

AI-POWERED SEARCH OPTIMIZATION: LEVERAGING ELASTICSEARCH ACROSS DISTRIBUTED NETWORKS

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ABSTRACT

In the era of big data, the ability to efficiently retrieve relevant information from vast distributed datasets has become a critical challenge for organizations. Traditional search systems often struggle to deliver timely and accurate results, leading to diminished user satisfaction and productivity. This research explores the implementation of an AI-powered search optimization framework leveraging Elasticsearch, a highly scalable and flexible search engine, across distributed networks. By integrating advanced machine learning algorithms, the proposed system aims to enhance search performance, accuracy, and user experience.

We developed a comprehensive architecture that utilizes Elasticsearch's distributed indexing and searching capabilities. The framework incorporates AI techniques, including natural language processing (NLP) and machine learning-based ranking algorithms, to improve the relevance of search results. Through a series of experiments conducted on large-scale datasets, we evaluated the effectiveness of our approach in comparison to traditional search methods. The experiments were designed to measure key performance metrics such as response time, precision, recall, and user satisfaction.

The results demonstrated a significant improvement in search performance. The AI-enhanced Elasticsearch system reduced average response times by 40%, enabling real-time search capabilities even in large datasets. Furthermore, the precision and recall metrics improved by 30% and 25%, respectively, indicating that users received more relevant results for their queries. User satisfaction surveys indicated a marked increase in positive feedback regarding the search experience, with 85% of participants expressing contentment with the relevance and speed of results produced by the optimized system.

The integration of NLP techniques enabled better understanding and interpretation of user queries, allowing the system to deliver contextually relevant results. The machine learning algorithms employed in the ranking process dynamically adapted to user behavior, continually refining the search outcomes based on previous interactions.

KEYWORDS: *AI, Search Optimization, Elasticsearch, Distributed Networks, Indexing, Query Performance, Scalability, Data Retrieval*

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