

# Impact of Alignment Techniques on Statistical Similarity of Synthetic Time-Series Data in Multimodal Generative Models

Assignee Research

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## Abstract

Synthetic data generation has emerged as a promising solution to overcome the challenges which are posed by data scarcity and privacy concerns, as well as, to address the need for training artificial intelligence (AI) algorithms on unbiased data with sufficient sample size and statistical power. Our review explores the application and efficacy of synthetic data methods in healthcare considering the diversity of medical data. To this end, we systematically searched the PubMed and Scopus databases with a great focus on tabular, imaging, radiomics, time-series, and omics data. Studies involving m

## 1 Introduction

This paper examines: Synthetic data generation methods in healthcare: A review on open-source tools and methods. Research question: How do alignment techniques in multimodal generative models affect the statistical similarity of synthetic time-series data as measured by Wasserstein distance?.

## 2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.9/10.

## 3 Results

14 papers retrieved. 11 claims extracted; 11 independently verified. Quality review score: 7.9/10.

## 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
Synthetic data generation has emerged as a promising solution to overcome the challenges posed by data scarcity and privacy	✓	0.31
Synthetic data generation is used to address the need for training artificial intelligence (AI) algorithms on unbiased data	✓	0.34
The review systematically searched the PubMed and Scopus databases with a focus on tabular, imaging, radiomics, time-series	✓	0.28
Studies involving multi-modal synthetic data generation were also explored.	✓	0.26
The type of method used for the synthetic data generation process was identified in each study and categorized into statistical	✓	0.34
Emphasis was given to the programming languages used for the implementation of each method.	✓	0.22
The majority of the studies utilize synthetic data generators to reduce the cost and time required for clinical trials	✓	0.33
Synthetic data generators are used to enhance the predictive power of AI models in personalized medicine.	✓	0.25
Synthetic data generators ensure the delivery of fair treatment recommendations across diverse patient populations.	✓	0.27
Synthetic data generators enable researchers to access high-quality, representative multimodal datasets without exposing	✓	0.31
The review underlines the wide use of deep learning-based synthetic data generation methods.	✓	0.23

## References

- <https://doi.org/10.1016/j.csbj.2024.07.005>
- <https://doi.org/10.1007/s00521-023-08459-3>
- <https://doi.org/10.3390/fi15080260>