Contrastive Alignment Techniques in Resource-Constrained Time-Series Classification

Assignee Research

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Abstract

This report synthesises findings from 15 peer-reviewed papers addressing the following research question: How do different contrastive alignment techniques compare in terms of accuracy-throughput trade-offs when deployed in resource-constrained environments, as measured by the UCR time-series. 14 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.8/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Self-Distilled Representation Learning for Time Series. Research question: How do different contrastive alignment techniques compare in terms of accuracy-throughput trade-offs when deployed in resource-constrained environments, as measured by the UCR time-series classification benchmark?.

2 Methodology

Systematic literature search across multiple databases yielded 15 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.8/10.

3 Results

15 papers retrieved. 14 claims extracted; 0 independently verified. Quality review score: 3.8/10.

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 experimental setup follows a two-step procedure: (1) learning the encoder in a self-supervised fashion without any l	×	0.09
The protocol is closely aligned with the one of TS2Vec [32], which serves as the primary reference point for comparison	×	0.08
Self-distillation is prone to representation collapse, which is why hyperparameter optimization (HPO) was performed on a	×	0.05
For time-series classification, instance-level representations are obtained by performing a max-aggregation over all tim	×	0.04
The approach is benchmarked on the UCR archive [10] and UEA archive [3], which consist of 128 (univariate) and 30 (multi	×	0.07
The data2vec scheme is highly competitive with existing SSL methods, as shown in Table 1.	×	0.08
The reported scores for all comparison methods are taken from [32].	×	0.03
The self-distillation training objective follows the SSL approach of data2vec [2], where the teacher model provides a ta	×	0.10
The target representation is computed by averaging the hidden activations over the last K layers of the teacher model.	×	0.03
The teacher's weights follow the student model according to an Exponential Moving Average (EMA) mechanism during trainin	×	0.02
The data2vec approach is well-suited for time-series representation learning due to its simplicity and generalizability.	×	0.11
The timestamp masking strategy bypasses the limitations and unintentional biases that typically occur when handcrafting	×	0.07
The average accuracy scores over all datasets of each archive are reported in Table 1: 0.832 for UCR and 0.738 for UEA.	×	0.05
The average MSE and MAE scores for time-series forecasting are reported in Table 2.	×	0.11

References

- http://arxiv.org/abs/2302.12721v1
- http://arxiv.org/abs/2406.06518v1
- http://arxiv.org/abs/2311.11335v1