#Download ollama and pull models (Embedding Model and LLM model)

```
# !sudo apt update
# !sudo apt install -y pciutils
# !curl -fsSL https://ollama.com/install.sh | sh

 0% [Working]                 Get:1
https://developer.download.nvidia.com/compute/cuda/repos/ubuntu2204/
x86_64  InRelease [1,581 B]
Get:2 https://cloud.r-project.org/bin/linux/ubuntu jammy-cran40/
InRelease [3,632 B]
Get:3 http://security.ubuntu.com/ubuntu jammy-security InRelease [129
kB]
Hit:4 http://archive.ubuntu.com/ubuntu jammy InRelease
Get:5 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [128
kB]
Hit:6 https://ppa.launchpadcontent.net/deadsnakes/ppa/ubuntu jammy
InRelease
Hit:7 https://ppa.launchpadcontent.net/graphics-drivers/ppa/ubuntu
jammy InRelease
Get:8 https://r2u.stat.illinois.edu/ubuntu jammy InRelease [6,555 B]
Hit:9 https://ppa.launchpadcontent.net/ubuntugis/ppa/ubuntu jammy
InRelease
Get:10
https://developer.download.nvidia.com/compute/cuda/repos/ubuntu2204/
x86_64  Packages [1,801 kB]
Get:11 http://security.ubuntu.com/ubuntu jammy-security/universe amd64
Packages [1,254 kB]
Get:12 https://r2u.stat.illinois.edu/ubuntu jammy/main all Packages
[9,063 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [127
kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64
Packages [4,741 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/main amd64
Packages [3,040 kB]
Get:16 http://security.ubuntu.com/ubuntu jammy-security/restricted
amd64 Packages [4,587 kB]
Get:17 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64
Packages [3,351 kB]
Get:18 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64
Packages [1,561 kB]
Get:19 https://r2u.stat.illinois.edu/ubuntu jammy/main amd64 Packages
[2,750 kB]
Fetched 32.5 MB in 4s (7,699 kB/s)
Reading package lists... Done
Building dependency tree... Done
```

```
Reading state information... Done
36 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: Skipping acquire of configured file 'main/source/Sources' as
repository 'https://r2u.stat.illinois.edu/ubuntu jammy InRelease' does
not seem to provide it (sources.list entry misspelt?)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libpci3 pci.ids
The following NEW packages will be installed:
  libpci3 pci.ids pciutils
0 upgraded, 3 newly installed, 0 to remove and 36 not upgraded.
Need to get 343 kB of archives.
After this operation, 1,581 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64
pci.ids all 0.0~2022.01.22-1ubuntu0.1 [251 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy/main amd64 libpci3 amd64
1:3.7.0-6 [28.9 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy/main amd64 pciutils amd64
1:3.7.0-6 [63.6 kB]
Fetched 343 kB in 2s (226 kB/s)
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog
based frontend cannot be used. at
/usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78, <> line 3.)
debconf: falling back to frontend: Readline
debconf: unable to initialize frontend: Readline
debconf: (This frontend requires a controlling tty.)
debconf: falling back to frontend: Teletype
dpkg-preconfigure: unable to re-open stdin:
Selecting previously unselected package pci.ids.
(Reading database ... 126308 files and directories currently
installed.)
Preparing to unpack .../pci.ids_0.0~2022.01.22-1ubuntu0.1_all.deb ...
Unpacking pci.ids (0.0~2022.01.22-1ubuntu0.1) ...
Selecting previously unselected package libpci3:amd64.
Preparing to unpack .../libpci3_1%3a3.7.0-6_amd64.deb ...
Unpacking libpci3:amd64 (1:3.7.0-6) ...
Selecting previously unselected package pciutils.
Preparing to unpack .../pciutils_1%3a3.7.0-6_amd64.deb ...
Unpacking pciutils (1:3.7.0-6) ...
Setting up pci.ids (0.0~2022.01.22-1ubuntu0.1) ...
Setting up libpci3:amd64 (1:3.7.0-6) ...
Setting up pciutils (1:3.7.0-6) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...
/sbin/ldconfig.real: /usr/local/lib/libtbbbind.so.3 is not a symbolic
link
```

```
/sbin/ldconfig.real: /usr/local/lib/libtbbmalloc.so.2 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbb.so.12 is not a symbolic
link

/sbin/ldconfig.real: /usr/local/lib/libur_adapter_level_zero_v2.so.0
is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtcm.so.1 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind_2_0.so.3 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtcm_debug.so.1 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libur_loader.so.0 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libur_adapter_level_zero.so.0 is
not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbmalloc_proxy.so.2 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libumf.so.0 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libur_adapter_opencl.so.0 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind_2_5.so.3 is not a
symbolic link

/sbin/ldconfig.real: /usr/local/lib/libhwloc.so.15 is not a symbolic
link

>>> Installing ollama to /usr/local
>>> Downloading Linux amd64 bundle
######################################################################
## 100.0%
>>> Creating ollama user...
>>> Adding ollama user to video group...
>>> Adding current user to ollama group...
>>> Creating ollama systemd service...
WARNING: systemd is not running
>>> NVIDIA GPU installed.
>>> The Ollama API is now available at 127.0.0.1:11434.
>>> Install complete. Run "ollama" from the command line.
```

```python
import threading
import subprocess
import time

def run_ollama_serve():
  subprocess.Popen(["ollama","serve"])


  thread=threading.Thread(target=run_ollama_serve)
  thread.start()
  time.sleep(10)



import threading
import subprocess
import time

# The previous method using subprocess.Popen and threading didn't keep
the server running.
# We will use a different approach to start the ollama server in the
background.
# This cell is intentionally left blank to replace the previous
problematic code.
# The actual server start will be in the next cell using a bash
script.

# %%script bash --bg

# ollama serve
```

Waiting for the ollama server to start...

```python
import time
time.sleep(20) # Wait for the server to start. Adjust the time if
necessary.

!ollama pull all-minilm:33m

Error: ollama server not responding - could not connect to ollama
server, run 'ollama serve' to start it



import time
import subprocess

def is_ollama_server_running():
    try:
        # Check if ollama list command runs without error
        subprocess.run(['ollama', 'list'], check=True,
```

```python
            stdout=subprocess.PIPE, stderr=subprocess.PIPE)
        return True
    except subprocess.CalledProcessError:
        return False
    except FileNotFoundError:
        print("Ollama not found. Make sure it's installed and in your
PATH.")
        return False

def start_ollama_server():
    print("Starting ollama server...")
    # Use --bg to start in the background
    subprocess.Popen(['ollama', 'serve'])
    time.sleep(10) # Give the server some time to start

# Check if server is running, if not, start it
if not is_ollama_server_running():
    start_ollama_server()
else:
    print("Ollama server is already running.")

# Now attempt to pull the model
!ollama pull all-minilm:33m
```

Starting ollama server...

```python
!ollama pull nomic-embed-text
```


```python
!pip install ollama
```

Collecting ollama
  Downloading ollama-0.5.1-py3-none-any.whl.metadata (4.3 kB)
Requirement already satisfied: httpx>=0.27 in
/usr/local/lib/python3.11/dist-packages (from ollama) (0.28.1)
Requirement already satisfied: pydantic>=2.9 in
/usr/local/lib/python3.11/dist-packages (from ollama) (2.11.7)
Requirement already satisfied: anyio in
/usr/local/lib/python3.11/dist-packages (from httpx>=0.27->ollama)
(4.9.0)
Requirement already satisfied: certifi in
/usr/local/lib/python3.11/dist-packages (from httpx>=0.27->ollama)
(2025.6.15)
Requirement already satisfied: httpcore==1.* in
/usr/local/lib/python3.11/dist-packages (from httpx>=0.27->ollama)
(1.0.9)
Requirement already satisfied: idna in /usr/local/lib/python3.11/dist-
packages (from httpx>=0.27->ollama) (3.10)
Requirement already satisfied: h11>=0.16 in
/usr/local/lib/python3.11/dist-packages (from httpcore==1.*-

```
>httpx>=0.27->ollama) (0.16.0)
Requirement already satisfied: annotated-types>=0.6.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic>=2.9->ollama)
(0.7.0)
Requirement already satisfied: pydantic-core==2.33.2 in
/usr/local/lib/python3.11/dist-packages (from pydantic>=2.9->ollama)
(2.33.2)
Requirement already satisfied: typing-extensions>=4.12.2 in
/usr/local/lib/python3.11/dist-packages (from pydantic>=2.9->ollama)
(4.14.0)
Requirement already satisfied: typing-inspection>=0.4.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic>=2.9->ollama)
(0.4.1)
Requirement already satisfied: sniffio>=1.1 in
/usr/local/lib/python3.11/dist-packages (from anyio->httpx>=0.27-
>ollama) (1.3.1)
Downloading ollama-0.5.1-py3-none-any.whl (13 kB)
Installing collected packages: ollama
Successfully installed ollama-0.5.1
```

```python
import ollama
vector=ollama.embeddings(model='nomic-embed-text', prompt='The sky is
blue because of rayleigh scattering')

print(vector)
```

```
embedding=[0.596611738204956, 0.4038065969944, -3.301659345626831, -
0.527764081954956, 0.7528295516967773, 1.5176159143447876, -
0.12341324985027313, 0.3994874060153961, 0.07080785185098648, -
1.1066460609436035, 0.6891273856163025, 1.2791866064071655,
1.1506240367889404, 1.0897144079208374, 0.24736447632312775,
0.2913069427013397, 0.14929239451885223, -0.6370189785957336, -
0.20820362865924835, -0.20084066689014435, -1.7955728769302368, -
0.6318198442459106, 0.03730666637420654, -0.6715432405471802,
1.2628475427627563, 1.2765344381332397, -0.16518892347812653, -
0.0018886495381593704, -0.29799869656562805, -0.48259031772613525,
1.2042748928070068, -0.633813221931458, -0.5424551367759705, -
1.0355058908462524, 0.6290382742881775, -1.2067773342132568,
0.6842918992042542, -0.05698380619287491, -0.19483155012130737,
0.12923064827919006, -0.018023675307631493, -0.5538797974586487,
0.3511584401130676, 0.047945208847522736, 0.6018522381782532, -
0.957679271697998, 0.5084206461906433, 1.5722949504852295, -
0.7101343870162964, -0.38054630160331726, -0.6738687753677368,
1.1416372060775757, -0.1083398337364197, -1.9447559118270874,
0.4668470025062561, 1.437364101409912, 0.5073143839836121, -
0.3435628116130829, 0.5022619366645813, 0.08047568053007126,
1.3476357460021973, 1.79447603225708, 0.09421845525503159,
1.1037598848342896, 1.3005530834197998, -0.9233483672142029, -
1.1415046453475952, -0.1893899142742157, 0.19687822461128235, -
0.3267350494861603, 1.4743890762329102, -1.2659586668014526,
```

0.06497234851121902, 0.7983435392379761, -0.5999121069908142, -1.1105527877807617, -1.3123114109039307, 0.4155399799346924, -0.10726697742938995, 1.0695700645446777, 0.3272382915019989, 0.44006097316741943, 0.4644833207130432, 0.2225322127342224, 1.2034796476364136, 0.612824022769928, 0.7478929758071899, -0.35485178232192993, -0.30607929825782776, -0.13049882650375366, 0.1651797741651535, -0.5772202014923096, 1.421271562576294, 0.2021683007478714, -0.4536314606666565, -0.1230991780757904, -0.6094827055931091, 1.4640828371047974, -1.3463176488876343, -0.6415805816650391, -1.182835340499878, -0.5092137455940247, -0.9118468761444092, 0.7179521918296814, 1.5051218271255493, 0.5314150452613831, -0.22863730788230896, -0.1808173954486847, -0.607716977596283, -0.9503152966499329, 0.18992497026920319, 0.6948076486587524, -0.08356841653585434, 0.04444463923573494, -0.21146120131015778, -1.4184205532073975, 0.09423966705799103, -0.879564106464386, 0.2458087980747223, 1.9921761751174927, 0.8835241198539734, -0.07445045560598373, 0.0839996188879013, -0.35051360726356506, -0.21258778870105743, 1.0222899913787842, -0.611575722694397, 0.00942428782582283, 0.26715683937072754, -1.0353208780288696, -0.7315455079078674, -0.7651793956756592, -0.0933900997042656, 0.2760028541088104, 0.10075954347848892, 0.4392056167125702, -0.19629773497581482, -0.8400853872299194, 0.13278190791606903, 0.4153699576854706, 0.8136956095695496, 0.453166663646698, 0.978903591632843, -0.6697325706481934, -0.1165512204170227, -1.3586668968200684, 0.5920721888542175, -0.02021847851574421, -0.2403138130903244, -0.7177209258079529, -0.5492299199104309, -0.18326786160469055, 0.41206029057502747, 0.6442871689796448, 0.10592977702617645, -1.110182762145996, 0.5376916527748108, -0.1994509994983673, 0.5514219999313354, 0.6689451336860657, 1.0992352962493896, 0.4787495732307434, -0.2538961172103882, 0.46902701258659363, -0.48571154475212097, -0.6594177484512329, 1.1181823015213013, 0.8031982183456421, 0.662143886089325, 0.7644698023796082, -1.094913125038147, -1.6800189018249512, -0.5539228916168213, -0.9314845204353333, -0.04931744560599327, 0.18482080101966858, 1.4208881855010986, -0.4571005702018738, 0.18980252742767334, -0.8143535852432251, -0.23008179664611816, -1.394913673400879, 0.30193692445755005, 0.16031041741371155, 0.5493873357772827, 0.042138226330280304, -1.172319769859314, -0.816856324672699, -0.7298208475112915, -0.5520516633987427, -0.2304537147283554, -0.5417223572731018, -1.4013811349868774, -0.9245904088020325, 0.21267491579055786, -0.4855476915836334, 1.1404117345809937, 1.0108745098114014, 0.3550950586795807, 0.3664192855358124, -0.13744419813156128, -0.3154374957084656, 0.4818825423717499, -0.21868471801280975, 0.23371616005897522, 1.2752426862716675, 0.27600178122520447, 0.9312672019004822, -1.1442681550979614, 0.10080569982528687, 1.2236602306365967, -0.3910464346408844, 0.2293361872434616, -0.12960609793663025, 1.2129926681518555, 0.09096094965934753, -0.9758371114730835, -0.02253013476729393, -0.2818033993244171,

1.69264137744490356, -0.46480971574783325, 0.3644765615463257,
0.6455419659614563, -0.4644624590873718, 0.8193121552467346,
0.036009568721055984, -0.6319578289985657, 0.1379246860742569,
0.9435267448425293, -0.3511826992034912, 0.20689649879932404,
0.28290611505508423, 0.687075674533844, 0.7111847996711731,
0.6212663054466248, 0.8290323615074158, 0.43868395686149597,
1.197878122329712, -0.19497549533843994, -0.004770632833242416, -
0.8353025317192078, 1.342053771018982, -1.5082056522369385,
0.2653544545173645, -0.9808100461959839, 1.0033750534057617, -
0.45849886536598206, -0.39256277680397034, -0.8312278985977173, -
0.0036808252334594727, 0.7320472240448, 0.09787164628505707,
0.6167395710945129, 1.0272433757781982, 0.023303255438804626, -
1.6345181465148926, -1.2574732303619385, 0.07179759442806244, -
0.06611626595258713, -1.0671790838241577, -0.6621577739715576, -
0.8173157572746277, 0.9018567204475403, -1.538090467453003, -
1.2504180669784546, 1.1567376852035522, -0.5349427461624146,
0.5186052322387695, 0.39508652687072754, -1.513311743736267,
0.6608579754829407, 0.5536298155784607, 0.42713016271591187,
0.2594867944717407, 0.2382032573223114, -0.5782996416091919,
0.36620089411735535, -0.6149708032608032, -0.10820846259593964,
0.9322540163993835, -0.34781453013420105, -0.17581503093242645, -
0.6907083988189697, -0.1995164304971695, 0.29979243874549866,
0.2964015305042267, 0.5056819319725037, 1.5905321836471558,
0.00990174151957035, 0.9876900911331177, 0.7938240170478821,
0.21945475041866302, 0.6569220423698425, 1.6160863637924194, -
0.461373507976532, 0.690303385257721, 1.3450679779052734,
0.061776865273714066, 0.7100813388824463, -0.8052645921707153,
0.27112340927124023, 0.3896143436431885, 1.0244975090026855,
0.1449095457792282, -0.05437922477722168, 0.27929237484931946,
0.046091530472040176, 0.3825424909591675, 0.4757801592350006, -
0.5945715308189392, -0.2099483162164688, 1.192258596420288, -
0.5413431525230408, 1.9740772247314453, -0.685494601726532,
1.1660597324371338, 0.5568597912788391, -0.006429770030081272,
0.6852979063987732, 0.6798750758171082, 0.3858884274959564, -
0.6941286325454712, 0.4736044108867645, -0.1331615447998047,
0.5947201251983643, 0.7879973649978638, -0.8968677520751953,
0.9747558236122131, -0.7986097931861877, -1.0501357316970825, -
0.2135218381881714, 0.5571238398551941, 0.42839139699935913, -
0.4009246826171875, -1.4893555641174316, -0.1762353479862213, -
0.19898667931556702, -1.1195495128631592, -0.43501564860343933,
1.1508671045303345, 1.2911837100982666, -1.7641068696975708, -
0.15243767201900482, -1.0906763076782227, -0.43505796790122986, -
0.32116326689720154, -0.1491089314222336, -0.2265586107969284,
0.5630074143409729, -0.3280337154865265, -0.35613518953323364,
0.12498334050178528, 0.14978930354118347, -0.2567434310913086, -
0.5006039142608643, 0.31109970808029175, -0.5565162301063538,
0.5325968861579895, 0.9118931889533997, -0.004447425715625286,
0.21498051285743713, -1.0382307767868042, -0.20909443497657776, -
0.2842057943344116, -0.7384029030799866, 0.7601131200790405,

0.185438871383667, 0.3847975730895996, 0.07829780131578445, -0.2608492970466614, -0.706405520439148, -0.26946765184402466, -0.8520636558532715, 1.091347336769104, 0.26609694957733154, 0.18803590536117554, -0.6470011472702026, -1.2459783554077148, 0.43427547812461853, 0.18813186883926392, -0.5077468752861023, 0.6880239844322205, 0.022120490670204163, 0.4516860246658325, -0.01980581507086754, 0.36271220445632935, -0.49404656887054443, -1.1517653465270996, -0.46668440103530884, -0.6133459210395813, -0.25544601678848267, -1.2270203828811646, -0.40044790506362915, -0.04076951742172241, 0.36222249269485474, -1.3018567562103271, 1.1129164695739746, -0.4887944757938385, -0.4470321536064148, 0.4242391586303711, -0.5528107285499573, -0.759588897228241, -0.49011731147766113, -1.2200953960418701, -0.038047611713409424, 0.608284056186676, -0.15999509394168854, -1.5344606637954712, 1.130014419555664, 0.9397381544113159, 0.5193549394607544, 0.7948578000068665, -0.15295174717903137, -2.24099063873291, -0.0092235598713159556, 0.03987658768892288, 0.4352607727050781, 0.07371846586465836, 0.3698995113372803, 0.2781955599784851, 1.4790211915969849, 1.0919923782348633, 0.1882440447807312, -0.4373933672904968, 0.9348320960998535, 0.3632541596889496, 0.22158417105674744, 0.5447224974632263, 0.423174649477005, -1.0663633346557617, 0.05321343243122101, -0.21944230794906616, -0.4225231111049652, -0.23518963158130646, -1.212566614151001, 0.5283460021018982, -0.35358744859695435, -0.19479885697364807, 0.289979487657547, 1.6998915672302246, 1.1239995956420898, -1.426933765411377, -0.591568112373352, -1.2233365774154663, 1.4709141254425049, 2.432877540588379, 0.2987994849681854, -2.2052388191223145, -0.818899929523468, 0.39353981614112854, -0.36842384934425354, -1.0225803852081299, 0.8729929327964783, 1.6586236953735352, 1.8521302938461304, -0.11706165224313736, -0.5797351598739624, 0.47949764132499695, 1.0777664184570312, 1.7730516195297241, 0.61417555809021, 0.14451919496059418, -0.14026616513729095, -0.0741211175918579, 0.28307077288627625, -0.2503310441970825, -0.15859661996364594, -0.13645072281360626, 0.132460355758667, 0.6617013216018677, -1.1295521259307861, -0.22827641665935516, 0.361577570438385, -0.6985985040664673, -1.2107559442520142, 0.08879562467336655, -1.4294335842132568, -0.0606250986456871, 0.7149401307106018, 1.1364094018936157, 0.46839794516563416, 0.7382111549377441, -0.3085472285747528, -0.9128619432449341, -0.5712950229644775, 1.6387861967086792, 0.19342255592346191, 0.3440253734588623, 0.3345757722854614, -0.6178752183914185, 0.5685961842536926, -0.7125232815742493, 0.2161216288805008, -0.19364379346370697, 0.4715735912322998, -0.36006492376327515, 0.26813340187072754, -0.5475116968154907, 0.06676196306943893, 0.047828108072280884, 0.048004090785980225, 0.4453081488609314, 0.5079702734947205, 0.38606053590774536, -0.5544606447219849, 0.38449594378471375, 0.7188999056816101, -0.7919629216194153, -0.2865538597106933, 1.2777585983276367, -0.49606284499168396, -1.6970856189727783, 1.5111522674560547,

0.19060102105140686, -0.07616302371025085, -1.0408554077148438, -0.3262596130371094, 0.9272560477256775, -0.5220814347267151, -0.27131104469299316, 0.5542806386947632, -0.633391797542572, -0.41792812943458557, 0.18687093257904053, -0.8607949614524841, 1.1215674877166748, -0.0623738095164299, -0.7583239674568176, 0.4652816355228424, 0.3405047357082367, 0.04031549394130707, 0.2570338845252991, -0.6417819261550903, -0.7205320000648499, 0.6786131858825684, -0.496814489364624, -0.2949983477592468, 0.9962171316146851, -0.0038913246244192123, 0.894688606262207, 0.023441269993782043, 0.5082686543464661, 0.4546356499195099, -0.00882089510560357, -0.2593657374382019, 0.23540456593036652, -1.4155504703521729, 0.3332231640815735, 1.3773936033248901, -0.4247310757637024, 0.6520944237709045, -0.9119656085968018, 0.5188640356063843, 0.2496802806854248, 1.1793019771575928, -0.5495083332061768, 0.13620063662528992, -0.34838902950286865, -1.1845099925994873, 0.11421182751655579, 0.11526980996131897, 0.279660165309906, 0.1937248557806015, 0.17726927995681763, 1.1113967895507812, -1.3886826038360596, -0.02917817234992981, 0.454542875289917, 0.3746641278266907, 0.012863422743976116, -0.04183897376060486, -0.4016326367855072, -0.5208070874214172, -0.530788779258728, -0.14520616829395294, 0.35424813628196716, 0.19974388182163239, 0.12470437586307526, -1.0574290752410889, -0.44522762298583984, 1.1787713766098022, 0.06322960555553436, 1.1563111543655396, -0.047420185059309006, -0.31989672780036926, -0.46688705682754517, 0.22948887944221497, -1.1282330751419067, 1.759867548942566, -1.0145319700241089, -0.4665185213088989, -0.25759658217430115, -0.5989101529121399, -0.8220952153205872, -0.268137663602829, -1.0793370008468628, -0.26433688402175903, -0.9908605217933655, -1.810337781906128, -0.07210736721754074, 0.4463964104652405, -0.7295593619346619, 1.0570154190063477, -1.022916555404663, 0.3224487602710724, 0.3827787935733795, -0.10382390767335892, -0.964362621307373, 0.34398627281188965, -0.29836732149124146, 0.37425747513771057, -0.4190165400505066, 0.12424048781394958, -0.17750480771064758, 0.06980859488248825, -1.2893588542938232, 1.3699705600738525, -0.07389415800571442, 0.7179818153381348, -2.0178496837615967, -0.13188695907592773, -1.9673259258270264, 0.37154966592788696, -1.1174101829528809, 1.168243646621704, -0.9618223905563354, -1.1637318134307861, -1.1128607988357544, 0.7947219610214233, 0.7270287275314331, -0.07695959508419037, 0.8235002756118774, -0.2530231475830078, -0.3969663977622986, -0.06334580481052399, 0.43208277225494385, -0.22821617126464844, 0.6416243314743042, 0.5933946371078491, 0.5161401629447937, 0.2904685437679291, 1.017472267150879, 0.3477233946323395, -0.43336841464042664, 1.0115700960159302, -0.16126297414302826, 1.1720529794692993, -0.45413142442703247, 0.03891567513346672, -0.8873960971832275, 1.289166808128357, 0.7298948168754578, 0.5521595478057861, -0.96771639585495, 0.6098096370697021, -0.48191970586776733, 0.5408534407615662, 0.1493312567472458, -0.4702226519584656, -2.071690559387207, -

```
1.0564754009246826, -0.10154920816421509, -2.1714041233062744,
0.18001121282577515, 0.6793662905693054, -0.5380242466926575,
0.284769207239151, -0.5594838857650757, -1.7851669788360596,
0.13525769114494324, -0.8120720982551575, 0.5468419790267944, -
0.4257524013519287, -0.4457937777042389, -0.011865351349115372, -
0.2414010465145111, 0.43063884973526, 0.8471792936325073,
0.5104038715362549, -0.07989782094955444, 0.9365085363388062,
0.9143933057785034, -0.3032689690589905, -0.2668214440345764, -
0.3113429546356201, -0.20978137850761414, -0.4172047328948975, -
0.2833954691886902, 0.629489004611969, -2.4666173458099365,
0.4440686106681824, 0.39702320098876953, -1.2595996856689453, -
1.5507508516311646, 0.4905312955379486, -0.6933292150497437,
0.3380364179611206, -0.6400011777877808, 0.40775373578071594, -
0.40219008922576904, -1.1780387163162231, -0.11065209656953812,
0.37948179244995117, 0.8448335528373718, 0.13452452421188354, -
0.9455470442771912, 0.4914744794368744, -0.4470999836921692, -
0.21429657936096191, -0.08379240334033966, -0.30885156989097595,
0.5806231498718262, 0.3542720377445221, 0.9969640374183655,
0.11141970753669739, 0.3750711977481842, -0.10743381083011627,
0.26700013875961304, -0.604420006275177, 1.0206973552703857,
0.8106960654258728, -0.36516568064689636, -0.6259576082229614, -
1.4596701860427856, -0.04029652416706085, -0.41633808612823486,
0.6577274799346924, -1.4596110582351685, -0.09516552090644836, -
0.653337299823761, 0.1119464859366417, 1.0175315141677856, -
0.25507399439811707, 0.5042980313301086, -0.34695523977279663, -
0.8164779543876648, -0.577079713344574, 0.13891853392124176, -
0.04879584163427353, -0.3081592321395874, -1.3044885396957397,
0.24270662665367126, 0.20688128471374512, 0.3283151090145111,
0.017381979152560234, -0.4584950804710388, 0.2928582429885864,
0.5352063775062561, 1.4805874824523926, -0.36589449644088745,
0.4414066970348358, 0.22818776965141296, -0.15724222362041473,
0.34908780455589294, 0.425024151802063, 0.6885184645652771,
0.4411327838897705, -0.018926845863461494, 2.034940481185913, -
0.05141178518533707, 0.45415663719177246, -0.22181059420108795,
0.34288108348846436, 0.7063103318214417, -1.1499360799789429, -
0.14816659688949585, -0.5441664457321167, 0.46863630414009094]

vector=ollama.embeddings(model='nomic-embed-text',prompt='Expertise')
print(vector)

embedding=[-0.062154702842235565, 0.8509528040885925, -
4.2390336990356445, -0.21854600310325623, 1.6232056617736816, -
0.01093389093875885, 0.3220036029815674, 0.262542724609375,
0.766206681728363, 0.5903343558311462, -0.1830856204032898, -
0.8519308567047119, 1.718031406402588, -0.6320403814315796,
0.5313819646835327, -0.4901276230812073, 0.2799268364906311, -
1.5966566801071167, 0.6501357555389404, -0.02220047265291214, -
0.3601174056529999, -0.3126825988292694, -0.05244264006614685,
0.24746616184711456, 2.9946017265319824, -1.3732534646987915, -
0.3827943801879883, -0.7648035287857056, 0.04506203159689903, -
```

0.5434907078742981, 0.9080800414085388, -0.013035222887992859, -0.11887557059526443, 0.302518367767334, -0.8055892586708069, -1.0521934032440186, 1.452751636505127, -0.15782080590724945, -0.019139116629958153, 0.7469062209129333, 0.7995085120201111, 0.20613647997379303, 0.586497962474823, -1.1919666528701782, 0.8535059690475464, -0.11383234709501266, -0.5205992460250854, -0.5288623571395874, -0.1943347007036209, -1.0133908987045288, -0.011658161878585815, -0.7796009182929993, 0.8346121311187744, 1.2512366771697998, 1.431962251663208, 0.3753196895122528, 0.29422706365585327, 0.3275288462638855, 1.0647255182266235, -1.1383525133132935, 1.257861852645874, 1.104103922843933, -1.6331496238708496, 1.624537706375122, -0.6330686807632446, -0.47008925676345825, -0.03898726403713226, 1.5157588720321655, -0.003731693606823683, 0.15822960436344147, 0.7073740363121033, -1.1021212339401245, 1.8088867664337158, 0.5369536876678467, -1.5115165710449219, 0.004724140278995037, -0.3361765742301941, 0.5158803462982178, 0.14797644317150116, 1.1413911581039429, 0.45047086477279663, -0.38162609934806824, 2.1611056327819824, 0.1881432682275772, 0.2326023429632187, -0.476910083580017, -1.1180657148361206, 0.08590805530548096, 1.2297108173370361, 1.428200602531433, 0.203701213002049, 1.527250051498413, -0.24309174716472626, 0.23387214541435242, -0.7517962455749512, 0.9080179333686829, -1.1023123264312744, -0.2627401351928711, -0.21205511689186096, -1.0970760583877563, -0.7114819288253784, -0.6037194728851318, -1.1697715520858765, -0.5290231108665466, 0.08438746631145477, 1.4026942253112793, 0.5110741257667542, -0.40838560461997986, -0.27146703004837036, 0.45225828886032104, -0.1985662877559662, 0.5508256554603577, -0.9483966827392578, 0.26525554060935974, -0.2453379780054092, -0.7898955345153809, -0.27140673995018005, -0.20477277040481567, -0.2836161255836487, -0.11065517365932465, -0.23395363986492157, -1.1119565963745117, 0.7654961943626404, 0.6055958867073059, 0.09817497432231903, 2.236146926879883, -1.410992980003357, 0.9067573547363281, 0.5683934688568115, -0.3185957670211792, -0.2978726923465729, -0.7394328117370605, -0.17853766679763794, -0.3386228382587433, 0.8072055578231812, 1.2400966882705688, -0.9765754342079163, -0.04246347397565842, 1.3868424892425537, 0.601485013961792, 0.9238837361335754, 0.7943791747093201, 0.001384563511237502, -0.9330504536628723, -0.31860700249671936, -0.594580352306366, -0.08505059778690338, 0.017490141093730927, -0.9346203207969666, -0.09330841153860092, -0.1034775972366333, 1.138682246208191, -0.29060283303260803, 0.03489288315176964, 1.5429996252059937, -0.2704054117202759, -0.014724005945026875, 0.1716228872537613, 0.685731828212738, -0.2914637327194214, 1.0415518283843994, 0.15397633612155914, -1.8565515279769897, 1.0845277309417725, 0.4291134178638458, 0.013048208318650723, 1.048318862915039, 0.7184508442878723, 0.7691197395324707, 0.8133527636528015, -0.6176983118057251, -0.9600858092308044, 0.2621467113494873, -0.5087074637413025, 1.0489060878753662, -0.19441604614257812,

0.6557232141494751, -1.1044994592666626, 1.7546558380126953, -0.7540993094444275, -0.276681512594223, -0.2811218500137329, 0.209843263030005219, 1.0299779176712036, -0.23880024254322052, -0.38503512740135193, -0.44390103220939636, -2.2112298011779785, -0.07172906398773193, -0.6773048043251038, 0.6706021428108215, 1.2572249174118042, -1.6300106048583984, -1.1080390214920044, -0.7144289612770081, -0.46658071875572205, 1.375800609588623, 1.2500019073486328, -0.14008797705173492, -0.6209596395492554, -1.0667797327041626, -0.4751971364021301, -0.042936503887176514, 0.9593455791473389, -0.14190690219402313, 1.4127142429351807, 0.2344547063112259, 0.3018616735935211, -0.6440281271934509, 0.6151768565177917, 1.1116070747375488, -0.10293576121330261, 0.47279247641563416, -0.22765982151031494, -0.033240702003240585, -0.6851121187210083, -0.3254867494106293, -0.7876293659210205, -0.14530174434185028, -0.18184982240200043, 0.20415982604026794, 0.9225236177444458, 0.5898919701576233, 0.3442346155643463, -1.3692494630813599, -0.008524664677679539, -0.5275763869285583, 0.3136341869831085, -0.6566197276115417, -0.033669568598270416, -0.20063088834285736, -1.5415314435958862, 1.8391801118850708, 1.282726764678955, 1.3513901233673096, -0.1241373643790756, 1.0318005084991455, 0.7729179859161377, 0.3000853359699249, 1.3527547121047974, -0.2443506419658661, 0.748958170413971, -0.7456801533699036, -0.45235008001327515, -1.5538485050201416, 0.5379365682601929, 0.7566463351249695, -0.5870307087898254, -0.2188471257686615, 0.1398185193538665, 0.7590957283973694, 0.2382746934890747, 0.49153226613998413, -0.029272189363837242, -0.22839798033237457, -0.06136361137032509, -0.1355406939983368, 0.6363832950592041, 0.9063788056373596, -0.09261512011289597, 0.8853827118873596, -0.4635144174098968, 1.4365483522415161, 0.0426420159637928, -0.1825985610485077, 0.5233640074729919, -1.4406784772872925, 1.1361037492752075, 0.07723452150821686, -0.4718058407306671, 0.26688486337661743, 0.4971053898334503, -0.23525337874889374, 0.3910396099090576, -0.6857481002807617, -0.04008864238858223, -0.7629345655441284, 0.18642550706863403, -0.7732582092285156, -0.06321284174919128, -0.8768422603607178, -1.385392665863037, -1.0695496797561646, -0.13977211713790894, 0.07658059149980545, 1.0809458494186401, 0.6461586356163025, 0.4135226607322693, 0.2969497740268707, -0.28264757990837097, 0.8809136152267456, 0.17003369331359863, 0.20300212502479553, 1.1191978454589844, -0.4069664478302002, 1.6798204183578491, 0.23733215034008026, -0.3182467222213745, -0.03953804820775986, -0.3546021282672882, 0.4879079759120941, -0.5023006200790405, 0.8184235095977783, 0.4322506785392761, 0.801102876663208, -0.1356779932975769, 0.9864423274993896, -1.7499393224716187, 0.5124762654304504, -0.5464043617248535, -2.344682216644287, -0.7827147245407104, -1.0525250434875488, -0.4592858850955963, -1.0607415437698364, 0.8374349474906921, 0.6147335767745972, -0.0455767807364464, 0.9461974501609802, 1.4011014699935913, 0.5825510025024414, -0.032070331275463104, -0.23081912100315094, -

1.346761703491211, -0.42642712593078613, 2.257363796234131, -1.250077486038208, 0.4088127613067627, -0.26008880138397217, -0.581989586353302, -0.34031417965888977, 0.5941120982170105, -0.055314164608716965, -0.6560033559799194, -1.539193868637085, 0.6825369596481323, 0.3984624743461609, -0.5963987112045288, -1.6874611377716064, 0.5995657444000244, 1.513237714767456, -0.9759528040885925, 0.3268865942955017, -1.0999528169631958, -0.7256530523300171, 0.44187450408935547, -0.09259242564439774, -0.4186097979545593, 0.08489961922168732, 0.4427972137928009, 0.06542038172483444, 0.40953949093818665, -1.290932536125183, -0.026346271857619286, 0.5402078628540039, -0.24404455721378326, 1.321019172668457, 0.875464677810669, 0.48505517840385437, -0.6879891753196716, 0.1324317455291748, -0.19061103463172913, -0.7491404414176941, -1.1191717386245728, -0.12740392982959747, 0.5556495785713196, 0.7879125475883484, 0.6333801746368408, -0.4412316083908081, 0.7581316828727722, -0.39496517181396484, 0.5103024840354919, -0.275043785572052, 0.8217849731445312, -0.42680105566978455, -0.40936943888664246, -1.8841354846954346, -1.9588496685028076, 0.5833073258399963, 0.5094121098518372, -0.04903320595622063, -0.19778114557266235, 0.19762171804904938, -1.1465847492218018, 1.7775830030441284, 0.12087643146514893, 0.3954471945762634, -0.5464947819709778, 0.38402092456817627, -0.7636886835098267, 0.047487400472164154, -1.3334208726882935, -0.9525594711303711, -0.8581644296646118, -0.14986613392829895, -1.2051368951797485, -0.05981492623686790 5, 0.49081331491470337, -0.17011111974716187, 0.7117443084716797, -1.6102619171142578, -1.2289228439331055, 1.0607699155807495, 0.8964927196502686, -0.6781898736953735, 1.6779303550720215, -0.4333498477935791, -1.0327099561691284, -0.011663476005196571, -0.383431613445282, 1.9694945812225342, 0.4979984164237976, -0.5222289562225342, -1.0068290233612 06, -0.23742975294589996, 1.0621588230133057, 0.40855953097343445, 1.0003407001495361, -0.9158129692077637, 0.6155138611793518, 0.9099094867706299, 0.07936862111091614, 0.7398103475570679, -0.3877540826797485 4, 0.1318327635526657, 0.8911345601081848, 0.06675054877996445, 0.9920971989631653, -0.6879477500915527, -1.793866753578186, 0.6206828951835632, -0.4747876524925232, 0.7368434071540833, -0.9721106886863708, -0.0492197722196579, -0.6447440385818481, 0.49349546432495117, 0.11236289888620377, 0.6483492851257324, 1.9330048561096191, -0.6159772276878357, 0.1956036388874054, -2.667714834213257, -0.1974915862083435, 0.392910361289978, 1.6572964191436768, 0.6469947695732117, -0.3441520035266876, -1.4274563789367676, 1.6859056949615479, -0.6446769833564758, -1.0885077714920044, -0.7195785641670227, 0.04485892131924629, 1.4212870597839355, 0.42391136288642883, 0.4489559233188629, -0.23221293091773987, -0.24855108559131622, -0.5425328612327576, 0.6013514399528503, -0.542155385017395, -2.1167478561401367, 0.6896028518676758, 0.018626743927598, 0.1247147023677 8259, -0.4821145236492157, 0.05824219435453415, 0.71150141954422, 1.028380274772644, -

0.8759145140647888, -0.14552953839302063, 1.0553393363952637, -
0.08091510832309723, -1.061547040939331, 0.28482866287231445,
0.15137635171413422, -0.1606956571340561, 0.42279088497161865,
0.18695327639579773, 0.7050836682319641, -0.5747454762458801, -
0.4957926273345947, -0.3256830871105194, -0.1438506841659546,
0.6796914339065552, -0.43776533007621765, -0.10335738211870193,
0.54676353931427, -0.7282113432884216, 0.869346022605896,
1.1122915744781494, -0.07371097803115845, -1.6561827659606934, -
1.8009965419769287, 0.30068570375442505, -0.15324246883392334,
1.350063443183899, 0.9388912916183472, -0.11829964071512222,
1.3162022829055786, 0.5423426032066345, -0.889453649520874, -
0.9558345079421997, -0.7806283831596375, -1.579106092453003,
1.1101722717285156, -1.323490023612976, -0.7844521403312683,
1.1400951147079468, -1.3872040510177612, 1.44088613986969,
1.0076055526733398, 1.3088946342468262, 1.425357699394226, -
0.7792746424674988, 0.05702124163508415, 0.9406765699386597, -
0.9449605345726013, 0.28973931074142456, 0.7508588433265686,
1.2084705829620361, -0.7987603545188904, -0.08435074239969254, -
2.536219835281372, 0.15969839692115784, -0.617260217666626,
0.18668752908706665, 0.4775453805923462, 0.22138050198554993,
0.7561498880386353, 0.4322860836982727, -0.7562721371650696,
0.287345290184021, 0.8693418502807617, -1.5677746534347534, -
0.03392555192112923, -0.8004058599472046, 0.0410105362534523,
0.2721215784549713, 0.8975319862365723, 0.8860694766044617,
0.2664414942264557, -0.10978152602910995, 1.1222940683364868, -
0.08254151791334152, -0.7523432970046997, 0.5324838161468506,
0.656155526638031, -1.1729990243911743, 0.803335964679718, -
1.4330806732177734, -0.028666645288467407, -0.4678136110305786, -
0.11277130991220474, -1.3527215719223022, -0.30801302194595337, -
0.4718014895915985, -0.25024107098579407, -0.8770809173583984,
0.7228962779045105, -0.920127809047699, 0.479932963848114, -
0.5764650702476501, -1.0579789876937866, -0.8380296230316162, -
0.7962159514427185, -0.3975289762020111, -0.08640912175178528,
1.7781096696853638, -0.5808870792388916, -1.1466816663742065, -
0.06057287007570267, -0.7188909649848938, 0.7166827917098999,
0.6231991052627563, 0.4326348304748535, 0.849321722984314, -
1.3840458393096924, -1.2752262353897095, 1.2332524061203003, -
0.42605435848236084, 0.8208522796630859, 0.49868088960647583, -
0.37813863158226013, -0.2641983302497864, -0.6032585501670837,
0.2734583914279938, 0.024483149871230125, -0.6019956469535828,
0.5020499229431152, 0.6263154149055481, -0.0515281371772289,
0.03234599903225899, -0.19529275596141815, 0.6527976393699646, -
0.14890292286872864, -0.7949174046516418, -0.20130634307861328, -
0.004685989115387201, -0.5009364485740662, -0.22852790355682373,
1.2096812725067139, -0.3357774019241333, 0.0535152368247509,
1.5262261629104614, -0.03480736166238785, 1.7229646444320679, -
0.7489586472511292, -1.2577842473983765, -0.11426174640655518,
0.047670379281044006, -0.6072517037391663, 0.41744479537010193,
0.1607428938150406, 0.4751468300819397, 1.0010015964508057,

0.10944715887308121, -0.797112226486206, -0.7652552127838135, -0.19070632755756378, -0.3394375741481781, 0.38672488927841187, -0.9479209780693054, 0.5476667284965515, -0.15957364439964294, -0.8904867172241211, -0.2805931568145752, 0.7620916366577148, 1.0767529010772705, -0.30177775025367737, 0.918859601020813, -0.6064395308494568, -1.2947887182235718, -1.4368120431900024, -0.11450366675853729, -1.3964992761611938, 0.44064733386039734, 0.29407575726509094, 1.7219398021697998, 1.4248435497283936, -0.3191978335380554, -0.8471165895462036, 0.15939684212207794, 1.1051760911941528, -0.9932686686515808, 0.9996742010116577, 1.942962884902954, 0.21060463786125183, 0.7723442316055298, 1.3451457023620605, 1.0549579858779907, -0.3048310875892639, -0.35262009501457214, -0.029795585200190544, -0.6778481602668762, 0.6431186199188232, -0.21739472448825836, -0.7366875410079956, -0.42577481269836426, 0.47929951548576355, 0.5403406620025635, -0.18655140697956085, -0.3638063669204712, 0.12469756603240967, -0.6121878623962402, 0.3311304450035095, 0.040876250714063644, -2.2068023681640625, -1.0166914463043213, 0.5684933066368103, -0.18314386904239655, -0.8128305077552795, -0.3863844871520996, 0.04576624557375908, 0.37623846530914307, 0.46985572576522827, 0.44481539726257324, -0.45053035020828247, -0.7226688265800476, -0.6160157322883606, -0.8304749727249146, 0.5610806941986084, -0.8526891469955444, 0.5026352405548096, -1.341504693031311, 1.4287893772125244, -0.2987135946750641, 0.3709523677825928, -0.9386633038520813, -0.8781396150588989, -2.0293092727661133, 0.015610845759510994, 0.004106278996914625, 0.36626726388931274, -0.13110391795635223, 0.27462923526763916, 0.33982619643211365, -0.2421313375234604, 1.0242505073547363, -0.03848777711391449, 0.3441970646381378, 0.6367168426513672, 1.1589360237121582, -2.3110837936401367, -0.494642972946167, -0.08399762958288193, -0.3238665461540222, 0.04323695972561836, 1.1951326131820679, 0.5782923102378845, 0.10458433628082275, 0.4622848927974701, 0.7496700286865234, 0.30271369218826294, 0.43601107597351074, -0.32055094838142395, -1.1730324029922485, -0.7528169751167297, 0.6883059144020081, 0.8378428220748901, -0.26829129457473755, -1.1347421407699585, -0.8878191709518433, 0.12918390333652496, 0.6425954103469849, 0.15115511417388916, -0.46042919158935547, 0.5233681797981262, -0.6531850099563599, 0.5600217580795288, 0.15862096846103668, -1.6875938177108765, 0.21505478024482727, -0.46397051215171814, 0.07877001166343689, -0.7487730979919434, -1.1489980220794678, -1.2350711822509766, 0.46937015652656555, -0.13347835838794708, 0.8108633160591125, 0.6386556029319763, 0.7506763935089111, 0.4220371544361145, -0.9587192535400391, -0.6771737933158875, 0.6870855093002319, 0.7760718464851379, -0.3971295952796936, -0.9867773652076721, 0.6601044535636902, -0.3112303614616394, -0.2075584083795475, -0.07184164971113205, 0.8817989230155945, -0.7020707130432129, 0.452743262052536, 2.9544925689697266, 0.7145848870277405, -0.10264386236667633, -0.6926596164703369, 1.3410015106201172, -0.42207127809524536, -

```
0.24875812232494354, -0.0880926251411438, -1.6478101015090942,
0.08962136507034302]

vector=ollama.embeddings(model='nomic-embed-text',prompt='Role')
print(vector)

embedding=[-0.9583832621574402, 0.721049964427948, -4.397023677825928,
-0.7517462372779846, 0.5575175285339355, 0.26540446281433105,
0.6406053900718689, -0.4163939952850342, 0.3454855680465698, -
0.040417082607746124, -1.2352701425552368, 0.5104450583457947,
1.475703477859497, 0.3629946708679199, 1.5615464448928833, -
0.07732497900724411, 0.3207903206348419, -0.9897714257240295, -
1.0862400531768799, 0.5113316774368286, -1.2322407960891724, -
0.798325777053833, 0.20015303790569305, 1.157972812652588,
3.1880109310150146, 1.8358241319656372, 0.4135563373565674, -
0.6970124840736389, -0.6463972926139832, -0.9344355463981628,
1.4735283851623535, 0.8019387722015381, 0.5116334557533264,
0.024403806775808334, -0.4777342677116394, -1.1204886436462402,
1.534216046333313, 1.7328041791915894, -0.4739932715892792, -
0.8142459988594055, -1.636167287826538, -0.9650665521621704, -
0.51967853307724, -0.08353451639413834, 1.590840220451355, -
1.4269102811813354, 0.39085957407951355, 0.5074397921562195, -
0.03216265141963959, -1.1602956056594849, -0.5066942572593689, -
1.621060848236084, -0.0706755593419075, -0.38503497838974,
2.13940167427063, -0.16412845253944397, 1.0440746545791626,
0.07102147489786148, -0.5012745261192322, -0.6092254519462585,
2.3068766593933105, 1.2339386940002441, -1.2279382944107056,
1.8145612478256226, -0.13877473771572113, -0.2637569308280945, -
0.4621123969554901, 1.2062182426452637, -0.45098158717155457, -
1.4209575653076172, 0.04337054863572121, -0.14913788437843323,
0.3777472674846649, 0.46561482548713684, 0.01130483765155077, -
1.2996875047683716, -0.4194203901290894, 0.807456910610199, -
0.011643427424132824, -0.35476234555244446, 0.7853302359580994,
0.9391772747039795, 2.943549871444702, 0.8279383182525635,
0.11218439042568207, 0.06740765273571014, 0.5150240063667297, -
0.6992477178573608, -1.3894821405410767, 1.5635180473327637,
0.5385423898696899, 2.0165798664093018, -0.4544690251350403,
0.02380824089050293, -0.5384663343429565, 0.8299885392189026, -
1.2392665147781372, 0.6127033233642578, -0.5074452757835388,
0.7090815305709839, -0.12640586495399475, -0.3567613661289215,
0.35278061032295227, -0.26547971367836, 0.8779810667037964,
1.874541163444519, 0.18201285600662231, 0.19020551443099976,
0.27359315752983093, -0.2653040885925293, -0.5123889446258545,
1.4790890216827393, -0.598283052444458, -1.2549930810928345,
0.08956215530633926, -0.09670832753181458, 1.0061525106430054, -
1.5624864101409912, 0.6085844039916992, 1.0942398309707642, -
0.3212031722068786, 0.30699634552001953, -0.514072597026825,
1.225295066833496, 0.08002462238073349, 0.6413169503211975, -
0.9431785345077515, 0.3977624177932739, -0.0361295603215694,
0.4934425950050354, 0.04923699423670769, -0.80690997838974, -
```

0.613928496837616, 0.18950067460536957, -0.07849302887916565,
0.10674615949392319, -1.0282323360443115, -0.8660615086555481,
1.510595440864563, 0.2246731072664261, 0.6026899814605713,
0.8181033134460449, 0.010935706086456776, -0.5597959756851196, -
0.26920536160469055, -0.9148733019828796, 1.6825411319732666, -
0.3514603078365326, -0.5735175013542175, -0.7593976855278015,
0.3060379922389984, 0.6741461157798767, -0.9164466857910156,
0.18497397005558014, 0.5522382259368896, -0.3070946931838989,
0.1277766227722168, 0.8179260492324829, 0.7591347694396973, -
0.4084753096103668, 1.2601776123046875, 0.8053790926933289, -
1.8393025398254395, 0.07530173659324646, -0.780599057674408, -
1.1845927238464355, 0.48984774947166443, 1.0586925745010376,
0.4975088834762573, 0.9927834272384644, -0.3838353455066681, -
1.1885619163513184, -0.9146336317062378, 0.1029079332947731,
0.23202469944953918, -0.31353938579559326, -0.6175848245620728, -
0.22644035518169403, 0.6996640563011169, -0.24009867012500763, -
0.4349076449871063, -1.164443016052246, 0.4931899905204773, -
0.20922215282917023, -0.6128187775611877, -0.42592862248420715,
1.0955379009246826, -1.4907071590423584, -0.46472030878067017, -
2.019784688949585, -0.09369299560785294, 1.3079277276992798, -
0.7027367353439331, -0.6619616150856018, -0.742866039276123, -
0.5350356101989746, 0.6615228056907654, -0.45422598719596863,
0.03639768064022064, -0.5264409780502319, -0.6758806109428406, -
1.153609275817871, 0.31369730830192566, -0.3510645627975464, -
0.04571129009127617, 0.3876284956932068, 0.07140548527240753,
0.6059155464172363, -0.8210588693618774, 0.20224659144878387,
1.3317703008651733, 0.23645344376564026, 0.40798476338386536, -
0.036456141620874405, -0.4843454360961914, -0.05787171795964241, -
0.09197627007961273, -0.7272498607635498, -0.42643147706985474,
0.43165117502212524, 0.4110994338989258, 0.5282337069511414, -
0.313754141330719, -0.4607478380203247, 0.359880268573761, -
0.18785633146762848, 0.6108449101448059, -1.3178250789642334, -
1.8376749753952026, -0.5001165866851807, -0.5171313285827637, -
0.6135304570198059, 1.6043752431869507, 1.239099383354187,
0.9977103471755981, -0.009803221561014652, 0.7981134057044983,
1.2958155870437622, 1.0497512817382812, -0.34678781032562256,
0.11194263398647308, 1.3849506378173828, -0.3864006996154785, -
0.6533615589141846, -0.1188393160700798, 0.9646053910255432,
0.452131062746048, -1.7785767316818237, 0.6364755034446716,
0.8775717616081238, 0.5395383834838867, -0.6588817238807678, -
0.056150130927562714, 0.4190312325954437, -0.06093356013298035, -
2.0986037254333496, -0.967941403388977, 0.5505657196044922,
0.47042420506477356, -0.7589367628097534, 0.09552180767059326, -
0.29772090911865234, 0.5924859046936035, -0.8529662489891052, -
0.047862645238637924, -0.9745899438858032, -1.5701277256011963,
1.023414969444275, 0.7322855591773987, 0.8835867047309875,
1.8890312910079956, 0.8144632577896118, -0.043045300990343094,
0.49082982540130615, -0.006181578151881695, -1.2581697702407837,
0.09512141346931458, -0.2765766382217407, -0.5264253616333008,

1.5362050533294678, -0.5598920583724976, -0.46474266052246094, 0.31007665395736694, -0.20502790808677673, 0.050988100469112396, 0.4516056776046753, 1.634276032447815, 0.7438240051269531, -0.6076213121414185, -0.15917973220348358, 0.49981504678726196, -0.6007813811302185, -0.6817411184310913, 1.8064007759094238, 0.19269882142543793, -0.5633679032325745, 1.5400906801223755, -0.18991176784038544, 0.03681079298257828, 0.021389491856098175, 0.14662396907806396, -0.261163592338562, -0.3892226815223694, 1.022238302230835, -1.470961570739746, -0.5052806735038757, 1.0334687232971191, -0.48528531193733215, 1.569872260093689, 1.409602403640747, -0.43084871768951416, -0.23856277763843536, -1.5207537412643433, 0.7827425003051758, -1.2126257419586182, 0.24330006539821625, -0.40355154871940613, -0.5010155439376831, 1.0078163146972656, -0.14306268095970154, 0.42314454913139343, -0.20976954698562622, -1.25013267993927, 0.4580336809158325, -0.18010416626930237, 2.096662759780884, -0.6319172978401184, 0.2658180594444275, 0.34758201241493225, 0.09480903297662735, -0.5298800468444824, 1.1451436281204224, 0.5997015833854675, -0.48138123750686646, -0.49295511841773987, 0.3357650935649872, 0.24923884868621826, 0.11714881658554077, -0.41124722361564636, -0.17561568319797516, 1.0648945569992065, 0.0882403627038002, -0.3779235780239105, -0.5931777954101562, -0.23835095763206482, -1.0108044147491455, -0.9778675436973572, 0.1675001084804535, -0.3888086974620819, -0.19520054757595062, -1.8739819526672363, -0.09383533895015717, -0.4035896360874176, 1.1368200778961182, 1.1038439273834229, -1.2547061443328857, 2.145695209503174, 0.3286939859390259, -0.5137407779693604, -0.22800293564796448, 0.48687344789505005, -0.7302588224411011, -1.4848394393920898, 0.32686886191368103, 0.4832165837287903, 1.2982343435287476, 1.2454140186309814, -0.11546333134174347, 0.6796532273292542, 0.7062503099441528, 0.005717302206903696, -0.02369314432144165, 0.0732998177409172, 0.9754007458686829, 1.272399663925171, -0.6036653518676758, -0.7284983992576599, -0.18874922394752502, -0.6991193890571594, -0.07684250175952911, -0.09056288748979568, 0.3196099102497101, 0.4936113953590393, -0.8608564138412476, 0.300753116607666, -1.4900445938110352, 0.8511397242546082, -0.31599724292755127, 0.1983719915151596, -0.45382198691368103, -0.7148206830024719, -0.4320954883499146, -0.5666908621788025, -0.6433104872703552, -0.07630572468042374, -0.22356078028678894, 0.044533275067806244, -0.06868438422679901, 0.35638296604156494, 0.17953377962112427, -1.394274353981018, -1.4379777908325195, 0.1327199935913086, 0.737166166305542, 1.23353111743927, 0.8864293694496155, 0.9486419558525085, -1.8370821475982666, -1.0949825048446655, -0.011364452540874481, 0.1595015525817871, 1.4367583990097046, -0.20581591129302979, -1.3159263134002686, -0.00966999027878046, 0.39222609996795654, 0.5329868793487549, 0.753253161907196, -0.13384562730789185, 0.9199041128158569, 1.2266913652420044, 1.0861502885818481, 0.05775051191449165, 0.21119950711727142, 0.040806230157613754, 0.33386069536209106,

0.46535295248031616, 0.010899902321398258, -0.7168098092079163, -1.5700303316116333, -2.1061131954193115, 1.967692494392395, 0.9561079740524292, -1.5648014545440674, -0.22697557508945465, -1.124323844909668, 0.23515117168426514, -1.005816102027893, -0.07300112396478653, 2.0889482498168945, 0.6348090767860413, -1.0204076766967773, -1.2930715084075928, 0.014505044557154179, -0.569739580154419, 1.7837692499160767, 0.6350296139717102, -0.5562925338745117, -1.3764381408691406, 0.05425819009542465, -0.0915893018245697, 0.2418525218963623, -0.5480993986129761, 0.7166508436203003, 1.552734613418579, -0.10917341709136963, 0.4104864001274109, -1.0122839212417603, -0.13403558731079102, 0.08730543404817581, 0.5241048336029053, -0.5303080677986145, -0.9144285321235657, -1.1272614002227783, 0.4426875412464142, 0.3682512044906616, 0.6831473708152771, 0.6380060315132141, 1.6383394002914429, 1.8127436637878418, -0.6366024613380432, 0.2463899850845337, 0.7923722267150879, -0.1637079417705536, -0.2907581329345703, -1.12908935546875, -0.268462210893631, 0.12034860998392105, 0.796639084815979, 1.4478118419647217, 0.22381830215454102, -0.4878019094467163, -0.03148868307471275, -1.49419331550059814, -0.679225742816925, -0.046150777488946915, 0.3086366355419159, -0.6471100449562073, 1.60863316059911255, -0.4280674457550049, 0.07620806246995926, 0.09795349836349487, -0.3660929501056671, -1.3282763957977295, -0.051992326974868774, 0.7807260751724243, -0.49027019739151, 0.2814764082431793, 0.04231610521674156, 0.5379336476325989, 1.7744042873382568, 0.25442060828208923, 0.1425698846578598, -0.29017752408981323, -0.9017726182937622, -0.10177743434906006, -0.12116245180368423, -1.3402070999145508, -1.1353131532669067, -0.2602657079696655, 0.7117278575897217, 0.3799564242362976, 1.1678860187530518, 1.0287500619888306, 1.1553550958633423, -0.7432804703712463, -0.4717964828014374, 0.231942281126976, -1.4182209968566895, 1.6350855827331543, -0.22127650678157806, 0.2474936544895172, 0.35191068053245544, -1.162804126739502, -0.8808318376541138, -0.38612937927246094, 0.7161569595336914, -0.5170440077781677, -0.1683785319328308, -0.4644894301891327, 0.5716362595558167, -0.21517762541770935, -0.7694419026374817, 0.15430167317390442, 0.2336061298847985, -1.1848562955856323, -0.4631164073944092, 1.2247929573059082, 0.8490880727767944, 0.6983554363250732, 0.6599695682525635, 0.5856671929359436, -0.9758443236351013, -0.20977593958377838, -0.7903737425804138, -0.18310098350048065, -1.4956138134002686, 0.22047707438468933, -0.34973397850990295, -0.3437691032886505, 0.4697604775428772, 0.20841185748577118, -0.26064157485961914, -0.31691989302635193, 0.07049340754747391, -0.9885380864143372, -0.4275417327880594, -0.7952687740325928, -1.2699028253555298, -1.0418620109558105, 0.0926835685968399, 0.6253930926322937, 0.9657738208770752, 0.3792686462402344, -0.7085951566696167, -0.6721063852310181, -0.8674271702766418, 0.9621312618255615, 0.7907866835594177, 0.34952253103256226, 0.09939629584550858, -1.6698815822601318, -0.35261476039886475,

0.55976861715311677, -0.766631543636322, 0.5466300249099731, -1.097150206565857, -0.17975786328315735, -0.8390508890151978, 0.31793126463890076, 0.6496113538742065, -0.9796836376190186, -0.6306508183479309, 1.2288122177124023, 0.08563714474439621, -0.6295024156570435, -0.3735041239738464, -0.2065560519695282, 0.30834710597991943, -0.3461736738681793, 0.15918567776679993, -0.09604517370462418, -0.4882104694843292, -0.35117307305336, -0.41160374879837036, 1.398208498954773, 0.2897837162017822, -0.9200842380523682, -0.011340041644871235, -0.4602261781692505, -0.2325202673673298, -0.7491379380226135, 0.1946558803319931, -1.1303163766860962, -0.32601067423820496, 1.0783900022506714, 0.22605052590370178, 0.3356142938137054, -0.2833895981311798, -1.0873740911483765, 0.7421426177024841, 0.7888354063034058, 0.11561492085456848, -0.15962445735931396, 0.7830837368965149, 0.27771294116973877, 1.607378602027893, 0.3691558539867401, 0.20167051255702972, -0.8975738883018494, -1.1781673431396484, -0.9541125702381134, 0.1105106920003891, -0.3212474584579468, 0.4559422433376312, 0.18626253306865692, -0.9378517866134644, -0.7480335831642151, 0.13831226527690887, 1.295743465423584, -0.4659472703933716, 0.7443270683288574, -1.7942135334014893, -0.1979609876871109, -1.2270723581314087, -0.01282889861613512, -0.9681800603866577, -0.5072977542877197, -0.443792462348938, 0.7332456111907959, -0.2687012553215027, -0.03784308210015297, 0.1793740838766098, 0.5353370308876038, 0.5766862034797668, -0.5075523853302002, 1.0998255014419556, 0.6903702020645142, 1.3378257751464844, -0.8132972717285156, 0.7663968801498413, 1.520700454711914, 0.8658944964408875, -0.08975818753242493, 0.81993359327731628, -0.40023377537727356, 1.282967209815979, -0.29474204778671265, -0.731077253818512, -0.8178811073303223, 0.45459508895874023, 1.090321660041809, -1.1497831344604492, -0.7093523144721985, -0.3090628385543823, -0.19001026451587677, 1.136713981628418, -0.5631029605865479, -1.7044293880462646, 0.8636764287948608, -0.30507931113243103, -0.9510030746459961, 0.5444645285606384, -0.5975852608680725, 0.36861997842788696, 0.28074419498443604, 0.6497764587402344, 0.9021871089935303, -0.3368116021156311, 0.4640852212905884, 0.14289340376853943, 0.18187806010246277, 1.524233341217041, -1.2053643465042114, 1.3444135189056396, -1.9224843978881836, 0.5625211596488953, -1.2543033361434937, 0.48740875720977783, 0.11203216016292572, 0.03084745444357395, -0.9403338432312012, 0.05809243023395538, -0.4815766215324402, 0.42602357268333435, -0.5332587957382202, -0.06581733375787735, 0.1422526240348816, -0.7052667737007141, 0.9882574677467346, -0.889302670955658, -0.5145857930183411, -0.05003814399242401, 0.19218969345092773, -0.36708560585975647, 0.4071180522441864, -0.8653441071510315, 0.4279380738735199, -0.15071746706962585, -0.009056557901203632, 0.03905083239078522, -0.16374069452285767, 0.3820286691188812, 1.0330408811569214, 0.7304753065109253, -0.4724141359329223, -1.0329835414886475, 0.47457659244537354, 1.1233419179916382, 1.1502084732055664,

```
1.8019247055505371, 0.08559725433588028, -0.9913179278373718, -
0.4568302631378174, -1.1441504955291748, -0.057020049542188644,
1.1547541618347168, -1.1338120698928833, 0.64058518409729, -
0.31881648302078247, 0.29444411396980286, 0.20552301406860352,
0.06815928220748901, -0.7735890746116638, -1.0126826763153076, -
0.27310463786125183, 0.5671935081481934, -0.8795097470283508, -
1.040381669998169, 0.6472793221473694, -0.9552735090255737,
0.5286827683448792, 0.16700538992881775, 0.831518292427063, -
0.32483935356140137, 0.689624547958374, -0.8778844475746155, -
0.5445390043666077, 0.21499350666999817, 0.4534011483192444, -
0.8289229273796082, 0.3988848626613617, -0.25345614552497864,
0.27868691086769104, 0.14073170721530914, 0.9641870260238647,
0.03716237097978592, 0.7661149501800537, 0.8508498668670654,
1.2284971475601196, 0.8863894939422607, -0.18479815125465393,
0.6592210531234741, -0.7567851543426514, -0.7345504760742188, -
0.7086063623428345, -1.089354944229126, 0.6533742547035217]
```

```
len(vector.embedding)
```

```
768
```

#pulling the LLM

```
!ollama pull gemma3:4b
```

```
!pip install langchain-ollama langchain-google-genai

Collecting langchain-ollama
  Downloading langchain_ollama-0.3.3-py3-none-any.whl.metadata (1.5
kB)
Collecting langchain-google-genai
  Downloading langchain_google_genai-2.1.5-py3-none-any.whl.metadata
(5.2 kB)
Requirement already satisfied: ollama<1.0.0,>=0.4.8 in
/usr/local/lib/python3.11/dist-packages (from langchain-ollama)
(0.5.1)
Requirement already satisfied: langchain-core<1.0.0,>=0.3.60 in
/usr/local/lib/python3.11/dist-packages (from langchain-ollama)
(0.3.66)
Collecting filetype<2.0.0,>=1.2.0 (from langchain-google-genai)
  Downloading filetype-1.2.0-py2.py3-none-any.whl.metadata (6.5 kB)
Collecting google-ai-generativelanguage<0.7.0,>=0.6.18 (from
langchain-google-genai)
  Downloading google_ai_generativelanguage-0.6.18-py3-none-
any.whl.metadata (9.8 kB)
Requirement already satisfied: pydantic<3,>=2 in
/usr/local/lib/python3.11/dist-packages (from langchain-google-genai)
(2.11.7)
```

```
Requirement already satisfied: google-api-core!=2.0.*,!=2.1.*,!
=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!
=2.9.*,<3.0.0,>=1.34.1 in /usr/local/lib/python3.11/dist-packages
(from google-api-core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!
=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1-
>google-ai-generativelanguage<0.7.0,>=0.6.18->langchain-google-genai)
(2.25.1)
Requirement already satisfied: google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1 in /usr/local/lib/python3.11/dist-packages
(from google-ai-generativelanguage<0.7.0,>=0.6.18->langchain-google-
genai) (2.38.0)
Requirement already satisfied: proto-plus<2.0.0,>=1.22.3 in
/usr/local/lib/python3.11/dist-packages (from google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (1.26.1)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!
=4.21.3,!=4.21.4,!=4.21.5,<7.0.0,>=3.20.2 in
/usr/local/lib/python3.11/dist-packages (from google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (5.29.5)
Requirement already satisfied: langsmith>=0.3.45 in
/usr/local/lib/python3.11/dist-packages (from langchain-
core<1.0.0,>=0.3.60->langchain-ollama) (0.4.1)
Requirement already satisfied: tenacity!=8.4.0,<10.0.0,>=8.1.0 in
/usr/local/lib/python3.11/dist-packages (from langchain-
core<1.0.0,>=0.3.60->langchain-ollama) (8.5.0)
Requirement already satisfied: jsonpatch<2.0,>=1.33 in
/usr/local/lib/python3.11/dist-packages (from langchain-
core<1.0.0,>=0.3.60->langchain-ollama) (1.33)
Requirement already satisfied: PyYAML>=5.3 in
/usr/local/lib/python3.11/dist-packages (from langchain-
core<1.0.0,>=0.3.60->langchain-ollama) (6.0.2)
Requirement already satisfied: packaging<25,>=23.2 in
/usr/local/lib/python3.11/dist-packages (from langchain-
core<1.0.0,>=0.3.60->langchain-ollama) (24.2)
Requirement already satisfied: typing-extensions>=4.7 in
/usr/local/lib/python3.11/dist-packages (from langchain-
core<1.0.0,>=0.3.60->langchain-ollama) (4.14.0)
Requirement already satisfied: httpx>=0.27 in
/usr/local/lib/python3.11/dist-packages (from ollama<1.0.0,>=0.4.8-
>langchain-ollama) (0.28.1)
Requirement already satisfied: annotated-types>=0.6.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3,>=2-
>langchain-google-genai) (0.7.0)
Requirement already satisfied: pydantic-core==2.33.2 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3,>=2-
>langchain-google-genai) (2.33.2)
Requirement already satisfied: typing-inspection>=0.4.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3,>=2-
>langchain-google-genai) (0.4.1)
Requirement already satisfied: googleapis-common-protos<2.0.0,>=1.56.2
```

```
in /usr/local/lib/python3.11/dist-packages (from google-api-core!
=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!
=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-api-core[grpc]!=2.0.*,!
=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!
=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (1.70.0)
Requirement already satisfied: requests<3.0.0,>=2.18.0 in
/usr/local/lib/python3.11/dist-packages (from google-api-core!=2.0.*,!
=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!
=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-api-core[grpc]!=2.0.*,!=2.1.*,!
=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!
=2.9.*,<3.0.0,>=1.34.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain-google-genai) (2.32.3)
Requirement already satisfied: grpcio<2.0.0,>=1.33.2 in
/usr/local/lib/python3.11/dist-packages (from google-api-core[grpc]!
=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!
=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (1.73.0)
Requirement already satisfied: grpcio-status<2.0.0,>=1.33.2 in
/usr/local/lib/python3.11/dist-packages (from google-api-core[grpc]!
=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!
=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (1.71.0)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in
/usr/local/lib/python3.11/dist-packages (from google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain-google-genai) (5.5.2)
Requirement already satisfied: pyasn1-modules>=0.2.1 in
/usr/local/lib/python3.11/dist-packages (from google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain-google-genai) (0.4.2)
Requirement already satisfied: rsa<5,>=3.1.4 in
/usr/local/lib/python3.11/dist-packages (from google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain-google-genai) (4.9.1)
Requirement already satisfied: anyio in
/usr/local/lib/python3.11/dist-packages (from httpx>=0.27-
>ollama<1.0.0,>=0.4.8->langchain-ollama) (4.9.0)
Requirement already satisfied: certifi in
/usr/local/lib/python3.11/dist-packages (from httpx>=0.27-
>ollama<1.0.0,>=0.4.8->langchain-ollama) (2025.6.15)
Requirement already satisfied: httpcore==1.* in
/usr/local/lib/python3.11/dist-packages (from httpx>=0.27-
>ollama<1.0.0,>=0.4.8->langchain-ollama) (1.0.9)
Requirement already satisfied: idna in /usr/local/lib/python3.11/dist-
packages (from httpx>=0.27->ollama<1.0.0,>=0.4.8->langchain-ollama)
(3.10)
Requirement already satisfied: h11>=0.16 in
/usr/local/lib/python3.11/dist-packages (from httpcore==1.*-
```

```
>httpx>=0.27->ollama<1.0.0,>=0.4.8->langchain-ollama) (0.16.0)
Requirement already satisfied: jsonpointer>=1.9 in
/usr/local/lib/python3.11/dist-packages (from jsonpatch<2.0,>=1.33-
>langchain-core<1.0.0,>=0.3.60->langchain-ollama) (3.0.0)
Requirement already satisfied: orjson<4.0.0,>=3.9.14 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.3.45-
>langchain-core<1.0.0,>=0.3.60->langchain-ollama) (3.10.18)
Requirement already satisfied: requests-toolbelt<2.0.0,>=1.0.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.3.45-
>langchain-core<1.0.0,>=0.3.60->langchain-ollama) (1.0.0)
Requirement already satisfied: zstandard<0.24.0,>=0.23.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.3.45-
>langchain-core<1.0.0,>=0.3.60->langchain-ollama) (0.23.0)
Requirement already satisfied: pyasn1<0.7.0,>=0.6.1 in
/usr/local/lib/python3.11/dist-packages (from pyasn1-modules>=0.2.1-
>google-auth!=2.24.0,!=2.25.0,<3.0.0,>=2.14.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (0.6.1)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.11/dist-packages (from requests<3.0.0,>=2.18.0-
>google-api-core!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!
=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-api-
core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!
=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (3.4.2)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.11/dist-packages (from requests<3.0.0,>=2.18.0-
>google-api-core!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!
=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-api-
core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!
=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain-google-genai) (2.4.0)
Requirement already satisfied: sniffio>=1.1 in
/usr/local/lib/python3.11/dist-packages (from anyio->httpx>=0.27-
>ollama<1.0.0,>=0.4.8->langchain-ollama) (1.3.1)
Downloading langchain_ollama-0.3.3-py3-none-any.whl (21 kB)
Downloading langchain_google_genai-2.1.5-py3-none-any.whl (44 kB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 44.8/44.8 kB 4.4 MB/s eta
0:00:00
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.4/1.4 MB 71.9 MB/s eta
0:00:00
a, google-ai-generativelanguage, langchain-google-genai
  Attempting uninstall: google-ai-generativelanguage
    Found existing installation: google-ai-generativelanguage 0.6.15
    Uninstalling google-ai-generativelanguage-0.6.15:
      Successfully uninstalled google-ai-generativelanguage-0.6.15
ERROR: pip's dependency resolver does not currently take into account
all the packages that are installed. This behaviour is the source of
the following dependency conflicts.
google-generativeai 0.8.5 requires google-ai-
generativelanguage==0.6.15, but you have google-ai-generativelanguage
```

0.6.18 which is incompatible.
Successfully installed filetype-1.2.0 google-ai-generativelanguage-0.6.18 langchain-google-genai-2.1.5 langchain-ollama-0.3.3

{"id":"b61287a273314c4f88faf470630647c3","pip_warning":{"packages":["google"]}}

```
!pip install langchain_ollama langchain_google_genai langchain langchain-community langchain-core
```

Requirement already satisfied: langchain_ollama in /usr/local/lib/python3.11/dist-packages (0.3.3)
Requirement already satisfied: langchain_google_genai in /usr/local/lib/python3.11/dist-packages (2.1.5)
Requirement already satisfied: langchain in /usr/local/lib/python3.11/dist-packages (0.3.26)
Collecting langchain-community
  Downloading langchain_community-0.3.26-py3-none-any.whl.metadata (2.9 kB)
Requirement already satisfied: langchain-core in /usr/local/lib/python3.11/dist-packages (0.3.66)
Requirement already satisfied: ollama<1.0.0,>=0.4.8 in /usr/local/lib/python3.11/dist-packages (from langchain_ollama) (0.5.1)
Requirement already satisfied: filetype<2.0.0,>=1.2.0 in /usr/local/lib/python3.11/dist-packages (from langchain_google_genai) (1.2.0)
Requirement already satisfied: google-ai-generativelanguage<0.7.0,>=0.6.18 in /usr/local/lib/python3.11/dist-packages (from langchain_google_genai) (0.6.18)
Requirement already satisfied: pydantic<3,>=2 in /usr/local/lib/python3.11/dist-packages (from langchain_google_genai) (2.11.7)
Requirement already satisfied: langchain-text-splitters<1.0.0,>=0.3.8 in /usr/local/lib/python3.11/dist-packages (from langchain) (0.3.8)
Requirement already satisfied: langsmith>=0.1.17 in /usr/local/lib/python3.11/dist-packages (from langchain) (0.4.1)
Requirement already satisfied: SQLAlchemy<3,>=1.4 in /usr/local/lib/python3.11/dist-packages (from langchain) (2.0.41)
Requirement already satisfied: requests<3,>=2 in /usr/local/lib/python3.11/dist-packages (from langchain) (2.32.3)
Requirement already satisfied: PyYAML>=5.3 in /usr/local/lib/python3.11/dist-packages (from langchain) (6.0.2)
Requirement already satisfied: aiohttp<4.0.0,>=3.8.3 in /usr/local/lib/python3.11/dist-packages (from langchain-community) (3.11.15)
Requirement already satisfied: tenacity!=8.4.0,<10,>=8.1.0 in /usr/local/lib/python3.11/dist-packages (from langchain-community) (8.5.0)
Collecting dataclasses-json<0.7,>=0.5.7 (from langchain-community)

```
  Downloading dataclasses_json-0.6.7-py3-none-any.whl.metadata (25 kB)
Collecting pydantic-settings<3.0.0,>=2.4.0 (from langchain-community)
  Downloading pydantic_settings-2.10.1-py3-none-any.whl.metadata (3.4
kB)
Collecting httpx-sse<1.0.0,>=0.4.0 (from langchain-community)
  Downloading httpx_sse-0.4.1-py3-none-any.whl.metadata (9.4 kB)
Requirement already satisfied: numpy>=1.26.2 in
/usr/local/lib/python3.11/dist-packages (from langchain-community)
(2.0.2)
Requirement already satisfied: jsonpatch<2.0,>=1.33 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (1.33)
Requirement already satisfied: packaging<25,>=23.2 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (24.2)
Requirement already satisfied: typing-extensions>=4.7 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (4.14.0)
Requirement already satisfied: aiohappyeyeballs>=2.3.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (2.6.1)
Requirement already satisfied: aiosignal>=1.1.2 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (1.3.2)
Requirement already satisfied: attrs>=17.3.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (25.3.0)
Requirement already satisfied: frozenlist>=1.1.1 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (1.7.0)
Requirement already satisfied: multidict<7.0,>=4.5 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (6.4.4)
Requirement already satisfied: propcache>=0.2.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (0.3.2)
Requirement already satisfied: yarl<2.0,>=1.17.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (1.20.1)
Collecting marshmallow<4.0.0,>=3.18.0 (from dataclasses-
json<0.7,>=0.5.7->langchain-community)
  Downloading marshmallow-3.26.1-py3-none-any.whl.metadata (7.3 kB)
Collecting typing-inspect<1,>=0.4.0 (from dataclasses-
json<0.7,>=0.5.7->langchain-community)
  Downloading typing_inspect-0.9.0-py3-none-any.whl.metadata (1.5 kB)
Requirement already satisfied: google-api-core!=2.0.*,!=2.1.*,!
=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!
=2.9.*,<3.0.0,>=1.34.1 in /usr/local/lib/python3.11/dist-packages
(from google-api-core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!
=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1-
>google-ai-generativelanguage<0.7.0,>=0.6.18->langchain_google_genai)
(2.25.1)
```

```
Requirement already satisfied: google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1 in /usr/local/lib/python3.11/dist-packages
(from google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain_google_genai) (2.38.0)
Requirement already satisfied: proto-plus<2.0.0,>=1.22.3 in
/usr/local/lib/python3.11/dist-packages (from google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain_google_genai) (1.26.1)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!
=4.21.3,!=4.21.4,!=4.21.5,<7.0.0,>=3.20.2 in
/usr/local/lib/python3.11/dist-packages (from google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain_google_genai) (5.29.5)
Requirement already satisfied: jsonpointer>=1.9 in
/usr/local/lib/python3.11/dist-packages (from jsonpatch<2.0,>=1.33-
>langchain-core) (3.0.0)
Requirement already satisfied: httpx<1,>=0.23.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (0.28.1)
Requirement already satisfied: orjson<4.0.0,>=3.9.14 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (3.10.18)
Requirement already satisfied: requests-toolbelt<2.0.0,>=1.0.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (1.0.0)
Requirement already satisfied: zstandard<0.24.0,>=0.23.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (0.23.0)
Requirement already satisfied: annotated-types>=0.6.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3,>=2-
>langchain_google_genai) (0.7.0)
Requirement already satisfied: pydantic-core==2.33.2 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3,>=2-
>langchain_google_genai) (2.33.2)
Requirement already satisfied: typing-inspection>=0.4.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3,>=2-
>langchain_google_genai) (0.4.1)
Collecting python-dotenv>=0.21.0 (from pydantic-
settings<3.0.0,>=2.4.0->langchain-community)
  Downloading python_dotenv-1.1.1-py3-none-any.whl.metadata (24 kB)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (3.4.2)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (2.4.0)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
```

```
>langchain) (2025.6.15)
Requirement already satisfied: greenlet>=1 in
/usr/local/lib/python3.11/dist-packages (from SQLAlchemy<3,>=1.4-
>langchain) (3.2.3)
Requirement already satisfied: googleapis-common-protos<2.0.0,>=1.56.2
in /usr/local/lib/python3.11/dist-packages (from google-api-core!
=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!
=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-api-core[grpc]!=2.0.*,!
=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!
=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain_google_genai) (1.70.0)
Requirement already satisfied: grpcio<2.0.0,>=1.33.2 in
/usr/local/lib/python3.11/dist-packages (from google-api-core[grpc]!
=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!
=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain_google_genai) (1.73.0)
Requirement already satisfied: grpcio-status<2.0.0,>=1.33.2 in
/usr/local/lib/python3.11/dist-packages (from google-api-core[grpc]!
=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!
=2.7.*,!=2.8.*,!=2.9.*,<3.0.0,>=1.34.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain_google_genai) (1.71.0)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in
/usr/local/lib/python3.11/dist-packages (from google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain_google_genai) (5.5.2)
Requirement already satisfied: pyasn1-modules>=0.2.1 in
/usr/local/lib/python3.11/dist-packages (from google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain_google_genai) (0.4.2)
Requirement already satisfied: rsa<5,>=3.1.4 in
/usr/local/lib/python3.11/dist-packages (from google-auth!=2.24.0,!
=2.25.0,<3.0.0,>=2.14.1->google-ai-generativelanguage<0.7.0,>=0.6.18-
>langchain_google_genai) (4.9.1)
Requirement already satisfied: anyio in
/usr/local/lib/python3.11/dist-packages (from httpx<1,>=0.23.0-
>langsmith>=0.1.17->langchain) (4.9.0)
Requirement already satisfied: httpcore==1.* in
/usr/local/lib/python3.11/dist-packages (from httpx<1,>=0.23.0-
>langsmith>=0.1.17->langchain) (1.0.9)
Requirement already satisfied: h11>=0.16 in
/usr/local/lib/python3.11/dist-packages (from httpcore==1.*-
>httpx<1,>=0.23.0->langsmith>=0.1.17->langchain) (0.16.0)
Collecting mypy-extensions>=0.3.0 (from typing-inspect<1,>=0.4.0-
>dataclasses-json<0.7,>=0.5.7->langchain-community)
  Downloading mypy_extensions-1.1.0-py3-none-any.whl.metadata (1.1 kB)
Requirement already satisfied: pyasn1<0.7.0,>=0.6.1 in
/usr/local/lib/python3.11/dist-packages (from pyasn1-modules>=0.2.1-
>google-auth!=2.24.0,!=2.25.0,<3.0.0,>=2.14.1->google-ai-
generativelanguage<0.7.0,>=0.6.18->langchain_google_genai) (0.6.1)
```

```
Requirement already satisfied: sniffio>=1.1 in
/usr/local/lib/python3.11/dist-packages (from anyio->httpx<1,>=0.23.0-
>langsmith>=0.1.17->langchain) (1.3.1)
Downloading langchain_community-0.3.26-py3-none-any.whl (2.5 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 2.5/2.5 MB 78.0 MB/s eta
0:00:00
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 45.2/45.2 kB 4.7 MB/s eta
0:00:00
arshmallow-3.26.1-py3-none-any.whl (50 kB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 50.9/50.9 kB 5.3 MB/s eta
0:00:00
ypy_extensions-1.1.0-py3-none-any.whl (5.0 kB)
Installing collected packages: python-dotenv, mypy-extensions,
marshmallow, httpx-sse, typing-inspect, pydantic-settings,
dataclasses-json, langchain-community
Successfully installed dataclasses-json-0.6.7 httpx-sse-0.4.1
langchain-community-0.3.26 marshmallow-3.26.1 mypy-extensions-1.1.0
pydantic-settings-2.10.1 python-dotenv-1.1.1 typing-inspect-0.9.0

from langchain_ollama import OllamaEmbeddings
from langchain.vectorstores import FAISS

# Initialize the Ollama embeddings
# embedding_model = OllamaEmbeddings(model="nomic-embed-text")

embedding_model = OllamaEmbeddings(model="all-minilm:33m")
```

Prompt Engineering for NLP Tasks using LLMs (Markdown Theory + Code)

Prompt Engineering Fundamentals

The Structure of a Good Prompt

1. **Role** - Define who the model should behave like.
2. **Task Instruction** - Clearly state what needs to be done.
3. **Example (Few-Shot Prompting)** - (Optional) Provide an example input and output.

Prompt Template

#Sentiment Analysis

```
prompt = """You are a sentiment analysis expert.

Your task is to determine whether the sentiment of a text is Positive,
Negative, or Neutral.
```

```
Only Output Postive, Negative or Neutral

Example:
Input: I love this phone! The battery lasts all day.
Output: Positive

Input: I am disappointed with the camera quality.
Output: Negative

Input: The product arrived on time and works as expected.
Output:"""

input_text = "This is okay, not great but not terrible either."

full_prompt = prompt + " " + input_text

response = ollama.chat(model="gemma3:4b", messages=[{"role": "user",
"content": full_prompt}])
print(response['message']['content'])
```

Neutral


```
!pip install --upgrade langchain langchain-core langchain-community
```

Requirement already satisfied: langchain in
/usr/local/lib/python3.11/dist-packages (0.3.26)
Requirement already satisfied: langchain-core in
/usr/local/lib/python3.11/dist-packages (0.3.66)
Requirement already satisfied: langchain-community in
/usr/local/lib/python3.11/dist-packages (0.3.26)
Requirement already satisfied: langchain-text-splitters<1.0.0,>=0.3.8
in /usr/local/lib/python3.11/dist-packages (from langchain) (0.3.8)
Requirement already satisfied: langsmith>=0.1.17 in
/usr/local/lib/python3.11/dist-packages (from langchain) (0.4.1)
Requirement already satisfied: pydantic<3.0.0,>=2.7.4 in
/usr/local/lib/python3.11/dist-packages (from langchain) (2.11.7)
Requirement already satisfied: SQLAlchemy<3,>=1.4 in
/usr/local/lib/python3.11/dist-packages (from langchain) (2.0.41)
Requirement already satisfied: requests<3,>=2 in
/usr/local/lib/python3.11/dist-packages (from langchain) (2.32.3)
Requirement already satisfied: PyYAML>=5.3 in
/usr/local/lib/python3.11/dist-packages (from langchain) (6.0.2)
Requirement already satisfied: tenacity!=8.4.0,<10.0.0,>=8.1.0 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (8.5.0)
Requirement already satisfied: jsonpatch<2.0,>=1.33 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (1.33)
Requirement already satisfied: packaging<25,>=23.2 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (24.2)
Requirement already satisfied: typing-extensions>=4.7 in
/usr/local/lib/python3.11/dist-packages (from langchain-core) (4.14.0)

```
Requirement already satisfied: aiohttp<4.0.0,>=3.8.3 in
/usr/local/lib/python3.11/dist-packages (from langchain-community)
(3.11.15)
Requirement already satisfied: dataclasses-json<0.7,>=0.5.7 in
/usr/local/lib/python3.11/dist-packages (from langchain-community)
(0.6.7)
Requirement already satisfied: pydantic-settings<3.0.0,>=2.4.0 in
/usr/local/lib/python3.11/dist-packages (from langchain-community)
(2.10.1)
Requirement already satisfied: httpx-sse<1.0.0,>=0.4.0 in
/usr/local/lib/python3.11/dist-packages (from langchain-community)
(0.4.1)
Requirement already satisfied: numpy>=1.26.2 in
/usr/local/lib/python3.11/dist-packages (from langchain-community)
(2.0.2)
Requirement already satisfied: aiohappyeyeballs>=2.3.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (2.6.1)
Requirement already satisfied: aiosignal>=1.1.2 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (1.3.2)
Requirement already satisfied: attrs>=17.3.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (25.3.0)
Requirement already satisfied: frozenlist>=1.1.1 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (1.7.0)
Requirement already satisfied: multidict<7.0,>=4.5 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (6.4.4)
Requirement already satisfied: propcache>=0.2.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (0.3.2)
Requirement already satisfied: yarl<2.0,>=1.17.0 in
/usr/local/lib/python3.11/dist-packages (from aiohttp<4.0.0,>=3.8.3-
>langchain-community) (1.20.1)
Requirement already satisfied: marshmallow<4.0.0,>=3.18.0 in
/usr/local/lib/python3.11/dist-packages (from dataclasses-
json<0.7,>=0.5.7->langchain-community) (3.26.1)
Requirement already satisfied: typing-inspect<1,>=0.4.0 in
/usr/local/lib/python3.11/dist-packages (from dataclasses-
json<0.7,>=0.5.7->langchain-community) (0.9.0)
Requirement already satisfied: jsonpointer>=1.9 in
/usr/local/lib/python3.11/dist-packages (from jsonpatch<2.0,>=1.33-
>langchain-core) (3.0.0)
Requirement already satisfied: httpx<1,>=0.23.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (0.28.1)
Requirement already satisfied: orjson<4.0.0,>=3.9.14 in
```

```
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (3.10.18)
Requirement already satisfied: requests-toolbelt<2.0.0,>=1.0.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (1.0.0)
Requirement already satisfied: zstandard<0.24.0,>=0.23.0 in
/usr/local/lib/python3.11/dist-packages (from langsmith>=0.1.17-
>langchain) (0.23.0)
Requirement already satisfied: annotated-types>=0.6.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3.0.0,>=2.7.4-
>langchain) (0.7.0)
Requirement already satisfied: pydantic-core==2.33.2 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3.0.0,>=2.7.4-
>langchain) (2.33.2)
Requirement already satisfied: typing-inspection>=0.4.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic<3.0.0,>=2.7.4-
>langchain) (0.4.1)
Requirement already satisfied: python-dotenv>=0.21.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic-
settings<3.0.0,>=2.4.0->langchain-community) (1.1.1)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (3.4.2)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (2.4.0)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.11/dist-packages (from requests<3,>=2-
>langchain) (2025.6.15)
Requirement already satisfied: greenlet>=1 in
/usr/local/lib/python3.11/dist-packages (from SQLAlchemy<3,>=1.4-
>langchain) (3.2.3)
Requirement already satisfied: anyio in
/usr/local/lib/python3.11/dist-packages (from httpx<1,>=0.23.0-
>langsmith>=0.1.17->langchain) (4.9.0)
Requirement already satisfied: httpcore==1.* in
/usr/local/lib/python3.11/dist-packages (from httpx<1,>=0.23.0-
>langsmith>=0.1.17->langchain) (1.0.9)
Requirement already satisfied: h11>=0.16 in
/usr/local/lib/python3.11/dist-packages (from httpcore==1.*-
>httpx<1,>=0.23.0->langsmith>=0.1.17->langchain) (0.16.0)
Requirement already satisfied: mypy-extensions>=0.3.0 in
/usr/local/lib/python3.11/dist-packages (from typing-
inspect<1,>=0.4.0->dataclasses-json<0.7,>=0.5.7->langchain-community)
(1.1.0)
Requirement already satisfied: sniffio>=1.1 in
```

```
/usr/local/lib/python3.11/dist-packages (from anyio->httpx<1,>=0.23.0-
>langsmith>=0.1.17->langchain) (1.3.1)
```

```python
# Let's write a LangChain version of the prompt-based sentiment
analyzer using Ollama as the LLM model.
from langchain_community.chat_models import ChatOllama
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain

# Define the prompt template
template = """You are a sentiment analysis expert.

Your task is to determine whether the sentiment of a text is Positive,
Negative, or Neutral.
Only Output Positive, Negative or Neutral

Example:
Input: I love this phone! The battery lasts all day.
Output: Positive

Input: I am disappointed with the camera quality.
Output: Negative

Input: The product arrived on time and works as expected.
Output: Neutral

Input: {text}
Output:"""

prompt = PromptTemplate.from_template(template)

# Use the LangChain ChatOllama wrapper
llm = ChatOllama(model="gemma3:4b")
chain = LLMChain(llm=llm, prompt=prompt)

# Test with multiple inputs
test_inputs = [
    "I love the camera quality and the performance is amazing!",
    "This product is terrible and I want a refund.",
    "It's just fine. Does what it says, nothing more.",
    "Absolutely fantastic, exceeded my expectations!"
]

results = [chain.run(text=inp) for inp in test_inputs]
results
```

```
/tmp/ipython-input-28-4031993471.py:28: LangChainDeprecationWarning:
The class `ChatOllama` was deprecated in LangChain 0.3.1 and will be
removed in 1.0.0. An updated version of the class exists in
the :class:`~langchain-ollama package and should be used instead. To
use it run `pip install -U :class:`~langchain-ollama` and import as
```

```
 `from :class:`~langchain_ollama import ChatOllama``.
   llm = ChatOllama(model="gemma3:4b")
/tmp/ipython-input-28-4031993471.py:29: LangChainDeprecationWarning:
The class `LLMChain` was deprecated in LangChain 0.1.17 and will be
removed in 1.0. Use :meth:`~RunnableSequence, e.g., `prompt | llm``
instead.
   chain = LLMChain(llm=llm, prompt=prompt)
/tmp/ipython-input-28-4031993471.py:39: LangChainDeprecationWarning:
The method `Chain.run` was deprecated in langchain 0.1.0 and will be
removed in 1.0. Use :meth:`~invoke` instead.
   results = [chain.run(text=inp) for inp in test_inputs]

['Positive', 'Negative\n', 'Neutral\n', 'Positive\n']
```

#Named Entity Recognition (NER)

```python
prompt = """You are an NLP model that extracts Named Entities from
text. Return the entities in the format:
-Dont Add answer in Input
Please Stricly answer in the format do not add any other strictly.
[{"entity": "Google", "type": "ORG"}, {"entity": "Sundar Pichai",
"type": "PERSON"}]

Example:
Input: Sundar Pichai is the CEO of Google.
Output: [{"entity": "Sundar Pichai", "type": "PERSON"}, {"entity":
"Google", "type": "ORG"}]

"""

input_text = "Satya Nadella is the CEO of Microsoft."

full_prompt = prompt + " " + input_text

response = ollama.chat(model="gemma3:4b", messages=[{"role": "user",
"content": full_prompt}])
print(response['message']['content'])
```

```
[{"entity": "Satya Nadella", "type": "PERSON"}, {"entity":
"Microsoft", "type": "ORG"}]
```

```python
from langchain_community.chat_models import ChatOllama
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain

# Define the prompt template
template = """You are an NLP model that extracts Named Entities from
text.
Return the entities in the format:
[{{"entity": "Google", "type": "ORG"}}, {{"entity": "Sundar Pichai",
```

```
"type": "PERSON"}}]
Do not add anything else. Be strict.

Example:
Input: Sundar Pichai is the CEO of Google.
Output: [{{"entity": "Sundar Pichai", "type": "PERSON"}}, {{"entity":
"Google", "type": "ORG"}}]

Input: {text}
Output:"""

# Create the prompt and model chain
prompt = PromptTemplate.from_template(template)
llm = ChatOllama(model="gemma3:4b")
chain = LLMChain(llm=llm, prompt=prompt)

# List of test inputs
test_inputs = [
    "Elon Musk founded SpaceX and also runs Tesla.",
    "Tim Cook leads Apple Inc.",
    "Barack Obama was born in Hawaii and served as president.",
    "Sundar Pichai works at Google."
]

# Run and print results
for inp in test_inputs:
    result = chain.run(text=inp)
    print(f"Input: {inp}\nEntities: {result.strip()}\n")

Input: Elon Musk founded SpaceX and also runs Tesla.
Entities: [{"entity": "Elon Musk", "type": "PERSON"}, {"entity":
"SpaceX", "type": "ORG"}, {"entity": "Tesla", "type": "ORG"}]

Input: Tim Cook leads Apple Inc.
Entities: [{"entity": "Tim Cook", "type": "PERSON"}, {"entity": "Apple
Inc.", "type": "ORG"}]

Input: Barack Obama was born in Hawaii and served as president.
Entities: [{"entity": "Barack Obama", "type": "PERSON"}, {"entity":
"Hawaii", "type": "GPE"}]

Input: Sundar Pichai works at Google.
Entities: [{"entity": "Sundar Pichai", "type": "PERSON"}, {"entity":
"Google", "type": "ORG"}]
```

#Summarization

```
prompt = """You are a professional summarizer. Your task is to write a
concise summary of the given text in 2-3 sentences.
```

```
Text:
Safely aligning powerful AI systems is one of the most important
unsolved problems for our mission. Techniques like learning from human
feedback are helping us get closer, and we are actively researching
new techniques to help us fill the gaps.

Summary:"""

response = ollama.chat(model="gemma3:4b", messages=[{"role": "user",
"content": prompt}])
print(response['message']['content'])

Aligning powerful AI systems with human values is a critical
challenge. Current methods, such as learning from human feedback, are
showing promise, but further research and development are needed to
fully address this complex problem. The team is actively pursuing
innovative techniques to ensure AI systems remain aligned with our
goals.

from langchain_community.chat_models import ChatOllama
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain

# Define the prompt template for summarization
template = """You are a professional summarizer. Your task is to write
a concise summary of the given text in 2-3 sentences.

Text:
{text}

Summary:"""

# Set up the LangChain components
prompt = PromptTemplate.from_template(template)
llm = ChatOllama(model="gemma3:4b")
chain = LLMChain(llm=llm, prompt=prompt)

# List of texts to summarize
texts = [
    "Safely aligning powerful AI systems is one of the most important
unsolved problems for our mission. Techniques like learning from human
feedback are helping us get closer, and we are actively researching
new techniques to help us fill the gaps.",
    "The Mars rover Perseverance has successfully collected samples
from the Martian surface. NASA scientists hope these samples will help
determine whether life ever existed on Mars.",
    "Open-source software is rapidly transforming the technology
landscape, enabling faster innovation, community collaboration, and
cost-effective deployment.",
```

```
    "Climate change continues to affect global ecosystems, causing
extreme weather events and threatening biodiversity across
continents."
]

# Run the chain on each input and print summaries
for text in texts:
    summary = chain.run(text=text)
    print(f"Original:\n{text}\n\nSummary:\n{summary.strip()}\
n{'-'*60}\n")
```

```
Original:
Safely aligning powerful AI systems is one of the most important
unsolved problems for our mission. Techniques like learning from human
feedback are helping us get closer, and we are actively researching
new techniques to help us fill the gaps.

Summary:
Aligning powerful AI systems with human values is a critical
challenge. Current methods, such as learning from human feedback, are
showing promise, but further research and development are needed to
fully address this complex problem. This ongoing effort is vital for
the responsible advancement of AI technology.
------------------------------------------------------------

Original:
The Mars rover Perseverance has successfully collected samples from
the Martian surface. NASA scientists hope these samples will help
determine whether life ever existed on Mars.

Summary:
Here's a concise summary of the text in 2 sentences:

NASA's Perseverance rover has successfully gathered samples from Mars'
surface. These samples are being collected with the hope of
discovering evidence of past or present life on the red planet.
------------------------------------------------------------

Original:
Open-source software is rapidly transforming the technology landscape,
enabling faster innovation, community collaboration, and cost-
effective deployment.

Summary:
Open-source software is driving rapid technological advancements
through collaborative development and increased innovation. Its
accessibility fosters community involvement and significantly reduces
costs associated with software deployment. This shift is fundamentally
reshaping the technology industry.
------------------------------------------------------------
```

```
Original:
Climate change continues to affect global ecosystems, causing extreme
weather events and threatening biodiversity across continents.

Summary:
Here's a concise summary of the text in 2 sentences:

Climate change is significantly impacting global ecosystems, leading
to increasingly frequent and severe extreme weather events. These
changes pose a serious threat to biodiversity worldwide, highlighting
the urgent need for action.
----------------------------------------------------------------
```

Code Generation

```python
prompt = """You are a Python coding assistant. Your task is to
generate Python code that solves the described problem.

Problem:
Write a function that takes a list of integers and returns a list of
only the even numbers.

Code:"""

response = ollama.chat(model="gemma3:4b", messages=[{"role": "user",
"content": prompt}])
print(response['message']['content'])

```python
def get_even_numbers(numbers):
  """
  This function takes a list of integers and returns a list of only
the even numbers.
  """
  even_numbers = []
  for number in numbers:
    if number % 2 == 0:
      even_numbers.append(number)
  return even_numbers
```

from langchain_community.chat_models import ChatOllama
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain

# Define the prompt template for Python code generation
template = """You are a Python coding assistant. Your task is to
```

```
generate Python code that solves the described problem.

Problem:
{problem}

Code:"""

# Create the prompt and chain
prompt = PromptTemplate.from_template(template)
llm = ChatOllama(model="gemma3:4b")
chain = LLMChain(llm=llm, prompt=prompt)

# List of example problems
problems = [
    "Write a function that takes a list of integers and returns a list
of only the even numbers.",
    "Write a Python function that checks if a string is a
palindrome.",
    "Write a function that returns the factorial of a number using
recursion.",
    "Write code to read a text file and count the number of words."
]

# Run the chain on each problem and print the output
for problem in problems:
    code_output = chain.run(problem=problem)
    print(f"Problem:\n{problem}\n\nGenerated Code:\
n{code_output.strip()}\n{'-'*60}\n")

Problem:
Write a function that takes a list of integers and returns a list of
only the even numbers.

Generated Code:
```python
def get_even_numbers(numbers):
    """
    This function takes a list of integers and returns a list of only
the even numbers.
    """
    even_numbers = []
    for number in numbers:
        if number % 2 == 0:
            even_numbers.append(number)
    return even_numbers
```

Problem:
Write a Python function that checks if a string is a palindrome.
```

Generated Code:
```python
def is_palindrome(text):
    """
    Checks if a string is a palindrome.

    Args:
       text: The string to check.

    Returns:
       True if the string is a palindrome, False otherwise.
    """
    processed_text = ''.join(filter(str.isalnum, text)).lower()
    return processed_text == processed_text[::-1]
```

Problem:
Write a function that returns the factorial of a number using recursion.

Generated Code:
```python
def factorial_recursive(n):
  """
  This function calculates the factorial of a non-negative integer using recursion.

  Args:
    n: A non-negative integer.

  Returns:
    The factorial of n.
  """
  if n == 0:
    return 1
  else:
    return n * factorial_recursive(n-1)
```

Problem:
Write code to read a text file and count the number of words.

Generated Code:
```python
def count_words(filepath):
    """
    Reads a text file and counts the number of words.
```

```python
    Args:
        filepath (str): The path to the text file.

    Returns:
        int: The number of words in the file.
    """
    try:
        with open(filepath, 'r') as file:
            content = file.read()
            words = content.split()
            return len(words)
    except FileNotFoundError:
        print(f"Error: File not found at {filepath}")
        return 0
    except Exception as e:
        print(f"An error occurred: {e}")
        return 0


if __name__ == '__main__':
    filepath = 'example.txt'  # Replace with your file path
    # Create a dummy file for testing
    with open(filepath, 'w') as f:
        f.write("This is a sample text file.\n")
        f.write("It has multiple lines.\n")
        f.write("Let's count the words.")

    word_count = count_words(filepath)
    print(f"The number of words in {filepath} is: {word_count}")
```
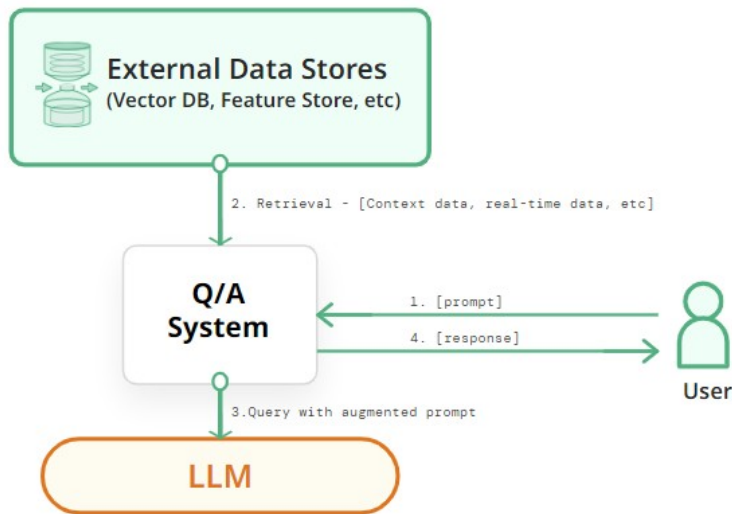--

5 Question-Answer Bot with Embedding Search

Question Answering using Embeddings

How it Works:

1. **Text Chunking**: Split a document into chunks.
2. **Embedding**: Convert each chunk into a vector using an embedding model.
3. **Query Embedding**: Convert the user's question into a vector.
4. **Similarity Search**: Find the most similar chunk using cosine similarity.
5. **Answer Generation**: Use the top chunk(s) as context to prompt the LLM.

Tools:

- `ollama run nomic-embed-text` for embeddings
- `faiss` for vector search

```
!!pip install faiss-cpu

['Collecting faiss-cpu',
 '  Downloading faiss_cpu-1.11.0-cp311-cp311-
manylinux_2_28_x86_64.whl.metadata (4.8 kB)',
 'Requirement already satisfied: numpy<3.0,>=1.25.0 in
/usr/local/lib/python3.11/dist-packages (from faiss-cpu) (2.0.2)',
 'Requirement already satisfied: packaging in
/usr/local/lib/python3.11/dist-packages (from faiss-cpu) (24.2)',
 'Downloading faiss_cpu-1.11.0-cp311-cp311-manylinux_2_28_x86_64.whl
(31.3 MB)',
```

```
  '\x1b[?25l   \x1b[90m━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━\
x1b[0m \x1b[32m0.0/31.3 MB\x1b[0m \x1b[31m?\x1b[0m eta \
x1b[36m-:--:--\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━\x1b[0m\x1b[91m╸\x1b[0m\
x1b[90m━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m \x1b[32m5.2/31.3 MB\
x1b[0m \x1b[31m180.0 MB/s\x1b[0m eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━━━━━━━━\x1b[0m\x1b[91m╸\x1b[0m\
x1b[90m━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m \x1b[32m10.7/31.3 MB\x1b[0m \
x1b[31m166.6 MB/s\x1b[0m eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━━━━━━━━━━━━━━━━\x1b[0m\x1b[91m╸\x1b[0m\
x1b[90m━━━━━━━━━━━━━━━\x1b[0m \x1b[32m17.2/31.3 MB\x1b[0m \
x1b[31m176.0 MB/s\x1b[0m eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m\x1b[91m╸\
x1b[0m\x1b[90m━━━━━━━━━\x1b[0m \x1b[32m24.2/31.3 MB\x1b[0m \
x1b[31m200.7 MB/s\x1b[0m eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m\
x1b[91m╸\x1b[0m \x1b[32m31.3/31.3 MB\x1b[0m \x1b[31m229.0 MB/s\x1b[0m
eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m\
x1b[91m╸\x1b[0m \x1b[32m31.3/31.3 MB\x1b[0m \x1b[31m229.0 MB/s\x1b[0m
eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[91m━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m\
x1b[91m╸\x1b[0m \x1b[32m31.3/31.3 MB\x1b[0m \x1b[31m229.0 MB/s\x1b[0m
eta \x1b[36m0:00:01\x1b[0m',
  '\x1b[2K   \x1b[90m━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━\x1b[0m \
x1b[32m31.3/31.3 MB\x1b[0m \x1b[31m68.4 MB/s\x1b[0m eta \
x1b[36m0:00:00\x1b[0m',
  '\x1b[?25hInstalling collected packages: faiss-cpu',
  'Successfully installed faiss-cpu-1.11.0']

from sentence_transformers import SentenceTransformer
import faiss
import numpy as np

# 1. Load embedding model
model = SentenceTransformer('all-MiniLM-L6-v2')

# 2. Sample chunks
chunks = [
    "The Eiffel Tower is located in Paris.",
    "Python is a programming language used for data science.",
    "OpenAI develops large language models like ChatGPT."
]

# 3. Embed chunks
vectors = model.encode(chunks)
index = faiss.IndexFlatL2(vectors.shape[1])
index.add(np.array(vectors))

# 4. Query
```

```python
query = "Where is the Eiffel Tower?"
query_vec = model.encode([query])
_, idx = index.search(np.array(query_vec), k=1)

# 5. Retrieve & use in LLM prompt
top_chunk = chunks[idx[0][0]]
llm_prompt = f"""Use the following context to answer the question:
Context: {top_chunk}
Question: {query}
Answer:"""

response = ollama.chat(model="gemma3:4b", messages=[{"role": "user",
"content": llm_prompt}])
print(response['message']['content'])
```

```
/usr/local/lib/python3.11/dist-packages/huggingface_hub/utils/
_auth.py:94: UserWarning:
The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your
settings tab (https://huggingface.co/settings/tokens), set it as
secret in your Google Colab and restart your session.
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to
access public models or datasets.
  warnings.warn(
```

{"model_id":"a27be54af6fe4afba8c672bd15cb7636","version_major":2,"version_minor":0}

{"model_id":"794ccd5dbd1047f1aecf6cccd5961264","version_major":2,"version_minor":0}

{"model_id":"22ce4d8b2ad4425990daedc1adc7f79d","version_major":2,"version_minor":0}

{"model_id":"aed48c5a318c4fc7b7d3b8d9000003ff","version_major":2,"version_minor":0}

{"model_id":"1eeeb567e232482d94ad86ff372755ac","version_major":2,"version_minor":0}

{"model_id":"b8fdf90b82c347908a99fd9799d930aa","version_major":2,"version_minor":0}

{"model_id":"6cc083b93ab24bf49804b5479a245323","version_major":2,"version_minor":0}

{"model_id":"d9fd5b27178b4ce98e48c076d17454c5","version_major":2,"version_minor":0}

{"model_id":"03858f69a8b44d759c58dcd9f3822374","version_major":2,"version_minor":0}

{"model_id":"18b56135947240aba660661f6db61309","version_major":2,"version_minor":0}

{"model_id":"dcf7d8cd40034dd5803a8eaa6182bc85","version_major":2,"version_minor":0}

Paris.

```python
from langchain_community.chat_models import ChatOllama
from langchain.prompts import PromptTemplate
from langchain.chains import LLMChain
from sentence_transformers import SentenceTransformer
import faiss
import numpy as np

# Step 1: Load embedding model and LLM
embed_model = SentenceTransformer('all-MiniLM-L6-v2')
llm = ChatOllama(model="gemma3:4b")

# Step 2: Create sample context chunks
chunks = [
    "The Eiffel Tower is located in Paris.",
    "Python is a programming language used for data science.",
    "OpenAI develops large language models like ChatGPT.",
    "The Great Wall of China is visible from space.",
    "Water boils at 100 degrees Celsius under standard conditions.",
    "The mitochondrion is the powerhouse of the cell.",
    "Mount Everest is the tallest mountain above sea level.",
    "Shakespeare wrote Hamlet and Macbeth.",
    "Tesla produces electric vehicles and solar products.",
    "Amazon is a large online retailer founded by Jeff Bezos.",
    "The Moon orbits the Earth approximately every 27.3 days.",
    "The speed of light is about 299,792 kilometers per second.",
    "Albert Einstein developed the theory of relativity.",
    "Venus is the second planet from the Sun.",
    "The Pacific Ocean is the largest and deepest ocean on Earth.",
    "Bacteria are single-celled microorganisms.",
    "The capital of Japan is Tokyo.",
    "Photosynthesis occurs in the chloroplasts of plant cells.",
    "Leonardo da Vinci painted the Mona Lisa.",
    "Bitcoin is a decentralized digital currency."
]

# Step 3: Embed chunks and index them
chunk_vectors = embed_model.encode(chunks)
index = faiss.IndexFlatL2(chunk_vectors.shape[1])
index.add(np.array(chunk_vectors))

# Step 4: Define prompt template
```

```python
template = """Use the following context to answer the question:
Context: {context}
Question: {question}
Answer:"""
prompt = PromptTemplate.from_template(template)
chain = LLMChain(llm=llm, prompt=prompt)

# Step 5: Define questions and run chain with retrieved context
questions = [
    "Where is the Eiffel Tower?",
    "Who painted the Mona Lisa?",
    "What does Tesla produce?",
    "What is the speed of light?",
    "Where does photosynthesis happen in plant cells?"
]

# Run the chain and print results nicely
results = []
for question in questions:
    query_vec = embed_model.encode([question])
    _, idx = index.search(np.array(query_vec), k=1)
    top_chunk = chunks[idx[0][0]]
    answer = chain.run(context=top_chunk, question=question).strip()
    results.append((question, top_chunk, answer))

# Nicely formatted output
for i, (question, context, answer) in enumerate(results, 1):
    print(f" Question {i}: {question}")
    print(f" Retrieved Context: {context}")
    print(f" Answer: {answer}")
    print("-" * 70)
```

 Question 1: Where is the Eiffel Tower?
 Retrieved Context: The Eiffel Tower is located in Paris.
 Answer: Paris.

 Question 2: Who painted the Mona Lisa?
 Retrieved Context: Leonardo da Vinci painted the Mona Lisa.
 Answer: Leonardo da Vinci.

 Question 3: What does Tesla produce?
 Retrieved Context: Tesla produces electric vehicles and solar products.
 Answer: Tesla produces electric vehicles and solar products.

 Question 4: What is the speed of light?
 Retrieved Context: The speed of light is about 299,792 kilometers per second.
 Answer: The speed of light is about 299,792 kilometers per second.
```

```
--------------------------------------------------------------------
□ Question 5: Where does photosynthesis happen in plant cells?
□ Retrieved Context: Photosynthesis occurs in the chloroplasts of
plant cells.
□ Answer: Chloroplasts.
--------------------------------------------------------------------
```