CS571 – Cloud computing Infrastructure

Week – 11 Homework 2

Q5 ==> GenAI - Develop your containerized app

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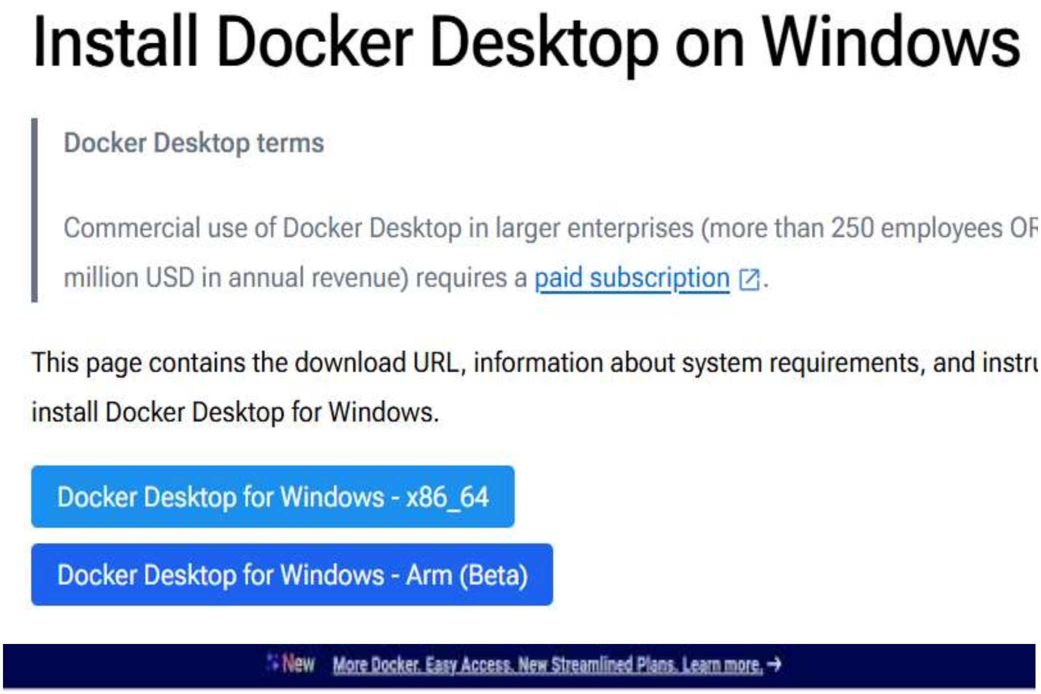
1. First, install the latest version of Docker Desktop for windows.

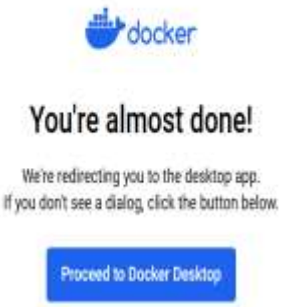


Install Docker Desktop on Windows

> **Docker Desktop terms**
>
> Commercial use of Docker Desktop in larger enterprises (more than 250 employees OF
> million USD in annual revenue) requires a paid subscription.

This page contains the download URL, information about system requirements, and instru install Docker Desktop for Windows.

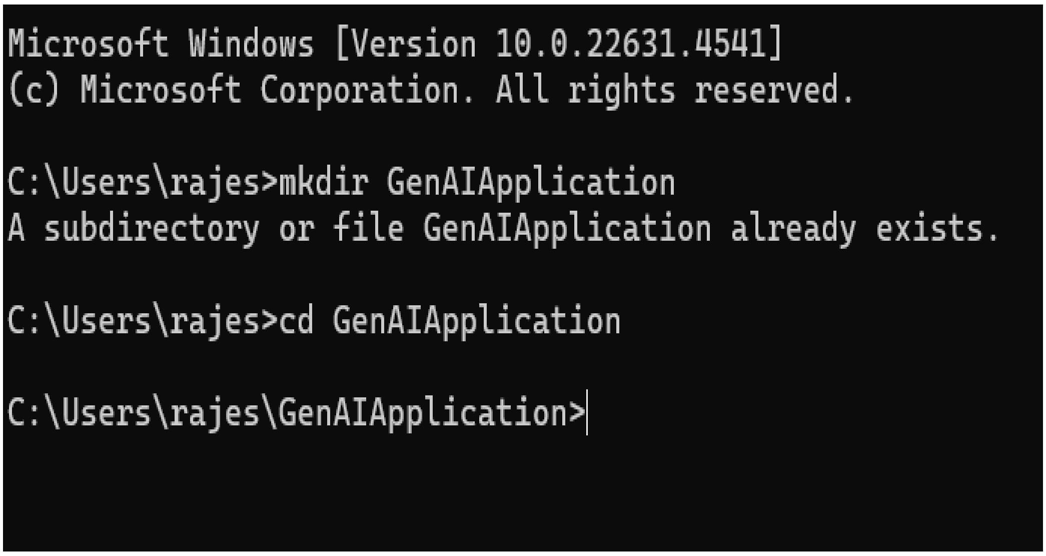
Docker Desktop for Windows - x86_64
Docker Desktop for Windows - Arm (Beta)
New More Docker. Easy Access. New Streamlined Plans. Learn more. →



You're almost done!

We're redirecting you to the desktop app.
If you don't see a dialog, click the button below.

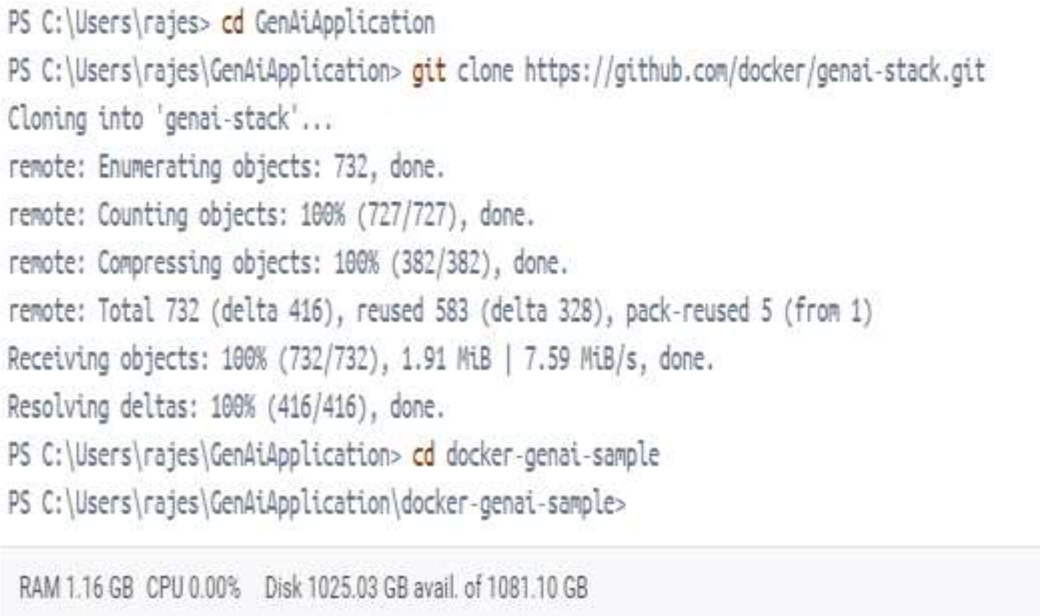
2. Create a working directory and navigate inside it(optional).



```
Microsoft Windows [Version 10.0.22631.4541]
(c) Microsoft Corporation. All rights reserved.

C:\Users\rajes>mkdir GenAIApplication
A subdirectory or file GenAIApplication already exists.

C:\Users\rajes>cd GenAIApplication

C:\Users\rajes\GenAIApplication>
```

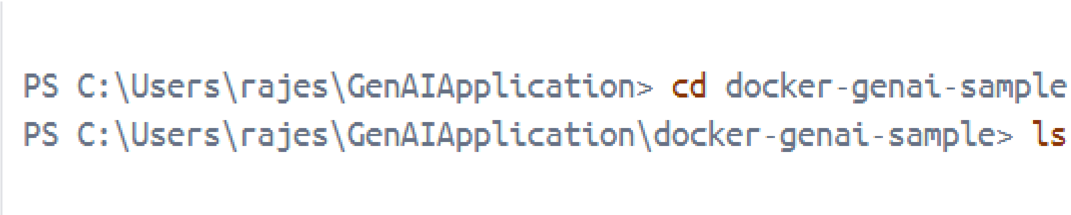
3. Clone the sample application. We run the following command to clone the repository:

git clone https://github.com/craig-osterhout/docker-genai-sample

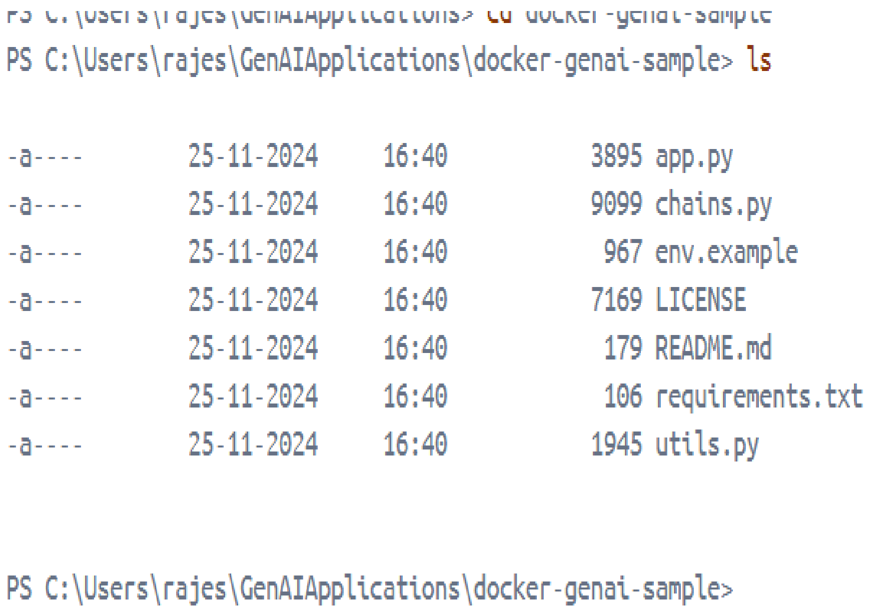


```
PS C:\Users\rajes> cd GenAiApplication
PS C:\Users\rajes\GenAiApplication> git clone https://github.com/docker/genai-stack.git
Cloning into 'genai-stack'...
remote: Enumerating objects: 732, done.
remote: Counting objects: 100% (727/727), done.
remote: Compressing objects: 100% (382/382), done.
remote: Total 732 (delta 416), reused 583 (delta 328), pack-reused 5 (from 1)
Receiving objects: 100% (732/732), 1.91 MiB | 7.59 MiB/s, done.
Resolving deltas: 100% (416/416), done.
PS C:\Users\rajes\GenAiApplication> cd docker-genai-sample
PS C:\Users\rajes\GenAiApplication\docker-genai-sample>
```

- You should now have the following files in your docker-genai-sample directory.-



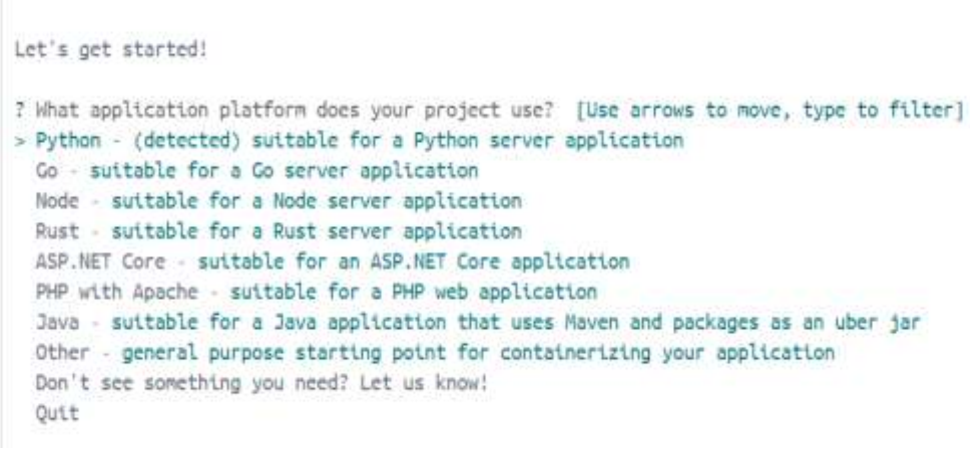
```
PS C:\Users\rajes\GenAIApplication> cd docker-genai-sample
PS C:\Users\rajes\GenAIApplication\docker-genai-sample> ls
```



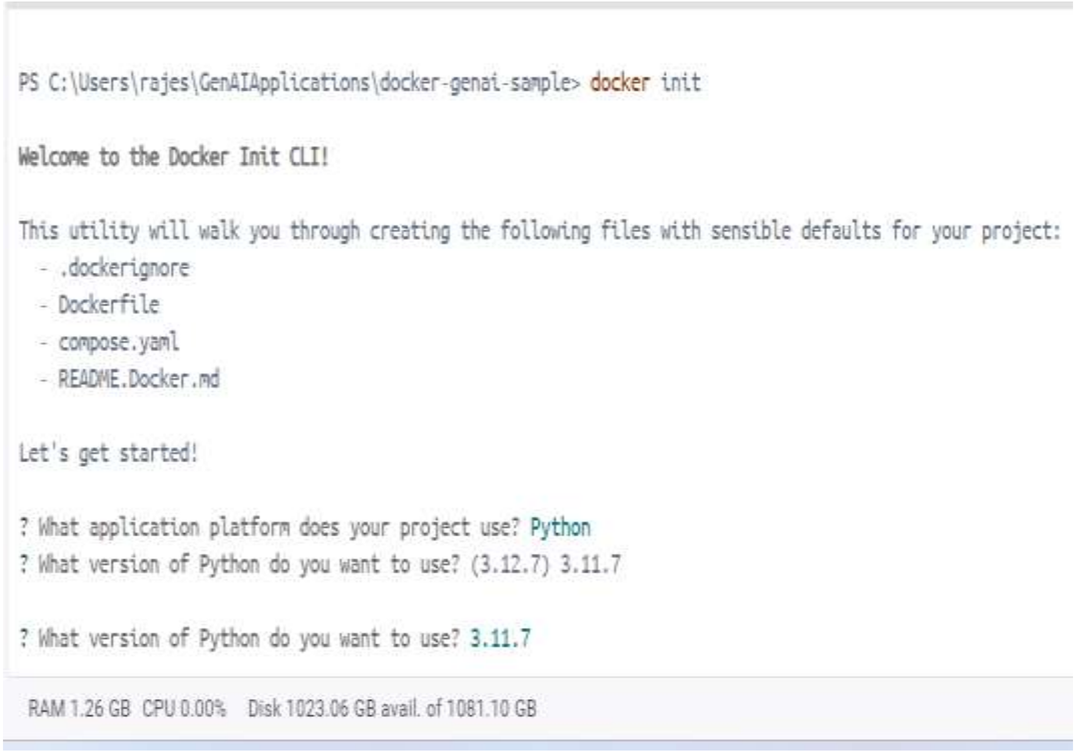
```
PS C:\Users\rajes\GenAIApplications> cd docker-genai-sample
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> ls

-a----        25-11-2024     16:40          3895 app.py
-a----        25-11-2024     16:40          9099 chains.py
-a----        25-11-2024     16:40           967 env.example
-a----        25-11-2024     16:40          7169 LICENSE
-a----        25-11-2024     16:40           179 README.md
-a----        25-11-2024     16:40           106 requirements.txt
-a----        25-11-2024     16:40          1945 utils.py


PS C:\Users\rajes\GenAIApplications\docker-genai-sample>
```

---

4. Now that we have an application, we can use docker init to create the necessary Docker assets to containerize our application. Inside the docker-genai-sample directory, run the docker init command.

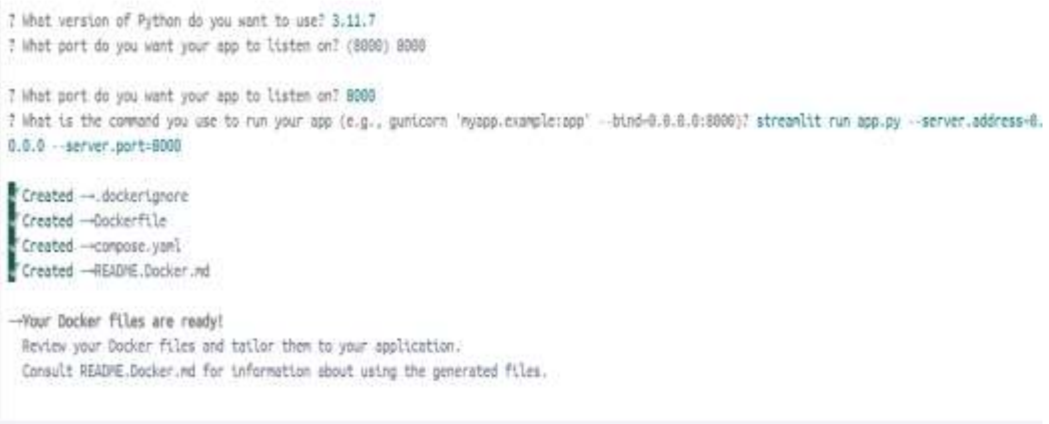


```
Let's get started!

? What application platform does your project use?  [Use arrows to move, type to filter]
> Python - (detected) suitable for a Python server application
  Go - suitable for a Go server application
  Node - suitable for a Node server application
  Rust - suitable for a Rust server application
  ASP.NET Core - suitable for an ASP.NET Core application
  PHP with Apache - suitable for a PHP web application
  Java - suitable for a Java application that uses Maven and packages as an uber jar
  Other - general purpose starting point for containerizing your application
  Don't see something you need? Let us know!
  Quit
```

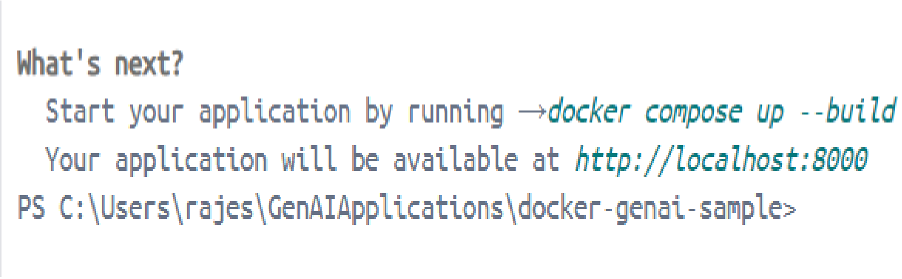


```
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> docker init

Welcome to the Docker Init CLI!

This utility will walk you through creating the following files with sensible defaults for your project:
  - .dockerignore
  - Dockerfile
  - compose.yaml
  - README.Docker.md

Let's get started!

? What application platform does your project use? Python
? What version of Python do you want to use? (3.12.7) 3.11.7

? What version of Python do you want to use? 3.11.7
```

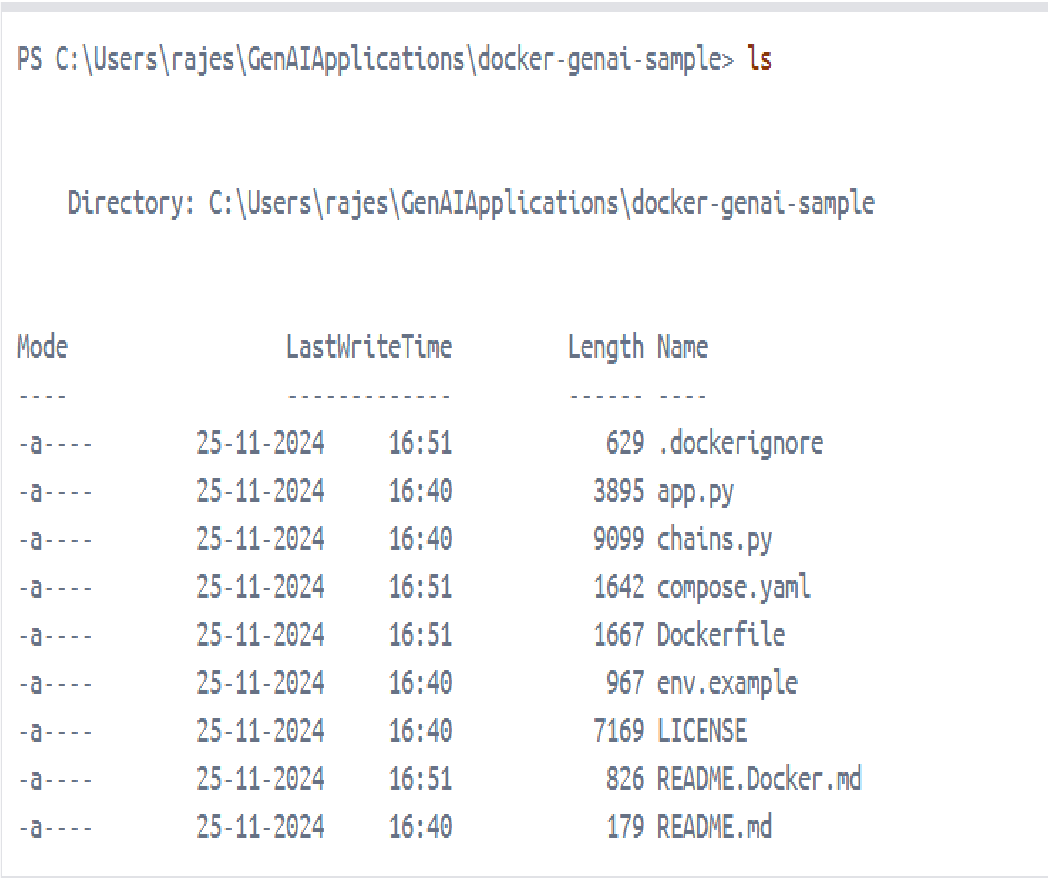
RAM 1.26 GB CPU 0.00% Disk 1023.06 GB avail. of 1081.10 GB



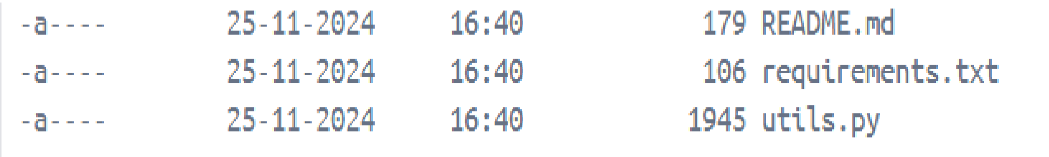
```
? What version of Python do you want to use? 3.11.7
? What port do you want your app to listen on? (8000) 8000

? What port do you want your app to listen on? 8000
? What is the command you use to run your app (e.g., gunicorn 'myapp.example:app' --bind=0.0.0.0:8000)? streamlit run app.py --server.address=0.
0.0.0 --server.port=8000

Created →.dockerignore
Created →Dockerfile
Created →compose.yaml
Created →README.Docker.md

→Your Docker files are ready!
 Review your Docker files and tailor them to your application.
 Consult README.Docker.md for information about using the generated files.
```



```
What's next?
  Start your application by running →docker compose up --build
  Your application will be available at http://localhost:8000
PS C:\Users\rajes\GenAIApplications\docker-genai-sample>
```

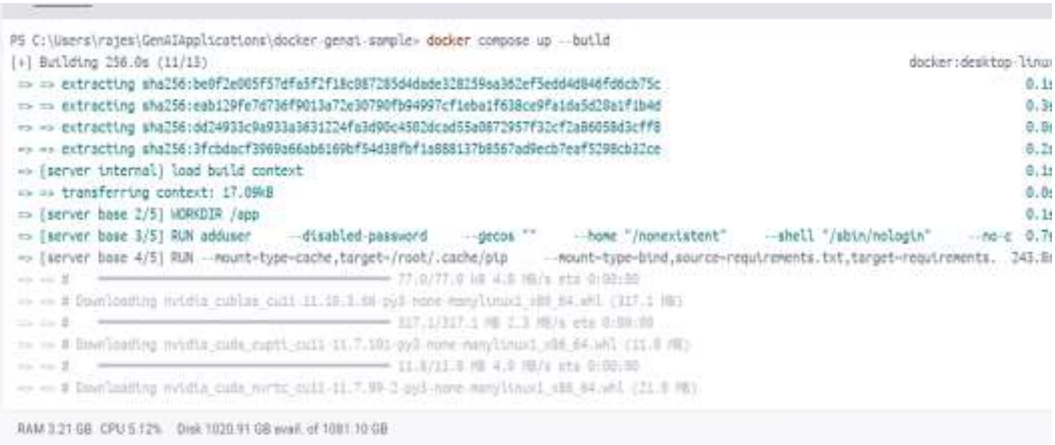


```
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> ls


    Directory: C:\Users\rajes\GenAIApplications\docker-genai-sample


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----        25-11-2024     16:51            629 .dockerignore
-a----        25-11-2024     16:40           3895 app.py
-a----        25-11-2024     16:40           9099 chains.py
-a----        25-11-2024     16:51           1642 compose.yaml
-a----        25-11-2024     16:51           1667 Dockerfile
-a----        25-11-2024     16:40            967 env.example
-a----        25-11-2024     16:40           7169 LICENSE
-a----        25-11-2024     16:51            826 README.Docker.md
-a----        25-11-2024     16:40            179 README.md
```

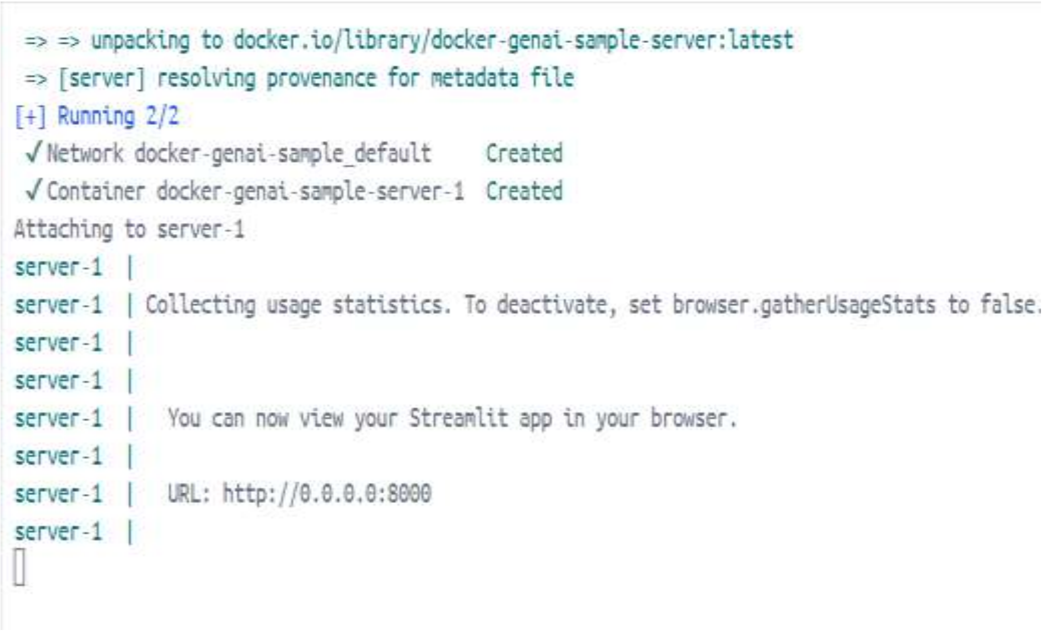


```
-a----        25-11-2024     16:40            179 README.md
-a----        25-11-2024     16:40            106 requirements.txt
-a----        25-11-2024     16:40           1945 utils.py
```

Run the following command, docker compose up –build to builds and runs your application



```
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> docker compose up --build
[+] Building 256.0s (11/13)                                                                     docker:desktop-linu
 => => extracting sha256:be0f2e065f57dfa5f2f18c087285d4dade328259aa362ef5edd4d846fd6cb75c                     0.1s
 => => extracting sha256:eab129fe7d736f9013a72e30790fb94997cf1eba1f638ce9fa1da5d28a1f1b4d                     0.3s
 => => extracting sha256:dd24933c9a933a3631224fa3d90c4582dcad55a0872957f32cf2a86058d3cff8                     0.8s
 => => extracting sha256:3fcbdacf3969a66ab6169bf54d38fbf1a888137b8567ad9ecb7eaf5298cb32ce                     0.2s
 => [server internal] load build context                                                                      0.1s
 => => transferring context: 17.09kB                                                                          0.0s
 => [server base 2/5] WORKDIR /app                                                                            0.1s
 => [server base 3/5] RUN adduser     --disabled-password     --gecos ""     --home "/nonexistent"     --shell "/sbin/nologin"     --no-c  0.7s
 => [server base 4/5] RUN --mount-type-cache,target-/root/.cache/pip     --mount-type-bind,source-requirements.txt,target-requirements.  243.8s
 => => #     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 77.0/77.0 kB 4.8 MB/s eta 0:00:00
 => => # Downloading nvidia_cublas_cu11-11.10.3.66-py3-none-manylinux1_x86_64.whl (317.1 MB)
 => => #     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 317.1/317.1 MB 2.3 MB/s eta 0:00:00
 => => # Downloading nvidia_cuda_cupti_cu11-11.7.101-py3-none-manylinux1_x86_64.whl (11.8 MB)
 => => #     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 11.8/11.8 MB 4.9 MB/s eta 0:00:00
 => => # Downloading nvidia_cuda_nvrtc_cu11-11.7.99-2-py3-none-manylinux1_x86_64.whl (21.0 MB)

RAM 3.21 GB  CPU 5.12%   Disk 1020.91 GB avail. of 1081.10 GB
```



```
 => => unpacking to docker.io/library/docker-genai-sample-server:latest
 => [server] resolving provenance for metadata file
[+] Running 2/2
 ✓ Network docker-genai-sample_default     Created
 ✓ Container docker-genai-sample-server-1  Created
Attaching to server-1
server-1  |
server-1  | Collecting usage statistics. To deactivate, set browser.gatherUsageStats to false.
server-1  |
server-1  |
server-1  |   You can now view your Streamlit app in your browser.
server-1  |
server-1  |   URL: http://0.0.0.0:8000
server-1  |
```

-Step 2: GenAI - Develop your app.

Adding a Local Database

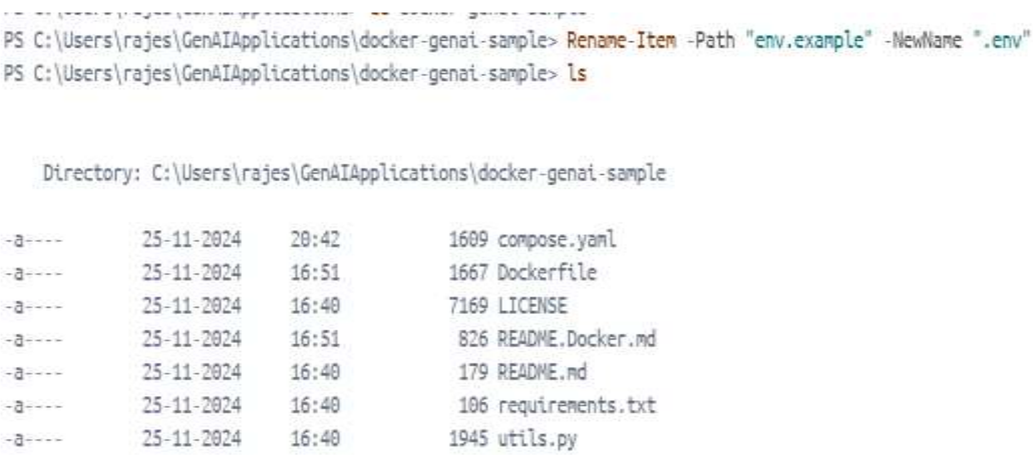
Here we will update the compose.yaml file to define a database service,

and we will specify an environment variables file to load the database connection

information rather than manually entering the information every time. To run the database service:

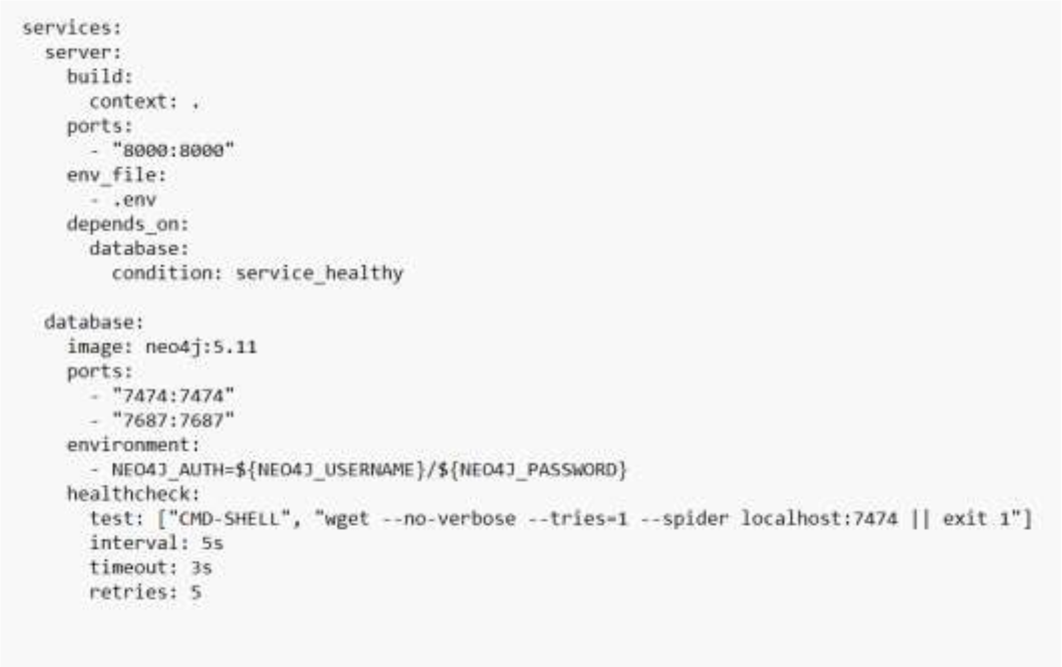
1. In the cloned repository's directory, rename env.example file to .env. This file contains the environment

variables that the containers will use.



```
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> Rename-Item -Path "env.example" -NewName ".env"
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> ls


    Directory: C:\Users\rajes\GenAIApplications\docker-genai-sample

-a----        25-11-2024     20:42           1609 compose.yaml
-a----        25-11-2024     16:51           1667 Dockerfile
-a----        25-11-2024     16:40           7169 LICENSE
-a----        25-11-2024     16:51            826 README.Docker.md
-a----        25-11-2024     16:40            179 README.md
-a----        25-11-2024     16:40            106 requirements.txt
-a----        25-11-2024     16:40           1945 utils.py
```

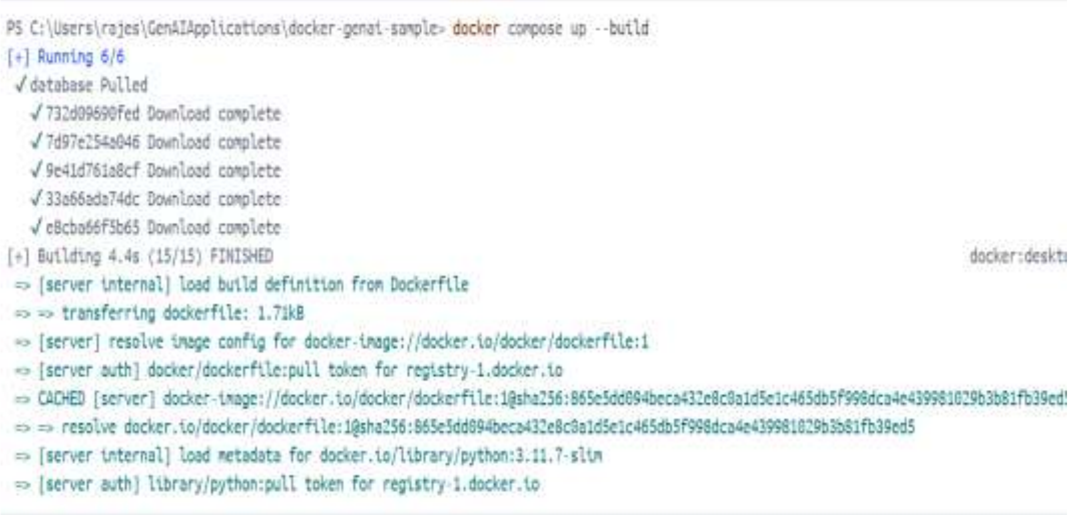
2. Then open the compose.yaml file in an IDE or text editor.



```
services:
  server:
    build:
      context: .
    ports:
      - "8000:8000"
    env_file:
      - .env
    depends_on:
      database:
        condition: service_healthy

  database:
    image: neo4j:5.11
    ports:
      - "7474:7474"
      - "7687:7687"
    environment:
      - NEO4J_AUTH=${NEO4J_USERNAME}/${NEO4J_PASSWORD}
    healthcheck:
      test: ["CMD-SHELL", "wget --no-verbose --tries=1 --spider localhost:7474 || exit 1"]
      interval: 5s
      timeout: 3s
      retries: 5
```

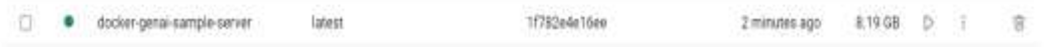
3. Run the application. Inside the docker-genai-sample directory, run the following command in a terminal.

$ docker compose up –build



```
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> docker compose up --build
[+] Running 6/6
 ✓database Pulled
   ✓732d09690fed Download complete
   ✓7d97e254a046 Download complete
   ✓9e41d761a8cf Download complete
   ✓33a66ada74dc Download complete
   ✓e8cba66f5b65 Download complete
[+] Building 4.4s (15/15) FINISHED                                                        docker:deskt
 => [server internal] load build definition from Dockerfile
 => => transferring dockerfile: 1.71kB
 => [server] resolve image config for docker-image://docker.io/docker/dockerfile:1
 => [server auth] docker/dockerfile:pull token for registry-1.docker.io
 => CACHED [server] docker-image://docker.io/docker/dockerfile:1@sha256:865e5dd094beca432e8c0a1d5e1c465db5f998dca4e439981029b3b81fb39ed5
 => => resolve docker.io/docker/dockerfile:1@sha256:865e5dd094beca432e8c0a1d5e1c465db5f998dca4e439981029b3b81fb39ed5
 => [server internal] load metadata for docker.io/library/python:3.11.7-slim
 => [server auth] library/python:pull token for registry-1.docker.io
```

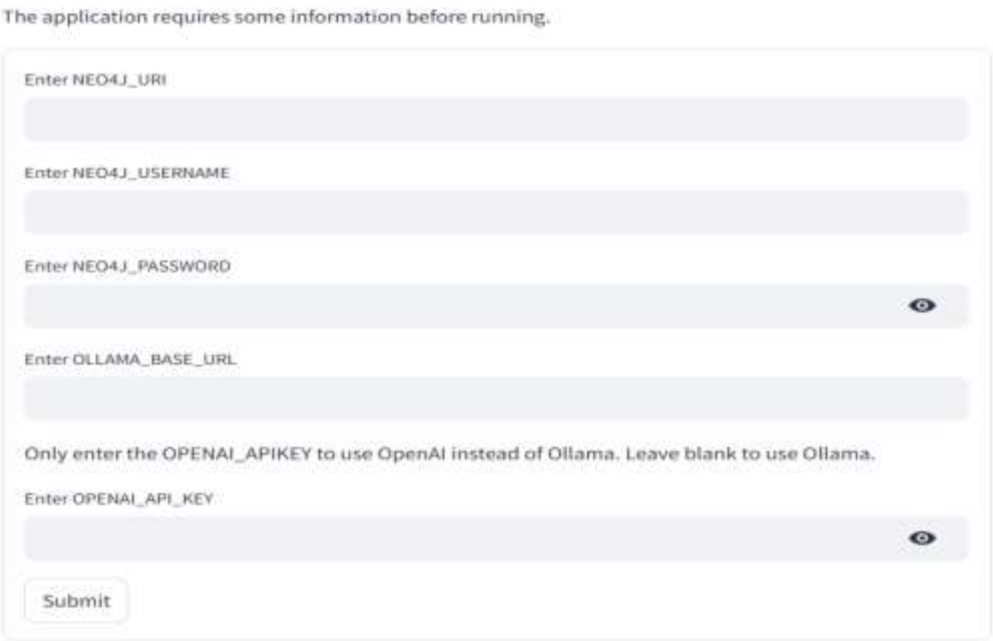
• We can also see the progress from Docker Desktop



□	●	docker-genai-sample-server	latest	1f782e4e16ee	2 minutes ago	8.19 GB

4. Open a browser and view the application at. http://localhost:8000. –

The streamlit application is then shown as follows.



The application requires some information before running.

Enter NEO4J_URI

Enter NEO4J_USERNAME

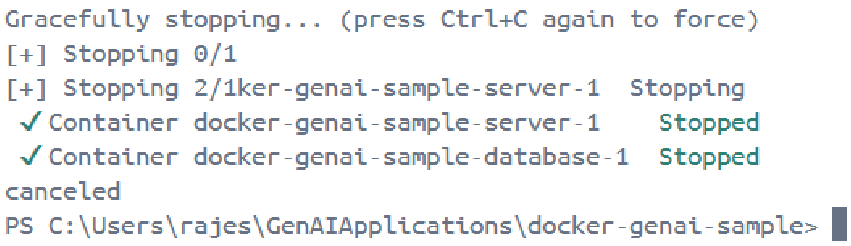
Enter NEO4J_PASSWORD

Enter OLLAMA_BASE_URL

Only enter the OPENAI_APIKEY to use OpenAI instead of Ollama. Leave blank to use Ollama.

Enter OPENAI_API_KEY

5. Stop the application In terminal, press ctrl + C to stop the application



```
Gracefully stopping... (press Ctrl+C again to force)
[+] Stopping 0/1
[+] Stopping 2/1ker-genai-sample-server-1  Stopping
 ✓Container docker-genai-sample-server-1    Stopped
 ✓Container docker-genai-sample-database-1  Stopped
canceled
PS C:\Users\rajes\GenAIApplications\docker-genai-sample> 
```