

PG4: Use word embeddings to improve prompts for Generative AI model. Retrieve similar words using word embeddings. Use the similar words to enrich a GenAI prompt. Use the AI model to generate responses for the original and enriched prompts. Compare the outputs in terms of detail and relevance.

Soln:

```
pip install transformers -U

from gensim.scripts.glove2word2vec import glove2word2vec
from gensim.models import KeyedVectors

# Paths to the GloVe file and output Word2Vec file
glove_input_file = "/content/glove.6B.100d.txt" # Path to GloVe file
word2vec_output_file = "/content/glove.6B.100d.word2vec.txt" # Output
file in Word2Vec format

# Convert GloVe format to Word2Vec format
glove2word2vec(glove_input_file, word2vec_output_file)

# Load the converted Word2Vec model
model = KeyedVectors.load_word2vec_format(word2vec_output_file,
binary=False)

# Test the loaded model
print(model.most_similar("king"))
```

Output:

```
[('prince', 0.7682328820228577), ('queen', 0.7507690787315369), ('son',
0.7020888328552246), ('brother', 0.6985775232315063), ('monarch',
0.6977890729904175), ('throne', 0.6919989585876465), ('kingdom',
0.6811409592628479), ('father', 0.6802029013633728), ('emperor',
0.6712858080863953), ('ii', 0.6676074266433716)]
```

```
# Define the original medical prompt
original_prompt = "Explain the importance of vaccinations in
healthcare."

# Define key terms extracted from the original prompt
key_terms = ["vaccinations", "healthcare"]

# Initialize an empty list to store similar terms
similar_terms = []
```

```

# Loop through each key term to find similar words
for term in key_terms:
    # Check if the key term exists in the vocabulary of the 'model'
    (word embedding model)
    # Assuming 'model.key_to_index' is a way to check for term
    existence in the model's vocabulary
    if term in model.key_to_index:
        # If the term exists, find the top 3 most similar words using
        'model.most_similar(term, topn=3)'
        # and extend the 'similar_terms' list with these words.
        # Assuming 'model.most_similar' returns a list of tuples, where
        each tuple is (word, similarity_score)
        # We are extracting only the 'word' part using a set
        comprehension for potential deduplication.
        similar_terms.extend({word for word, _ in
        model.most_similar(term, topn=3)})

# Enrich the original prompt with the retrieved similar terms
if similar_terms:
    # If similar terms were found, create an enriched prompt by
    appending
    # "Consider aspects like: " followed by a comma-separated string of
    similar terms.
    enriched_prompt = f"{original_prompt} Consider aspects like: {'',
    '.join(similar_terms)}."
else:
    # If no similar terms were found, the enriched prompt is the same
    as the original prompt.
    enriched_prompt = original_prompt

# Output the original and enriched prompts
print("Original Prompt:", original_prompt)
print("Enriched Prompt:", enriched_prompt)

```

Output:

Original Prompt: Explain the importance of vaccinations in healthcare.
 Enriched Prompt: Explain the importance of vaccinations in healthcare.
 Consider aspects like: vaccines, vaccination, measles, services, care,
 health.

```

import getpass
import os
GOOGLE_API_KEY= os.environ["GOOGLE_API_KEY"] = getpass.getpass("Enter
your Google AI API key: ")

```

Enter your Google AI API key:

```
!pip install langchain_google_genai
```

```
from langchain_google_genai import ChatGoogleGenerativeAI

llm = ChatGoogleGenerativeAI(
    model="gemini-2.0-flash-exp",
    temperature=0,
    api_key=GOOGLE_API_KEY,
    max_tokens=256,
    timeout=None,
    max_retries=2,
    # other params...
)
```

```
llm.invoke("Hi")
```

Output:

```
AIMessage(content='Hi there! How can I help you today?', additional_kwargs={},
response_metadata={'prompt_feedback': {'block_reason': 0, 'safety_ratings': []}, 'finish_reason': 'STOP',
'safety_ratings': []}, id='run-88300c57-17bd-4b38-9eea-1d454793adc1-0',
usage_metadata={'input_tokens': 1, 'output_tokens': 11, 'total_tokens': 12, 'input_token_details':
{'cache_read': 0}})
```

```
print(llm.invoke(original_prompt).content)
```

Output:

Vaccinations are a cornerstone of modern healthcare and play a vital role in protecting individuals and communities from infectious diseases. Their importance can be summarized in several key areas:

****1. Disease Prevention and Eradication:****

* ****Individual Protection:**** Vaccines work by exposing the body to a weakened or inactive form of a disease-causing agent (virus or bacteria). This triggers the immune system to produce antibodies, which provide protection against future infections. If the individual is later exposed to the real disease, their immune system is primed to fight it off quickly and effectively, often preventing illness or significantly reducing its severity.

* ****Herd Immunity:**** When a large percentage of a population is vaccinated, it creates "herd immunity." This means that even those who cannot be vaccinated (e.g., infants too young, individuals with certain medical conditions) are protected because the disease has difficulty spreading. Herd immunity is crucial for protecting vulnerable populations.

* **Disease Eradication/Elimination:** Vaccination campaigns have successfully eradicated diseases like smallpox and have significantly reduced the incidence of others, such as polio and measles. Continued vaccination efforts are essential to maintain these achievements and prevent the resurgence of these diseases.

2. Reduced Morbidity and Mortality:

```
print(llm.invoke(enriched_prompt).content)
```

Output:

The Vital Importance of Vaccinations in Healthcare

Vaccinations are a cornerstone of modern healthcare, playing a crucial role in preventing infectious diseases and promoting overall public health. They represent a powerful and cost-effective intervention that has dramatically reduced the incidence and severity of many life-threatening illnesses.

Here's a breakdown of their importance, considering the aspects you mentioned:

1. Vaccines: The Foundation of Protection

* **Definition:** Vaccines are biological preparations that provide active acquired immunity to a particular infectious disease. They typically contain weakened or inactive forms of the disease-causing agent (virus or bacteria), or parts of it (antigens).

* **Mechanism:** Vaccines work by stimulating the body's immune system to recognize and remember the specific pathogen. This "memory" allows the body to mount a rapid and effective immune response upon future exposure to the actual disease, preventing or mitigating its severity.

* **Variety:** A wide range of vaccines exist, targeting diseases like measles, mumps, rubella, polio, tetanus, diphtheria, pertussis, influenza, and COVID-19, among others.

2. Vaccination: The Act of Immunization

* **Definition:** Vaccination is the process of administering a vaccine