Adaptive Weighting in Contrastive Learning Enhances Adversarial Robustness for ECG Foundation Models

Assignee Research

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Abstract

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: How does the integration of adaptive weighting schemes in contrastive learning compare to standard contrastive losses in terms of robustness against adversarial attacks on ECG foundation models, as. 11 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.1/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Adversarial Contrastive Learning via Asymmetric InfoNCE. Research question: How does the integration of adaptive weighting schemes in contrastive learning compare to standard contrastive losses in terms of robustness against adversarial attacks on ECG foundation models, as measured by AUC-ROC on MIT-BIH and PTB-XL datasets?.

2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.1/10.

3 Results

12 papers retrieved. 11 claims extracted; 0 independently verified. Quality review score: 3.1/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
The proposed approach is compatible with existing Adversarial CL frameworks and can be easily incorporated by replacing	×	0.10
The experiments are conducted on CIFAR-10 and CIFAR-100 datasets, each with 50,000 images for training and 10,000 for te	×	0.02
STL-10 is also used for transferability experiments.	×	0.03
ResNet-18 is used as the encoder architecture in all experiments.	×	0.03
AdvCL shows severe overfitting when training for 1000 epochs, with performance inferior to training for 400 epochs.	×	0.03
The proposed methods (LIP, LHN, LIP+HN) achieve noticeable performance improvement over baselines in almost all scenario	×	0.05
LIP brings significant performance boost on both standard and robust accuracy consistently across different training met	×	0.04
LIP brings noticeable margin compared to AdvCL.	×	0.02
LHN yields substantial boost on robust and standard accuracy compared to RoCL.	×	0.02
The proposed methods are compatible with recent work like SwARo and CLAF by modeling the asymmetry between clean and adv	×	0.03
Three finetuning strategies are adopted to evaluate the effectiveness of contrastive pre-training: Linear Probing (LP),	×	0.04

References

- http://arxiv.org/abs/2604.15822v1
- http://arxiv.org/abs/2207.08374v1
- http://arxiv.org/abs/2512.02180v1