# Policy Search AI: Semantic Spotter on HDFC Policy Documents

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## 1. Problem Statement

Create a generative search system using LlamaIndex capable of searching a collection of HDFC policy descriptions and recommending appropriate policies based on user queries. The system should ensure accurate, reliable, and citation-supported answers.

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## 2. Starter Code Overview

- **Library Installations:** Installed `llama-index`, `openai`, `chromadb`, and related packages.
- **API Setup:** Mounted Google Drive for data access and set up OpenAI API key.
- **Data Loading:** Loaded HDFC policy documents using `SimpleDirectoryReader`.
- **Vector Storage:** Created a ChromaDB collection to store document vectors.
- **Query Engine:** Built a query engine from the vector index.
- **Response Handling:** Implemented an interactive Q&A system.

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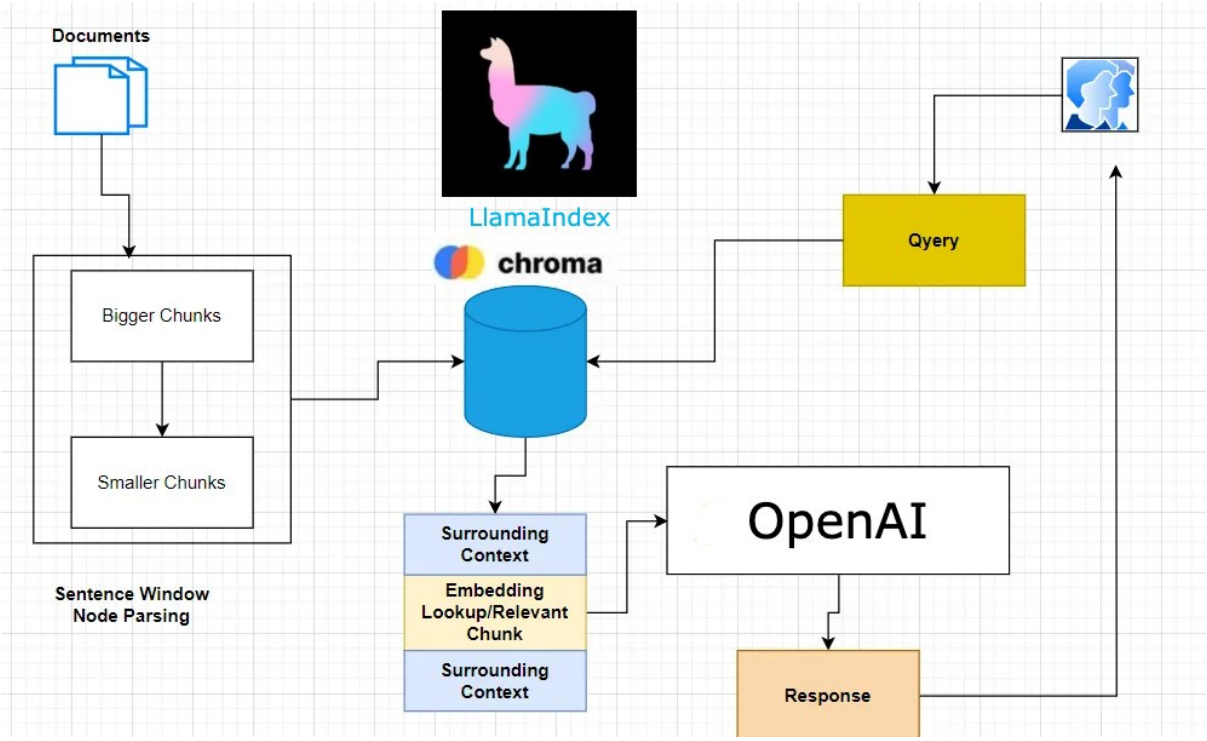
## 3. Product Specifications

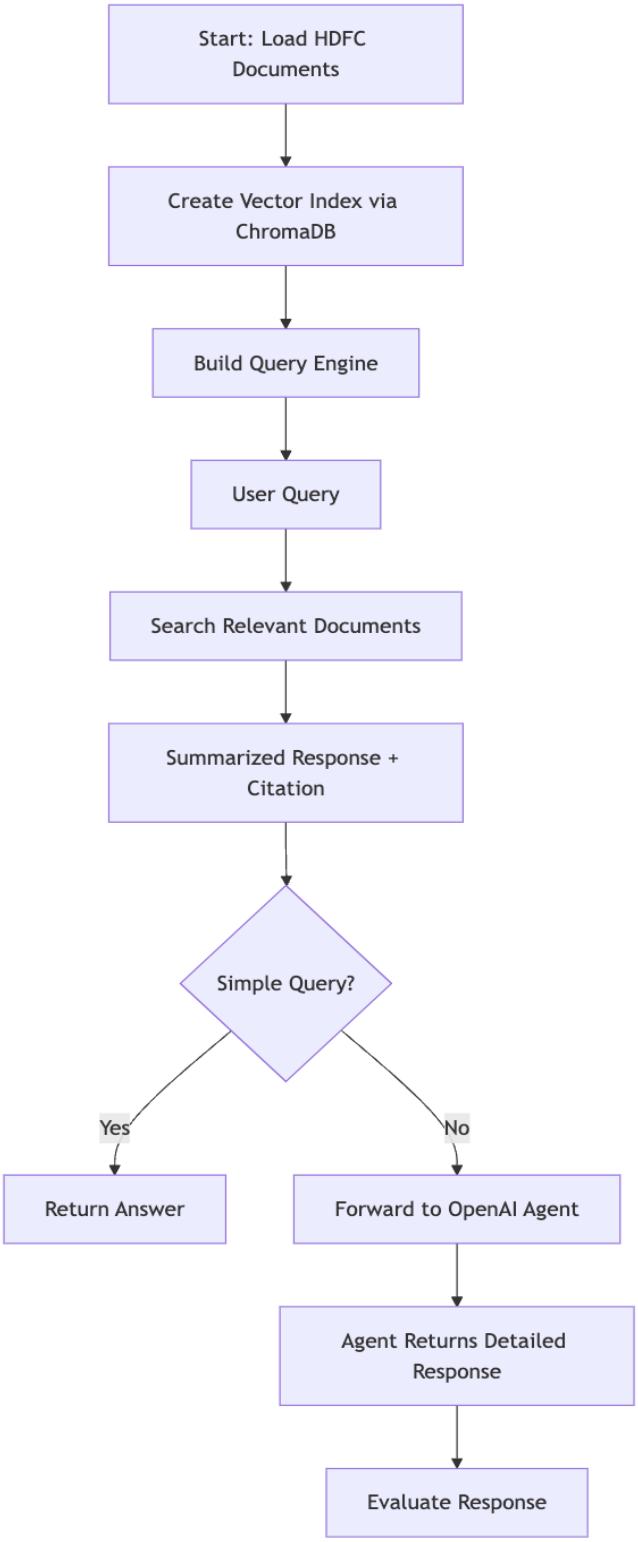
- **Dataset:** HDFC policy documents stored in a local folder.
- **Response:** Retrieve and summarize content relevant to user queries.
- **Citation:** Include source file names and page numbers with responses.
- **Evaluation:** Use Faithfulness and Relevancy Evaluators.
- **Tools:** LlamaIndex, ChromaDB, OpenAI API.

# 4. Solution Strategy

- Load and preprocess HDFC policy documents.
- Create dense vector representations using ChromaDB.
- Build a semantic query engine.
- For simple queries, directly return responses.
- For complex queries, delegate to OpenAI Agent for chain-of-thought reasoning.
- Evaluate responses for faithfulness and relevancy to ensure trustworthiness.



# 5. Flow Diagram



# 6. Implementation Details

## Step 1: Install Libraries

```
!pip install llama-index openai chromadb -U
```

## Step 2: Setup Drive and API Key

```
from google.colab import drive
from google.colab import userdata
import os
import openai

drive.mount('/content/drive')
openai.api_key = userdata.get('OPENAI_KEY')
os.environ['OPENAI_API_KEY'] = openai.api_key
```

## Step 3: Load Documents

```
from llama_index.core import SimpleDirectoryReader
reader = SimpleDirectoryReader(input_dir="/path_to_policy_docs")
documents = reader.load_data()
```

## Step 4: Create Vector Index

```
import chromadb
from llama_index.vector_stores.chroma import ChromaVectorStore
from llama_index.core import StorageContext, VectorStoreIndex

db = chromadb.PersistentClient(path="./chroma_db")
collection = db.get_or_create_collection("HDFC_policy")
vector_store = ChromaVectorStore(chroma_collection=collection)
storage_context = StorageContext.from_defaults(vector_store=vector_store)
index = VectorStoreIndex.from_documents(documents,
storage_context=storage_context)
```

## Step 5: Build Query Engine

```
query_engine = index.as_query_engine()
```

## Step 6: Setup Agent

```
from llama_index.agent.openai import OpenAIAgent
from llama_index.core.tools import QueryEngineTool

search_tool = QueryEngineTool.from_defaults(
    query_engine=query_engine,
    name="policy_document_search",
    description="Useful for answering HDFC Policies related queries"
)

agent = OpenAIAgent.from_tools(tools=[search_tool], llm=OpenAI(model="gpt-
3.5-turbo", temperature=0.0), verbose=True)
```

### Step 7: Evaluate Responses

```
from llama_index.core.evaluation import FaithfulnessEvaluator,
RelevancyEvaluator

evaluators = {
    "faithfulness": FaithfulnessEvaluator(llm=OpenAI(model="gpt-3.5-turbo",
temperature=0.0)),
    "relevancy": RelevancyEvaluator(llm=OpenAI(model="gpt-3.5-turbo",
temperature=0.0))
}

results = {}
for name, evaluator in evaluators.items():
    results[name] = evaluator.evaluate_response(query=query,
response=response)
```

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# 7. Next Steps and Enhancements

- **Data Quality:** Clean policy documents for better retrieval quality.
- **Advanced Node Parsing:** Use customized sentence splitting and chunking.
- **Model Improvements:** Integrate newer models like GPT-4 for improved performance.
- **UI Development:** Build a web-based user interface for easier access.
- **Multi-Agent Collaboration:** Implement multiple specialized agents (e.g., health, accident, investment policies).

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# 8. References


- LlamaIndex Documentation
- OpenAI API Documentation
- ChromaDB Documentation