Department of Electrical and Computer Engineering



408N - Apnea Apnea Detection From A Single Lead ECG Rodrigo Cornejo & Samuel Monser



A. JAMES CLARK SCHOOL OF ENGINEERING

CNN + LSTM 71% 71% N 72% A 79% N 62% A 75% N 67% A CNN 75% 80% N 68% A 79% N 69% A 79% N 68% A Random Forest 78% 83% N 70% A 81% N 74% A 82% N 72% A SVM 77% 79% N 73% A 81% N 69% A 81% N 71% A KNN 82% 87% N 76% A 85% N 78% A 86% N 77% A A: Apnea, N: non-apnea Why the KNN model Why the KNN model	MODELS	ACCURACY	RECALL	PRECISION	F1-SCORE
CNN 75% 80% N 68% A 79% N 69% A 79% N 68% A Random Forest 78% 83% N 70% A 81% N 74% A 82% N 72% A SVM 77% 79% N 73% A 82% N 69% A 81% N 71% A KNN 82% 87% N 76% A 85% N 78% A 86% N 77% A A: Apnea, N: non-apnea Why the KNN model Why the KNN model	CNN + LSTM	71%	71% N 72% A	79% N 62% A	75% N 67% A
Random Forest 78% 83% N 70% A 81% N 74% A 82% N 72% A SVM 77% 79% N 73% A 82% N 69% A 81% N 71% A KNN 82% 87% N 76% A 85% N 78% A 86% N 77% A A: Apnea, N: non-apnea Why the KNN model Why the KNN model	CNN	75%	80% N 68% A	79% N 69% A	79% N 68% A
SVM 77% 79% N 73% A 82% N 69% A 81% N 71% A KNN 82% 87% N 76% A 85% N 78% A 86% N 77% A A: Apnea, N: non-apnea Why the KNN model	Random Forest	78%	83% N 70% A	81% N 74% A	82% N 72% A
KNN 82% 87% N 76% A 85% N 78% A 86% N 77% A A: Apnea, N: non-apnea My the KNN model Why the KNN model	SVM	77%	79% N 73% A	82% N 69% A	81% N 71% A
A: Apnea, N: non-apnea Why the KNN model	KNN	82%	87% N 76% A	85% N 78% A	86% N 77% A
		M/by tb	A: Apr	nea, N: non-	apnea
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- events during detection.

Conclusion/Future Work

- Developed a pipeline to preprocess and label ECG data from the PhysioNet Apnea-ECG database
- Started model development using a Convolutional Neural Network (CNN)
- Transitioned to a hybrid CNN-LSTM architecture to better capture temporal patterns
- Currently working to improve model performance through tuning and experimentation
- Future goal: deploy a lightweight, accurate model suitable for wearable ECG devices

[1] H. Malik and S. Hossain, "QRS complexes and RR interval of ECG signals," ResearchGate, Aug. 2018. [Online]. Available: https://www.researchgate.net/figure/Ilustration-of-QRS-complexes-and-RR-interval-of-ECG-signals_fig4_326588784. [Accessed: 28-Apr-2025]. [2] The Polysomnogram Test, Sleep-Apnea-Guide, 2020. [Online]. Available: https://www.sleep-apnea-guide.com/images/polysomnogram.jpg. [Accessed: 15-Apr-2025].

[3] "Frequency domain methods — pyHRV 0.4.0 documentation," pyHRV, [Online]. Available: https://pyhrv.readthedocs.io/en/latest/_pages/api/frequency.html. [Accessed: 28-Apr-2025].



