Generative AI Search: Challenge Lab

1 hour No cost

Challenge Lab Overview

This lab will challenge you to perform actions and automation across products. Instead of following step-by-step instructions, you are given a common business scenario and a set of tasks - you figure out how to complete them on your own! An automated scoring system (shown on this page) provides feedback on whether you have completed your tasks correctly.

> When you take a Challenge Lab, you will not be taught Google Cloud concepts. You will need to use your skills to assess how to build the solution to the challenge presented. This lab is only recommended for students who have those skills. Are you up for the challenge?

Objective

The objective of this challenge lab is to showcase your proficiency in integrating Search in applications with Vertex AI Search and Conversation, while also demonstrating your ability to leverage the Vertex AI Text-Embeddings API. Specifically, you will focus on generating embeddings for text sentences and calculating similarity using the cosine similarity function. In this lab, you will design and implement a comprehensive solution that combines powerful search capabilities, a virtual assistant, and text embeddings for semantic search and similarity calculations to enhance the user experience.

Setup

Qwiklabs setup

For each lab, you get a new Google Cloud project and set of resources for a fixed time at no cost.

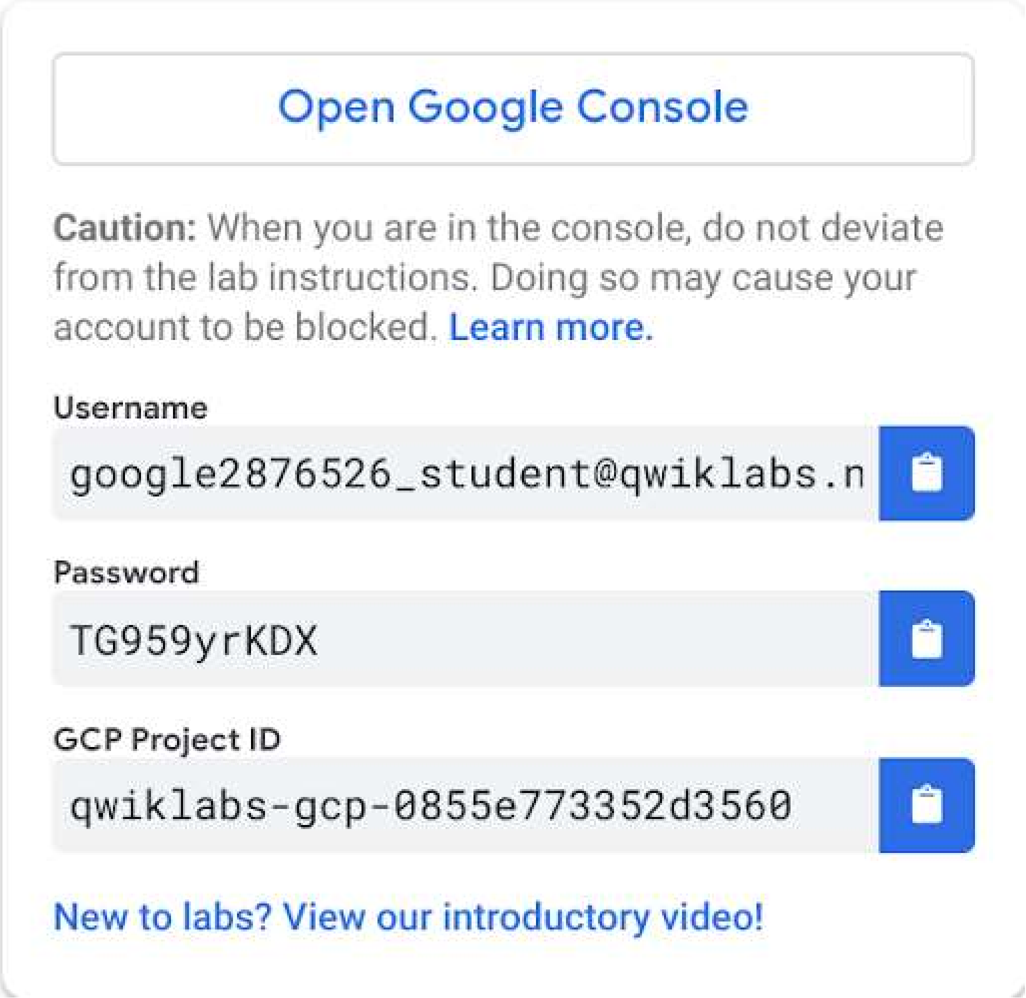
1. Make sure you signed into Qwiklabs using an **incognito window**.

2. Note the lab's access time (for example, and make sure you can finish in that time block.

   There is no pause feature. You can restart if needed, but you have to start at the beginning.

3. When ready, click .

4. Note your lab credentials. You will use them to sign in to the Google Cloud Console.



Open Google Console

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. Learn more.

Username

google2876526_student@qwiklabs.n

Password

TG959yrKDX

GCP Project ID

qwiklabs-gcp-0855e773352d3560

New to labs? View our introductory video!

5. Click **Open Google Console**.

6. Click **Use another account** and copy/paste credentials for **this** lab into the prompts.

If you use other credentials, you'll get errors or **incur charges**.

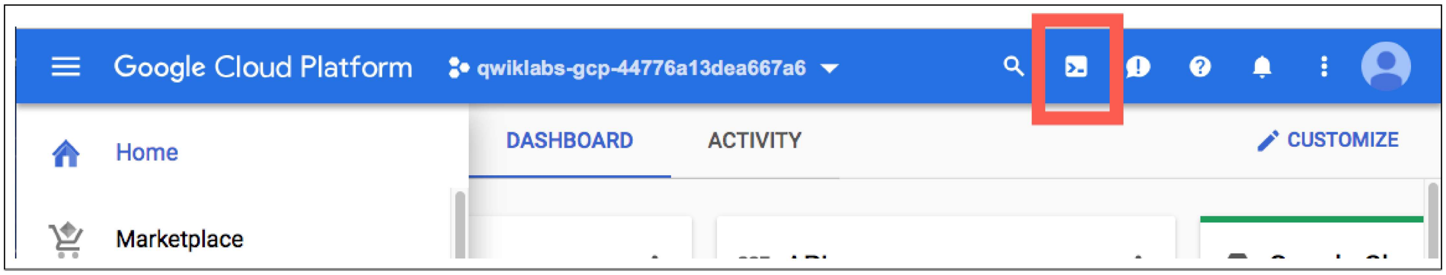
7. Accept the terms and skip the recovery resource page.

Do not click **End Lab** unless you are finished with the lab or want to restart it. This clears your work and removes the project.

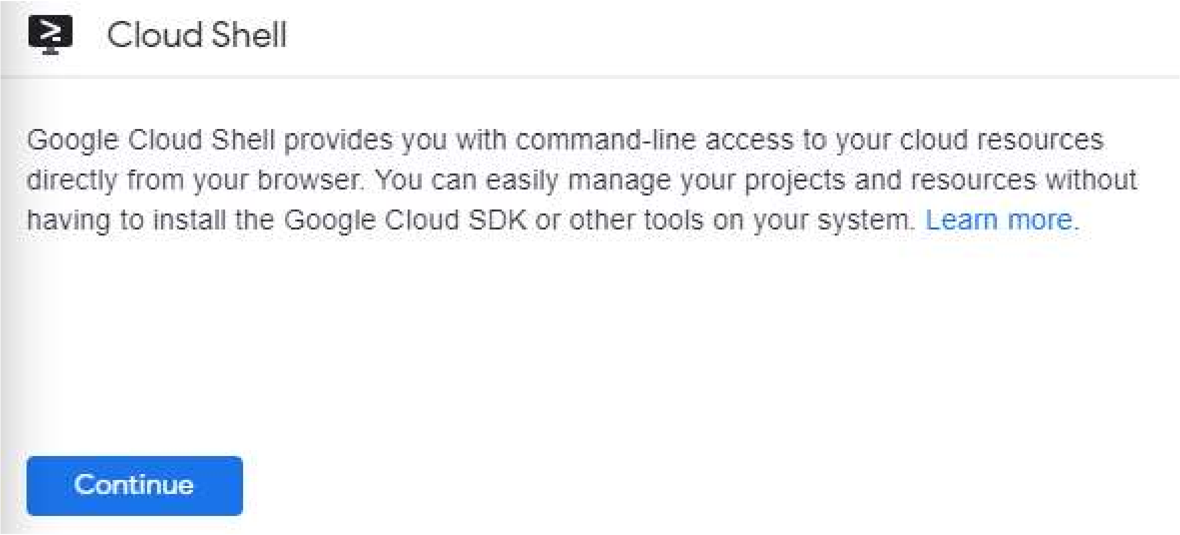
Activate Cloud Shell

Cloud Shell is a virtual machine that is loaded with development tools. It offers a persistent 5GB home directory and runs on the Google Cloud. Cloud Shell provides command-line access to your Google Cloud resources.

In the Cloud Console, in the top right toolbar, click the **Activate Cloud Shell** button.



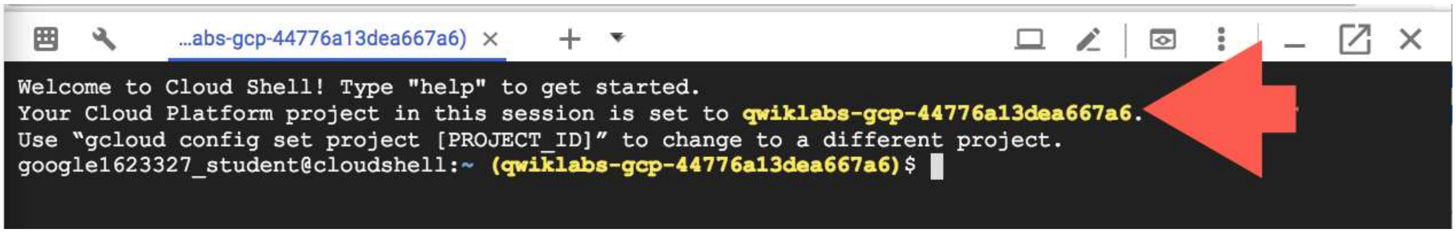
Click **Continue**.


Cloud Shell

Google Cloud Shell provides you with command-line access to your cloud resources directly from your browser. You can easily manage your projects and resources without having to install the Google Cloud SDK or other tools on your system. Learn more.

Continue

It takes a few moments to provision and connect to the environment. When you are connected, you are already authenticated, and the project is set to your *PROJECT_ID*. For example:



```
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to qwiklabs-gcp-44776a13dea667a6.
Use “gcloud config set project [PROJECT_ID]” to change to a different project.
google1623327_student@cloudshell:~ (qwiklabs-gcp-44776a13dea667a6)$
```

`gcloud` is the command-line tool for Google Cloud. It comes pre-installed on Cloud Shell and supports tab-completion.

You can list the active account name with this command:

```
gcloud auth list
```

(Output)

```
Credentialed accounts:
 - <myaccount>@<mydomain>.com (active)
```

(Example output)

```
Credentialed accounts:
 - google1623327_student@qwiklabs.net
```

You can list the project ID with this command:

```
gcloud config list project
```

(Output)

```
[core]
project = <project_ID>
```

(Example output)

```
[core]
project = qwiklabs-gcp-44776a13dea667a6
```

For full documentation of `gcloud` see the gcloud command-line tool overview.

Challenge Scenario

Cymbal Shops

Here is a company overview as provided on the Cymbal Shops's website.

Cymbal Shops is an American retail chain headquartered in Minneapolis that sells homeware, electronics, and clothing.

Founded in 1974, Cymbal Shops started out as Cymbal Air, selling AC systems manufactured by Cymbal Group in Minnesota and neighboring states. The company quickly expanded into domestic merchandise in order to satisfy the need for quality products at an affordable price in the midst of a recession.

Cymbal Shops' broad product assortment was once a benefit - capturing planned purchases and last minute splurges. In recent years, however, the company has struggled to adapt to the acceleration in e-commerce. Digitally native companies are on the rise and Cymbal Shops must implement significant changes in order to keep pace and maintain relevance. Today, Cymbal Shops operates 714 stores across North America and reported $15 billion in revenue in 2019. They currently employ 80,400 employees across the United States and Canada.

Cymbal Shops is a digitally transforming legacy retailer.

It is inspired by clients like: Bed Bath & Beyond, Best Buy, Home Depot, Nordstrom.

Your challenge

You work as an engineer at Cymbal Shops, a retail chain company renowned for its innovative solutions. Cymbal Shops is embarking on a significant project that involves developing a robust search functionality and virtual assistant for a new application. Your task is to design a Proof of Concept (POC) solution that seamlessly integrates Vertex AI Search, Conversation, and focuses on generating embeddings for text sentences using the Vertex AI Text-Embeddings API. Additionally, you will calculate similarity using the cosine similarity function.

Cymbal Shops' new application demands a powerful and efficient search feature, aiming to catalog and retrieve various data types, including text documents, images, and structured data using Vertex AI Search. Additionally, the company aims to create a virtual assistant using Vertex AI Conversation to assist customers with queries about products and devices available in the Google Store. The virtual assistant will be built and configured using Vertex AI Conversation. Moreover, the solution should leverage text embeddings generated by the Vertex AI Text-Embeddings API for semantic search and similarity calculations.

Therefore in this lab, you should:

1. Create a website search app named `App Name 1`.

2. Create a structured data search app `App Name 2`.

3. Create an unstructured data search app `App Name 3`.

4. Create a generative chat application named `Agent Name`.

5. Enhance customer engagement and optimize performance.

6. Generate embeddings for text sentences.

7. Calculate similarity from embeddings using the cosine similarity function.

Task 1. Create a website search app

In this task, demonstrate how Vertex AI Search can be utilized to create a web search application, showcasing its effectiveness in searching and retrieving content from websites. This app should be capable of crawling web content, indexing it, and providing users with the ability to search for information.

Therefore in this task:

1. Create an app named `App Name 1` of type `Search` and set the location of the app to `Global`.

2. Configure this app to use a datastore named `Datastore Name 1` that indexes data from the following website: cloud.google.com/*.

3. Finally, preview the app and verify if it is working as intended.

Click **Check my progress** to verify the objectives.

○

Create a website search app

Check my progress

Task 2. Create a structured and unstructured data search app

In this task, showcase how Vertex AI Search can be employed to create a structured data search application, emphasizing its capabilities in handling and searching structured information. The application should allow users to search for specific data points, filter results, and navigate through structured information efficiently.

Therefore in this task:

1. Create an app named `App Name 2` of type `Search` and set the location of the app to `Global`.

2. Configure this app to use a datastore named `Datastore Name 2` that ingests data from the following Cloud Storage bucket: `cloud-samples-data/gen-app-builder/search/kaggle_movies`.

> **Hint**: This Cloud Storage bucket contains Newline Delimited JSON-formatted dataset of movies made available by Kaggle.

3. Preview the `Datastore Name 2` app and configure the search results to only display the following:

Key	**Value**
Title	title
Thumbnail	poster_path
Text 1	tagline
Text 2	revenue

4. Finally, preview the app and verify if it is working as intended.

Click **Check my progress** to verify the objectives.

○

Create a structured data search app

Check my progress

In this sub task, demonstrate how Vertex AI Search can be harnessed to create an unstructured data search application, illustrating its proficiency in searching and presenting unstructured content.

Therefore, in this task,

5. Create an app named `App Name 3` of type `Search` and set the location of the app to `Global`.

6. Configure this app to use a datastore named `Datastore Name 3` that ingests unstructured data from the following Cloud Storage bucket: `cloud-samples-data/gen-app-builder/search/alphabet-investor-pdfs`.

7. Finally, preview the app and verify if it is working as intended.

Click **Check my progress** to verify the objectives.

○

Create a unstructured data search app

Check my progress

Task 3. Create a generative chat application

In this task, you should create a Data Store Agent using Vertex AI Conversation. This agent should be able to comprehend unstructured data. Your objective is to configure and deploy a virtual agent that can provide assistance to customers, with a particular focus on handling unstructured information.

Therefore, in this task,

1. Enable necessary APIs: Dialogflow and Vertex AI Search and Conversation.

2. Create a Chat application with the following configurations:

Key	**Property**
Company Name	`Company Name`

Agent Name	`Agent Name`

3. Configure this application to use a `Datastore Name 4` that ingests unstructured data from the folder present in the following Cloud Storage bucket: `cloud-samples-data/gen-app-builder/search/alphabet-investor-pdfs`

Note: It can take up to 10 minutes for your documents to be available and ready for use by your agent while your newly added data is being indexed.

4. Test the virtual agent by starting an interactive session with the chatbot to see how it responds to various questions that a customer might ask.

   a. Type a greeting to your agent such as Hello.

   b. Ask the agent the some questions such as.

   - What was the revenue for Google in 2004?
   - Where does Google see the most potential opportunity for long term growth?
   - Where is Google allocating the most amount of its capital?

Note: If your agent is giving you responses from the default negative intent (e.g., "I'm sorry, I didn't get that. Can you rephrase your question?"), then be aware that it can take some time for the agent to be ready for use while your domains, URLs, or documents are being indexed.

Click **Check my progress** to verify the objectives.

○

Create a generative chat application

Check my progress

Task 4. Enhance customer engagement and optimize performance

In this task, you will set up both voice and chat interactions for your virtual agent, created with Vertex AI Conversation. The objective is to create versatile communication channels that allow customers to engage with your agent through voice commands and text-based chat, delivering a flexible and user-friendly experience. You will further delve into the conversation history and analytics of your Data Store Agent to view and interpret data related to customer interactions, agent responses, and overall performance. Understanding these analytics is essential for optimizing your virtual agent's capabilities and enhancing customer service.

Therefore in this task;

1. Integrate a phone gateway into your bot named `Agent Name` for the United States.Name this phone gateway as `Phone Gateway Name`.

> **Note:** This bot makes use of the Speech-to-Text and Text-to-Speech capabilities in Google Cloud.

2. Embed a chat widget on a website so customers can chat with it in addition to making a phone call to speak with it.
3. Finally, enable interaction logging for conversation history and analytics to view statistics related to agent requests and responses, and determine where the problems and friction points are in your virtual agent.

Click **Check my progress** to verify the objectives.

○

Enhance customer engagement and optimize performance

Check my progress

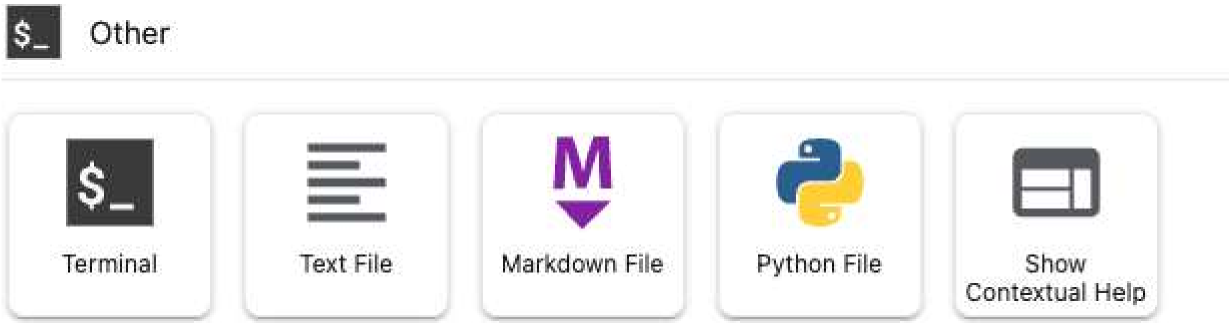
Task 5. Generate embedding and calculate similarity

Open Python notebook and install libraries

1. In the top search bar of Cloud Console enter `Vertex AI` and select the Vertex AI option.

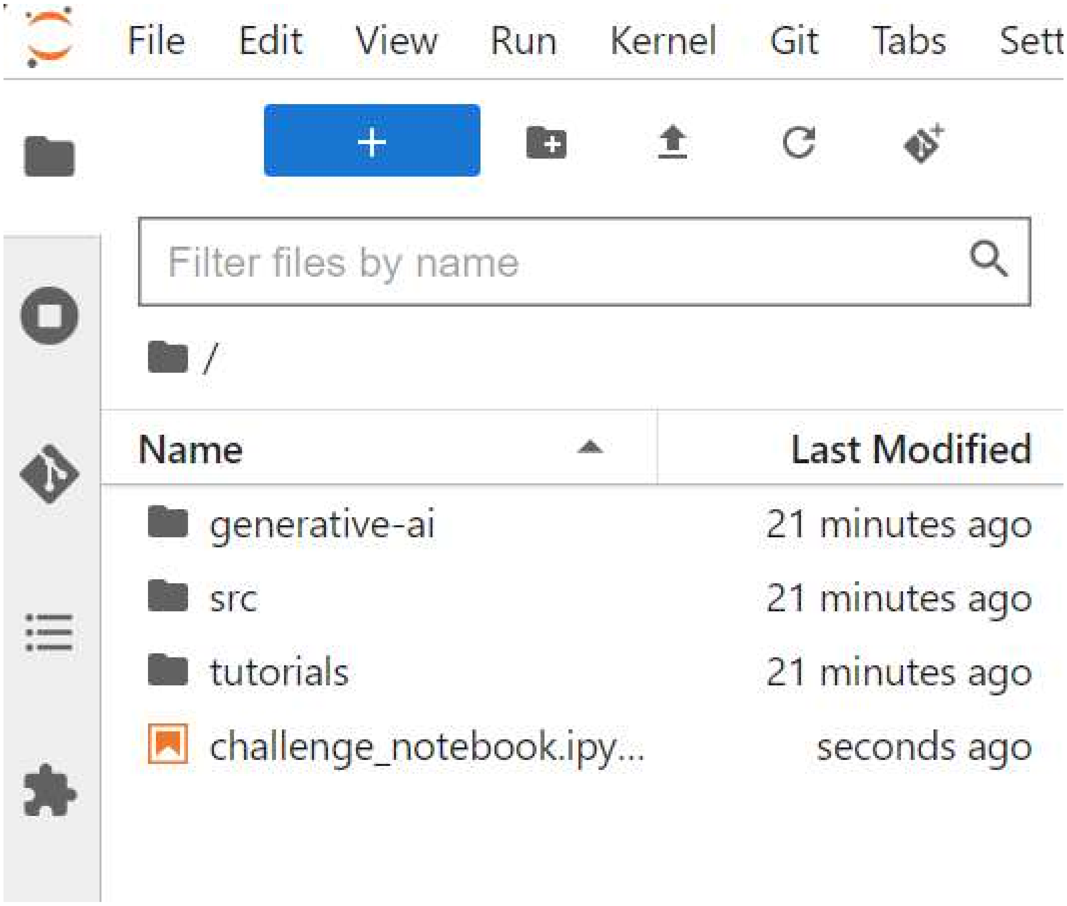
2. On the left navigation menu select **Workbench** > **User-Managed Notebooks** > **generative-ai-jupyterlab** > **Open Jupyterlab**.

3. Once your Jupyter notebook opens select **Terminal**.



4. Use `gsutil` to download the `challenge_notebook.ipynb` Ipython notebook file from the Cloud Storage bucket `gs://partner-usecase-bucket/genai024/`.

5. Click on the refresh button on top of the file browser to see the IPython Notebook you just downloaded and open it.



Click **Check my progress** to verify the objective.

○ Download Jupyter notebook file

Check my progress

6. Select the first cell of the notebook and either hit the play button on the notebook toolbar or press `Shift + Enter` on your keyboard to execute the cell.

Generate embeddings

7. Use the notebook toolbar to press the play icon or enter Shift + Enter to run the all of the cells of the notebook up until the cell with the following statement:

8. The next cell exports your `PROJECT_ID` AND `REGION`. Subsitute the values, as shown in **Connection Details Panel** on the left hand side.

Output:

```
PROJECT = !gcloud config get-value project
PROJECT_ID = PROJECT[0]
REGION = 'GCP REGION'
```

The block should look like this:

```
PROJECT = !gcloud config get-value project
PROJECT_ID = PROJECT[0]
REGION = "Lab GCP Region"
```

content_c

```
# Set up the Cloud Logging client
from google.cloud import logging as cloud_logging
import logging

client = cloud_logging.Client()
handler = cloud_logging.handlers.CloudLoggingHandler(client)
logging.getLogger().setLevel(logging.INFO)
logging.getLogger().addHandler(handler)
```

9. In the next cell, add statements to load a pre-trained text embedding model named **textembedding-gecko@001**.

10. In the next cell, obtain text embeddings for the following sentences: `I love natural language processing, Machine learning is fascinating`

11. In the next cell, write a code to provide information about the length and initial values of the vector representation of the first input text sentence obtained from the text embedding model.

Your code must extract the numerical values (vector) from the first element of the embedding result (embedding[0]) and store the result in a variable named vector. Then, log the length (dimensionality) and the first 10 values of the vector using the following lines of code already provided in the cell.

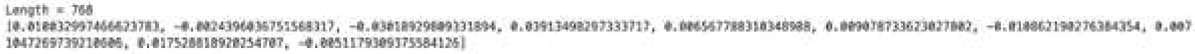
Example:

```
logging.info(f"Length of the vector: {len(vector)}")
logging.info(f"First 10 values of the vector: {vector[:10]}")
```

content_c

This is a common practice to inspect the characteristics of the obtained embeddings.

The output should look similar to the following.



```
Length = 768
[0.010032997466623783, -0.0024396036751568317, -0.03018929809131894, 0.03913498297333717, 0.006567788310348988, 0.009078733623027002, -0.010862190276384354, 0.007
1047269739210606, 0.017528818920254707, -0.0051179309375584126]
```

Calculate the similarity from embeddings

12. To calculate the similarity we will use the sklearn libraries, specifically the cosine_similarity function. Run the next cell to import them.

13. In the next cell, write a code to generate individual embeddings for the following sentences:

    a. Artificial intelligence is transforming industries.

    b. Exploring the wonders of deep learning.

14. Subsequently, define vectors `vec_1` and `vec_2` that hold the numerical values that represent the semantic content of the respective sentences in the embedding space.

15. Finally, in the next cell, write a code that prints the similarity between these vectors. The cell already has necessary lines of code that logs the value.

The output should look similar to the following

Output:

```
[[0.60454496]]
```

Click **Check my progress** to verify the objective.

○ Generate and calculate the embedding

Check my progress

Congratulations!

You've successfully integrated Search in applications with Vertex AI Search and