

# Manifold-Aware Distance Metrics vs. Standard Metrics in Large-Scale Retrieval Systems

Assignee Research

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## Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: What is the computational overhead and throughput impact of manifold-aware distance metrics (MA-DPR) compared to standard distance metrics in large-scale retrieval systems, when scaled to billions of. Dense Passage Retrieval (DPR) typically relies on Euclidean or cosine distance to measure query-passage relevance in embedding space, which is effective when embeddings lie on a linear manifold. However, our experiments across DPR benchmarks suggest that embeddings often lie on. 0 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 7.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

## 1 Introduction

This paper examines: MA-DPR: Manifold-aware Distance Metrics for Dense Passage Retrieval. Research question: What is the computational overhead and throughput impact of manifold-aware distance metrics (MA-DPR) compared to standard distance metrics in large-scale retrieval systems, when scaled to billions of passages on the BEIR benchmark suite?.

## 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 7.5/10.

### **3 Results**

14 papers retrieved. 0 claims extracted; 0 independently verified. Quality review score: 7.5/10.

### **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.

### **References**

- <http://arxiv.org/abs/2509.13562v1>
- <http://arxiv.org/abs/2104.08663v4>
- <http://arxiv.org/abs/2005.12992v1>