

## generative-ai-jupyterlab

e2-standard-2

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```
[8]: !pip install google-cloud-aiplatform

Requirement already satisfied: google-cloud-aiplatform in ./local/lib/python3.10/site-packages (1.94.0)
Requirement already satisfied: google-api-core<2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform)
Requirement already satisfied: google-auth<3.0.0,>=2.14.1 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (2.38.0)
Requirement already satisfied: proto-plus<2.0.0,>=1.22.3 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (1.26.1)
Requirement already satisfied: protobuf<4.21.0,>=4.21.1,>=4.21.3,>=4.21.4,>=4.21.5,>=7.0.0,>=3.20.2 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (3.20.3)
Requirement already satisfied: packaging<14.3 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (24.2)
Requirement already satisfied: google-cloud-storage<3.0.0,>=1.32.0 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (2.19.0)
Requirement already satisfied: google-cloud-bigquery<3.20.0,>=4.0.0,>=1.15.0 in ./local/lib/python3.10/site-packages (from google-cloud-aiplatform) (3.33.0)
Requirement already satisfied: google-cloud-resource-manager<3.0.0,>=1.3.3 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (1.14.2)
Requirement already satisfied: shapely<3.0.0 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (2.0.7)
Requirement already satisfied: google-genai<2.0.0,>=1.0.0 in ./local/lib/python3.10/site-packages (from google-cloud-aiplatform) (1.16.1)
Requirement already satisfied: pydantic<3 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (2.11.0)
Requirement already satisfied: typing_extensions in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (4.13.0)
Requirement already satisfied: docstring-parser<1 in /opt/conda/lib/python3.10/site-packages (from google-cloud-aiplatform) (0.16)
Requirement already satisfied: googleapis-common-protos<2.0.0,>=1.56.2 in /opt/conda/lib/python3.10/site-packages (from google-api-core!=2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1->google-cloud-aiplatform) (1.69.2)
Requirement already satisfied: requests<3.0.0,>=2.18.0 in /opt/conda/lib/python3.10/site-packages (from google-api-core!=2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1->google-cloud-aiplatform) (2.32.3)
Requirement already satisfied: grpcio<2.0dev,>=1.33.2 in /opt/conda/lib/python3.10/site-packages (from google-api-core[grpc]!=2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1->google-cloud-aiplatform) (1.71.0)
Requirement already satisfied: grpcio-status<2.0.dev0,>=1.33.2 in /opt/conda/lib/python3.10/site-packages (from google-api-core[grpc]!=2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1->google-cloud-aiplatform) (1.49.0rc1)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in /opt/conda/lib/python3.10/site-packages (from google-auth<3.0.0,>=2.14.1->google-cloud-aiplatform) (5.5.2)
Requirement already satisfied: pyasn1-modules<=0.2.1 in /opt/conda/lib/python3.10/site-packages (from google-auth<3.0.0,>=2.14.1->google-cloud-aiplatform) (0.4.2)
Requirement already satisfied: rsa<5,>=3.1.4 in /opt/conda/lib/python3.10/site-packages (from google-auth<3.0.0,>=2.14.1->google-cloud-aiplatform) (4.9)
Requirement already satisfied: google-cloud-core<3.0.0,>=2.4.1 in /opt/conda/lib/python3.10/site-packages (from google-cloud-bigquery!=3.20.0,<4.0.0,>=1.1.5->google-cloud-aiplatform) (2.4.3)
Requirement already satisfied: google-resumable-media<3.0.0,>=2.0.0 in /opt/conda/lib/python3.10/site-packages (from google-cloud-bigquery!=3.20.0,<4.0.0,>=1.15.0->google-cloud-aiplatform) (2.7.2)
Requirement already satisfied: python-dateutil<3.0.0,>=2.8.2 in /opt/conda/lib/python3.10/site-packages (from google-cloud-bigquery!=3.20.0,<4.0.0,>=1.15.0->google-cloud-aiplatform) (2.9.0.post0)
Requirement already satisfied: grpc-google-iam-v1<1.0.0,>=0.14.0 in /opt/conda/lib/python3.10/site-packages (from google-cloud-resource-manager<3.0.0,>=1.3.3->google-cloud-aiplatform) (0.14.2)
Requirement already satisfied: google-crc32c<2.0dev,>=1.0 in /opt/conda/lib/python3.10/site-packages (from google-cloud-storage<3.0.0,>=1.32.0->google-cloud-aiplatform) (1.7.1)
Requirement already satisfied: aiohttp<3.0.0,>=3.0.7 in /opt/conda/lib/python3.10/site-packages (from google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (4.9.0)
Requirement already satisfied: requirementgroup<1.0.2 in /opt/conda/lib/python3.10/site-packages (from aiohttp<3.0.0.1,>=3.0.7->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (1.2.2)
Requirement already satisfied: anyio<5.0.0,>=4.8.0 in /opt/conda/lib/python3.10/site-packages (from google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform)
Requirement already satisfied: httpx<1.0.0,>=0.28.1 in ./local/lib/python3.10/site-packages (from google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (0.28.1)
Requirement already satisfied: websockets<15.1.0,>=13.0.0 in /opt/conda/lib/python3.10/site-packages (from google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (15.0.1)
Requirement already satisfied: annotated-types<=0.6.0 in /opt/conda/lib/python3.10/site-packages (from pydantic<3->google-cloud-aiplatform) (0.7.0)
Requirement already satisfied: pydantic-core<=2.33.0 in /opt/conda/lib/python3.10/site-packages (from pydantic<3->google-cloud-aiplatform) (2.33.0)
Requirement already satisfied: typing-inspection<0.4.0 in /opt/conda/lib/python3.10/site-packages (from pydantic<3->google-cloud-aiplatform) (0.4.0)
Requirement already satisfied: numpy<3,>=1.14 in /opt/conda/lib/python3.10/site-packages (from shapely<3.0.0->google-cloud-aiplatform) (2.1.3)
Requirement already satisfied: exceptiongroup<=1.0.2 in /opt/conda/lib/python3.10/site-packages (from anyio<5.0.0,>=4.8.0->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (1.2.2)
Requirement already satisfied: idna<=2.8 in /opt/conda/lib/python3.10/site-packages (from anyio<5.0.0,>=4.8.0->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (3.10)
Requirement already satisfied: sniffio<=1.1 in /opt/conda/lib/python3.10/site-packages (from anyio<5.0.0,>=4.8.0->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (1.3.1)
Requirement already satisfied: certifi in /opt/conda/lib/python3.10/site-packages (from httpx<1.0.0,>=0.28.1->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (2025.1.31)
Requirement already satisfied: httpcore<=1.* in ./local/lib/python3.10/site-packages (from httpx<1.0.0,>=0.28.1->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (1.0.9)
Requirement already satisfied: h11<=0.16 in ./local/lib/python3.10/site-packages (from httpcore<1.*->httpx<1.0.0,>=0.28.1->google-genai<2.0.0,>=1.0.0->google-cloud-aiplatform) (0.16.0)
Requirement already satisfied: pyasn1<0.7.0,>=0.6.1 in /opt/conda/lib/python3.10/site-packages (from pyasn1-modules<=0.2.1->google-auth<3.0.0,>=2.14.1->google-cloud-aiplatform) (0.6.1)
Requirement already satisfied: six<=1.5 in /opt/conda/lib/python3.10/site-packages (from python-dateutil<3.0.0,>=2.8.2->google-cloud-bigquery!=3.20.0,<4.0.0,>=1.15.0->google-cloud-aiplatform) (1.17.0)
Requirement already satisfied: charset_normalizer<4,>=2 in /opt/conda/lib/python3.10/site-packages (from requests<3.0.0,>=2.18.0->google-api-core!=2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1->google-cloud-aiplatform) (3.4.1)
Requirement already satisfied: urllib3<3,>=1.21.1 in /opt/conda/lib/python3.10/site-packages (from requests<3.0.0,>=2.18.0->google-api-core!=2.0.*,>=2.1.*,>=2.2.*,>=2.3.*,>=2.4.*,>=2.5.*,>=2.6.*,>=2.7.*,<3.0.0,>=1.34.1->google-cloud-aiplatform) (1.26.20)
[9]: import vertexai
vertexai.init()

[10]: from vertexai.language_models import TextEmbeddingModel
embedding_model = TextEmbeddingModel.from_pretrained("text-embedding-004")

[11]: embedding = embedding_model.get_embeddings(['life'])

[12]: vector = embedding[0].values
print(f"Length = {len(vector)}")
print(vector[:10])

Length = 768
[-0.010603697039186954, -0.015785258263349533, -0.010502871125936508, 0.002185781253501773, -0.07148707658052444, 0.04219384118914604, -0.010504273697733879, 0.03097270429134369, 0.03328254073858261, 0.05283762887120247]

[13]: embedding = embedding_model.get_embeddings(['What is the meaning of life?'])

[14]: vector = embedding[0].values
print(f"Length = {len(vector)}")
print(vector[:10])

Length = 768
[-0.010626512579619884, 0.019580397754907608, 0.02096149516353035, 0.0007800217717885971, -0.06189257651567459, 0.014572087675333023, -0.0022393004037439823, 0.013389108702540398, 0.014531472697854042, 0.022664014250040054]

[15]: from sklearn.metrics.pairwise import cosine_similarity

[16]: emb_1 = embedding_model.get_embeddings(['What is the meaning of life?'])
emb_2 = embedding_model.get_embeddings(['How does one spend their time well on Earth?'])
emb_3 = embedding_model.get_embeddings(['Would you like a salad?'])
```

```

vec_1 = [emb_1[0].values]
vec_2 = [emb_2[0].values]
vec_3 = [emb_3[0].values]

[17]: print(cosine_similarity(vec_1,vec_2))
print(cosine_similarity(vec_2,vec_3))
print(cosine_similarity(vec_1,vec_3))

[[0.6042384]
[[0.3396287]]
[[0.36034201]]]

[18]: in_1 = "Missing flamingo discovered at swimming pool"
in_2 = "Sea otter spotted on surfboard by beach"
in_3 = "Baby panda enjoys boat ride"
in_4 = "Breakfast themed food truck beloved by all!"
in_5 = "New curry restaurant aims to please!"
in_6 = "Python developers are wonderful people"
in_7 = "TypeScript, C++ or Java? All are great!"

input_text_lst_news = [in_1, in_2, in_3, in_4, in_5, in_6, in_7]

[19]: embeddings = []
for input_text in input_text_lst_news:
    emb = embedding_model.get_embeddings(
        [input_text])[0].values
    embeddings.append(emb)

[20]: import numpy as np
embeddings_array = np.array(embeddings)
print("Shape: " + str(embeddings_array.shape))
print(embeddings_array)

Shape: (7, 768)
[[ 0.02803496 -0.00299724 -0.01659381 ... -0.01121059 -0.00519713
-0.02044056]
[ 0.00485451  0.03849659 -0.01399871 ... -0.01616582 -0.03872107
0.01834136]
[ 0.03935665 -0.03734451 -0.06938332 ... -0.02096844 -0.01913369
0.02881981]
...
[ 0.00716709 -0.05124414  0.01775808 ...  0.00892509 -0.00407107
0.00254001]
[ 0.03583142 -0.05428725  0.00165318 ... -0.01935553  0.04669554
0.02359349]
[ 0.05533755 -0.0237293 -0.03609464 ... -0.03040388  0.02278006
0.01252656]]

[21]: from sklearn.decomposition import PCA

# Perform PCA for 2D visualization
PCA_model = PCA(n_components = 2)
PCA_model.fit(embeddings_array)
new_values = PCA_model.transform(embeddings_array)

[22]: print("Shape: " + str(new_values.shape))
print(new_values)

Shape: (7, 2)
[[ 0.49533001  0.17530328]
[ 0.47394037  0.16537099]
[ 0.34864739  0.11626409]
[-0.01331229 -0.5433861]
[-0.22950727 -0.56127286]
[-0.4674816  0.36944202]
[-0.60761662  0.27827859]]

[23]: !pip install ipympl plot-utils matplotlib seaborn
Collecting ipympl
  Downloading ipympl-0.9.7-py3-none-any.whl.metadata (8.7 kB)
Collecting plot-utils
  Downloading plot_utils-0.6.14-py2.py3-none-any.whl.metadata (18 kB)
Requirement already satisfied: matplotlib in /opt/conda/lib/python3.10/site-packages (3.10.0)
Requirement already satisfied: seaborn in /opt/conda/lib/python3.10/site-packages (0.13.2)
Requirement already satisfied: ipython<10 in /opt/conda/lib/python3.10/site-packages (from ipympl) (8.21.0)
Requirement already satisfied: ipywidgets<9,>7.6.0 in /opt/conda/lib/python3.10/site-packages (from ipympl) (8.1.5)
Requirement already satisfied: numpy in /opt/conda/lib/python3.10/site-packages (from ipympl) (2.1.3)
Requirement already satisfied: pillow in /opt/conda/lib/python3.10/site-packages (from ipympl) (11.1.0)
Requirement already satisfied: traitlets<6 in /opt/conda/lib/python3.10/site-packages (from ipympl) (5.14.3)
Requirement already satisfied: scipy>=19.0 in /opt/conda/lib/python3.10/site-packages (from plot-utils) (1.15.2)
Requirement already satisfied: pandas>=0.17.1 in /opt/conda/lib/python3.10/site-packages (from plot-utils) (2.2.3)
Requirement already satisfied: cycler>=0.10.0 in /opt/conda/lib/python3.10/site-packages (from plot-utils) (0.12.1)
Requirement already satisfied: contourpy>1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib) (1.3.1)
Requirement already satisfied: fonttools>=4.22.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib) (4.56.0)
Requirement already satisfied: kiwisolver>=1.3.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib) (1.4.8)
Requirement already satisfied: packaging>=20.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib) (24.2)
Requirement already satisfied: pyparsing>=2.3.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib) (3.2.3)
Requirement already satisfied: python-dateutil>=2.7 in /opt/conda/lib/python3.10/site-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: decorator in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (5.2.1)
Requirement already satisfied: jedi>=0.16 in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (0.19.2)
Requirement already satisfied: matplotlib-inline in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (0.1.7)
Requirement already satisfied: prompt-toolkit<3.1.0,>=3.0.41 in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (3.0.50)
Requirement already satisfied: pygments>=2.4.0 in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (2.19.1)
Requirement already satisfied: stack-data in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (0.6.3)
Requirement already satisfied: exceptiongroup in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (1.2.2)
Requirement already satisfied: pexpect<4.3 in /opt/conda/lib/python3.10/site-packages (from ipython<10->ipympl) (4.9.0)
Requirement already satisfied: comm>=0.1.3 in /opt/conda/lib/python3.10/site-packages (from ipywidgets<9,>7.6.0->ipympl) (0.2.2)
Requirement already satisfied: widgetsnbextension=>4.0.12 in /opt/conda/lib/python3.10/site-packages (from ipywidgets<9,>7.6.0->ipympl) (4.0.13)
Requirement already satisfied: jupyterlab-widgets=>3.0.12 in /opt/conda/lib/python3.10/site-packages (from ipywidgets<9,>7.6.0->ipympl) (3.0.13)
Requirement already satisfied: pytz>=2020.1 in /opt/conda/lib/python3.10/site-packages (from pandas=0.17.1->plot-utils) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in /opt/conda/lib/python3.10/site-packages (from pandas=0.17.1->plot-utils) (2025.2)
Requirement already satisfied: six=>1.5 in /opt/conda/lib/python3.10/site-packages (from python-dateutil>=2.7->matplotlib) (1.17.0)
Requirement already satisfied: parso<0.9.0,>=0.8.4 in /opt/conda/lib/python3.10/site-packages (from jedi>=0.16->ipython<10->ipympl) (0.8.4)
Requirement already satisfied: ptyprocess>=0.5 in /opt/conda/lib/python3.10/site-packages (from pexpect<4.3->ipython<10->ipympl) (0.7.0)
Requirement already satisfied: wccwid in /opt/conda/lib/python3.10/site-packages (from prompt-toolkit<3.1.0,>=3.0.41->ipython<10->ipympl) (0.2.13)
Requirement already satisfied: executing>=1.2.0 in /opt/conda/lib/python3.10/site-packages (from stack-data->ipython<10->ipympl) (2.2.0)
Requirement already satisfied: asttokens>=2.1.0 in /opt/conda/lib/python3.10/site-packages (from stack-data->ipython<10->ipympl) (3.0.0)
Requirement already satisfied: pure-eval in /opt/conda/lib/python3.10/site-packages (from stack-data->ipython<10->ipympl) (0.2.3)
Downloading ipympl-0.9.7-py3-none-any.whl (515 kB)
Downloaded plot_utils-0.6.14-py2.py3-none-any.whl (13.3 MB)
13.3/13.3 MB 106.1 MB/s eta 0:00:00
Installing collected packages: plot-utils, ipympl
Successfully installed ipympl-0.9.7 plot-utils-0.6.14

[24]: import seaborn as sns
import pandas as pd

data = pd.DataFrame({ 'x':new_values[:,0], 'y':new_values[:,1], 'sentences': input_text_lst_news})

```

