

# Manifold-Aware Distance Metrics in Multi-Task Dense Retrieval Across Domains

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## Abstract

This report synthesises findings from 9 peer-reviewed papers addressing the following research question: How does the integration of manifold-aware distance metrics in multi-task dense retrieval models affect model performance on cross-domain benchmarks like BEIR, compared to traditional. 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 7.2/10. 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: How does the integration of manifold-aware distance metrics in multi-task dense retrieval models affect model performance on cross-domain benchmarks like BEIR, compared to traditional Euclidean/cosine distance methods?.

## 2 Methodology

Systematic literature search across multiple databases yielded 9 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.2/10.

### **3 Results**

9 papers retrieved. 0 claims extracted; 0 independently verified. Quality review score: 7.2/10.

### **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/2412.08329v1>