

Electrocardiograms as fingerprints

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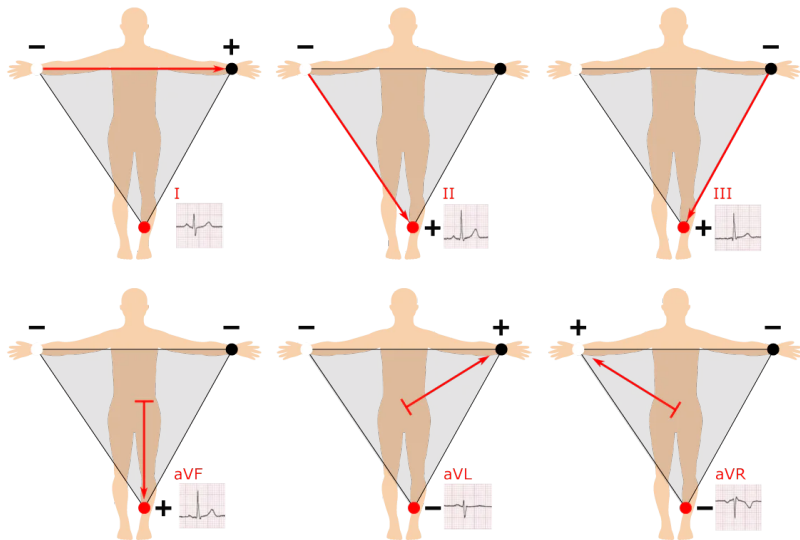
UWB, FAS

2023

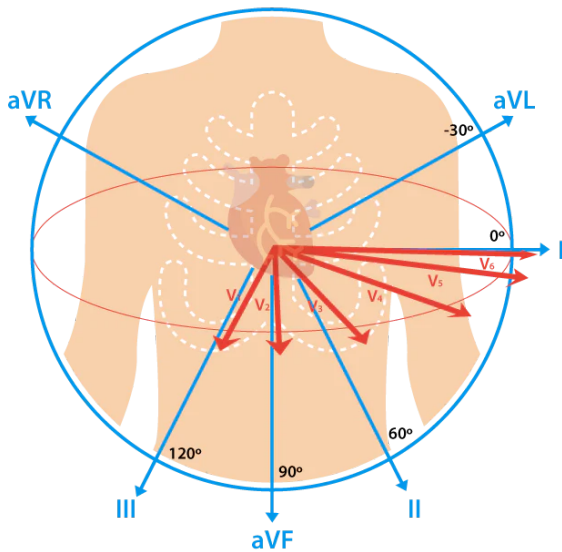
Electrocardiogram



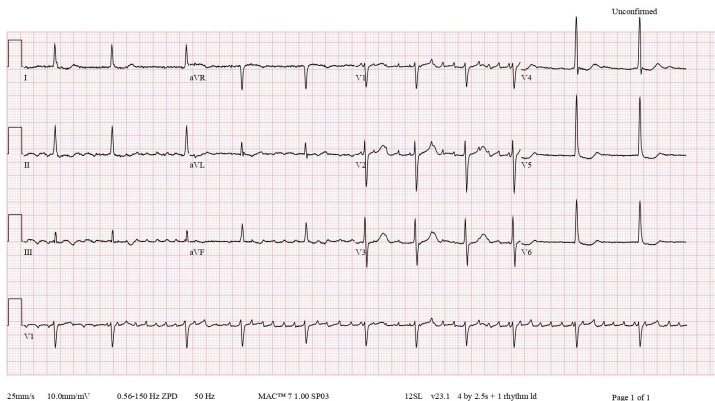
Electrocardiogram



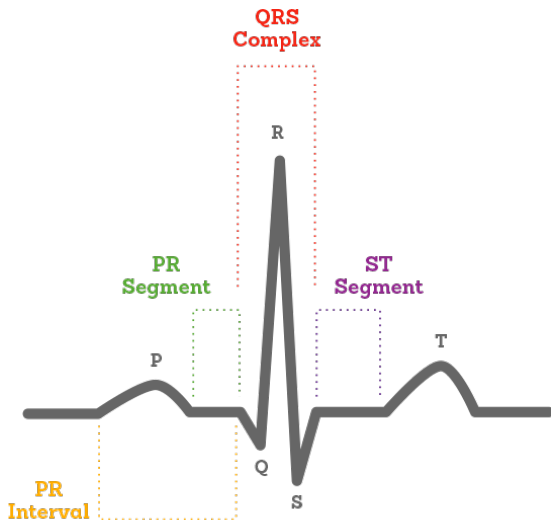
Electrocardiogram



Electrocardiogram



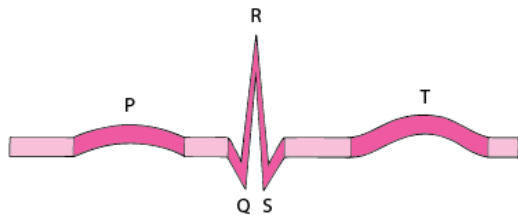
Electrocardiogram



QT



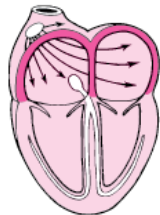
Electrocardiogram



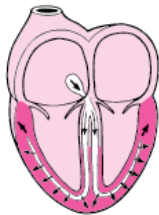
P Wave

QRS Complex

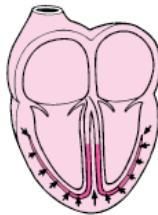
T Wave



Activation of the atria

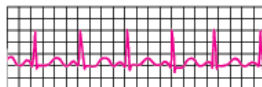


Activation of the ventricles

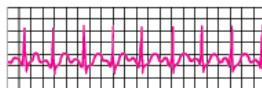


Recovery wave

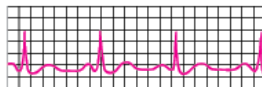
Normal Heartbeat



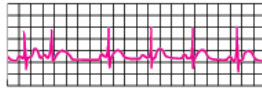
Fast Heartbeat



Slow Heartbeat



Irregular Heartbeat



Human ECGs are great unique identifiers.

ECG-based identification applications

1 forensics

ECG-based identification applications

- 1 forensics
- 2 access control / authentication

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ECG-based identification applications

- 1 forensics
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- 3 medical diagnosis
- 4 patient management

- approx. 80k MUSE XML ECGs 2017-2022, 30k patients
- patient ID included
- 500 Hz, 10s \rightarrow (5000, 12)
- after trimming \rightarrow (4096, 12)

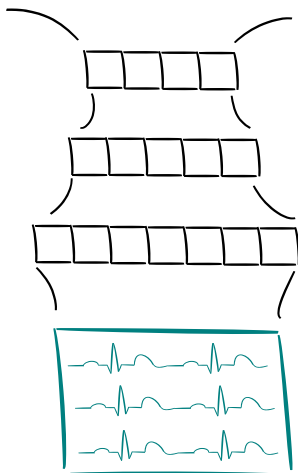
Embedding model

output representation

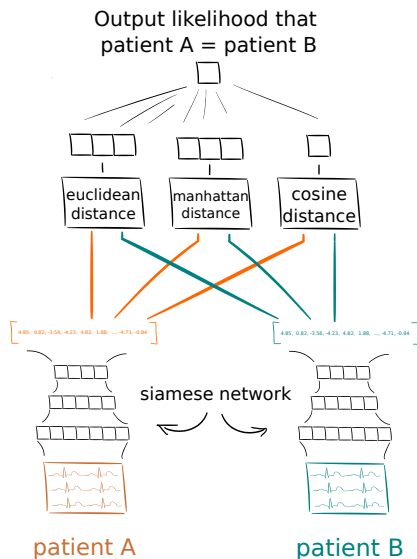
[4.85, 0.82, -3.56, -4.23, 4.82, 1.88, ..., -4.71, -0.84]

Residual convolutional
network

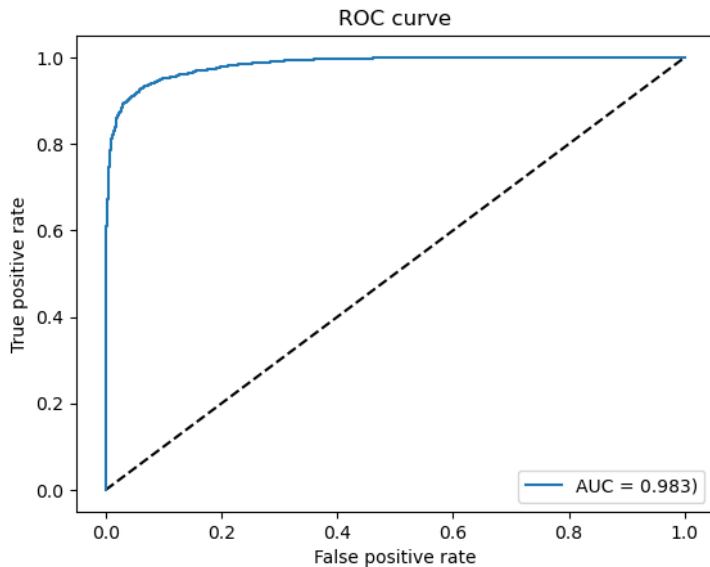
input EKG



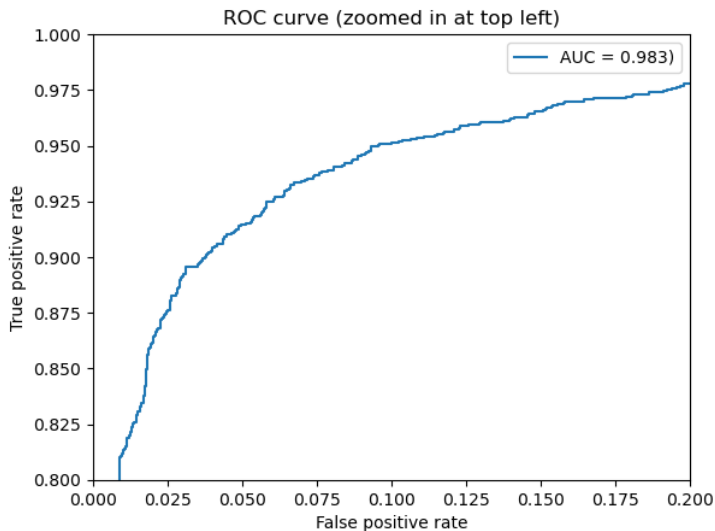
Discriminator



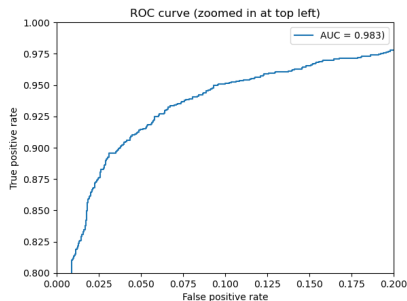
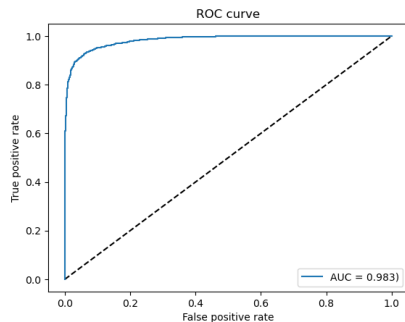
Results



Results

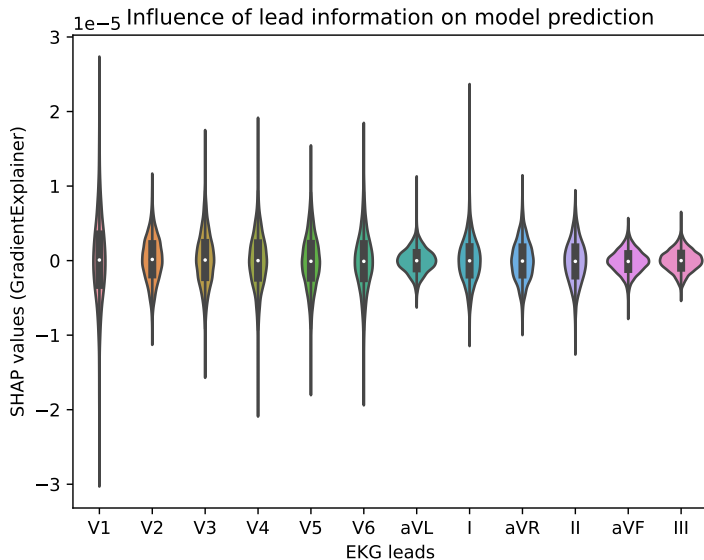


Results



Measurement	Validation	Test
AUC confidence intervals	(0.9857, 0.9873)	(0.9777, 0.9825)
AUC means + CI	$0.9865 \pm 8e-4$	$0.9801 \pm 24e-4$

SHAP explanation



End

Please share any suggestions!