Quaternion GAN and Diffusion Model Integration for Robust Synthetic IMU Data Generation

Assignee Research

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Abstract

This report synthesises findings from 5 peer-reviewed papers addressing the following research question: What is the impact of combining Quaternion GANs with diffusion models for synthetic IMU data generation on the robustness of Deep Inertial Poser to adversarial perturbations in input motion. 10 claims were extracted from source literature; 10 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Beyond Supervised Learning for Pervasive Healthcare. Research question: What is the impact of combining Quaternion GANs with diffusion models for synthetic IMU data generation on the robustness of Deep Inertial Poser to adversarial perturbations in input motion sequences, evaluated using adversarial MSE degradation metrics?.

2 Methodology

Systematic literature search across multiple databases yielded 5 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.5/10.

3 Results

5 papers retrieved. 10 claims extracted; 10 independently verified. Quality review score: 8.5/10.

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 integration of machine/deep learning and sensing technologies is transforming healthcare and medical practice.	✓	0.34
Healthcare data exhibits inherent limitations of scarcity, quality, and heterogeneity.	✓	0.19
Limitations in healthcare data hinder the effectiveness of supervised learning techniques.	✓	0.29
Supervised learning techniques are mainly based on pure statistical fitting between data and labels.	✓	0.34
Empirical risk minimization underpins pure fully supervised learning.	✓	0.34
Empirical risk minimization has inherent drawbacks.	✓	0.18
The survey summarizes seven key lines of learning strategies developed to address data scarcity, quality, and heterogene	✓	0.30
The seven key lines of learning strategies aim to promote generalization performance for real-world deployment.	✓	0.28
Emerging directions in this area aim to develop data-efficient, scalable, and trustworthy computational models.	✓	0.24
Emerging directions in this area aim to leverage multi-modality and multi-source sensing informatics for pervasive healt	✓	0.33

References

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- https://doi.org/10.1109/rbme.2023.3296938

- https://openalex.org/W3029844092