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→ Collecting deepeval
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            Requirement already satisfied: torch in /usr/local/lib/python3.11/dist-packages (2.6.0+cu124)
            Requirement already satisfied: transformers in /usr/local/lib/python3.11/dist-packages (4.49.0)
            Requirement already satisfied: sentence-transformers in /usr/local/lib/python3.11/dist-packages (3.4.1)
            Requirement already satisfied: openai in /usr/local/lib/python3.11/dist-packages (1.66.3)
            Collecting datasets
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            Collecting langchain_community (from deepeval)
                 Downloading langchain_community-0.3.20-py3-none-any.whl.metadata (2.4 kB)
            Collecting langchain_openai (from deepeval)
                 Downloading langchain_openai-0.3.9-py3-none-any.whl.metadata (2.3 kB)
            Collecting llama-index (from deepeval)
                 Downloading llama_index-0.12.25-py3-none-any.whl.metadata (12 kB)
            Collecting ollama (from deepeval)
                 Downloading ollama-0.4.7-py3-none-any.whl.metadata (4.7 kB)
            Requirement already satisfied: opentelemetry-api<2.0.0, ≥ 1.24.0 in /usr/local/lib/python3.11/dist-packages (from deepev
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            Collecting portalocker (from deepeval)
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            Requirement already satisfied: pytest in /usr/local/lib/python3.11/dist-packages (from deepeval) (8.3.5)
            Collecting pytest-asyncio (from deepeval)
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            Collecting pytest-repeat (from deepeval)
                 Downloading pytest_repeat-0.9.3-py3-none-any.whl.metadata (4.9 kB)
            Collecting pytest-rerunfailures<13.0, ≥ 12.0 (from deepeval)
                 Downloading pytest_rerunfailures-12.0-py3-none-any.whl.metadata (18 kB)
            Collecting pytest-xdist (from deepeval)
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            Requirement already satisfied: requests<3.0.0, ≥2.31.0 in /usr/local/lib/python3.11/dist-packages (from deepeval) (2.32
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pip install langgraph
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                 Downloading langgraph-0.3.18-py3-none-any.whl.metadata (7.5 kB)
            Requirement already satisfied: langchain-core<0.4, ≥ 0.1 in /usr/local/lib/python3.11/dist-packages (from langgraph) (0.3.
            Collecting langgraph-checkpoint<3.0.0, ≥ 2.0.10 (from langgraph)
                 Downloading langgraph_checkpoint-2.0.21-py3-none-any.whl.metadata (4.6 kB)
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            Collecting langgraph-sdk<0.2.0, ≥ 0.1.42 (from langgraph)
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    Downloading langgraph_prebuilt-0.1.4-py3-none-any.whl (24 kB)
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    Installing collected packages: langgraph-sdk, langgraph-checkpoint, langgraph-prebuilt, langgraph
    Successfully installed langgraph-0.3.18 langgraph-checkpoint-2.0.21 langgraph-prebuilt-0.1.4 langgraph-sdk-0.1.58
pip install pymupdf
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    Installing collected packages: pymupdf
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    Requirement already satisfied: six≥1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil≥2.8.2→pandas)
import os
import openai
os.environ["OPENAI_API_KEY"] = 'sk-proj-KP0_jRkwjRJVGF5cm4cvIzysl-6sdf0d3QxoN2pEZYqk6SeUMM3VA-ROsZTnKwF-vjxmvPgZTZT3BlbkFJhoI
openai.api_key = os.getenv("OPENAI_API_KEY")
from google.colab import drive
drive.mount('/content/drive')
folder_path = "/content/drive/My Drive/GenAI/policy docs"
file_names = os.listdir(folder_path)
pdf_files = [f for f in file_names if f.endswith('.pdf')]
print(pdf_files)
环 Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force remount
    ['FR_Y-11I20011214_i.pdf', 'FR_Y-11Q20020923_i.pdf', 'FR_Y-12A20231231_i.pdf', 'FR_Y-1520221231_i.pdf', 'FR_Y-1620161231_
from langchain_community.document_loaders import PyMuPDFLoader
from langchain_text_splitters import TokenTextSplitter
text_splitter = TokenTextSplitter(chunk_size=1024, chunk_overlap=0)
pdf content = ""
```

Requirement already satisfied: anyio in /usr/local/lib/python3.11/dist-packages (from httpx≥0.25.2→langgraph-sdk<0.2.0,

```
loader = PyMuPDFLoader("test data excel.pdf")
data = loader.load()
pages = len(data)
for x in range(pages):
    pdf_content = pdf_content + data[x].page_content
print(len(pdf_content))
757940
from sentence_transformers import SentenceTransformer
from langchain_openai import OpenAIEmbeddings
from langchain.text_splitter import RecursiveCharacterTextSplitter
text_splitter = RecursiveCharacterTextSplitter(chunk_size = 300,chunk_overlap = 50, length_function = len )
split_pdf_content = text_splitter.create_documents([pdf_content])
embedding_model = OpenAIEmbeddings(api_key=openai.api_key)
content = [rc.page_content for rc in split_pdf_content]
embeddings = embedding_model.embed_documents(content)
import random
import re
import numpy as np
from langchain_openai import ChatOpenAI
from pydantic import BaseModel
from transformers import pipeline
from typing import Optional, List
import pandas as pd
import os
from openpyxl import load workbook
import heapq
# Load model directly
for i in range(0, 4000):
    reference_index = random.randint(0, len(embeddings) - 1)
    reference_embedding = embeddings[reference_index]
    contexts = [content[reference_index]]
    similarity_threshold = 0.85
    similarity_scores = []
    for i, embedding in enumerate(embeddings):
       product = np.dot(reference_embedding, embedding)
       norm = np.linalg.norm(reference_embedding) * np.linalg.norm(embedding)
        similarity = product / norm
        if similarity ≥ similarity_threshold:
            similarity_scores.append((similarity, i))
    # Select top 3-5 most relevant contexts
    top_k = 5  # Adjust this number based on experimentation
    top_k_indices = [idx for _, idx in heapq.nlargest(top_k, similarity_scores)]
    # Use only the top-k most similar contexts
    contexts = [content[i] for i in top_k_indices]
    # Evolution prompt templates as strings
    multi_context_template = ""
    I want you to rewrite the given `input` so that it requires readers to use information from all elements in `Context`.
    1. `Input` should require information from all `Context` elements.
    2. `Rewritten Input` must be concise and fully answerable from `Context`.
    3. Do not use phrases like 'based on the provided context.'
    4. `Rewritten Input` should not exceed 15 words.
    5. Do not use phrases like "The response generated by the model"
    6. Do not use phrases like "Sorry"
    Context: {context}
    Input: {original_input}
    Rewritten Input:
```

```
reasoning_template = """
I want you to rewrite the given `input` so that it explicitly requests multi-step reasoning.
1. `Rewritten Input` should require multiple logical connections or inferences.
2. `Rewritten Input` should be concise and understandable.
3. Do not use phrases like 'based on the provided context.'
4. `Rewritten Input` must be fully answerable from `Context`.5. `Rewritten Input` should not exceed 15 words.
6. Do not use phrases like "The response generated by the model"
7. Do not use phrases like "Sorry"
Context: {context}
Input: {original_input}
Rewritten Input:
hypothetical_scenario_template = """
I want you to rewrite the given `input` to incorporate a hypothetical or speculative scenario.
1. `Rewritten Input` should encourage applying knowledge from `Context` to deduce outcomes.
2. `Rewritten Input` should be concise and understandable.
3. Do not use phrases like 'based on the provided context.
4. `Rewritten Input` must be fully answerable from `Context`.5. `Rewritten Input` should not exceed 15 words.
6. Do not use phrases like "The response generated by the model"
7. Do not use phrases like "Sorry"
Context: {context}
Input: {original input}
Rewritten Input:
example_generated_query = "What rules are mentioned for Capital Assessments and Stress Testing under Report FR Y-14Q"
context = contexts
original_input = example_generated_query
evolution_templates = [multi_context_template, reasoning_template, hypothetical_scenario_template]
# Number of evolution steps to apply
num_evolution_steps = 3
# Function to perform random evolution steps
def evolve_query(original_input, context, steps):
    current_input = original_input
    for _ in range(steps):
        # Choose a random (or using custom logic) template from the list
        chosen_template = random.choice(evolution_templates)
        # Replace the placeholders with the current context and input
        evolved_prompt = chosen_template.replace("{context}", str(context)).replace("{original_input}", str(current_input
        # Update the current input with the "Rewritten Input" section
        current_input = ChatOpenAI(model_name="gpt-3.5-turbo",openai_api_key=openai.api_key, max_completion_tokens=20).in
    return current_input
# Evolve the input by randomly selecting the evolution type
evolved_query = evolve_query(original_input, context, num_evolution_steps)
expected_output_template = """
I want you to generate an answer for the given `input`. This answer has to be factually aligned to the provided context.
Context: {context}
Input: {evolved_query}
Answer:
# Fill in the values
prompt = expected_output_template.replace("{context}", str(context)).replace("{evolved_query}", str(evolved_query))
# Generate expected output
expected_output = ChatOpenAI(model_name="gpt-3.5-turbo",openai_api_key=openai.api_key).invoke(prompt)
class SyntheticData(BaseModel):
  query: str
```

```
expected_output: Optional[str]
 context: List[str]
synthetic_data = SyntheticData(
 query=str(evolved_query),
 expected_output=str(expected_output),
 context=context
# Simple implementation of synthetic dataset
synthetic_dataset = []
synthetic_dataset.append(synthetic_data)
print("Question is " + synthetic_dataset[0].query)
print("Answer is " + synthetic_dataset[0].expected_output)
\label{eq:match} \verb| match = re.search(r'content=[\'"](.+?)[\'"] \s+additional_kwargs=', synthetic_dataset[0].query) \\
question = match.group(1)
match = re.search(r'content=[\'"](.+?)[\'"]\s+additional_kwargs=', synthetic_dataset[0].expected_output)
answer = match.group(1)
# File and sheet name
file_path = "/test_data.xlsx"
sheet_name = "Sheet1"
# New data to be added
new data = pd.DataFrame({
    "Question": [question], # Ensure 'question' is defined before
    "Answer": [answer]
                             # Ensure 'answer' is defined before
})
if not os.path.exists(file_path):
    # Create a new file if it doesn't exist
   with pd.ExcelWriter(file_path, engine="openpyxl") as writer:
        new_data.to_excel(writer, sheet_name=sheet_name, index=False)
   print("New Excel file created.")
else:
    # Load existing workbook
   book = load_workbook(file_path)
    # Open ExcelWriter with append mode
   with pd.ExcelWriter(file_path, engine="openpyxl", mode="a", if_sheet_exists="overlay") as writer:
        if sheet_name in writer.sheets:
            start_row = writer.sheets[sheet_name].max_row # Find the last row
        else:
            start_row = 0 # If the sheet doesn't exist, start from the first row
        new_data.to_excel(writer, sheet_name=sheet_name, index=False, header=False, startrow=start_row)
   print("Existing Excel file updated.")
```

Question is content='How are corporate loans and leases in the syndicated pipeline managed for FR Y-14Q?' additional_kw:

Answer is content='Corporate loans and leases in the syndicated pipeline are managed by reporting the date on which the Existing Excel file updated.

Question is content='What is needed to report average balance and rate for FR Y-9C items?' additional_kwargs={'refusal' Answer is content='To report the average balance and rate for FR Y-9C items, you would need to refer to specific line in Existing Excel file updated.

Question is content='Predict the impact of Capital Assessments and Stress Testing regulations on financial institutions Answer is content='The Capital Assessments and Stress Testing regulations have a significant impact on financial institution Existing Excel file updated.

Question is content='How are various consumer loans classified in FR Y-9C line items on Schedule HC-C?' additional_kwar{
Answer is content='Various consumer loans are classified in FR Y-9C line items on Schedule HC-C based on specific criter
Existing Excel file updated.

Question is content='How would specific Capital Assessments impact Stress Testing requirements in FR Y-14Q?' additional Answer is content='Specific Capital Assessments can impact Stress Testing requirements in FR Y-14Q by influencing the capitating Excel file updated.

Question is content='How do gains/losses on sale affect the outcome of domestic mortgage originations?' additional_kwarṣ Answer is content='Gains and losses on the sale of domestic mortgages can significantly impact the outcome of mortgage c Existing Excel file updated.

Question is content='Explain how to report credit facility LGD and PD estimates using decimal format.' additional_kwarg: Answer is content="To report credit facility LGD and PD estimates using decimal format, you must follow these guideline: Existing Excel file updated.

Question is content='How does FR Y-14Q integrate Capital Assessments and Stress Testing rules based on Context?' addition Answer is content='FR Y-14Q integrates Capital Assessments and Stress Testing rules by incorporating various line items Existing Excel file updated.

Question is content='List loans from FR Y-9C, Schedule HC-C based on specified line items.' additional_kwargs={'refusal Answer is content='Based on the specified line items, you should list the loans included in FR Y-9C, Schedule HC-C as for Existing Excel file updated.

Question is content='Predict how reporting credit facility shifts impacts Y-14 schedules for compliance.' additional_kwataswer is content='Reporting credit facility shifts impacts Y-14 schedules for compliance by ensuring accurate and up-to Existing Excel file updated.

Question is content='How are Capital Assessments and Stress Testing managed in Report FR Y-14Q in a hypothetical scenar: Answer is content='In Report FR Y-14Q, Capital Assessments and Stress Testing are managed by following specific guideline Existing Excel file updated.

Question is content='Explain how reporting institutions segment product types in Report FR Y-14Q.' additional_kwargs={'1} Answer is content='Reporting institutions segment product types in Report FR Y-14Q by segmenting the portfolio into differentiation Existing Excel file updated.

Question is content='Which loans on FR Y-14Q from Schedule HC-C involve non-owner-occupied properties?' additional_kwar{ Answer is content='Loans secured by non-owner-occupied properties are reported on FR Y-9C, Schedule HC-C, line 1.e.(2). Existing Excel file updated.

Question is content='Which exposures from commodity indices should be included on the diversified worksheet?' additional Answer is content='The exposures from commodity indices that should be included on the diversified worksheet are those Existing Excel file updated.

Question is content='Explain assumptions for stochastic and static LGD models, including rationale and documentation broadswer is content='The assumptions for stochastic LGD models include factors such as the LGD mean, volatility, and rational existing Excel file updated.

Question is content='How do rules on Capital Assessments and Stress Testing impact Report FR Y-14Q outcomes?' additional Answer is content='The rules on Capital Assessments and Stress Testing impact Report FR Y-14Q outcomes by ensuring that Existing Excel file updated.

Question is content='How does noninterest income from Capital and ALM activities influence financial reporting outcomes' Answer is content="Noninterest income from Capital and ALM activities can significantly impact financial reporting outcomes in Existing Excel file updated.

Question is content='Specify the required key details for Capital Assessments in FR Y-14Q report regarding securities.' Answer is content='In the FR Y-14Q report, the key details required for Capital Assessments regarding securities include Existing Excel file updated.

Question is content='Explain how entities with specific asset thresholds report capital changes in stress testing.' add: Answer is content='Entities with specific asset thresholds report capital changes in stress testing by following the regexisting Excel file updated.

Question is content='Explain how FR Y-14Q reporting applies Capital Assessments and Stress Testing rules.' additional_kr Answer is content="FR Y-14Q reporting applies Capital Assessments and Stress Testing rules by requiring financial institutions and Existing Excel file updated.

Question is content='How does supranational entities govern Capital Assessments and Stress Testing in report FR Y?' add: Answer is content='Supranational entities govern Capital Assessments and Stress Testing in report FR Y by adhering to the Existing Excel file updated.

Question is content='Explain Capital Assessments and Stress Testing handling for FR Y-14Q in detail.' additional_kwargs: Answer is content="I'm sorry, but the input you provided is not related to the context given. If you have a specific que Existing Excel file updated.

Question is content='How are credit protection and option exposures reported with speculative outcomes in FR Y-14Q?' add Answer is content='Credit protection and option exposures are reported in FR Y-14Q based on whether they are speculative Existing Excel file updated.

Question is content='Explain how FR Y-14Q submissions incorporate Capital Assessments and Stress Testing.' additional_ki Answer is content='FR Y-14Q submissions incorporate Capital Assessments and Stress Testing by requiring reporting entit: Existing Excel file updated.

Question is content='Calculate cash discounts, trade discounts, returned sales, allowances, and expenses for financial 1 Answer is content='To calculate cash discounts, trade discounts, returned sales, allowances, and expenses for financial Existing Excel file updated.

Question is content='How should Net CE reporting handle excess collateral for a given counterparty?' additional_kwargs=-Answer is content='Net CE reporting should handle excess collateral for a given counterparty by reflecting any excess collateral for a given counterparty by

Question is content='How are credit facilities managed in default scenarios for Report FR Y-14Q?' additional_kwargs={'real Answer is content='Credit facilities are managed in default scenarios by reporting all instances of involuntary payoff; Existing Excel file updated.

Question is content='Explain the specific steps for reporting Capital Assessments in FR Y-14Q.' additional_kwargs={'refu Answer is content='Reporting Capital Assessments in FR Y-14Q involves multiple steps. One important aspect is the report Existing Excel file updated.