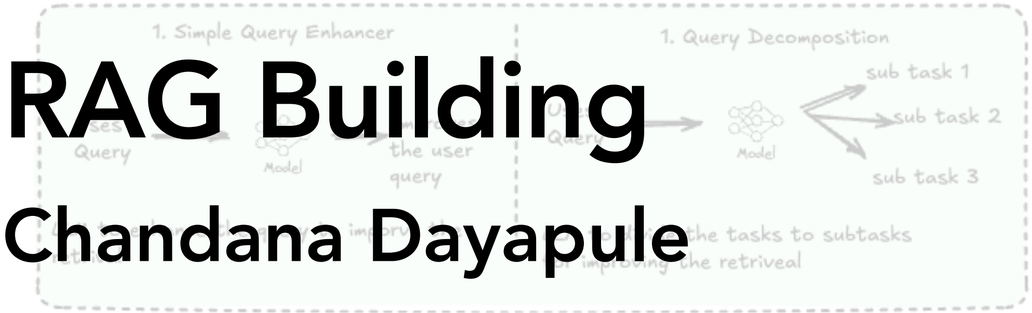
RAG Building

Chandana Dayapule

Indexing

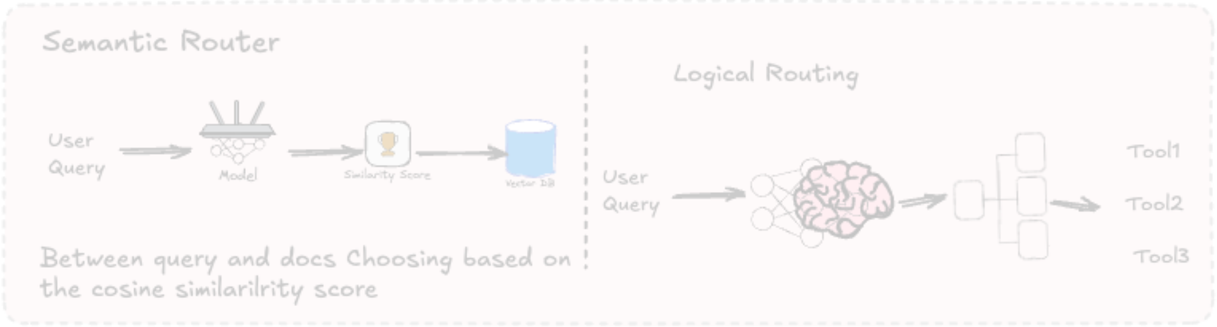
Overall Workflow

Translator



Retriver

Router



Generator

Content

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        5. Indexer
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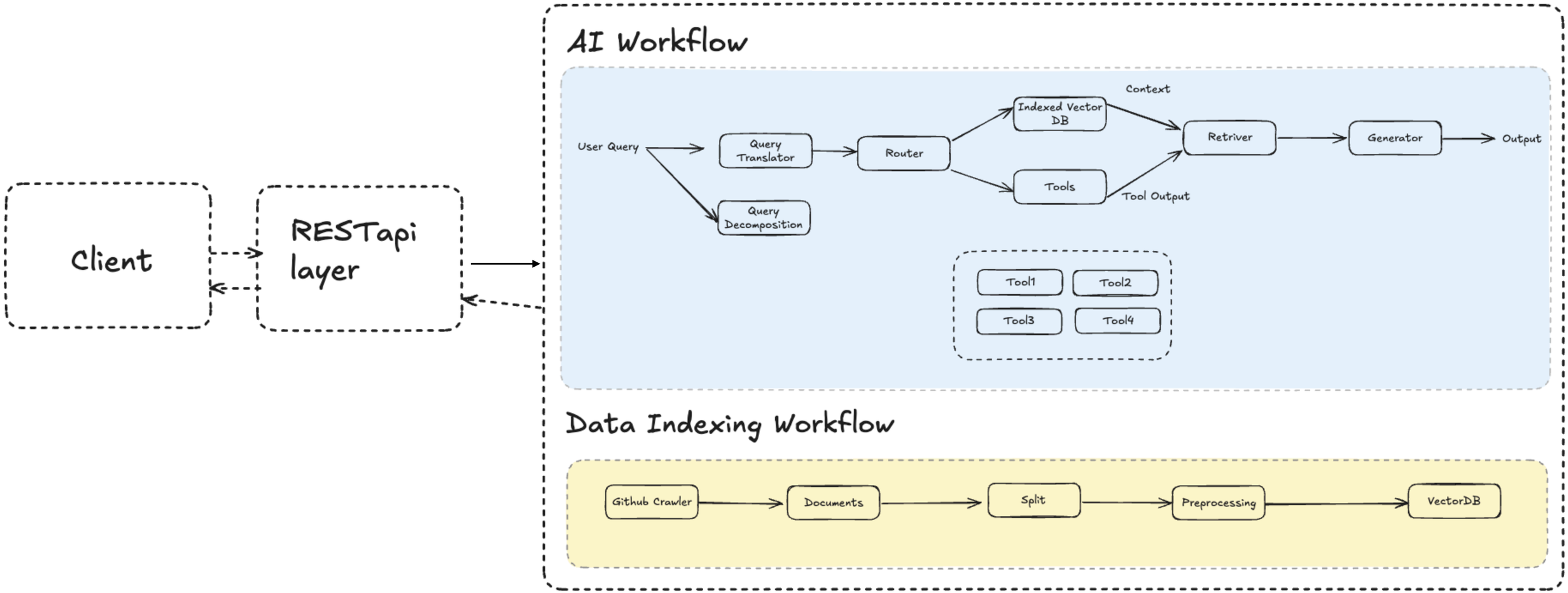
Architectural Diagram



Code Implementation Modules

Modules Built

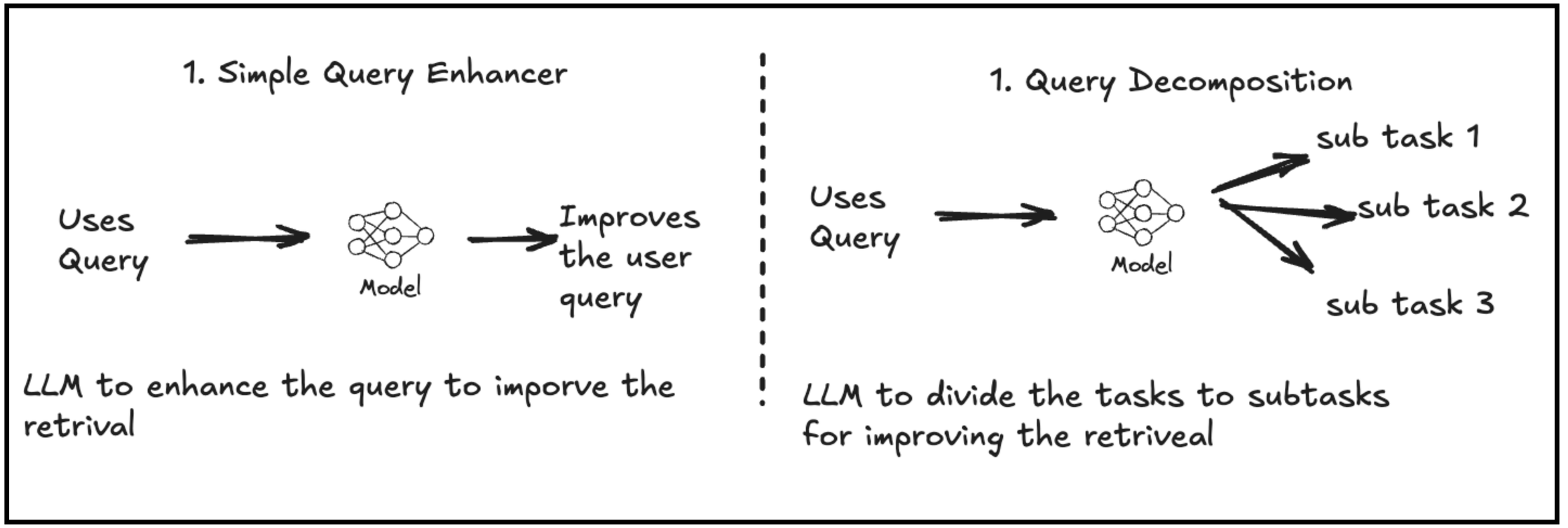
1. Query Translator
2. Query Router
3. Query Retriever
4. Query Generator

Vector DB indexing

1. Github crawler
2. Docs Loader
3. Docs splitter or chucking
4. Indexing Vector db

1. Query Translator

1. Query Translator



Method 1 - Simple Query Enhancer

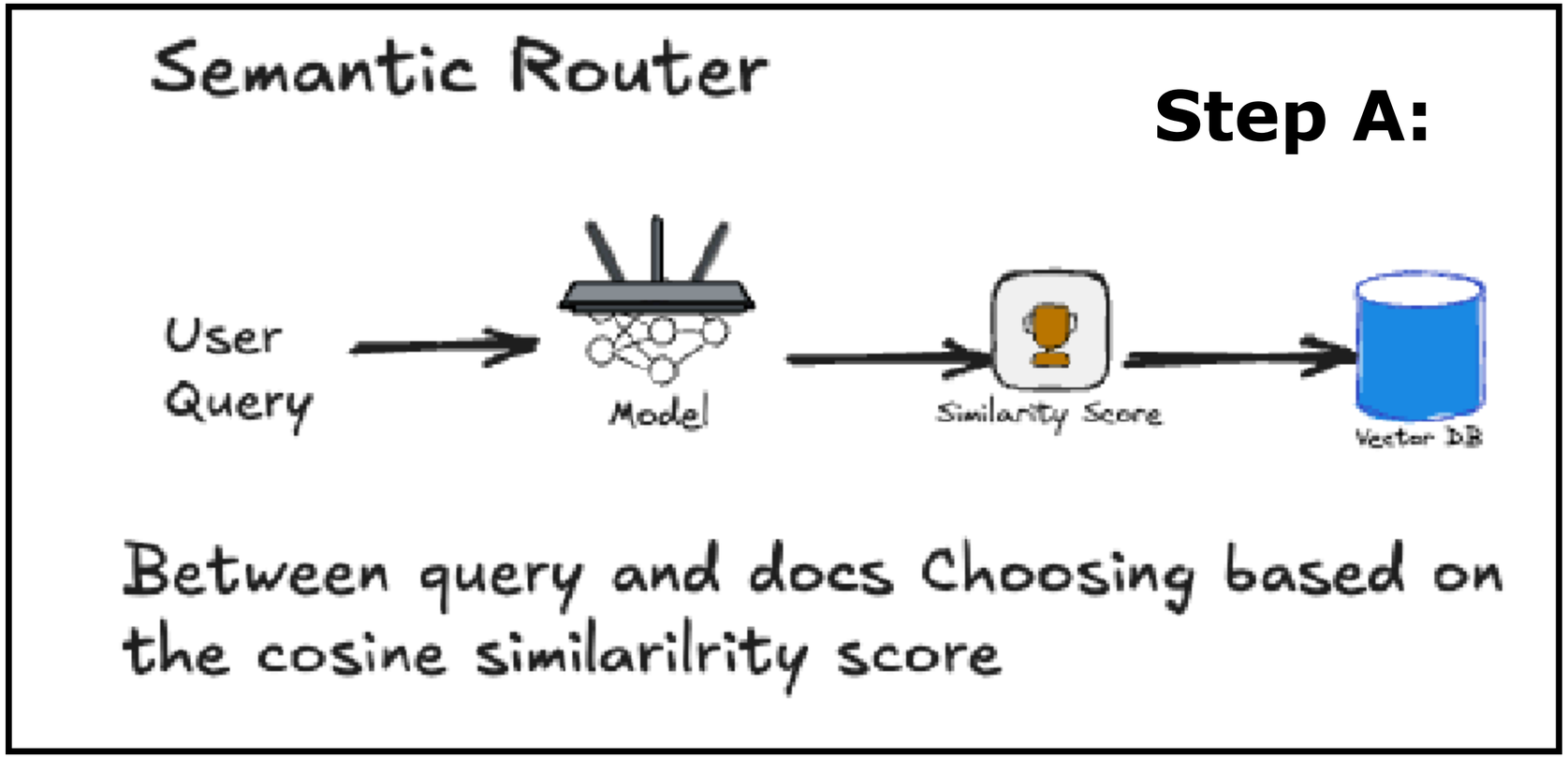
Translated into a format that matches the retrieval mechanism.

Method 2 - Query Decomposition

Splitting a complex query into simpler, more manageable sub-queries.

2.1 Query Router - Semantic Router

Query router is responsible for directing queries to the most appropriate data source



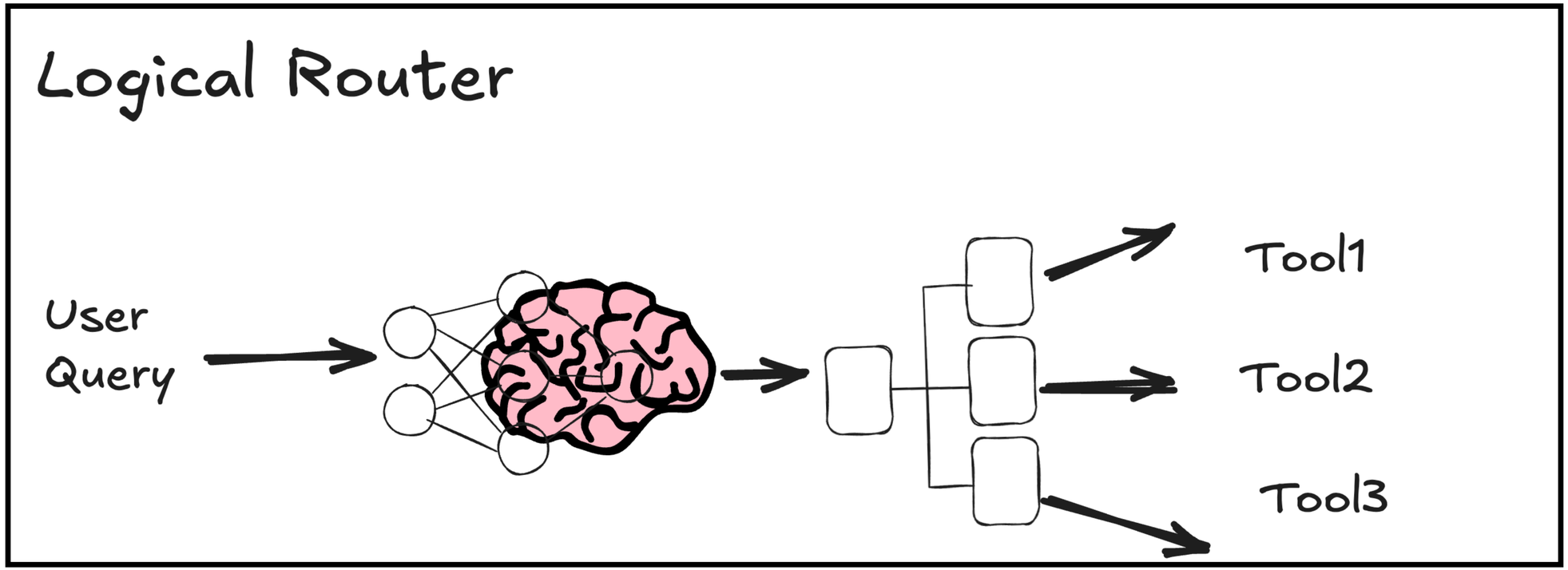
This task is performed in three steps

1. Analysis
2. Decision making
3. Execution

This module takes an user query, and makes a decision what type (Vector DB, Tool) of query the user requested, The current classification include,

1. Github documents
2. Wikipedia search
3. Brave search

2.2. Query Router - Tooling Router



Based on the logical flow Of the Tooling module from The description the LLM Logically routes to one

4. Query Retriver

Querying a
1. Vector database or
2. Tools to

For Vectoredb - retrieve the most relevant top k documents based on the semantic similarity to a query.
For Tooling - using LLM to retrieve the context

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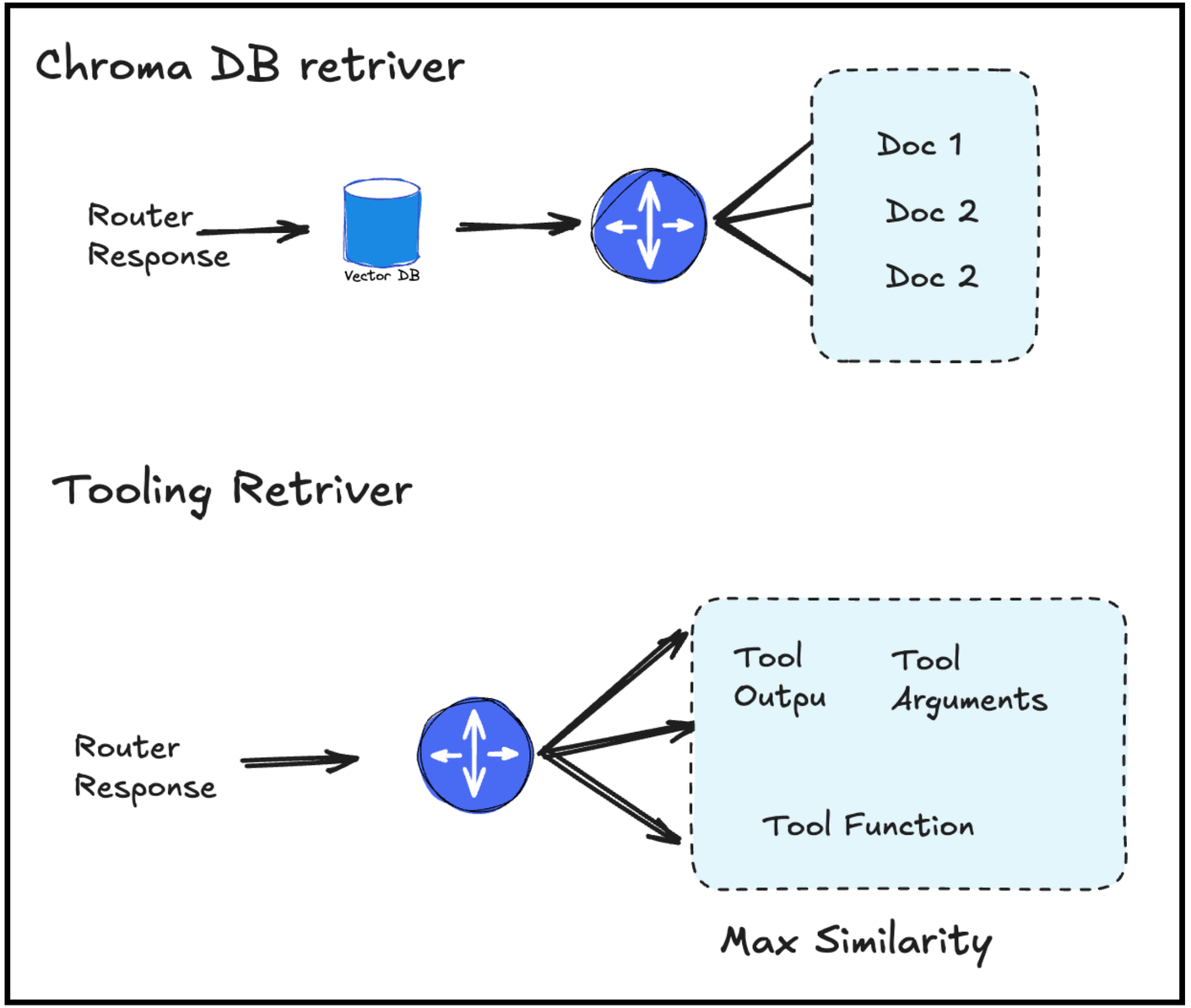
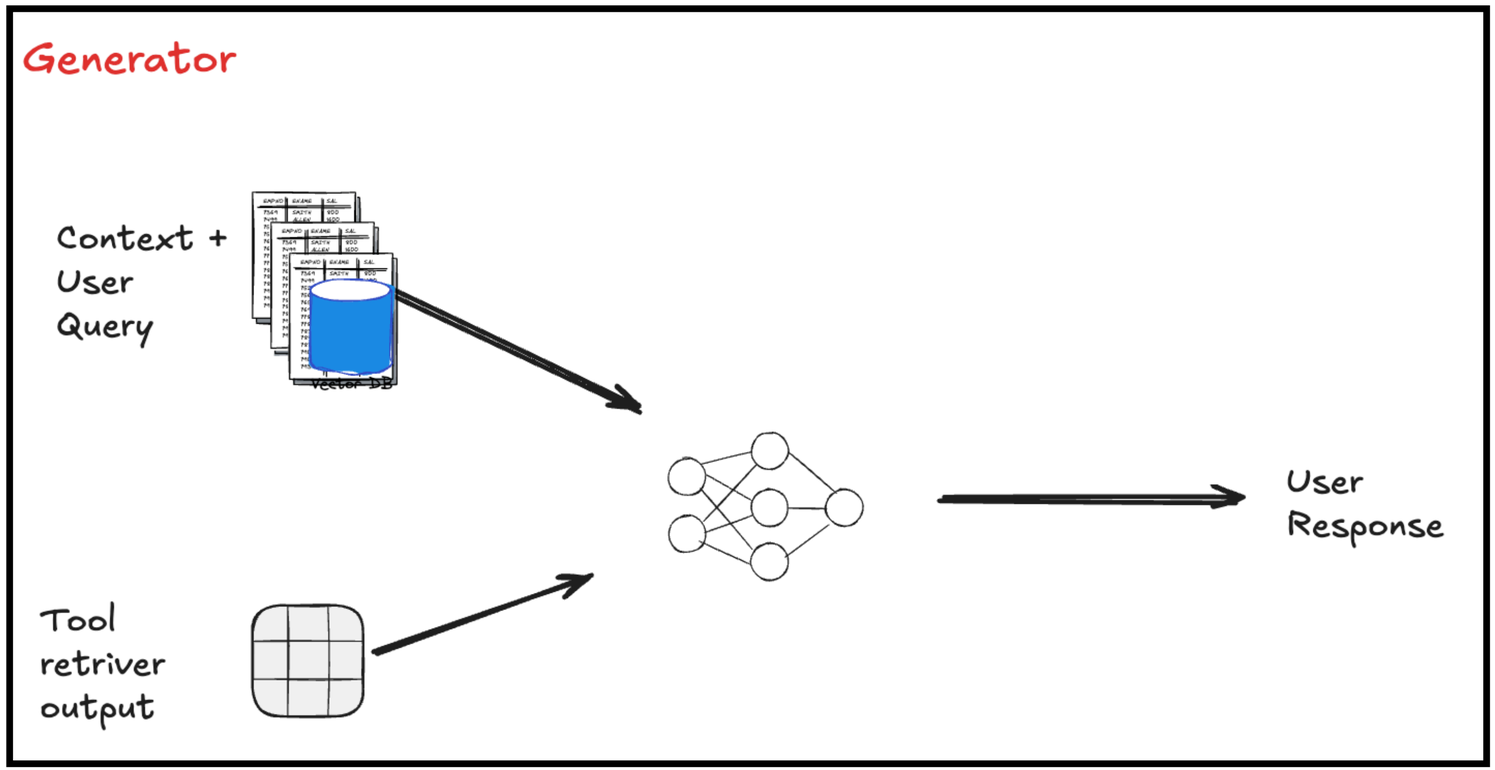


5. Generator

Generates answer based on input user query + context if from vector db or tooling output to the llm



This module takes an user query, and makes a decision what type (Vector DB, Tool) of query the user requested,
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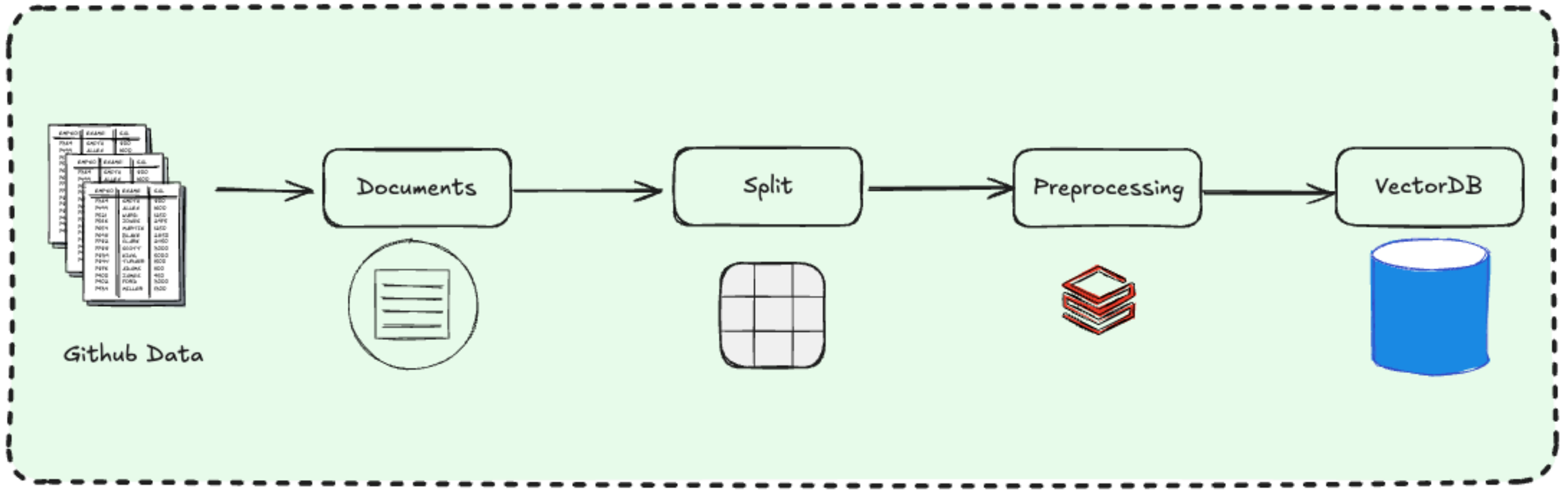
3. Brave search

6. Indexing - Chroma Vector DB



Representing textual or other forms of data as vectors (numerical representations) and then indexing them into a vector database Chroma

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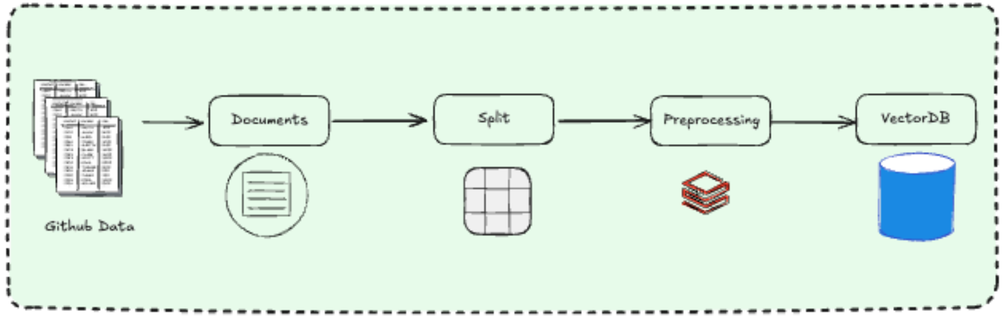
3. Brave search

Overall Workflow

Indexing



Translator

1. Simple Query Enhancer

Uses Query → Model → Improves the user query

LLM to enhance the query to imporve the retrival

1. Query Decomposition

Uses Query → Model → sub task 1, sub task 2, sub task 3

LLM to divide the tasks to subtasks for improving the retriveal

Retriver

Chroma DB retriver

Router Response → Vector DB → Doc 1, Doc 2, Doc 2

Tooling Retriver

Router Response → Tool Outpu, Tool Arguments, Tool Function

Max Similarity

Router

Semantic Router

User Query → Model → Similarity Score → Vector DB

Between query and docs Choosing based on the cosine similarilrity score

Logical Routing

User Query → Tool1, Tool2, Tool3

Generator

Context + User Query

Tool retriver output

→ User Response

Test Cases

Github queries
Non-Github queries
Web-search queries
Real time queries

https://drive.google.com/file/d/1fh7CKp27c-NoKm7fKq2lhJjRNf3lZMRg/view

Future Work

1. **Vector DB** - explore different types of vectoredb

2. **Data**
    1. Index different types of data and structure
    2. Data Cleaning
    3. Improving chucking

3. **RAG Pipeline**
    1. **Query Translator**
        1. Implementing various different methods in the query abstraction and query subtasks
        2. Implementing a entire pipeline to perform subtasks or subqueries
        3. Testing the performance of baseline user query vs enhanced queries
        4. Improving query decomposer

Future Work

1. **RAG Pipeline**
    1. **Query Router**
        1. Scaling the router to accommodate **various router paths**
        2. Performing testing for real time user queries
        3. Improving the **similarity search** for the vectordb data
        4. Router mechanism for **multiple vector data bases**
        5. Including multiple tools to scale the router mechanism
        6. implement Mulit-query of the user that can come from query decomposition
    2. **Query Retriver**
        1. Trade-off analysis on the docs retrieved
        2. Improving the context
        3. Building relavancy module with the query and the docs
        4. Rerouting if the documents are not relevant
        5. Reranking, Rank fusion mechanism

Future Work

1. **RAG Pipeline**
    1. **Query Generator**
        1. Improving the generation mechanism by testing accuracy - Human testing
        2. Using generation quality to query reconstruction or query improvement

    2. **Data Indexer**
        1. Including **chuck optimization** techniques for big data
        2. **Multi-representation indexing** - Summarizing the chunks including in for improving the retrieval
        3. For graph data including tree based or hierarchical indexing techniques

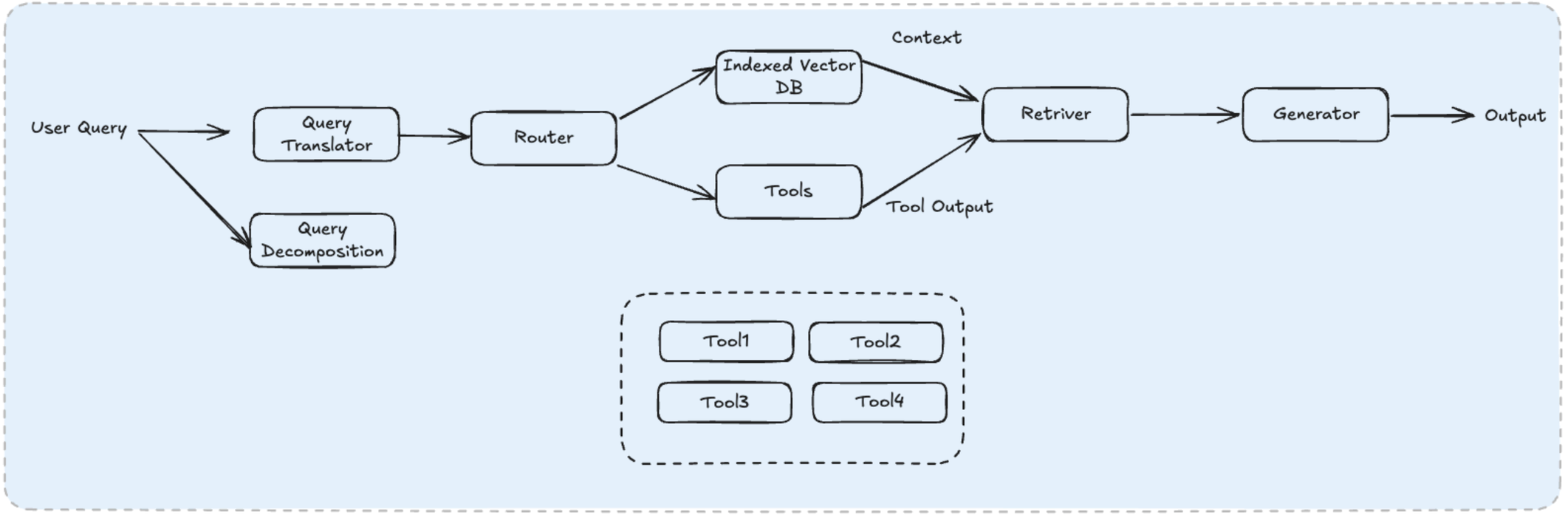
Framework

Python - AI RAG module building
VectorDB - Chroma
Langchain - Orchestration
RESTful APIs - Fastapi



Appendix

Overall workflow



Data Indexing Workflow