

This project documents the development of an AI-powered search engine, built to apply the knowledge I gained from studying algorithms. My understanding of algorithms was largely shaped by the book *Grokking Algorithms* by Aditya Y. Bhargava.

During the course of this project, I realized that algorithms form the foundation of artificial intelligence and machine learning. Exploring indexing and vectorization techniques significantly deepened my understanding of how modern AI systems operate. This project exposed me to practical applications of theoretical concepts and strengthened my interest in AI-driven systems.

The core data structures and algorithms used in this project include Trie, Depth-First Search (DFS), and Hash Tables.

Extracted function names from the codebase were organized using a Trie structure, allowing the data to be represented as a graph with nodes and edges. This structure made it possible to efficiently apply DFS for searching.

During benchmarking, DFS performed significantly faster than hash table-based searches. This result aligned with what I had studied in *Grokking Algorithms*, reinforcing the importance of choosing the right algorithm for a given problem.

One of the most challenging aspects of the project was handling Git conflicts. I encountered complex merge issues that I had never faced before. Resolving these conflicts required a deeper understanding of Git internals, particularly rebasing and conflict resolution strategies.

This experience was valuable and improved my confidence in handling real-world version control problems.

Semantic search was a key AI component of this project. Implementing it demonstrated the vast potential of AI beyond traditional keyword-based search.

Through this process, I learned that the same semantic techniques used in text-based search can be applied to other domains, such as image search, provided the data is properly labeled. This reinforced the idea that AI systems are highly adaptable when built on strong algorithmic foundations.

One major lesson from this project is that understanding concepts from books is far easier than applying them in real projects. Practical implementation revealed gaps in my knowledge and forced me to think critically.

I also learned that challenging problems are essential for growth. As I continue to take on more complex projects, I expect development to become faster and more efficient. This project has strengthened my problem-solving skills and broadened my perspective on the possibilities within AI and machine learning.