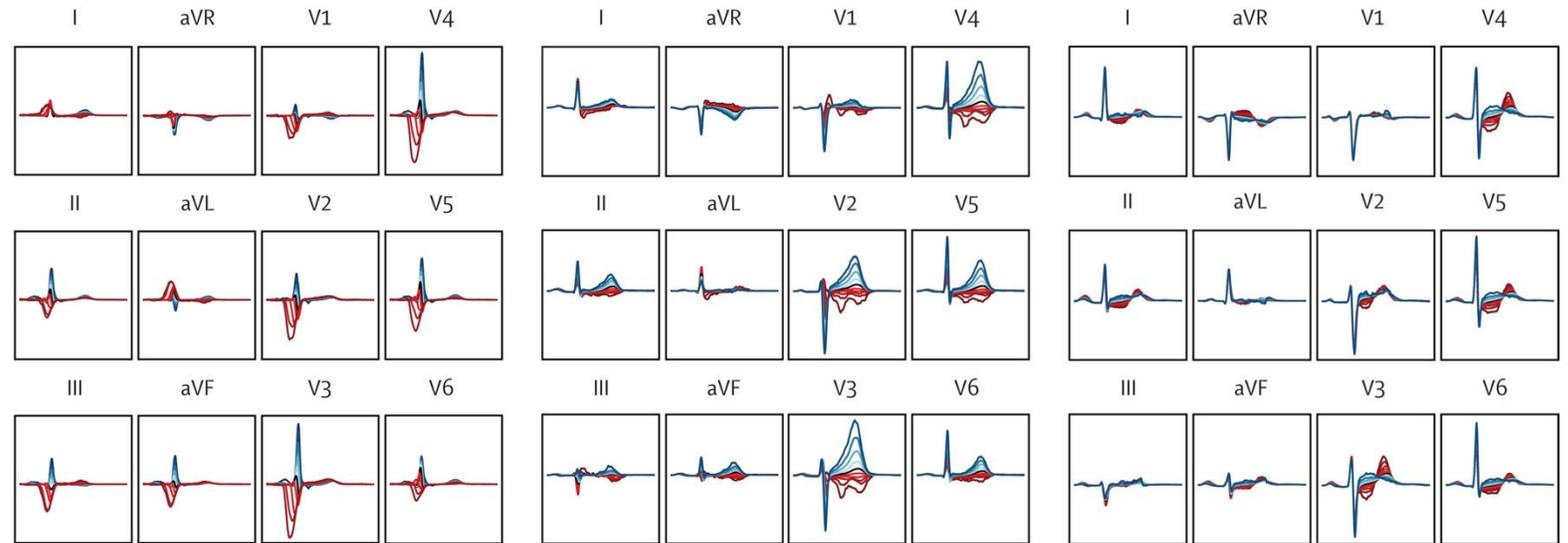
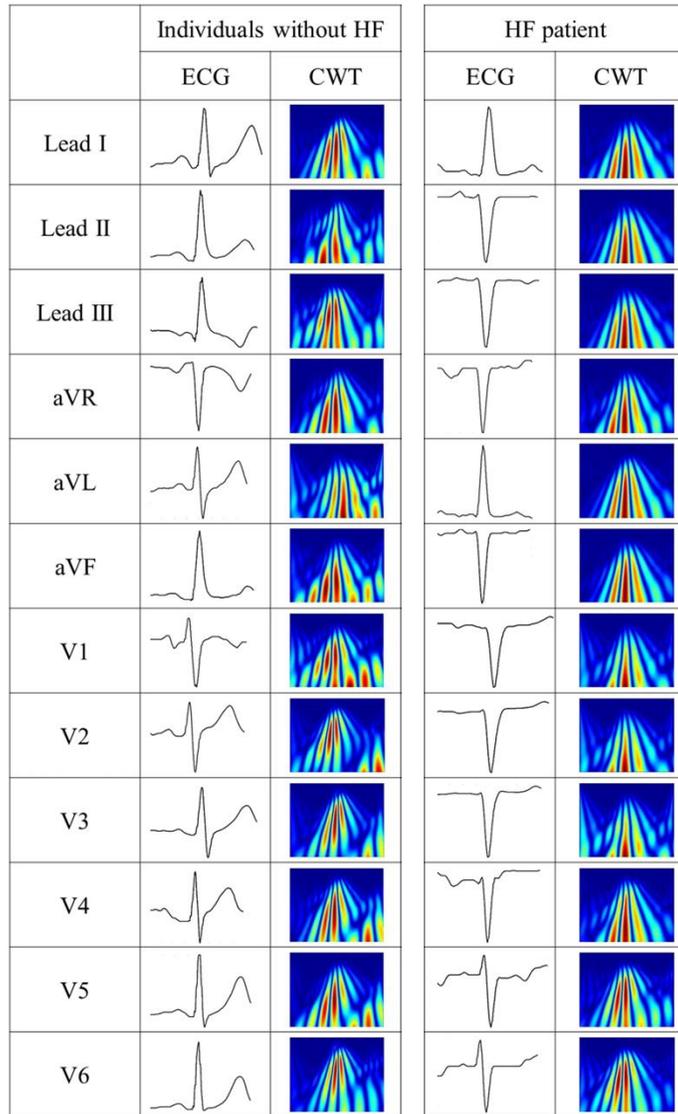
Schematic Diagram	Facial Areas	$\Delta$ AUC
	Cheek	0.0365
	Forehead	0.0185
	Nose	0.0178
	Eyes	0.0160
	Mouth	0.0154
	Ears	0.0148
	Chin	0.0062

Lin et al.: Feasibility of using deep learning to detect coronary artery disease based on facial photo; *European Heart Journal* (2020)

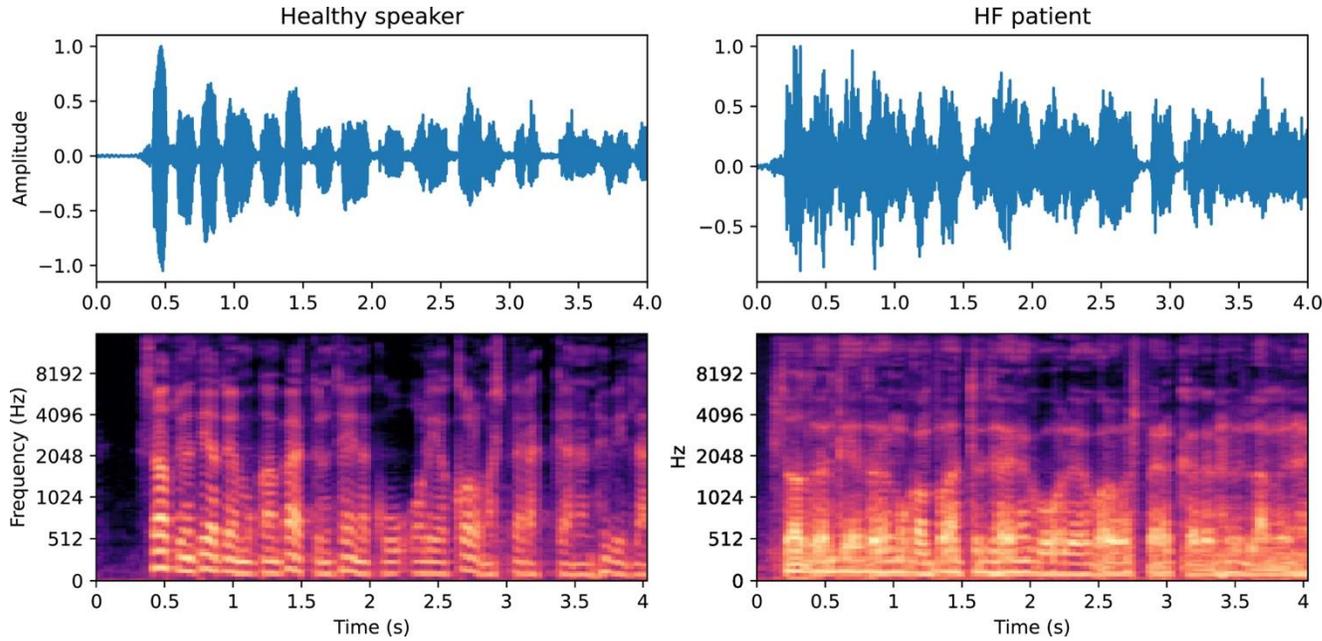
## Dose-response Relationship between Positive Facial Areas and Coronary Artery Disease



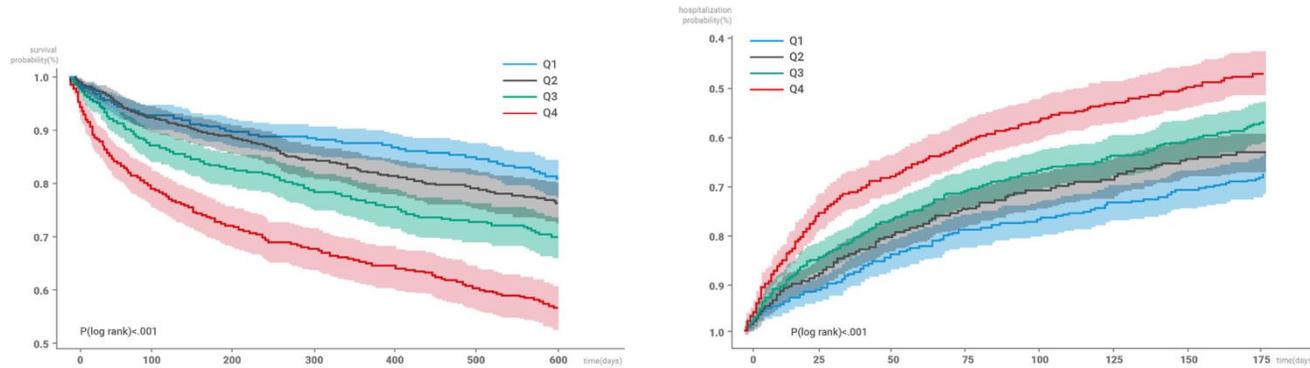
# Künstliche Intelligenz in der Herzinsuffizienzdiagnostik



# Künstliche Intelligenz in der Herzinsuffizienzdiagnostik



Reddy et al.: The automatic detection of heart failure using speech signals; Computer Speech & Language (2021)



NT-proBNP	Q1	Q2	Q3	Q4
570	570	526	473	465
569	569	455	431	416
563	563	488	428	408
565	565	448	394	370
	465	457	446	324
	302	254		
	281	236		
	244	203		

NT-proBNP	Q1	Q2	Q3	Q4
570	570	514	469	439
569	569	494	448	413
563	563	465	417	381
565	565	407	359	321
	395	357	337	326
	319	299	288	
	289	267	253	
	251	233	218	

**A**

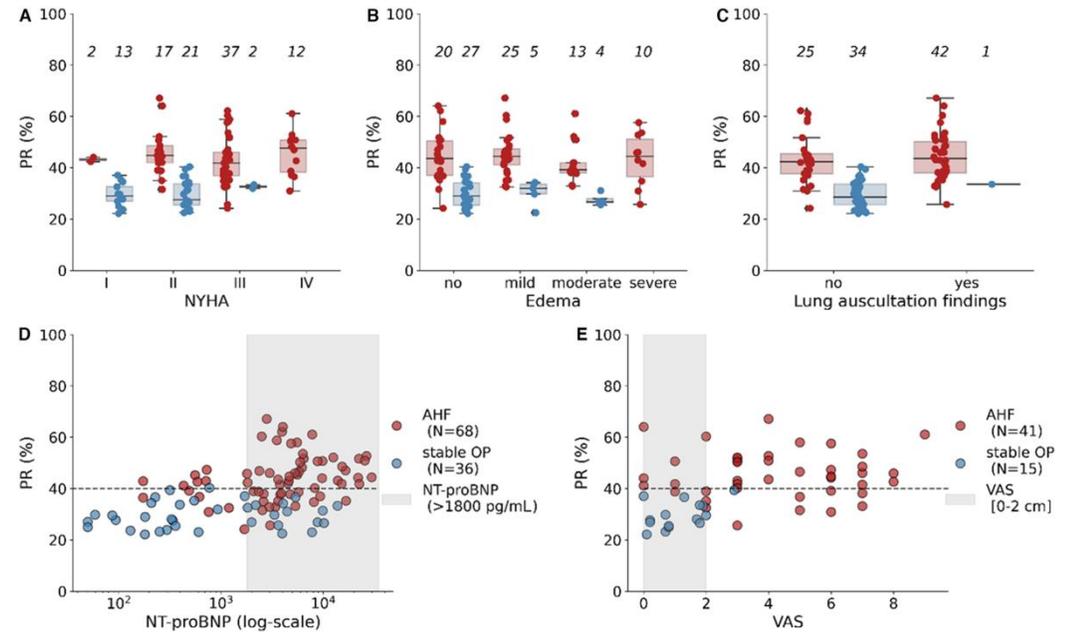
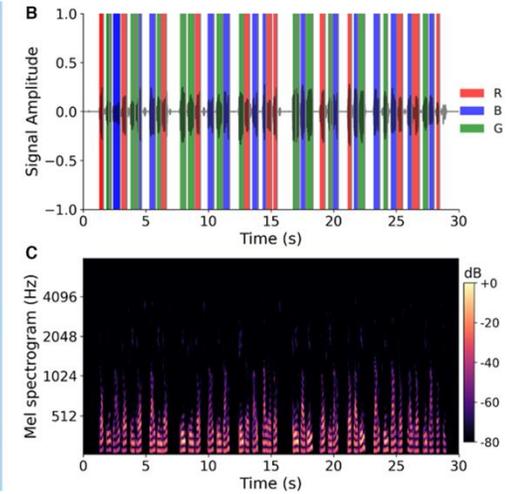
**Reading Patient Consent**  
(Bitte lesen Sie den Text laut vor und sprechen Sie dabei in Richtung des Mikrofons.)  
Ich erteile dem Forschungspersonal die Zustimmung zur Erfassung und Verarbeitung meiner Sprachaufzeichnung für dieses HeartTalk-Projekt.

**Number Counting Test**  
(Bitte zählen Sie von eins bis zehn und sprechen Sie dabei so klar und schnell wie möglich.)  
1 2 3 4 5 6 7 8 9 10

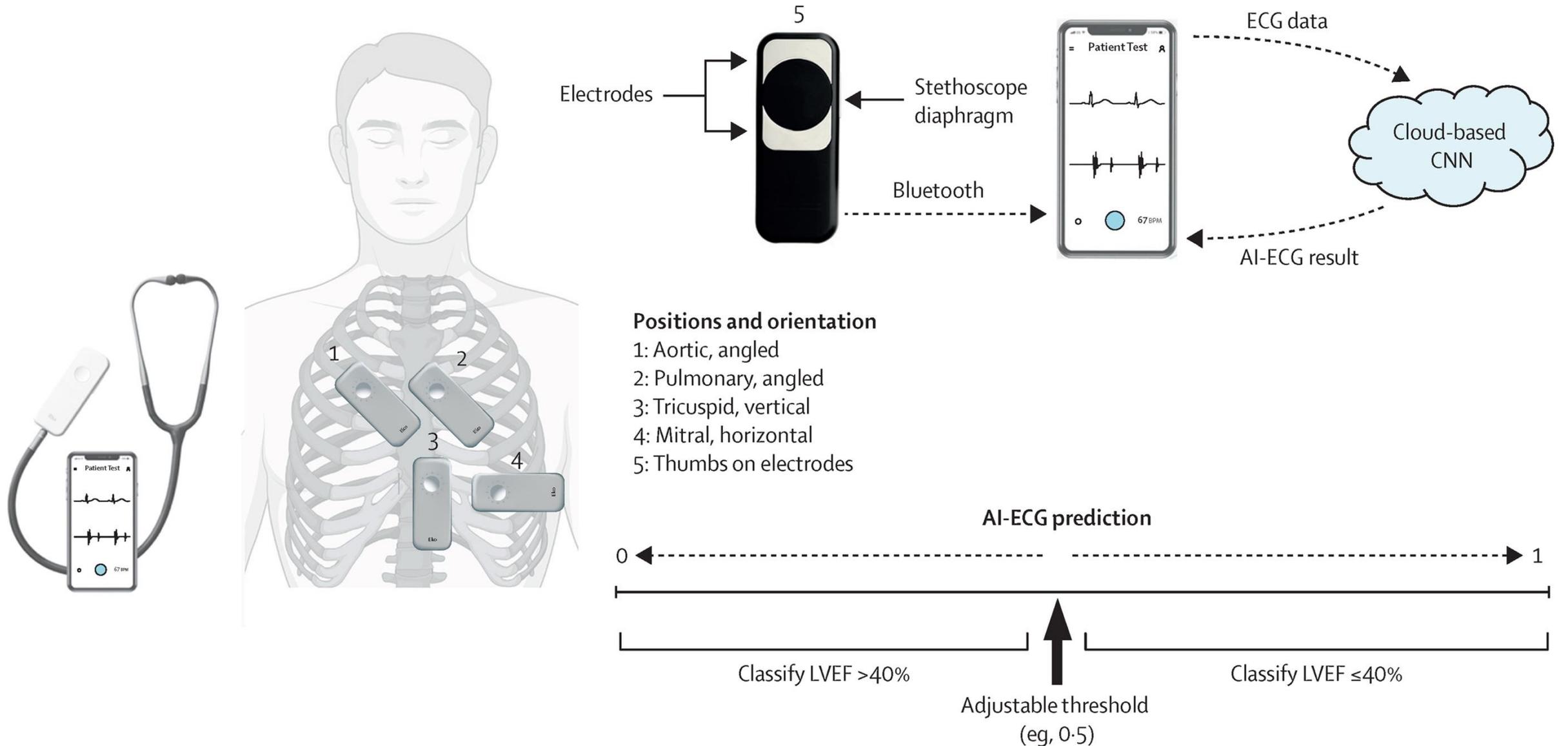
**Reverse Number Counting Test**  
(Bitte zählen Sie von zehn bis eins und sprechen Sie dabei so klar und schnell wie möglich.)  
10 9 8 7 6 5 4 3 2 1

**Stroop Word Reading Test**  
(Bitte lesen Sie die Wörter so klar und schnell wie möglich vor.)  
ROT GRÜN BLAU ROT GRÜN ROT BLAU GRÜN ROT GRÜN GRÜN ROT BLAU GRÜN  
BLAU GRÜN ROT BLAU BLAU ROT ROT GRÜN BLAU GRÜN ROT GRÜN BLAU ROT  
BLAU GRÜN BLAU GRÜN BLAU ROT BLAU ROT GRÜN BLAU ROT GRÜN

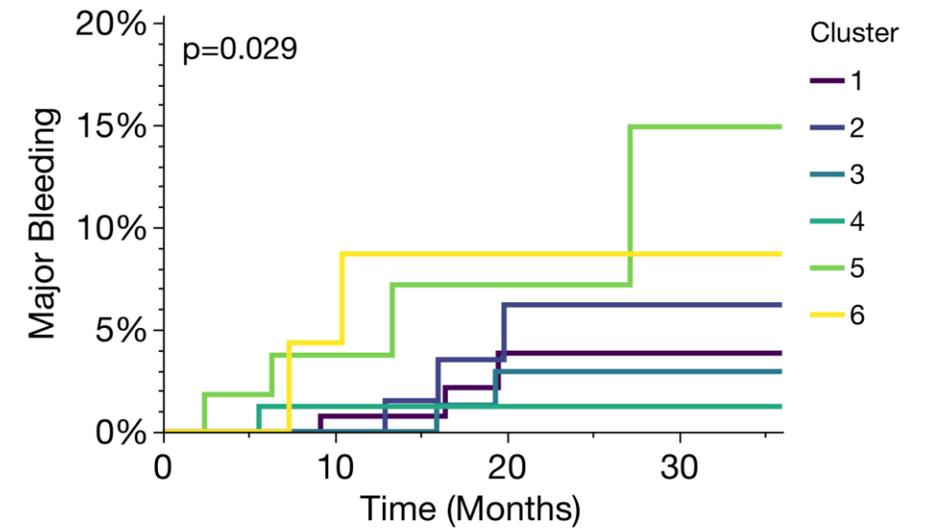
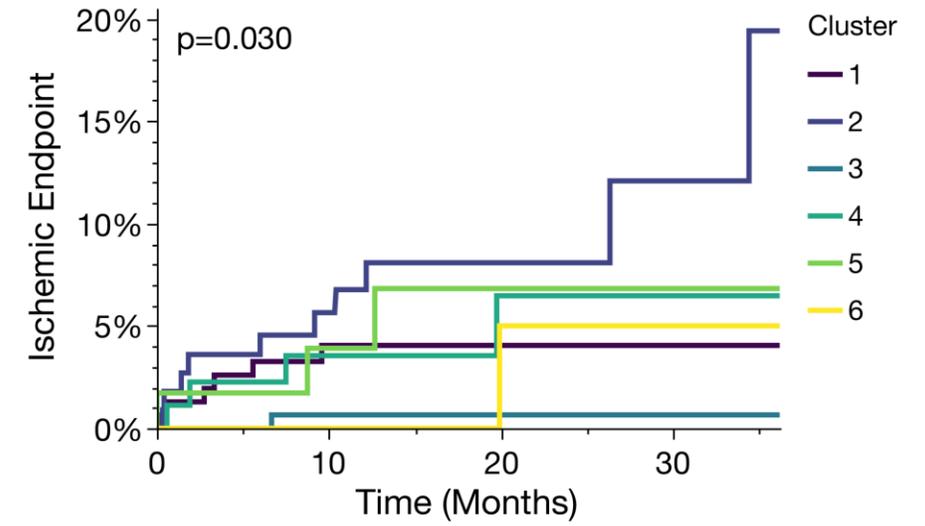
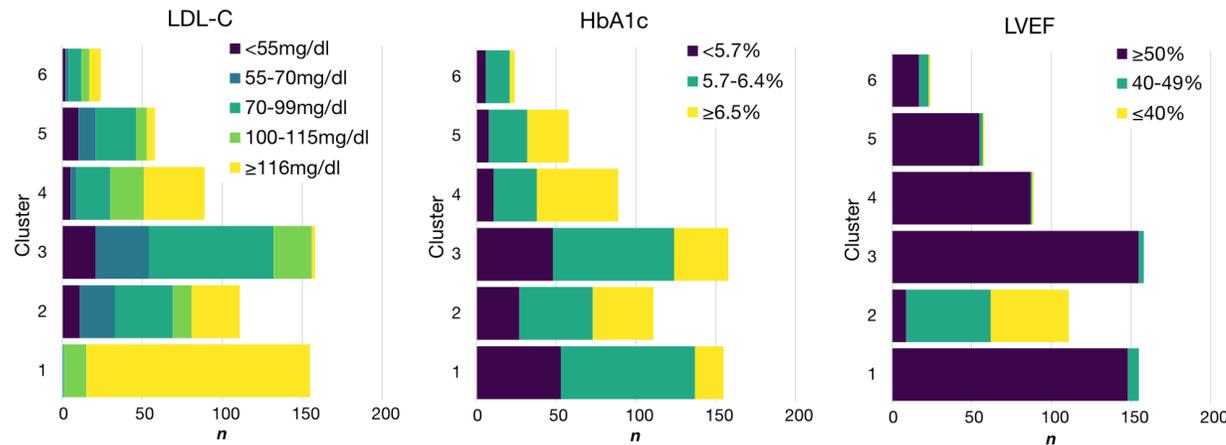
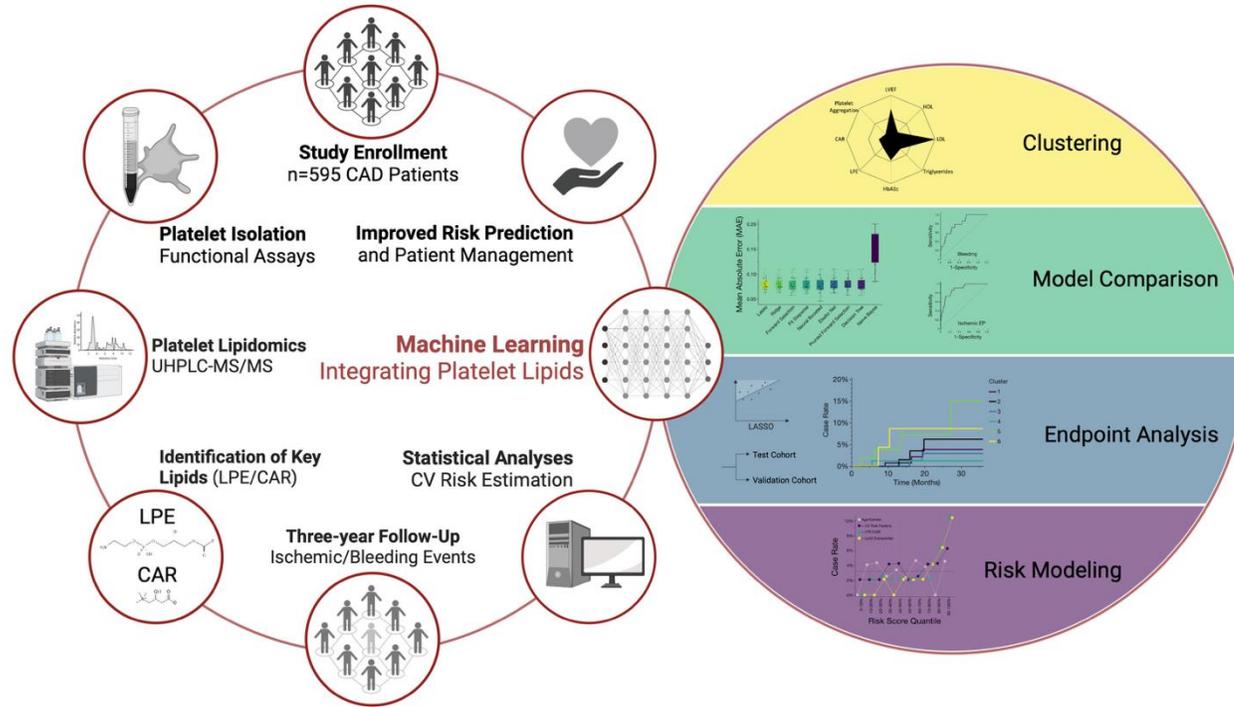
**Stroop Color Word Reading Test**  
(Bitte lesen Sie die Wörter so klar und schnell wie möglich vor.)  
ROT GRÜN BLAU ROT GRÜN ROT BLAU GRÜN ROT GRÜN GRÜN ROT BLAU GRÜN  
BLAU GRÜN ROT BLAU BLAU ROT ROT GRÜN BLAU GRÜN ROT GRÜN BLAU ROT  
BLAU GRÜN BLAU GRÜN BLAU ROT BLAU ROT GRÜN BLAU ROT GRÜN



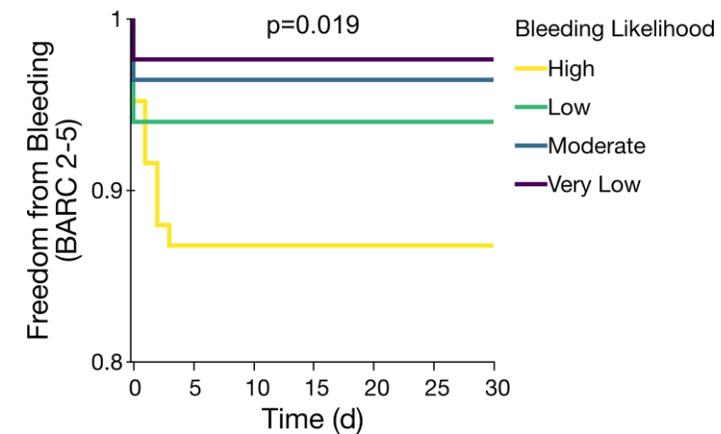
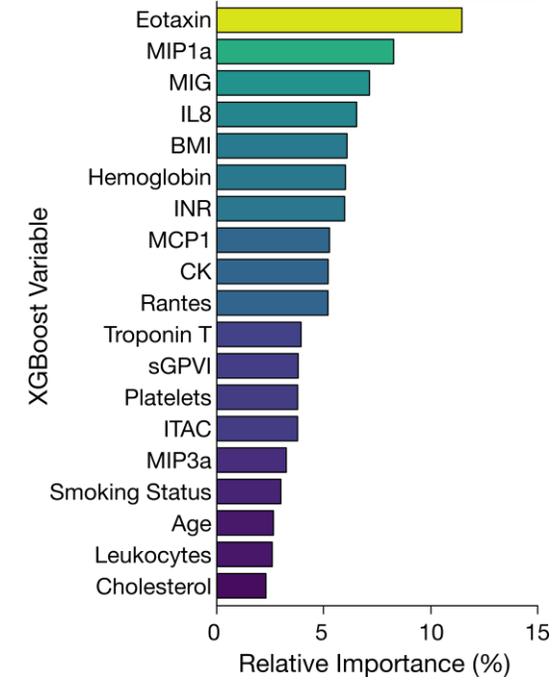
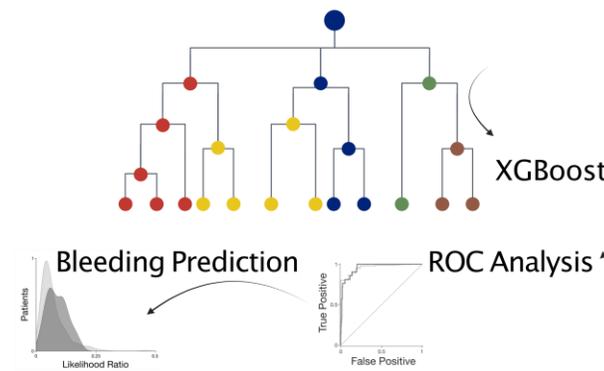
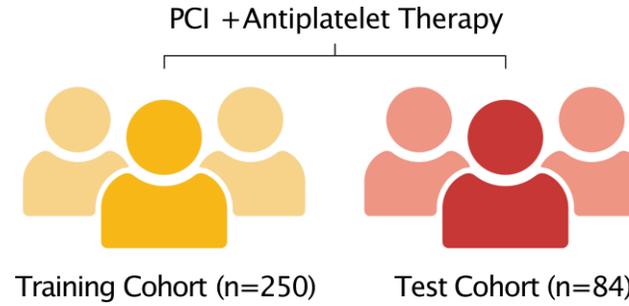
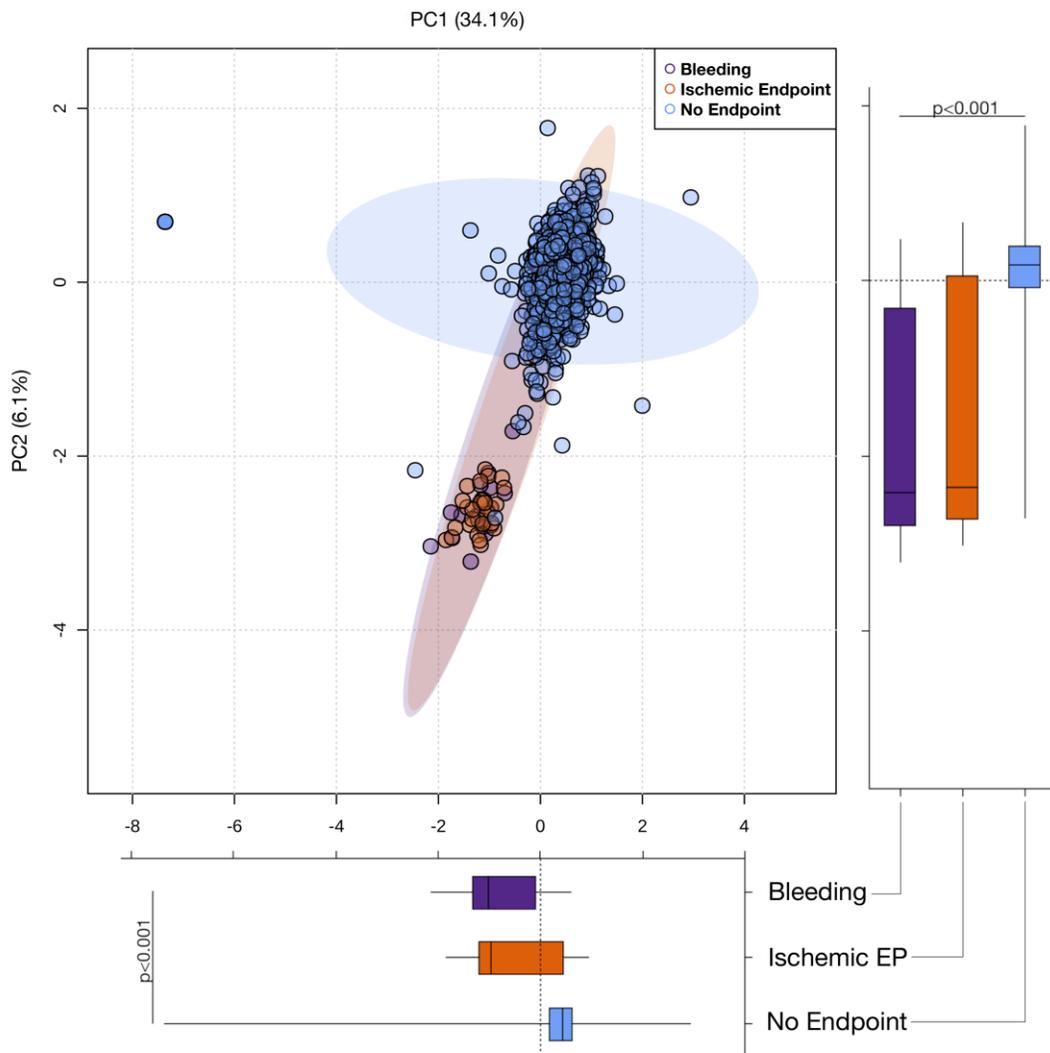
# Anwendbarkeit der künstlichen Intelligenz



# Künstliche Intelligenz – Risikostratifizierung

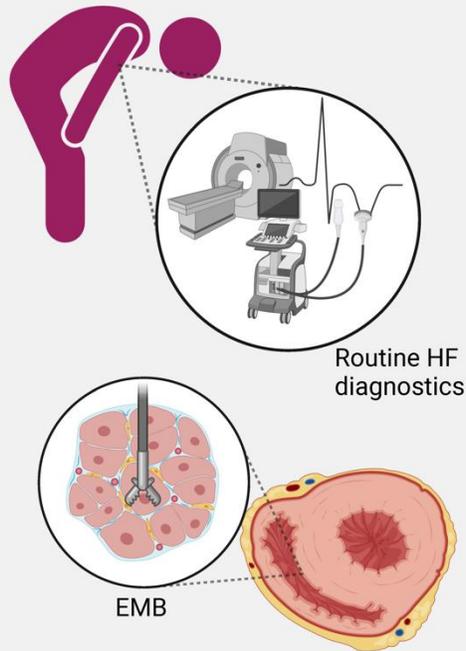


# Big Data – Warum mehr wirklich mehr ist



1

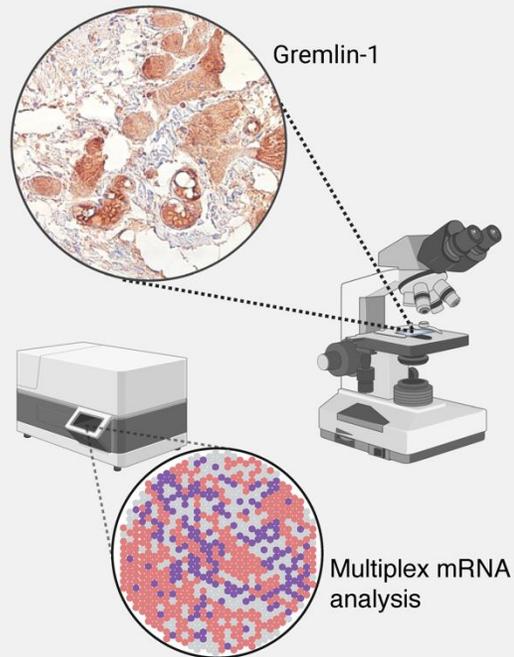
## Clinical Scenario



- Baseline diagnostics including endomyocardial biopsy (EMB) in patients with non-ischemic HF

2

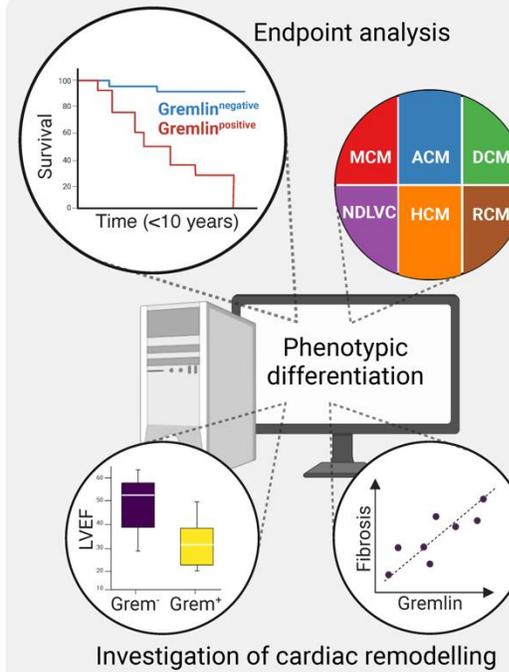
## Assessment of Fibroinflammation



- Histological and mRNA expression analysis of the myocardium (including Gremlin-1)

3

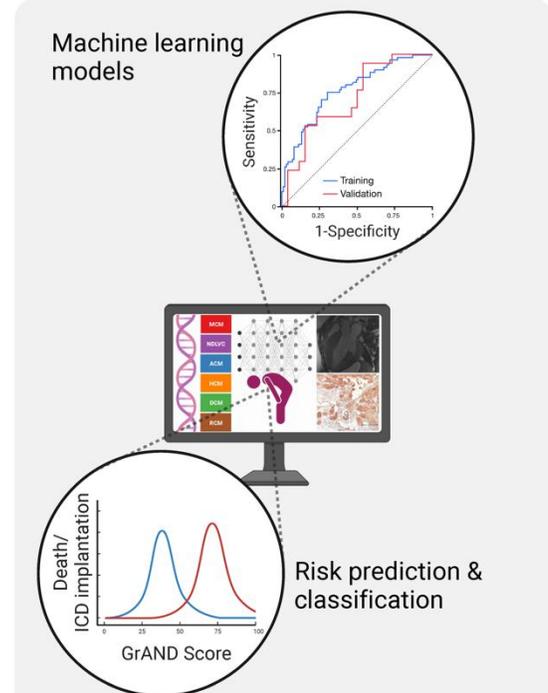
## Determination of Potential Biomarkers



- Impact of Gremlin-1 on cardiac remodelling and prognosis of patients with cardiomyopathy

4

## Improved Diagnostic Value

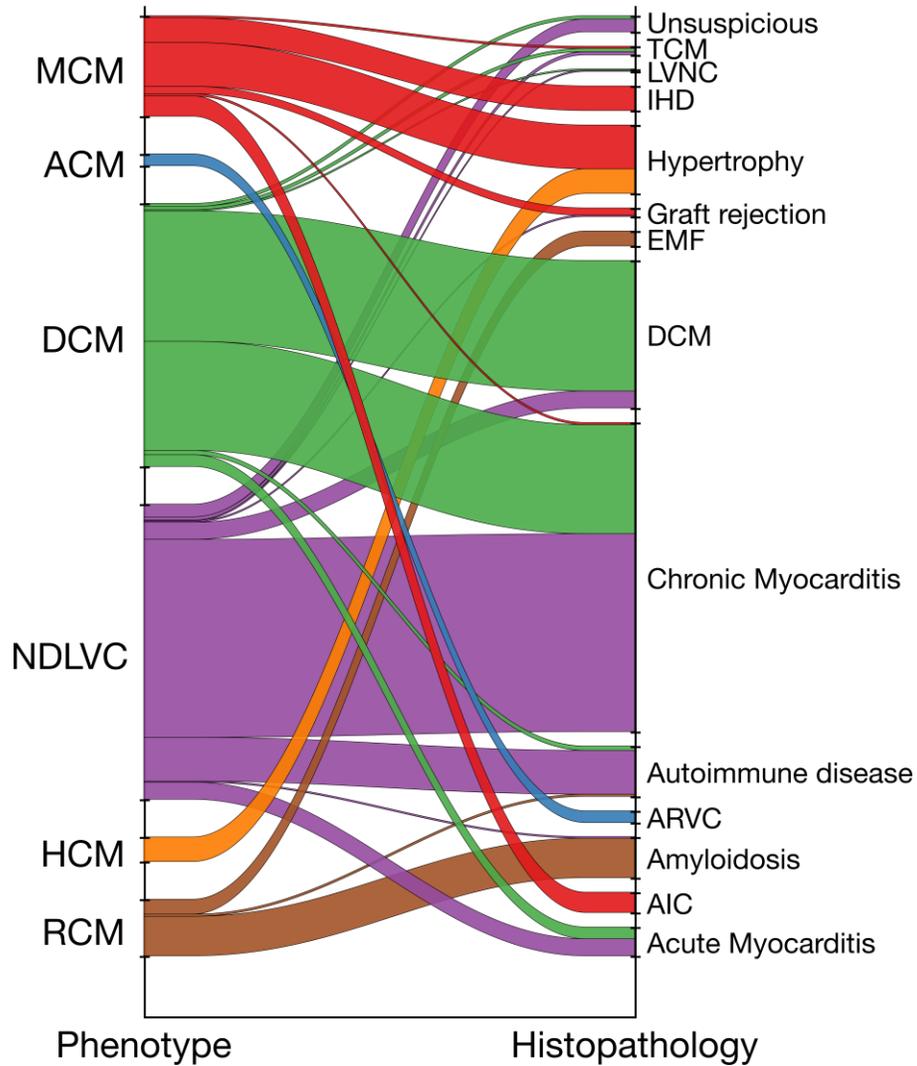


- Enhanced risk stratification and patient management integrating histological findings

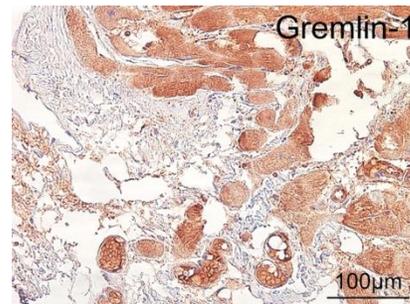
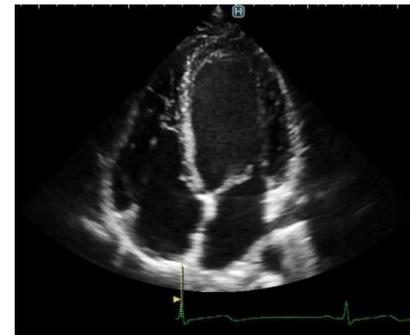
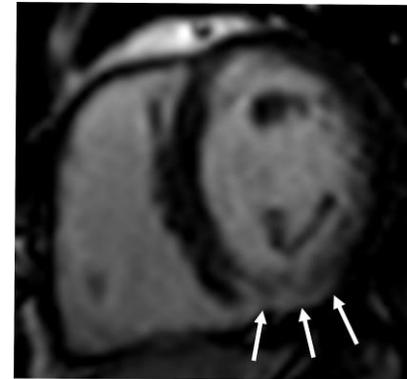


# Big Data in der Herzinsuffizienz: Weg zur Präzisionsdiagnostik

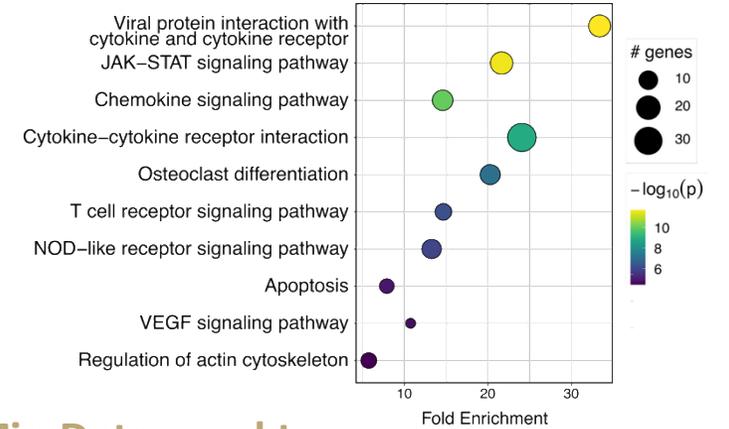
## Endomyokardbiopsie



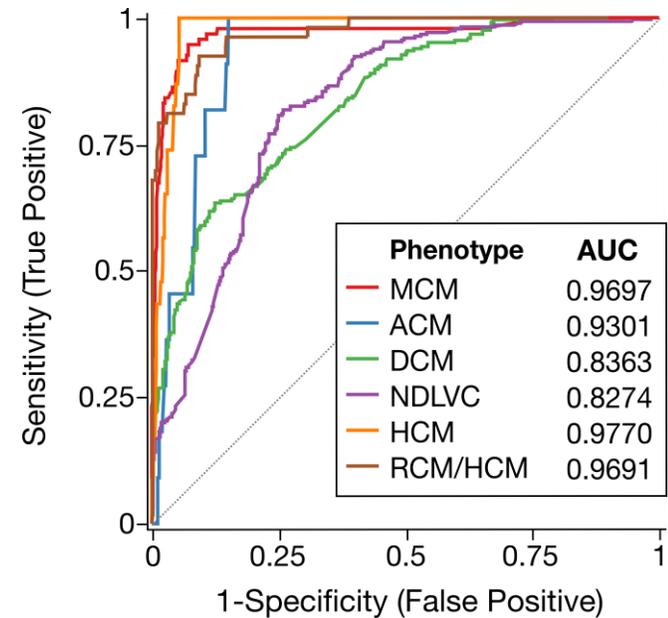
## Imaging/Biomarker



## Transkriptom

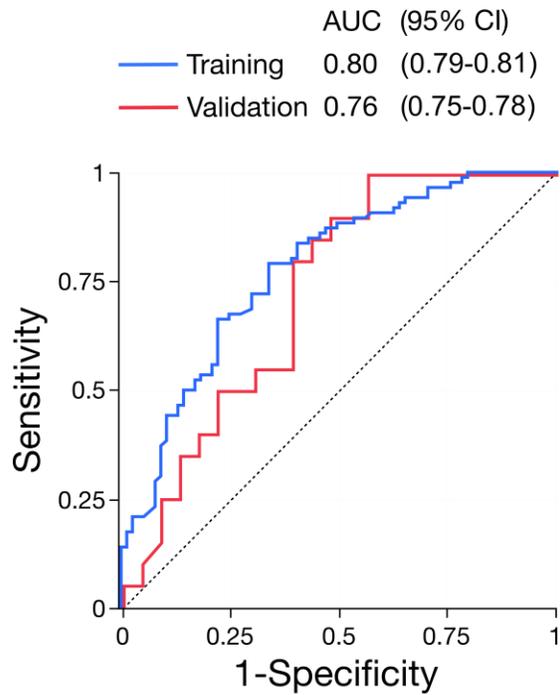


## > 1 Mio Datenpunkte



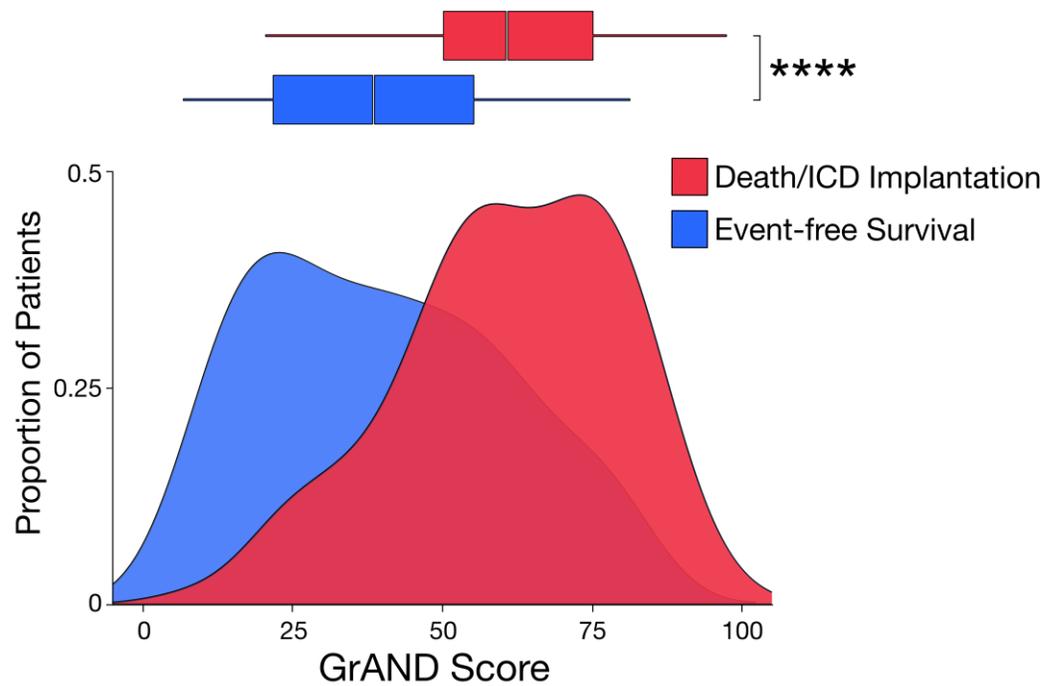
## 1) Machine Learning

Datenanalyse  
Validierung



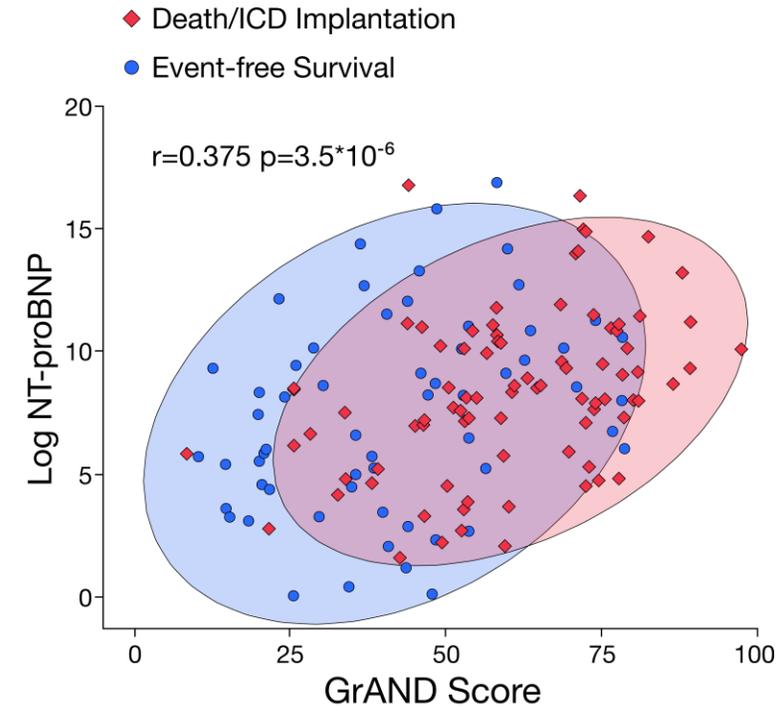
## 2) Risikostratifizierung

Risikoprädiktion  
Individuelle Stratifizierung

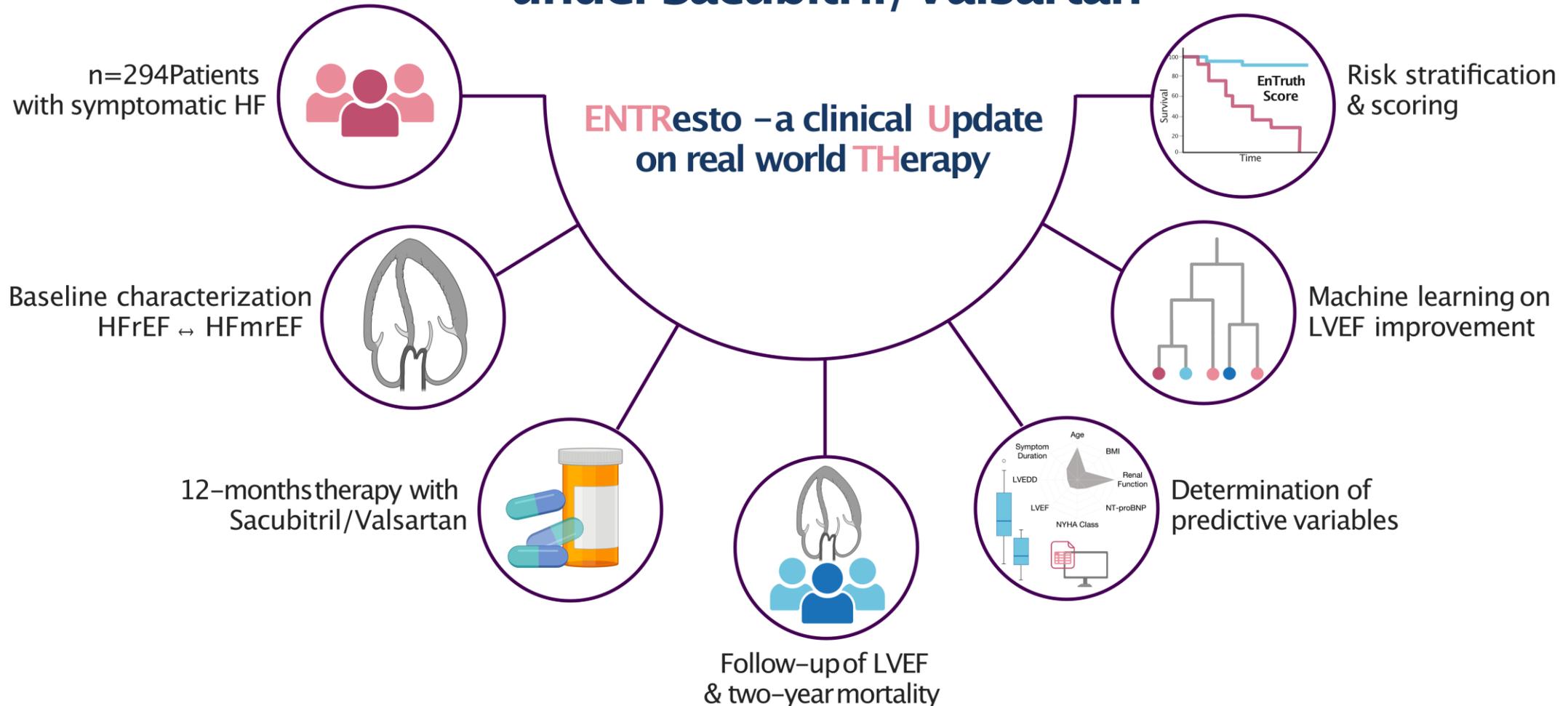


## 3) Klinische Relevanz

Monitoring  
Therapieplanung

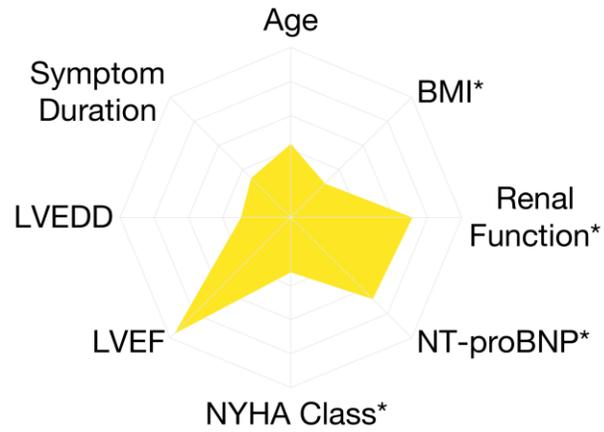


## Prediction of LVEF Improvement under Sacubitril/Valsartan

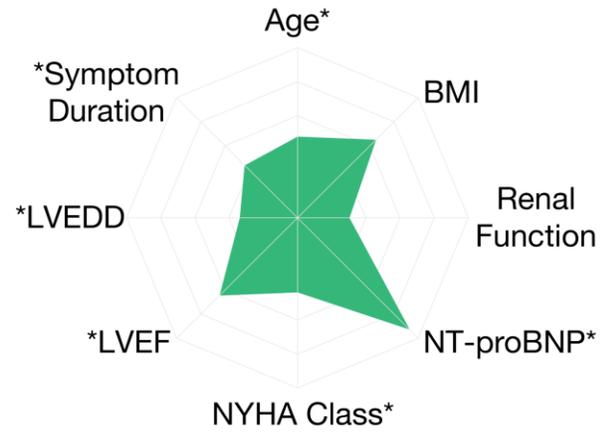


# Phänotypisierung & Stratifizierung durch künstliche Intelligenz

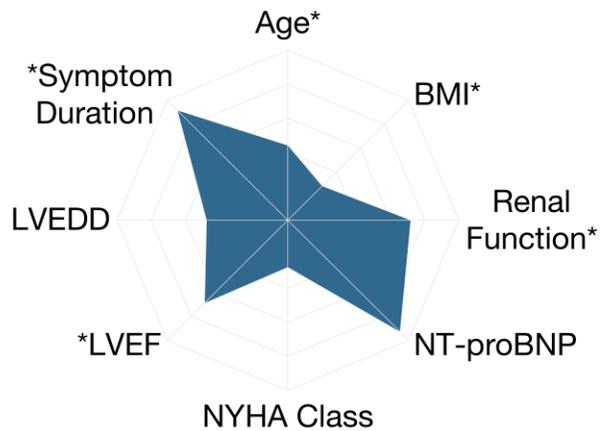
Cluster 1



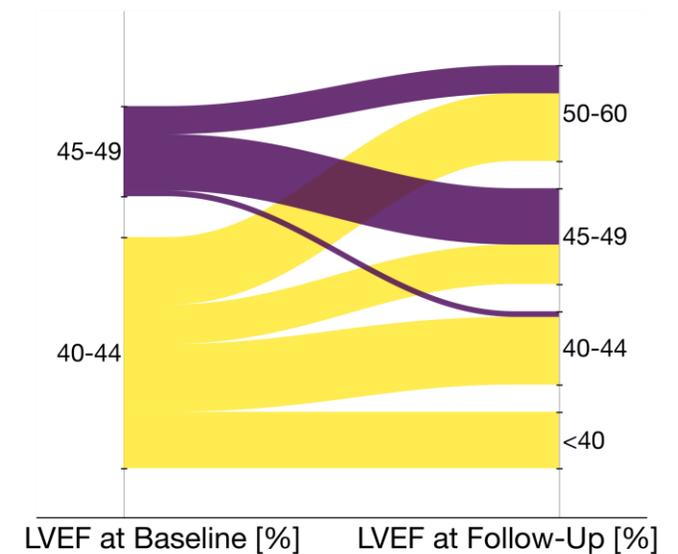
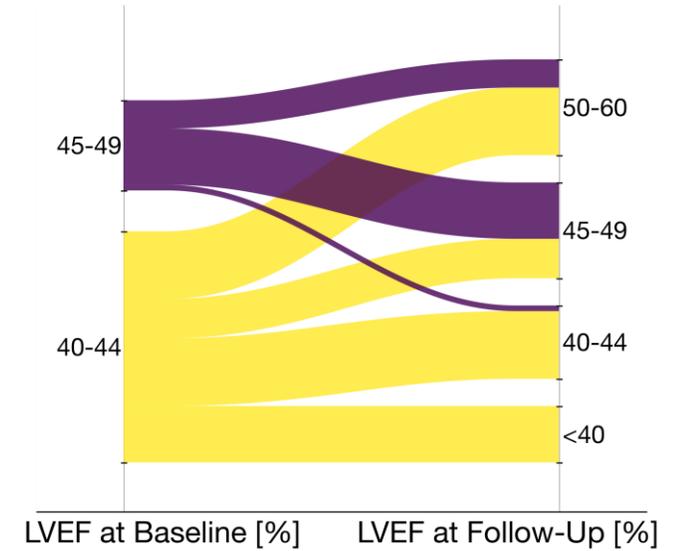
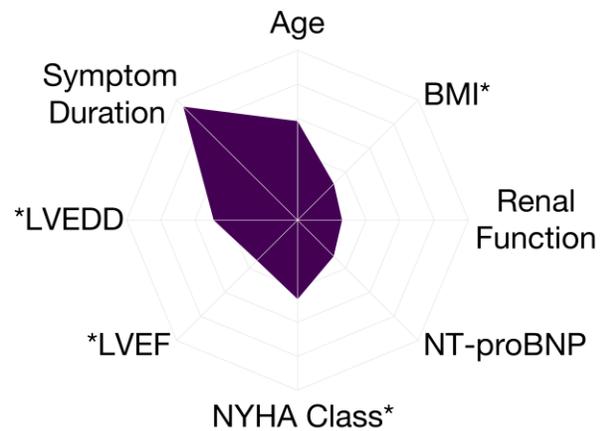
Cluster 2



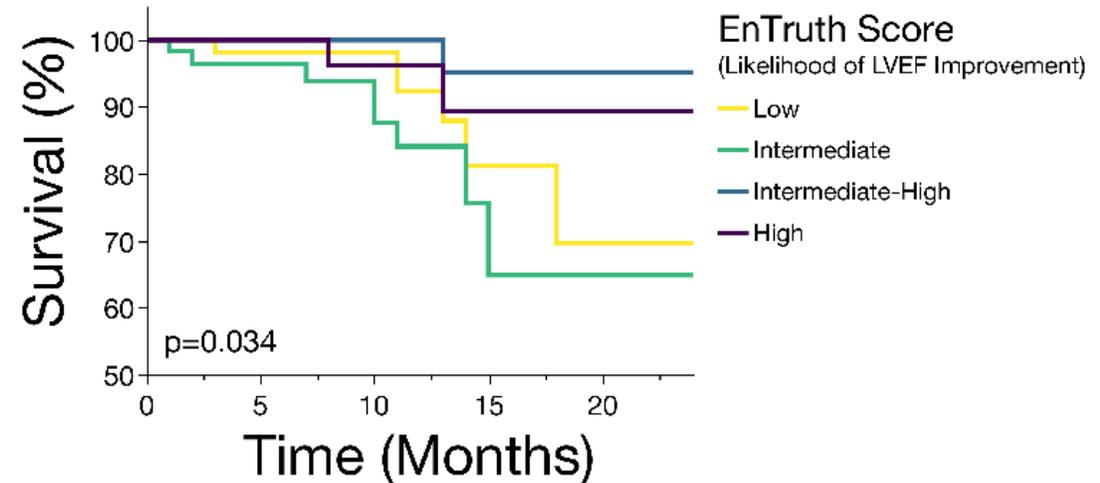
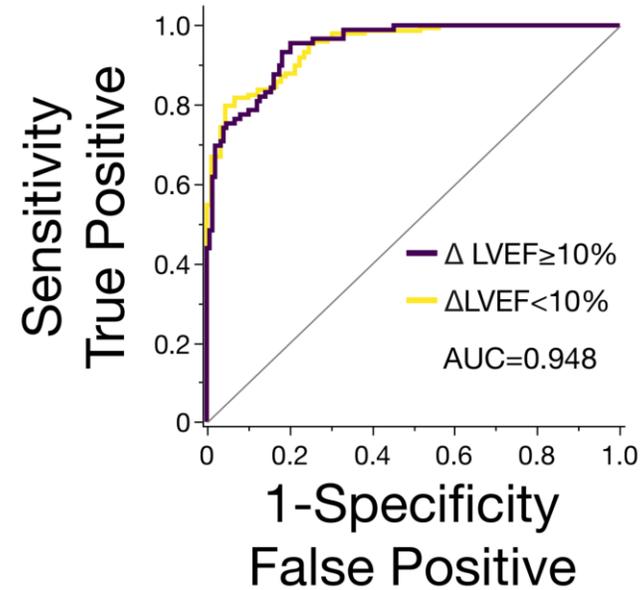
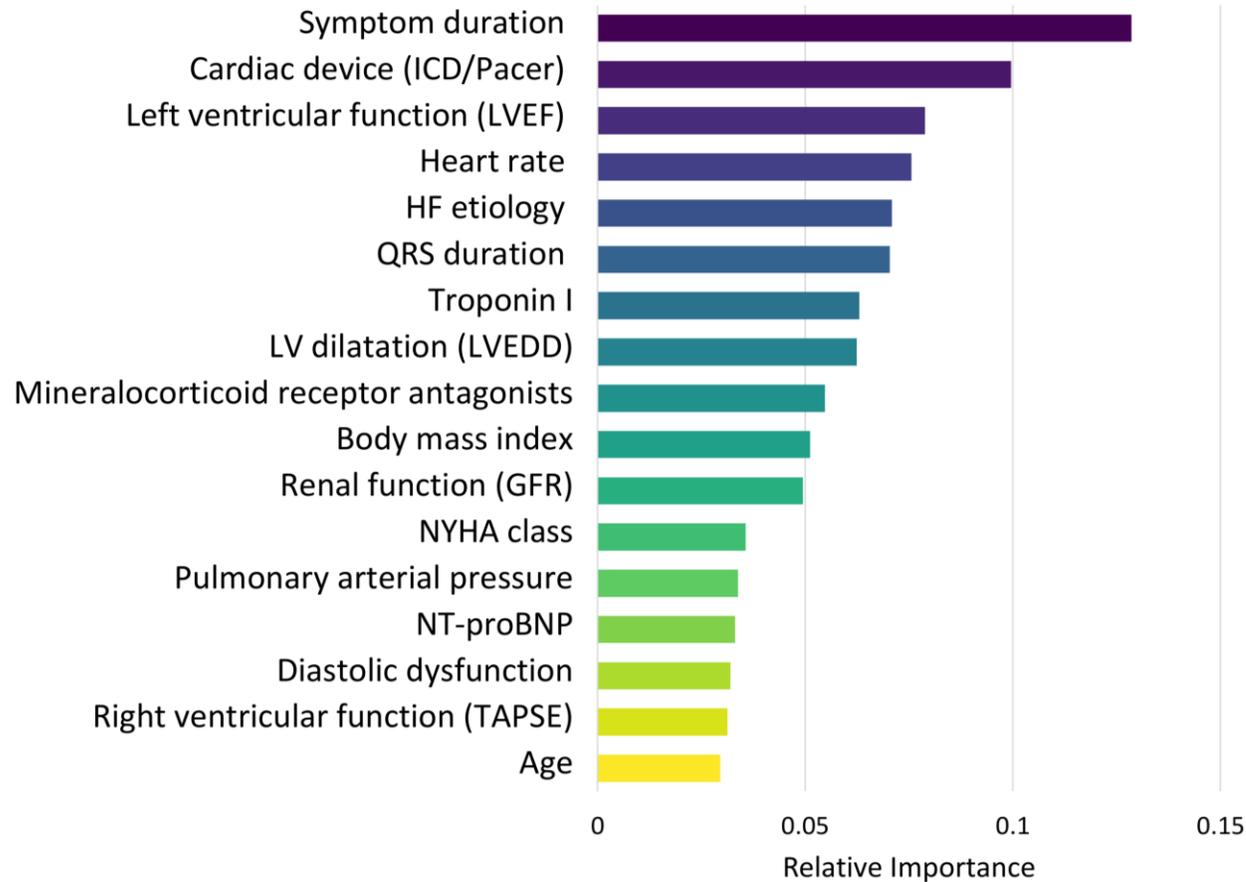
Cluster 3



Cluster 4



# Datengetriebene Therapieüberwachung und Prognoseverbesserung



Vielen Dank für Ihre  
Aufmerksamkeit!

**Dr. med. Tobias Harm**

Abteilung für Innere Medizin III  
Kardiologie & Angiologie

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TÜBINGEN



**Universitätsklinikum  
Tübingen**