

▼ IT 458

Assignment 3

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- ▼ Import the corpus and required libraries

```
import string
import nltk
import re
import pandas as pd

nltk.download('stopwords')
nltk.download('punkt')
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
True
```

```
urls = [
    "https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/india-gate.html",
    "https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/raj-ghat.html",
    "https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/chhatarpur-mandir.html",
    "https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/bahai-lotus-temple.html",
    "https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/connaught-place.html",
    "https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/chandni-chowk.html",

```

<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/akshardham.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/garden-of-five-senses.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/delhi/dilli-haat.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/cholamandal-artists-village.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/fort-st-george.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/krishnamacharya-yoga-mandiram.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/chettinad-cuisine.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/kalakshetra.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/filter-coffee.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/tanjore-paintings.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/chennai/kapaleeswarar-temple.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/experiences/spiritual/buddhism.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/experiences/spiritual/jainism.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/experiences/spiritual/sikhism.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/experiences/spiritual/christianity.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/experiences/spiritual/islam.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/experiences/spiritual/hinduism.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/jaipur/ranthambore-national-park.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/jaipur/mandawa-fort.html>",
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"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/jaipur/govind-devji-temple.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/jaipur/jantar-mantar.html>",
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"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/jaipur/samode-palace.html>",
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"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/jaipur/hawa-mahal.html>",
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"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/mumbai/chhatrapati-shivaji-maharaj-terminus.h>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/mumbai/global-vipasana-pagoda.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/mumbai/deolali.html>",
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"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/mumbai/ganeshpuri-temple.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/mumbai/mahalaxmi-temple.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/mumbai/haji-ali-mosque.html>",
"<https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/varanasi/sarnath.html>",

["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/varanasi/kaimoor-wildlife-sanctuary.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/varanasi/kaimoor-wildlife-sanctuary.html),
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["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/varanasi/ramnagar-fort.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/varanasi/ramnagar-fort.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/ahar.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/ahar.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/city-palace.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/city-palace.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/dungarpur.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/dungarpur.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/bagore-ki-haveli.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/udaipur/bagore-ki-haveli.html),
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["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/haridwar/daksh-mahadev-temple-and-sati-kund.h](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/haridwar/daksh-mahadev-temple-and-sati-kund.h)
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["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kolkata/writers-building.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kolkata/writers-building.html),
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["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kolkata/race-course.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kolkata/race-course.html),
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["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kolkata/belur-math.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kolkata/belur-math.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/vidhana-soudha.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/vidhana-soudha.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/bannerghatta-national-park.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/bannerghatta-national-park.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/belur.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/belur.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/bangalore-palace.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/bangalore-palace.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/halebeedu--halebidu-.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/halebeedu--halebidu-.html),
["https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/br-hills.html"](https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/br-hills.html),

```
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/cubbon-park.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/hesaraghatta-lake.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/bull-temple.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/bengaluru/kolar-gold-fields.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/hyderabad/chowmahalla-palace.html",
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"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/hyderabad/hussain-sagar-lake.html",
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"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/hyderabad/birla-mandir.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/hyderabad/ananda-buddha-vihara.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/hyderabad/chilkur-balaji-temple.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kochi/fort-kochi.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/hyderabad/purani-haveli.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kochi/athirapally-waterfalls.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kochi/bishop-s-house.html",
"https://www.incredibleindia.org/content/incredible-india-v2/en/destinations/kochi/chinese-fishing-nets.html"
]
```

```
docs_list = []
```

```
import urllib.request
from bs4 import BeautifulSoup

for url in urls:
    html = urllib.request.urlopen(url)
    htmlParse = BeautifulSoup(html, 'html.parser')
    para = htmlParse.find("div", {"class": "read-more-hide"}).p.get_text()
    docs_list.append(para)
```

```
import copy
docs = copy.deepcopy(docs_list)
print(docs_list[1])
len(docs_list)
corpus = docs_list
```

Built in the memory of Mohandas Karamchand Gandhi, who is revered as the Father of the Nation, Raj Ghat is a marble p

▼ Pre-process the corpus

1. Tokenization
2. Normalization
3. Stemming and Lemmatization
4. Removal of Stopwords

```
import nltk
from nltk.corpus import stopwords
from functools import reduce
from collections import defaultdict
from nltk import WordNetLemmatizer
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
from nltk.stem import PorterStemmer, SnowballStemmer
from nltk.tokenize import word_tokenize
import string
import re
from functools import reduce

nltk.download('stopwords')
nltk.download('punkt')
nltk.download('wordnet')
nltk.download('omw-1.4')
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package omw-1.4 to /root/nltk_data...
```

```
[nltk_data] Package omw-1.4 is already up-to-date!  
True
```

```
def count_tokens(arr):  
    print(f'Vocabulary size: {len(set(reduce(lambda x, y: x + y, arr)))}')  
  
def remove_punctuation(text):  
    trans = str.maketrans('', '', string.punctuation)  
    return text.translate(trans)  
  
print(f'Total number of distinct tokens in each document of corpus: {sum(map(lambda x: len(x), corpus))}')
```

```
Total number of distinct tokens in each document of corpus: 103508
```

```
corpus_tokens = []  
  
for doc in corpus:  
    corpus_tokens.append(word_tokenize(doc))  
  
count_tokens(corpus_tokens)
```

```
Vocabulary size: 4239
```

```
normalized_tokens = []  
  
for tokens in corpus_tokens:  
    normalized_doc_tokens = []  
  
    for token in tokens:  
        token = remove_punctuation(token).lower()  
  
        if token.isalpha():  
            normalized_doc_tokens.append(token)  
  
    normalized_tokens.append(normalized_doc_tokens)
```

```
count_tokens(normalized_tokens)
```

Vocabulary size: 3751

```
wordnet = WordNetLemmatizer()
```

```
lemmatized_tokens = []
```

```
for tokens in normalized_tokens:
```

```
    lemma = []
```

```
    for token in tokens:
```

```
        lemma.append(wordnet.lemmatize(wordnet.lemmatize(token, pos='v'), pos='n'))
```

```
    lemmatized_tokens.append(lemma)
```

```
count_tokens(lemmatized_tokens)
```

Vocabulary size: 3146

```
final_tokens = []
```

```
for tokens in lemmatized_tokens:
```

```
    final_tokens.append([token for token in tokens if not token in stopwords.words("english")])
```

```
count_tokens(final_tokens)
```

Vocabulary size: 3053

▼ Generate the Term Weights

Use the TF-IDF weighting scheme, with custom variants of the TF and IDF weighting schemes

Calculate the weights - $w_{i,j} = tf_{i,j} * idf_i$

```
vocab = list(set(reduce(lambda x, y: x + y, final_tokens)))
inv_vocab = { word: idx for idx, word in enumerate(vocab) }
```

```
import numpy as np
def generate_weights(tf_func, idf_func):
    inc_matrix = np.empty(shape=(100, len(vocab))).astype(int)
    inc_matrix.fill(0)

    tf_table = np.empty(shape=(100, len(vocab))).astype(float)
    tf_table.fill(0)

    weights = np.empty(shape=(100, len(vocab))).astype(float)
    weights.fill(0)

    inverted_index = defaultdict(set)
    doc_freq_table = np.zeros(len(vocab)).astype(int)
    idf_table = np.zeros(len(vocab))

    # Incidence Matrix
    for doc_id, tokens in enumerate(final_tokens):
        for token in tokens:
            inc_matrix[doc_id][inv_vocab[token]] += 1

    # Table of TF weights
    for i in range(inc_matrix.shape[0]):
        for j in range(inc_matrix.shape[1]):
            tf_table[i][j] = tf_func(inc_matrix[i][j], inc_matrix[i].max())

    # Inverted Index
    for docid, tokens in enumerate(final_tokens):
        for token in tokens:
            inverted_index[token].add(docid)

    # Count of document frequency n(i) for term k(i)
    for term, docs in inverted_index.items():
        doc_freq_table[inv_vocab[term]] = len(docs)
```



```

# Table of IDF weights
for i in range(len(vocab)):
    idf_table[i] = idf_func(doc_freq_table[i])

# Calculate weights
for i in range(tf_table.shape[0]):
    for j in range(tf_table.shape[1]):
        weights[i][j] = tf_table[i][j] * idf_table[i]

return weights, idf_table

```

```

def log_norm(f_ij, _):
    return 1 + np.log2(f_ij) if f_ij != 0 else 0

def inv_freq(n_i, N = 100):
    return np.log2(N / n_i)

```

```

weights, idf_table = generate_weights(log_norm, inv_freq)
weights

```

```

array([[0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.]])

```

```
idf_table
```

```

array([5.05889369, 5.05889369, 6.64385619, ..., 6.64385619, 6.64385619,
       6.64385619])

```

▼ Sample queries

```
Q1 = 'Temples in Karnataka'
Q2 = 'Massive hills located in Karnataka'
```

▼ Generate ranked list of documents for queries

```
def process_query(q):
    tokens = word_tokenize(q)
    tokens = [remove_punctuation(token).lower() for token in tokens if token.isalpha()]
    tokens = [wordnet.lemmatize(wordnet.lemmatize(token, pos='v'), pos='n') for token in tokens]
    tokens = [token for token in tokens if not token in stopwords.words("english")]

    return tokens

q1 = process_query(Q1)
q2 = process_query(Q2)
```

```
def query_weights(q, tf_var_func):
    token_inc = np.zeros(len(vocab))
    tf_q = np.zeros(len(vocab))
    weights_q = np.zeros(len(vocab))

    for token in q:
        if token in vocab:
            token_inc[inv_vocab[token]] += 1

    for idx, tf in enumerate(token_inc):
        tf_q[idx] = tf_var_func(tf, token_inc.max())
        weights_q[idx] = tf_q[idx] * idf_table[idx]

    return weights_q

weights_q = np.empty(shape=(2, len(vocab)))
```

```
weights_q[0] = query_weights(q1, log_norm)
weights_q[1] = query_weights(q2, log_norm)
```

```
def cos_sim(w1, w2):
    return (w1 * w2).sum() / ( np.sqrt((w1 ** 2).sum()) * np.sqrt((w2 ** 2).sum()) )
```

```
def ranking(weights_q, query, ranks=10):
    q_similarities = []

    for doc_weights in weights:
        q_similarities.append(cos_sim(doc_weights, weights_q))

    sim_ranks = np.argsort(q_similarities)[::-1][:ranks]

    similarity_ranks = '\n '.join(map(lambda x: docs_list[x], sim_ranks))

    print(query, end='\n\n')
    print(f'Document ranks (First {ranks}) based on similarity (Cosine similarity):\n {similarity_ranks}', end='\n\n')
```

```
ranking(weights_q[0], Q1, 10)
```

Temples in Karnataka

Document ranks (First 10) based on similarity (Cosine similarity):

Belur is a popular temple town of Karnataka that stands as a proud reminder of the princely past of the Hoysala empi
The Mahalaxmi Temple is an ancient shrine dedicated to Goddess Laxmi, Goddess Mahakali and Goddess Mahasaraswati, wh

Four hours away from Udaipur lies the grand and ancient Charbhuj (meaning four-armed) temple, built in 1444 and ded
One of the most prominent shrines in the city, Dakshineswar Kali Temple is dedicated to Goddess Kali. Located on the
Believed to the second-deepest gold mines in the world, the Kolar Gold Fields is located at a distance of 100 km fr
The Chilkur Balaji Temple, located on the outskirts of Hyderabad, on the banks of the Osman Sagar Lake, is a popular

Dedicated to Goddess Katyayani, an incarnation of Goddess Durga, Chhatarpur Temple is said to be the second-largest
A popular attraction of Bengaluru, the Bull Temple that is dedicated to Nandi (bull god). This temple is noted for i
Once a dense forestland inhabited by a few tribal communities, Ganeshpuri was transformed into a spiritual centre by

Believed to be one of the oldest and most revered temples of Chennai, Kapaleeswarar Temple is a shrine of Lord Shiva

```
ranking(weights_q[1], Q2, 10)
```

Massive hills located in Karnataka

Document ranks (First 10) based on similarity (Cosine similarity):

Beautiful terracotta temples, lush forests, scenic views as well as rich art and architecture attract tourists from
Pear-shaped and encircled by green hills of the Aravalli range, the Fateh Sagar Lake is one of the most serene spots
Located about 16 km from Nashik and 262 km from Mumbai, the hill station of Deolali is a popular getaway. Also known

Just 11 km outside Jaipur, lies the magnificent Amber Fort (Amer Fort), sitting atop a hill, and rising like a senti
One of the best things about Mumbai is the sea and the access it provides for quick day-time trips to nearby beaches

The Biligirirangana Hills lies at the meeting point of the Eastern and Western Ghats and draws nature lovers from al
The popular Ranthambore National Park and Tiger Reserve was once the private game reserve of the royal family of Jai
Jainism is among the major religions in the country and its prominence is reflected in various temples spread across

The Dilwara temples, in Mount Abu, Rajasthan are another example of the beauty with which spirituality has been conse

The Pareshnath Jain Temple, also known as Pareswanath Temple Digambar, is one of the holiest places of worship for th

Palitana, in Gujarat, is famed for a large cluster of Jain temples. On your way to the Shatrunjaya Hill top from the

A large cluster of white Jain temples, dating back to the 9th century, marks the landscape of Sonagiri. Located aroun

One begins to believe in the spiritual power of beauty and love when one visits these destinations standing through a

Belur is a popular temple town of Karnataka that stands as a proud reminder of the princely past of the Hoysala empi
It is a Buddhist complex with meditation halls and a temple site atop the Mahindra hills in Secunderabad, near Hussa

▼ Incorporating Relevance Feedback using Rocchio's Algorithm

```
q1_relevant_docs = list([99, 51, 91, 60, 56, 72, 34, 26, 27, 28, 29, 30, 31, 32, 33])
```

```
q2_relevant_docs = list([97, 9, 30, 25, 26, 60, 6, 58, 73, 5, 31, 20, 1, 82, 21])
```

```
q1_non_relevant_docs = [doc for doc in list(range(0,100)) if doc not in q1_relevant_docs]
```

```
q2_non_relevant_docs = [doc for doc in list(range(0,100)) if doc not in q2_relevant_docs]
```

```
def rocchio_algorithm(beta, gamma, query_weights, r, N_r):
```

```
    result = np.zeros(len(vocab))
```

```
    sum_of_r = np.zeros(len(vocab))
```

```
    sum_of_n_r = np.zeros(len(vocab))
```

```
    # Sum of relevant document weights
```

```
    for i in range(len(vocab)):
```

```
        for j in r:
```

```
            sum_of_r[i] = sum_of_r[i] + weights[j][i]
```

```
    # Sum of non-relevant document weights
```

```
    for i in range(len(vocab)):
```

```
        for j in N_r:
```

```
            sum_of_n_r[i] = sum_of_n_r[i] + weights[j][i]
```

```
    # Weights for positive feedback or relevant docs
```

```
    if beta != 0:
```

```
        positive_roocchio_algorithm = np.divide(sum_of_r, (len(r)/beta))
```

```
    else :
```

```
        positive_roocchio_algorithm = np.zeros(len(vocab))
```

```
    # Weights for negative feedback or non-relevant docs
```

```
    if gamma != 0:
```

```
        negative_roocchio_algorithm = np.divide(sum_of_n_r, (len(N_r)/gamma))
```

```
    else :
```

```
        negative_roocchio_algorithm = np.zeros(len(vocab))
```

```
    # Result as the sum of query
```

```
    for term in range(len(vocab)):
```

```
        result[term] = query_weights[term] + positive_roocchio_algorithm[term] - negative_roocchio_algorithm[term]
```

```
    return result
```

▼ Incorporating Relevance Feedback using Rocchio's Algorithm

```
weights_q1_feedback = rocchio_algorithm(1, 0, weights_q[0], q1_relevant_docs, q1_non_relevant_docs)
ranking(weights_q1_feedback, Q1, 10)
```

Temples in Karnataka

Document ranks (First 10) based on similarity (Cosine similarity):

Rising from the bank of Lake Pichola, the imposing City Palace is a grand icon of Udaipur's and Rajasthan's royal pa

With a facade that is 244 m long and 30.4 m high, the palace complex has 11 smaller palaces. Construction of the pala

It has a maze of courtyards, pavilions, terraces, corridors, rooms and hanging gardens. Encircled by fortifications, This landscaped garden is located at the foothills of Nahargarh on the way to Amber Fort. It houses an intricately c Jaipur's most iconic building, the pink Hawa Mahal, stands royally in the bustling Johari Bazaar. With a fine honeyc One of the most ethereal sights in Jaipur is the architectural marvel of Jal Mahal, which is standing right at the c While visiting the majestic Nahargarh Fort, one should rope in a visit to the fantastic Jaipur Wax Museum. Not unlik Situated 22 km away from Udaipur, the Ekling Temple is one of the most famous pilgrimage sites in the state of Rajas Govind Devji Temple is situated in the City Palace complex and is dedicated to Lord Krishna and Radha. The idols of Jhunjhunu is one of the oldest towns in the state of Rajasthan. It lies at a distance of about 186 km from Jaipur. W The grand Salar Jung Museum is famous for housing one of the largest compilations of artefacts collected by one pers Boasting the famous Chand Baori stepwell and Harsha Mata Temple, Abhaneri is one of the most prominent tourist desti

```
weights_q2_feedback = rocchio_algorithm(1, 0, weights_q[1], q2_relevant_docs, q2_non_relevant_docs)
ranking(weights_q2_feedback, Q2, 10)
```

One of the most prominent spiritual sites in Delhi, Hazrat Nizamuddin Dargah is the shrine of Muslim sufi saint, Niza

Jainism is among the major religions in the country and its prominence is reflected in various temples spread across

The Dilwara temples, in Mount Abu, Rajasthan are another example of the beauty with which spirituality has been conse

The Pareshnath Jain Temple, also known as Pareswanath Temple Digambar, is one of the holiest places of worship for th

Palitana, in Gujarat, is famed for a large cluster of Jain temples. On your way to the Shatrunjaya Hill top from the

A large cluster of white Jain temples, dating back to the 9th century, marks the landscape of Sonagiri. Located around
One begins to believe in the spiritual power of beauty and love when one visits these destinations standing through a
One of the largest religions followed throughout the country, Hinduism is also among the oldest in the world. In fact
Most Hindus believe that there are four major pilgrimages that every devotee should take in his/her lifetime to get to
Rivers and streams are highly venerated in Hinduism, and several cities that are sprawled along their banks have been
Varanasi or Benaras, nestled on the banks of the holy Ganges river is believed to be the oldest living inhabitation in
The city of Haridwar, lying in the foothills of the Himalayas, in Uttarakhand, is bustling with devotees, its air filled
Revered as the birthplace of Lord Rama, Ayodhya, in Uttar Pradesh, is a popular pilgrimage site for Hindus. It is spread
Poised on the banks of the holy River Yamuna, Mathura and Vrindavan (Uttar Pradesh), are revered as the land where Lord
Sitting on the Arabian Sea coastline, the city of Dwarka, in Gujarat, is a popular pilgrim site, revered as the abode
Synonymous with spirituality and serenity, the temple town of Kanchipuram, in Tamil Nadu, is dotted with ancient temples
Sprawled along River Kshipra, the ancient city of Ujjain, in Madhya Pradesh, is a cross of bustling lanes that weave
In addition, many, in the Hindu religion, believe that long walks and doing circumambulations around rivers, temples,
Holding the Guinness World Records as the world's largest comprehensive Hindu temple, the Akshardham temple complex
One of the holiest ghats of Haridwar, Har-ki-Pauri is visited by thousands of pilgrims every year. The ghat is the site
One of the most prominent stopovers of Kolkata, Armenian Church is located at Armenian Street, near the Howrah Bridge
This landscaped garden is located at the foothills of Nahargarh on the way to Amber Fort. It houses an intricately carved
One of the major religions in India, Buddhism is based on the teachings of Lord Buddha or Siddhartha Gautama, a prince
One of the most revered Buddhist pilgrimage centres in the world, Sarnath, is believed to be the place where Lord Buddha
Noted for the Buddhist shrine of Mahaparinirvana Temple, Kushinagar, in Uttar Pradesh is a popular pilgrim site. The
The ancient city of Sravasti is a major pilgrimage centre for Buddhists and draws a large number of devotees from India
An archaeological site, Kaushambi, in Uttar Pradesh, is said to have been the place where Lord Buddha stayed and preached
A quaint hamlet scattered with the ruins of one of the greatest education institutes in history, the Nalanda University

There are several monasteries one can visit in India. Some of the prominent ones are Hemis (in Ladakh), Tabo (in Siti

One of the more popular attractions of Mumbai, the Haji Ali complex houses the tomb of Muslim saint, Pir Haji Ali Sh

▼ Incorporating Relevance Feedback using Rocchio's Algorithm

```
weights_q1_feedback = rocchio_algorithm(0, 1, weights_q[0], q1_relevant_docs, q1_non_relevant_docs)
ranking(weights_q1_feedback, Q1, 10)
```

Temples in Karnataka

Document ranks (First 10) based on similarity (Cosine similarity):

A speciality drink from the region, filter coffee is prepared by mixing together milk and a decoction of coffee, mad
Chettinad is a popular style of cooking that uses local spices generously. Some of the common flavours you would com
About 110 km away from Udaipur is the hilly paradise of Dungarpur nestled in the foothills of the Aravalli range. Pc
Located around 40 km from Jaipur, the almost 500-year-old Samode Palace is the perfect example of Rajput haveli arch
Built in the memory of Mohandas Karamchand Gandhi, who is revered as the Father of the Nation, Raj Ghat is a marble
The Old City is sometimes referred to as Vishwanatha Khanda. It is flanked by Dashashwamedha Ghat and Godaulia on sc
Hyderabad's iconic landmark, the 56-m-high Charminar is an imposing four-sided archway with four minarets soaring ab
Govind Devji Temple is situated in the City Palace complex and is dedicated to Lord Krishna and Radha. The idols of
A picturesque mountain pass, around an hour away from Udaipur, Haldighti is famous for several wars that were fought
The heartbeat of Delhi, Connaught Place is a heritage neighbourhood that has been modeled after the Georgian style c

```
weights_q2_feedback = rocchio_algorithm(0, 1, weights_q[1], q2_relevant_docs, q2_non_relevant_docs)
ranking(weights_q2_feedback, Q2, 10)
```

Massive hills located in Karnataka

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Hyderabad's iconic landmark, the 56-m-high Charminar is an imposing four-sided archway with four minarets soaring at

▼ Standard Feedback

$$\beta = 0.75$$

$$\gamma = 0.25$$

```
weights_q1_feedback = rocchio_algorithm(0.75, 0.25, weights_q[0], q1_relevant_docs, q1_non_relevant_docs)
ranking(weights_q1_feedback, Q1, 10)
```

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```
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ranking(weights_q2_feedback, Q2, 10)
```

Cathedral Mary Help of Christians is the primary place of worship for Catholics in Shillong. It is one of the oldest

India boasts some of the finest mosques and dargahs in the world, chief of which is the Jama Masjid, in Delhi. Belie

Another popular site, echoing with spiritual fervour is the Hazratbal Shrine, located on the banks of the Dal Lake in

Ajmer Sharif, in Rajasthan, is believed to be the site where no prayer goes unanswered. The resting place of Gharib N

The majestic complex of Fatehpur Sikri, in Agra, houses the tomb of Hazrat Sheikh Salim Chishti, a great saint. Every

One of the more popular attractions of Mumbai, the Haji Ali complex houses the tomb of Muslim saint, Pir Haji Ali Sha

One of the most prominent spiritual sites in Delhi, Hazrat Nizamuddin Dargah is the shrine of Muslim sufi saint, Niza

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One begins to believe in the spiritual power of beauty and love when one visits these destinations standing through a

Exuding a mystique and serene vibe, Athirappilly Waterfalls are the most famous falls in the state of Kerala. Locate

One of the more popular attractions of Mumbai, the Haji Ali complex houses the tomb of Muslim saint, Pir Haji Ali Sh

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