Machine Learning-Based Prediction of Cardiac Arrest Outcome Using a Large Multi-Center Database

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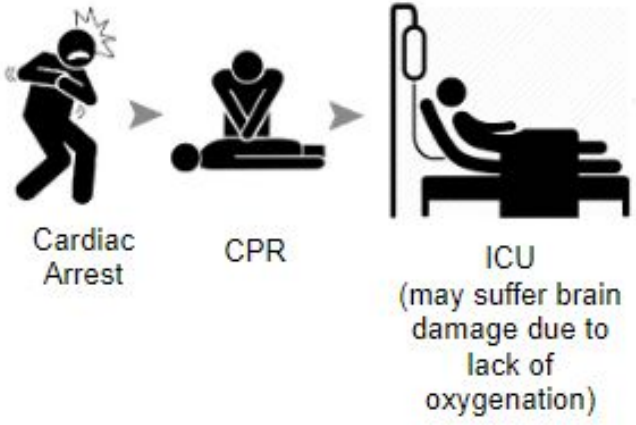
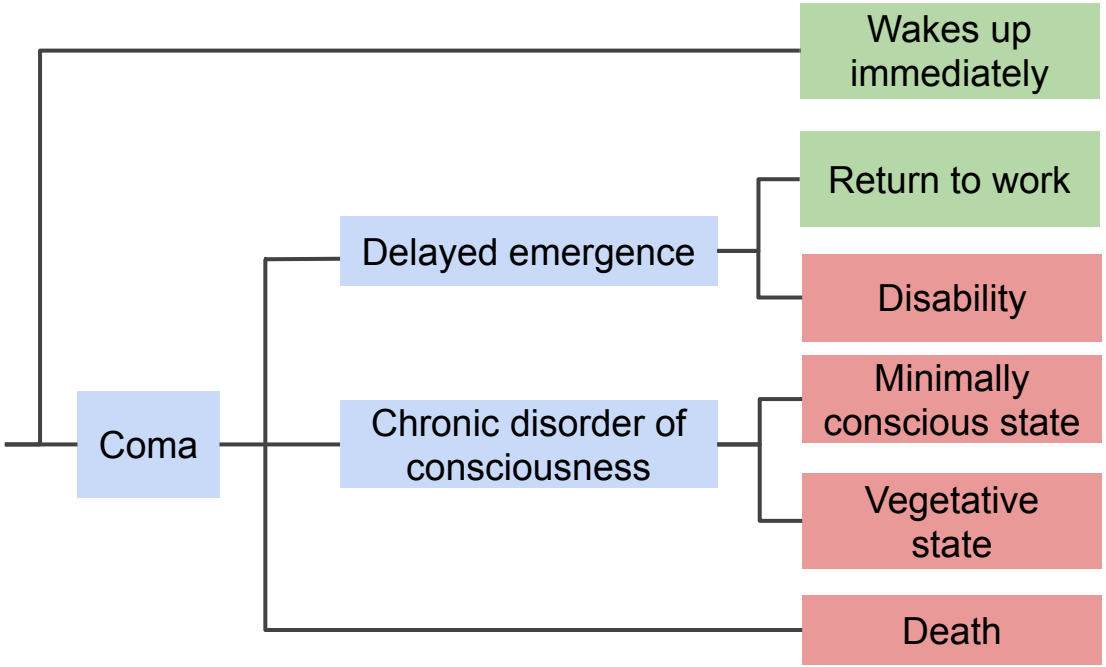
Problem Introduction



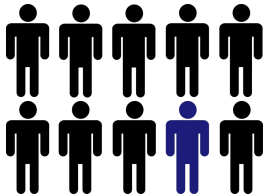


Significance and Innovation

$140,000 cost incurred

per QALY for continuing aggressive treatment in high-risk patients

Fewer than 10%



leave hospital without neurological damage

Large Unmet Need

for accurate and reliable methods to predict post-CA prognostication

We bring to the table...

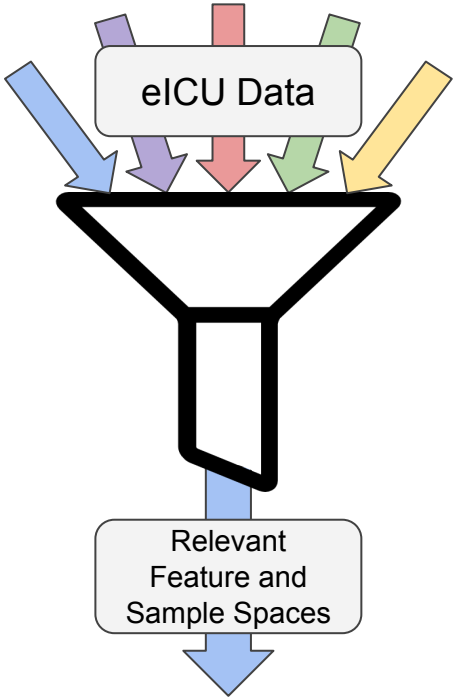
Integration of physiological time series

Large database from 200+ hospitals

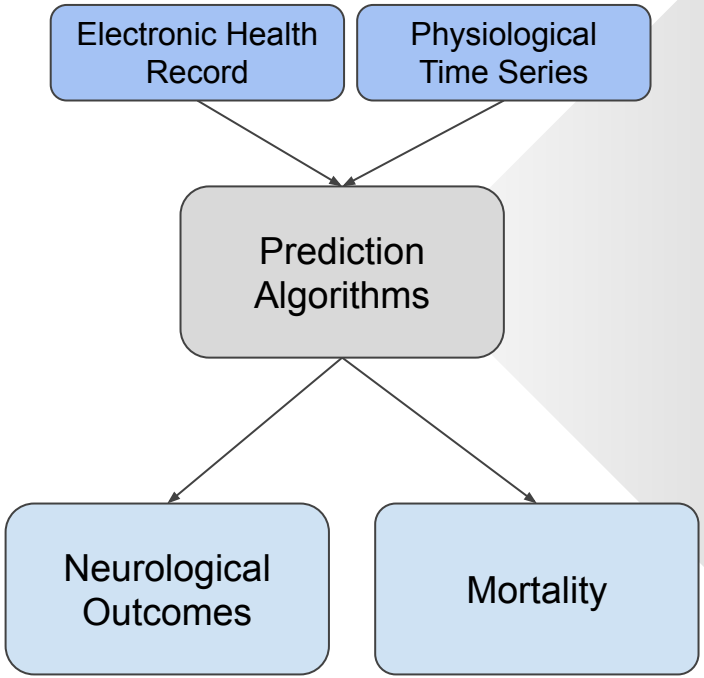
Clinical and engineering expertise

Approach

Aim 1: Data preprocessing and data exploration



Aim 2: Prediction of cardiac arrest outcomes



Machine Learning Algorithms:

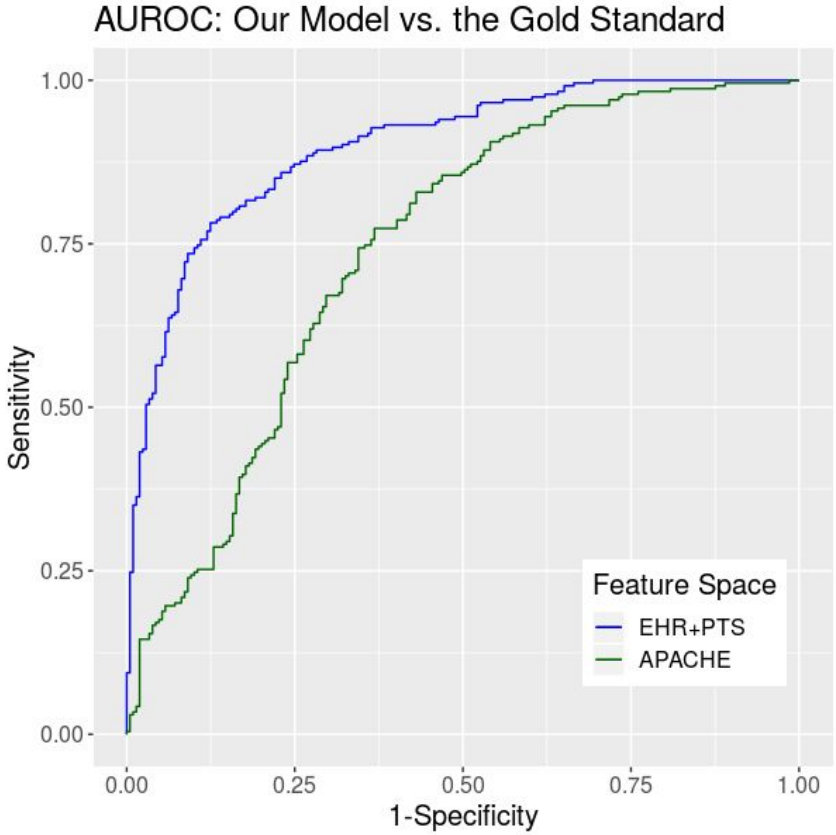
- GLM: LASSO & Elastic Net
- Random Forest
- Gradient Boosting
- XGboost
- Neural Networks (LSTM, GRU)
- Transfer Learning

Model Refinement:

- Optimization Techniques
- Combination of Models (stacking)

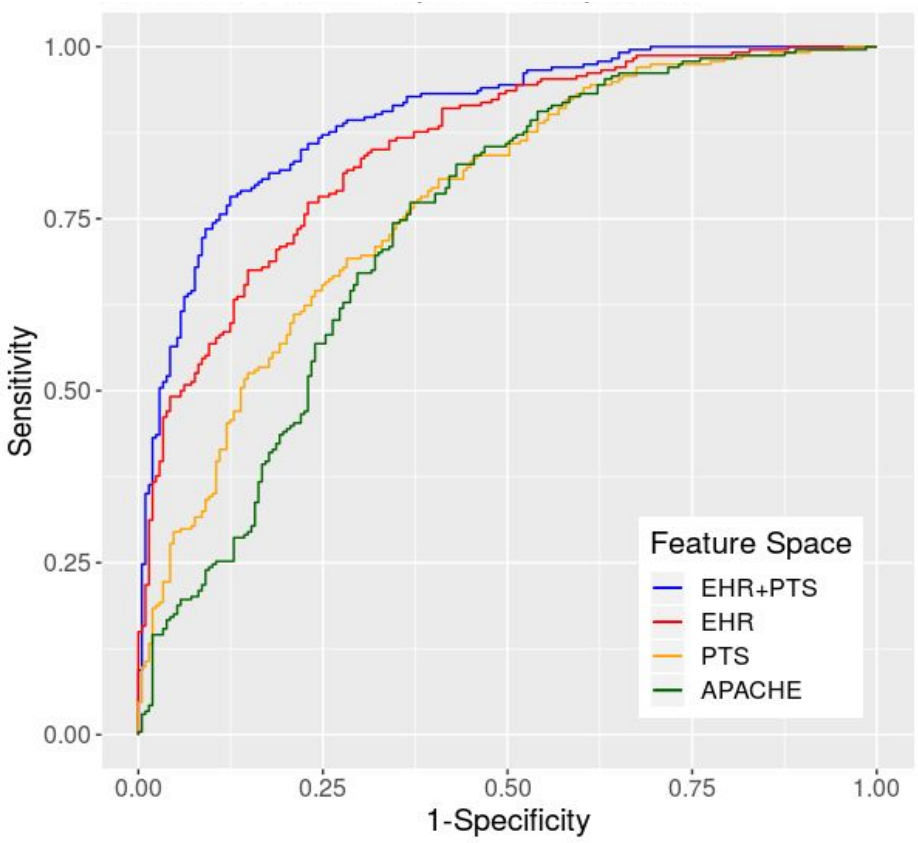
Results

Neurological Outcome



	Clinical Baseline	Our Model
Area Under the ROC Curve	0.74	0.87
Sensitivity	0.77	0.78
Specificity	0.63	0.88

Results



	Clinical Baseline	EHR	PTS	EHR + PTS
AUC	0.74	0.83	0.78	0.87
Sensitivity	0.77	0.77	0.66	0.78
Specificity	0.63	0.77	0.74	0.88

With further validation, our models could:

- aid physicians in clinical decision making to allocate appropriate treatment regimens
- help identify previously overlooked predictive features which merit further investigation

Acknowledgements

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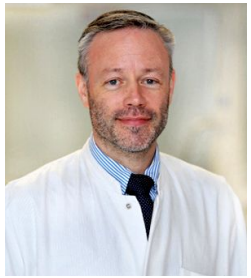

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