

Abstract

ADS-Search is a modular, adaptive search algorithm optimized for 2D/3D/4D datasets. It combines division-based partitioning, dual steering logic (horizontal/vertical), and context-aware ascending/descending scan strategies. Through real-time feedback loops and fallback mechanisms, it maintains consistent performance across diverse data conditions. Tested on datasets exceeding 10 million points, ADS-Search demonstrated robust execution speed and adaptability, outperforming classical search techniques in complex environments.

1. Introduction

Massive datasets in modern applications (e.g., cybersecurity logs, medical imaging, sensor networks) demand fast and intelligent search mechanisms. Conventional methods often fail to scale with growing complexity or dimensionality. ADS-Search was developed in response to limitations observed in linear traversal, spatial trees (e.g., KD-Trees), and rigid static search models.

2. Related Work

Numerous approaches exist for spatial and multidimensional data search. ADS-Search differs by combining scan logic, feedback, and modular steering adaptation.

3. Algorithm Design

ADS-Search operates in five stages: Division, Profiling, Steering Selection, Scan Execution, and Feedback Loop. Each segment adapts scanning logic based on statistical properties and feedback timing.

4. Experimental Results

Tested across datasets from 500K to 10M+ entries. ADS-Search showed superior performance in adaptability and execution time compared to classic scans.

5. Limitations and Future Work

Current version focuses on structured numeric grids. Future directions include GPU parallelism and reinforcement-based steering adaptation.

6. Conclusion

ADS-Search offers a scalable, adaptive approach to multidimensional data search, with real-time feedback and intelligent steering logic.

Code and License

GitHub: <https://github.com/Saaam8/ADS-Search> License: MIT

DOI Reference

This work is officially archived at Zenodo: <https://doi.org/10.5281/zenodo.15477355>

Disclosure Statement

This manuscript was drafted with the assistance of language-generation tools, under the full supervision and verification of the author.