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Develop Advanced Enterprise Search and Conversation Applications

Course · 8 hours

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Search

Improving RAG Solutions

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Using BigQuery Embeddings in a RAG Architecture

Challenge Lab

Generative AI Search: Challenge

Course > Develop Advanced Enterprise Search and Conversation Applications >

Quick tip: Review the prerequisites before you run the lab

[End Lab](#)

00:25:38

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.](#)[Open Google Cloud console](#)

GCP Username

student-00-9ca827e73a99e



GCP Password

vq0QnZhGn1ZX



GCP Project ID

qwiklabs-gcp-02-9c2eeccac



Using Vertex AI Vector Search and Vertex AI Embeddings for Text for StackOverflow Questions

Lab 2 hours No cost Intermediate

★★★☆☆

This lab may incorporate AI tools to support your learning.

Overview

This lab demonstrates how to provide semantic search to a large dataset of questions from StackOverflow. Because of the large size of the dataset, you will query the questions using BigQuery. Then, you will create text embeddings from the questions using the [Vertex AI Text-Embeddings API](#) service and store them in a Cloud Storage bucket. Once all embeddings are created, you will create a [Vertex AI Vector Search](#) index for those embeddings, so that you can search them afterwards.

The Vertex AI Text-Embeddings API enhances the process of generating text embeddings. These text embeddings, which are numerical representations of text, play a pivotal role in many tasks involving the identification of similar items, like Google searches, online shopping recommendations, and personalized music suggestions.

Vertex AI Vector Search Engine service is a high-scale, low-latency solution, for finding similar vectors from a large corpus. Vector Search is a fully managed offering, further reducing operational overhead. It is built upon [Approximate Nearest Neighbor \(ANN\) technology](#) developed by Google Research.

Check out [this demo page](#) to see what you will accomplish at the end of this lab.

What you will learn:

- Query a public dataset using BigQuery.
- Convert a BigQuery dataset to embeddings using the Vertex AI Text-Embeddings API.
- Create an index in Vertex AI Vector Search.
- Upload embeddings to the index.
- Create an index endpoint.
- Deploy the index to the index endpoint.
- Perform an online query.

Setup and requirements

Before you click the Start Lab button

Read these instructions. Labs are timed and you cannot pause them. The timer, which starts when you click **Start Lab**, shows how long Google Cloud resources will be made available to you.

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What you need

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- Access to a standard internet browser (Chrome browser recommended).
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Workbench

Task 3. Set up the Jupyter notebook environment

Task 4. Prepare the data in BigQuery

Task 5. Create text embeddings from BigQuery data

Task 6. Upload embeddings to Cloud Storage

Task 7. Create an index in Vertex AI Vector Search for your embeddings

Task 8. Create online queries

Task 9. Clean up the Google Cloud environment

Congratulations

[Next >](#)

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Note: If you are using a Pixelbook, open an Incognito window to run this lab.

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3. Reference the index name to make sure it got created successfully.

```
INDEX_RESOURCE_NAME = tree_ah_index.resource_name  
INDEX_RESOURCE_NAME
```

4. Using the resource name, you can retrieve an existing `MatchingEngineIndex`.

```
tree_ah_index =  
aiplatform.MatchingEngineIndex(index_name=INDEX_RESOURCE_NAME)
```

5. Create an `IndexEndpoint` so that it can be accessed via an API.

```
my_index_endpoint =  
aiplatform.MatchingEngineIndexEndpoint.create(  
    display_name=DISPLAY_NAME,  
    description=DISPLAY_NAME,  
    public_endpoint_enabled=True,
```

6. Deploy your index to the created endpoint. This can take up to 15 minutes.

```
DEPLOYED_INDEX_ID = "deployed_index_id_unique"  
  
DEPLOYED_INDEX_ID  
  
my_index_endpoint = my_index_endpoint.deploy_index(  
    index=tree_ah_index, deployed_index_id=DEPLOYED_INDEX_ID  
)  
  
my_index_endpoint.deployed_indexes
```

7. Verify number of declared items matches the number of embeddings. Each `IndexEndpoint` can have multiple indexes deployed to it. For each index, you can retrieve the number of deployed vectors using the `index_endpoint._gca_resource.index_stats.vectors_count`. The numbers may not match exactly due to potential rate-limiting failures incurred when using the embedding service.

```
aiplatform.MatchingEngineIndex(  
    deployed_index=index  
)  
    ._gca_resource.index_stats.vectors_count  
    for deployed_index in my_index_endpoint.deployed_indexes  
)  
  
print(f"Expected: {BQ_NUM_ROWS}, Actual: {number_of_vectors}")
```

Task 8. Create online queries

After you build your indexes, you may query against the deployed index to find nearest neighbors.

Note: For the `DOT_PRODUCT_DISTANCE` distance type, the "distance" property

1. Create an embedding for a test question.

```
test_embeddings = encode_texts_to_embeddings(sentences=["Install  
GPU for Tensorflow"])
```

2. Test the query to retrieve the similar embeddings.

```
NUM_NEIGHBOURS = 10  
  
response = my_index_endpoint.find_neighbors()
```

```
    deployed_index_id=DEPLOYED_INDEX_ID,
    queries=test_embeddings,
    num_neighbors=NUM_NEIGHBOURS,
)
response
```

3. Verify that the retrieved results are relevant by checking the StackOverflow links.

```
for match_index, neighbor in enumerate(response[0]):
    print(f"https://stackoverflow.com/questions/{neighbor.id}")
```

Task 9. Clean up the Google Cloud environment

To clean up all Google Cloud resources used in this project, you can delete the Google Cloud project you used for the lab. You can also manually delete resources that you created by running the following code.

```
import os
delete_bucket = False

my_index_endpoint.delete(force=True)

# Delete indexes
tree_ah_index.delete()

if delete_bucket or os.getenv("IS_TESTING"):
    ! gsutil rm -rf {BUCKET_URI}
```

Congratulations

You have now completed the lab! In this lab, you created a semantic search system using Vertex AI Text-Embeddings API and Vertex AI Vector Search. You did that with a big dataset and learned how to work around API limits and quotas, the same way you would have to in a production environment.

Next steps

- Check out the [Generative AI on Vertex AI documentation](#).
- Learn more about Generative AI on the [Google Cloud Tech YouTube channel](#).

Google Cloud Training & Certification

...helps you make the most of Google Cloud technologies. [Our classes](#) include technical skills and best practices to help you get up to speed quickly and continue your learning journey. We offer fundamental to advanced level training, with on-demand, live, and virtual options to suit your busy schedule. [Certifications](#) help you validate and prove your skill and expertise in Google Cloud technologies.

Manual Last Updated October 15, 2024

Lab Last Tested October 15, 2024

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