

CS 203: Software Tools & Techniques for AI
IIT Gandhinagar
Sem-II - 2024-25

Lab 8
Group 8
Afraz, 23110019
Sarvesh Pravin Chaudhari, 23110076

Docker Hub: <https://hub.docker.com/repository/docker/sarvesh9325/fastapi/general>

Google Drive:

https://drive.google.com/drive/folders/1-exi4AOQbTz87PJQUaPF5MXVMcDSZPII?usp=drive_link

Screenshot when performing all the tasks. (Dockerfile code, building command and its output, running container, and its output)

Building Frontend Docker and its image in docker hub

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE

```

g231100768instance-20250322-054743:~/frontends docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
g231100768instance-20250322-054743:~/frontends
g231100768instance-20250322-054743:~/frontends
g231100768instance-20250322-054743:~/frontends
g231100768instance-20250322-054743:~/frontends docker-compose up -d
Building frontend
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
  Install the buildx component to build images with BuildKit:
    https://docs.docker.com/go/buildx/

Sending build context to Docker daemon 7.68kB
Step 1/7 : FROM python:3.9
3.9: Pulling from library/python
7cd785773db4: Pull complete
091eb8249475: Pull complete
255774e0027b: Pull complete
353e14e5cc47: Pull complete
f6d72b00ae7c: Pull complete
6e02a90e59ae: Pull complete
1299e0671245: Pull complete
Digest: sha256:bc2e05bca883473050fc3b7c134c28ab822be73126balce29517d9e8b7f3703b
Status: Downloaded newer image for python:3.9
--> 859d4a0ff1fd8
Step 2/7 : WORKDIR /app
--> Running in 3cc84852f2c4
--> Removed intermediate container 3cc84852f2c4
--> 53d3dd634507
Step 3/7 : COPY requirements.txt .
--> 1e5b2f3b272d
Step 4/7 : RUN pip install --no-cache-dir -r requirements.txt
--> Running in 8b805d7ef391
Collecting fastapi
  Downloading fastapi-0.115.12-py3-none-any.whl (95 kB)
Collecting uvicorn
  Downloading uvicorn-0.34.0-py3-none-any.whl (62 kB)

```

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE

```

--> Running in 8b805d7ef391
Collecting fastapi
  Downloading fastapi-0.115.12-py3-none-any.whl (95 kB)
--> 95.2/95.2 kB 2.2 MB/s eta 0:00:00
Collecting uvicorn
  Downloading uvicorn-0.34.0-py3-none-any.whl (62 kB)
--> 62.3/62.3 kB 20.4 MB/s eta 0:00:00
Collecting requests
  Downloading requests-2.32.3-py3-none-any.whl (64 kB)
--> 64.9/64.9 kB 16.4 MB/s eta 0:00:00
Collecting jinja2
  Downloading jinja2-3.1.6-py3-none-any.whl (134 kB)
--> 134.9/134.9 kB 12.7 MB/s eta 0:00:00
Collecting starlette
  Downloading starlette-0.46.1-py3-none-any.whl (71 kB)
--> 72.0/72.0 kB 152.4 MB/s eta 0:00:00
Collecting python-multipart
  Downloading python_multipart-0.0.20-py3-none-any.whl (24 kB)
Collecting pydantic!=1.8,!=1.8.1,!=2.0.0,!=2.0.1,!=2.1.0,<3.0.0,>=1.7.4
  Downloading pydantic-2.10.6-py3-none-any.whl (431 kB)
--> 431.7/431.7 kB 13.4 MB/s eta 0:00:00
Collecting typing_extensions>=4.8.0
  Downloading typing_extensions-4.13.0-py3-none-any.whl (45 kB)
--> 45.7/45.7 kB 149.4 MB/s eta 0:00:00
Collecting h11>=0.8
  Downloading h11-0.14.0-py3-none-any.whl (58 kB)
--> 58.3/58.3 kB 157.2 MB/s eta 0:00:00
Collecting click>=7.0
  Downloading click-8.1.8-py3-none-any.whl (98 kB)
--> 98.2/98.2 kB 155.4 MB/s eta 0:00:00
Collecting certifi>=2017.4.17
  Downloading certifi-2025.1.31-py3-none-any.whl (166 kB)
--> 166.4/166.4 kB 185.8 MB/s eta 0:00:00
Collecting charset_normalizer<4,>=2
  Downloading charset_normalizer-3.4.1-cp39-cp39-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (146 kB)
Collecting idna<4,>=2.5
  Downloading idna-3.10-py3-none-any.whl (70 kB)

```

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE ⚙️ 📈 🛡️

```
Downloading charset_normalizer-3.4.1-cp39-cp39-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (146 kB)
  146.2/146.2 kB 178.8 MB/s eta 0:00:00
Collecting idna<4,>=2.5
  Downloading idna-3.10-py3-none-any.whl (70 kB)
    70.4/70.4 kB 170.9 MB/s eta 0:00:00
Collecting urllib3<3,>=1.21.1
  Downloading urllib3-2.3.0-py3-none-any.whl (128 kB)
    128.4/128.4 kB 188.9 MB/s eta 0:00:00
Collecting MarkupSafe>=2.0
  Downloading MarkupSafe-0.0.2-cp39-cp39-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (20 kB)
Collecting anyio<5,>=3.6.2
  Downloading anyio-4.9.0-py3-none-any.whl (100 kB)
    100.9/100.9 kB 169.9 MB/s eta 0:00:00
Collecting exceptiongroup>=1.0.2
  Downloading exceptiongroup-1.2.2-py3-none-any.whl (16 kB)
Collecting sniffio>=1.1
  Downloading sniffio-1.3.1-py3-none-any.whl (10 kB)
Collecting pydantic-core==2.27.2
  Downloading pydantic_core-2.27.2-cp39-cp39-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (2.0 MB)
    2.0/2.0 kB 48.7 MB/s eta 0:00:00
Collecting annotated-types>=0.6.0
  Downloading annotated_types-0.7.0-py3-none-any.whl (13 kB)
Installing collected packages: urllib3, typing-extensions, sniffio, python-multipart, MarkupSafe, idna, h11, exceptiongroup, click, charset-normalizer, certifi, annotated-types, uvicorn, requests, pydantic-core, jinja2, anyio, starlette, pydantic, fastapi
Successfully installed MarkupSafe-3.0.2 annotated-types-0.7.0 anyio-4.9.0 certifi-2025.1.31 charset-normalizer-3.4.1 click-8.1.8 exceptiongroup-1.2.2 fastapi-0.115.12 h11-0.14.0 idna-3.10 jinja2-3.1.6 pydantic-2.10.6 pydantic-core-2.27.2 python-multipart-0.0.20 requests-2.32.3 sniffio-1.3.1 starlette-0.46.1 typing-extensions-4.13.0 urllib3-2.3.0 uvicorn-0.34.0
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager. It is recommended to use a virtual environment instead: https://pip.pypa.io/warnings/venv

[notice] A new release of pip is available: 23.0.1 -> 25.0.1
[notice] To update, run: pip install --upgrade pip
--> Removed intermediate container 8b805d7ef391
--> dda5e103e723
Step 5/7 : COPY .
--> d0a1ff4df4db
Step 6/7 : EXPOSE 9567
--> Running in 07cd92f65fd6
```

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE ⚙️ 📈 🛡️

```
--> d0a1ff4df4db
Step 6/7 : EXPOSE 9567
--> Running in 07cd92f65fd6
--> Removed intermediate container 07cd92f65fd6
--> 9532404ad649
Step 7/7 : CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "9567"]
--> Running in d925196d5a08
--> Removed intermediate container d925196d5a08
--> 4c21fc1e4dae
Successfully built 4c21fc1e4dae
Successfully tagged frontend_frontend:latest
WARNING: Image for service frontend was built because it did not already exist. To rebuild this image you must use `docker-compose build` or `docker-compose up --build`.
Creating frontend ... done
g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS               NAMES
5ef7466e0af2        frontend            "uvicorn main:app ..."   11 seconds ago   Up 11 seconds   0.0.0.0:9567->9567/tcp, :::9567->9567/tcp   frontend
g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ docker images
REPOSITORY          TAG       IMAGE ID        CREATED             SIZE
frontend_frontend  latest   4c21fc1e4dae  14 seconds ago   1.02GB
python              3.9      859d4a0f1fd8  3 months ago     999MB
g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ docker login
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /home/g23110076/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$
```

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE ⚙️ 📈 🛡️

```

g231100768instance-20250322-054743:~/frontends$ docker images
REPOSITORY          TAG      IMAGE ID      CREATED             SIZE
frontend_frontend  latest   4c21fc1e4dae  14 seconds ago  999MB
python              3.9     859d4a0ff1d8  3 months ago   999MB
g231100768instance-20250322-054743:~/frontends$ docker login
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /home/g23110076/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
g231100768instance-20250322-054743:~/frontends$ docker tag frontend_frontend sarvesh9325/fastapi:1
g231100768instance-20250322-054743:~/frontends$ docker push sarvesh9325/fastapi:1
The push refers to repository [docker.io/sarvesh9325/fastapi]
5ae4ccde6f77: Pushed
b65ff8b47361: Pushed
63e3d2d42440: Pushed
a2f859d7d272: Pushed
7c6f47952aec: Layer already exists
bb8db7b4260: Layer already exists
c0102644065e: Layer already exists
4c13ea2c0b02: Layer already exists
2ed6a19677f5: Layer already exists
d2f7abdd607: Layer already exists
53babe930602: Layer already exists
1: digest: sha256:ed93066bbfc3511dacf3209dc53ad7b61d6dd6717dd3301b505d6eaaf2d5fb1 size: 2628
g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ g231100768instance-20250322-054743:~/frontends$ 

```

Building docker container for backend and elastic search

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE ⚙️ 📈 🛡️

```

version      Show version information and quit
g231100768instance-20250322-061824:~/backend$ docker-compose up --build
g231100768instance-20250322-061824:~/backend$ g231100768instance-20250322-061824:~/backend$ g231100768instance-20250322-061824:~/backend$ docker-compose up --build
Creating network "backend_backend_network" with driver "bridge"
Pulling elasticsearch (docker.elastic.co/elasticsearch/elasticsearch:7.17.0)...
7.17.0: Pulling from elasticsearch/elasticsearch
c661c71060f1: Pull complete
cdaad67ce350: Pull complete
a8464068c73b: Pull complete
75d4d725ba6b: Pull complete
65f516cc091e: Pull complete
9958bb1703a1: Pull complete
ece583f2db06: Pull complete
aaSeef34e4ab: Pull complete
Digest: sha256:57b382ddaa5d05385aea8c7b60dad97e02ff41ca0da54f723151c2aed9ac8f54
Status: Downloaded newer image for docker.elastic.co/elasticsearch/elasticsearch:7.17.0
Building backend
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
  Install the buildx component to build images with BuildKit:
  https://docs.docker.com/go/buildx/
Sending build context to Docker daemon 7.168kB
Step 1/7 : FROM python:3.9
--> 859d4a0ff1d8
Step 2/7 : WORKDIR /app
--> Using cache
--> 3b831279258a
Step 3/7 : COPY requirements.txt /app
--> Using cache
--> 92a1dd0daaf09
Step 4/7 : RUN pip install --no-cache-dir -r requirements.txt
--> Using cache
--> ffefaf5dbc25c
Step 5/7 : COPY . /app
--> Using cache
--> 1091ed1b0f8e

```

SSH-in-browser

```

Step 6/7 : EXPOSE 9567
--> Using cache
--> cce51d71ff3
Step 7/7 : CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "9567"]
--> Using cache
--> 512cff1cb6e8
Successfully built 512cff1cb6e8
Successfully tagged backend backend:latest
Creating elasticsearch ... done
Creating backend ... done
Attaching to elasticsearch, backend
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:34,205Z", "level": "INFO", "component": "o.e.n.Node", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "version[7.17.0], pid[6], build[default/docker/bce86328705acaa9a6daede7140defd4d9ec56bd/2022-01-28T08:36:04.875 279988Z], OS[Linux/6.8.0-1025-gcp/amd64], JVM[Eclipse Adoptium/OpenJDK 64-Bit Server VM/17.0.1/17.0.1+12]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:34,215Z", "level": "INFO", "component": "o.e.n.Node", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "JVM home [/usr/share/elasticsearch/jdk], using bundled JDK [true]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:34,217Z", "level": "INFO", "component": "o.e.n.Node", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "JVM arguments [-Xms1m, -Xmx1m, -XX:+AlwaysPreTouch, -Xss1m, -Djava.awt.headless=true, -Dfile.encoding=UTF-8, -Djna.nosys=true, -XX:+OmitStackTraceInFastThrow, -XX:+ShowCodeDetailsInExceptionMessages, -Dio.netty.noUnsafe=true, -Dio.netty.noKeySetOptimization=true, -Dio.netty.recycler.maxCapacityPerThread=0, -Dio.netty.allocator.numDirectArenas=0, -Dlog4j.shutdownHookEnabled=false, -Dlog4j2.disable.jmx=true, -Dlog4j2.formatMsgNoLookups=true, -Djava.locale.providers=SPI,COMPAT, --add-opens java.base/java.io=ALL-UNNAMED, -XX:+UseG1GC, -Djava.io.tmpdir=/tmp/elasticsearch-8121891521194239076, -XX:+HeapDumpOnOutOfMemoryError, -XX:+ExitOnOutOfMemoryError, -XX:HeapDumpPath=/data/err.pid%p.log, -Xlog:gc*,gc+age=trace, safepoint:file=/logs/gc.log:uctime,pid,tags:filecount=32, filesize=64m, -Des.cgroups.hierarchy.override=/, -Xms512m, -Xmx512m, -XX:MaxDirectMemorySize=268435456, -XX:G1HeapRegionSize=4m, -XX:InitiatingHeapOccupancyPercent=30, -XX:G1ReservePercent=15, -Des.path.home=/usr/share/elasticsearch, -Des.path.conf=/usr/share/elasticsearch/config, -Desdistribution.flavor=default, -Desdistribution.type=docker, -Des.bundled_jdk=true]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:38,607Z", "level": "INFO", "component": "o.e.p.PluginsService", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "loaded module [aggs-matrix-stats]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:38,610Z", "level": "INFO", "component": "o.e.p.PluginsService", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "loaded module [analysis-common]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:38,610Z", "level": "INFO", "component": "o.e.p.PluginsService", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "loaded module [constant-keyword]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:38,611Z", "level": "INFO", "component": "o.e.p.PluginsService", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "loaded module [frozen-indices]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:38,611Z", "level": "INFO", "component": "o.e.p.PluginsService", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "loaded module [ingest-common]"}
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:51:38,612Z", "level": "INFO", "component": "o.e.p.PluginsService", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "loaded module [ingest-geoip]"} 
```

SSH-in-browser

```

action\" : "complete", \"name\" : "complete" }) in policy [ilm-history-ilm-policy]", "cluster.uuid": "5HxQuPiqRYmBnXpR8H2SyA", "node.id": "k19CtZ5URNmOS5xRGDGbwQ"
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:52:04,489Z", "level": "INFO", "component": "o.e.x.i.IndexLifecycleTransition", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "moving index [.ds-ilm-history-5-2025.03.27-000001] from [{\"phase\":\"new\", \"action\":\"complete\"}, {\"name\":\"complete\"}) to [{\"phase\":\"hot\", \"action\":\"unfollow\", \"name\":\"branch-check-unfollow-prerequisites\"}] in policy [ilm-history-ilm-policy]", "cluster.uuid": "5HxQuPiqRYmBnXpR8H2SyA", "node.id": "k19CtZ5URNmOS5xRGDGbwQ" }
elasticsearch  | {"type": "server", "timestamp": "2025-03-27T17:52:04,576Z", "level": "INFO", "component": "o.e.x.i.IndexLifecycleTransition", "cluster.name": "docker-cluster", "node.name": "e8496520c2b6", "message": "moving index [.ds-ilm-history-5-2025.03.27-000001] from [{\"phase\":\"hot\", \"action\":\"unfollow\", \"name\":\"branch-check-unfollow-prerequisites\"}] to [{\"phase\":\"hot\", \"action\":\"rollover\", \"name\":\"check-rollover-ready\"}] in policy [ilm-history-ilm-policy]", "cluster.uuid": "5HxQuPiqRYmBnXpR8H2SyA", "node.id": "k19CtZ5URNmOS5xRGDGbwQ" }
Gracefully stopping... (press Ctrl+C again to force)
Stopping backend ... done
Stopping elasticsearch ... done
g231100768instance-20250322-061824:~/backend$ g231100768instance-20250322-061824:~/backend$ g231100768instance-20250322-061824:~/backend$ docker images
REPOSITORY          TAG      IMAGE ID      CREATED     SIZE
backend backend      latest   512cff1cb6e8   6 minutes ago  1.02GB
fastapi             2        512cff1cb6e8   6 minutes ago  1.02GB
sarvesh9325/fastapi 2        512cff1cb6e8   6 minutes ago  1.02GB
python              3.9     859d4a0ff1fd8   3 months ago   999MB
docker.elastic.co/elasticsearch/elasticsearch 7.17.0  6fe993d6e7ed   3 years ago   612MB
g231100768instance-20250322-061824:~/backend$ docker login
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /home/g23110076/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store 
```

Creating docker images of backend and elastic search in docker hub

```
SSH-in-browser ! UPLOAD FILE ! DOWNLOAD FILE ! ! ! ! ! !  
g23110076@instance-20250322-061824:~/backend$ docker tag 512cff1cb6e8 sarvesh9325/fastapi:2  
g23110076@instance-20250322-061824:~/backend$ docker push sarvesh9325/fastapi:2  
The push refers to repository [docker.io/sarvesh9325/fastapi]  
5cccad0bc5c17: Layer already exists  
8d9c931b516f: Layer already exists  
300f70e9a34e: Layer already exists  
7911b140271d: Layer already exists  
7c6f47952aec: Layer already exists  
bb8db7b74260: Layer already exists  
c0102644065e: Layer already exists  
4c13ea2c0b02: Layer already exists  
2ed6a19677ff5: Layer already exists  
d2f7abdd607: Layer already exists  
53babe930602: Layer already exists  
2: digest: sha256:f9dd1acf1b51e3297affa5a3ec7eade00a5f7135facd5e38c853c7412d93a3b size: 2628  
g23110076@instance-20250322-061824:~/backend$  
The push refers to repository [docker.io/sarvesh9325/fastapi]  
g23110076@instance-20250322-061824:~/backend$ docker tag 6fe993d6e7ed sarvesh9325/fastapi:3  
g23110076@instance-20250322-061824:~/backend$ docker push sarvesh9325/fastapi:3  
The push refers to repository [docker.io/sarvesh9325/fastapi]  
2eb2dc5bc2c3: Layer already exists  
c93bf4f0664cd: Layer already exists  
0299883ad88e: Layer already exists  
b606b9873f8b: Layer already exists  
06e6775eda8d: Layer already exists  
4ebfc4c36c93: Layer already exists  
08b0071823a7: Layer already exists  
b8d5c39a4f0f: Layer already exists  
0eb131dffd0: Layer already exists  
3: digest: sha256:fa714115247e14df214e2f08c33702403eb88c02ba44e79322a1f42d733013 size: 2204  
g23110076@instance-20250322-061824:~/backend$  
g23110076@instance-20250322-061824:~/backend$  
g23110076@instance-20250322-061824:~/backend$  
g23110076@instance-20250322-061824:~/backend$
```

Dockerfile and docker-compose.yml for backend and elastic-search VM

```
GNU nano 6.2
FROM python:3.9
WORKDIR /app
COPY requirements.txt /app/
RUN pip install --no-cache-dir -r requirements.txt
COPY . /app/
EXPOSE 9567
CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "9567"]
```

Dockerfile

```
GNU nano 6.2
version: '3.8'
services:
  elasticsearch:
    image: docker.elastic.co/elasticsearch/elasticsearch:7.17.0
    container_name: elasticsearch
    environment:
      - discovery.type=single-node
      - ES_JAVA_OPTS=-Xms512m -Xmx512m
    ports:
      - "9200:9200"
    networks:
      - backend_network
    healthcheck:
      test: ["CMD", "curl", "-f", "http://elasticsearch:9200"]
      interval: 10s
      timeout: 5s
      retries: 5

  backend:
    build: ./app
    container_name: backend
    depends_on:
      elasticsearch:
        condition: service_healthy
    environment:
      - ELASTICSEARCH_HOST=elasticsearch
    ports:
      - "9567:9567"
    networks:
      - backend_network

networks:
  backend_network:
```

Dockerfile and docker-compose.yml for frontend VM

```
GNU nano 6.2
FROM python:3.9
WORKDIR /app
COPY requirements.txt .
RUN pip install --no-cache-dir -r requirements.txt
COPY . .
EXPOSE 9567
CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "9567"]
```

```
GNU nano 6.2
version: '3.8'
services:
  frontend:
    build: ./.
    container_name: frontend
    ports:
      - "9567:9567"
    networks:
      - frontend_network
    depends_on: []
    extra_hosts:
      - "backend:34.100.196.170"

networks:
  frontend_network:
    driver: bridge
```

Fastapi and elastic search for backend

```
GNU nano 6.2                                         main.py

from fastapi import FastAPI,HTTPException
from pydantic import BaseModel
import requests
import uuid
import time

app=FastAPI()

class Document(BaseModel):
    document:str

elasticsearch_url="http://elasticsearch:9200/documents/_doc"

def create_index():
    index_url="http://elasticsearch:9200/documents"
    mapping={
        "mappings":{
            "properties":{
                "id":{"type":"keyword"},
                "text":{"type":"text"}
            }
        }
    }
    requests.put(index_url,json=mapping)
    for _ in range(10):
        try:
            response = requests.get("http://elasticsearch:9200/_cluster/health")
            if response.status_code == 200:
                print("Elasticsearch is ready!")
                break
        except requests.exceptions.RequestException:
            print("Waiting for Elasticsearch...")
            time.sleep(5)
    else:
```

```
GNU nano 6.2                                         main.py

create_index()

@app.post("/insert")
def insert_document(doc: Document):
    doc_id=str(uuid.uuid4())
    data={
        "id":doc_id,
        "text":doc.document
    }
    response=requests.post(f"{elasticsearch_url}/{doc_id}",json=data)
    if response.status_code==201:
        return {"message":"Document inserted successfully","id":doc_id}
    raise HTTPException(status_code=500,detail="Failed to insert document")

@app.get("/")
def get_best_document():
    query={
        "query":{
            "match_all":{}
        },
        "size":1,
        "sort":[{"_score":"desc"}]
    }
    search_url="http://elasticsearch:9200/documents/_search"
    response=requests.get(search_url,json=query)
    if response.status_code==200:
        data=response.json()
        if data["hits"]["hits"]:
            best_doc=data["hits"]["hits"][0]["_source"]
            return {"best_document":best_doc}
        return {"message":"No Documents found"}
    raise HTTPException(status_code=500,detail="Failed to retrieve document")
```

Fastapi for frontend

```

GNU nano 6.2
main.py
from fastapi import FastAPI,Form
from fastapi.responses import HTMLResponse
from fastapi.staticfiles import StaticFiles
from fastapi.templating import Jinja2Templates
from starlette.requests import Request
import requests

app=FastAPI()

backendurl="http://backend:9567"
templates=Jinja2Templates(directory="templates")

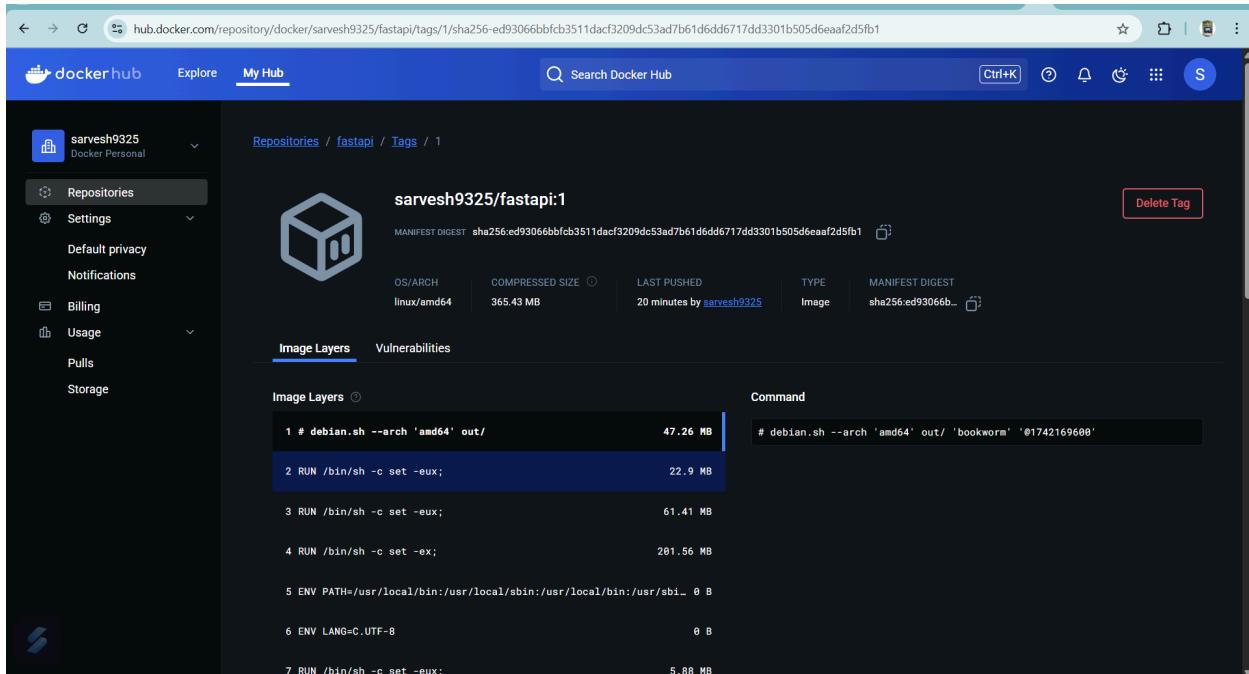
@app.get("/",response_class=HTMLResponse)
def serve_home(request:Request):
    return templates.TemplateResponse("index.html", {"request":request})

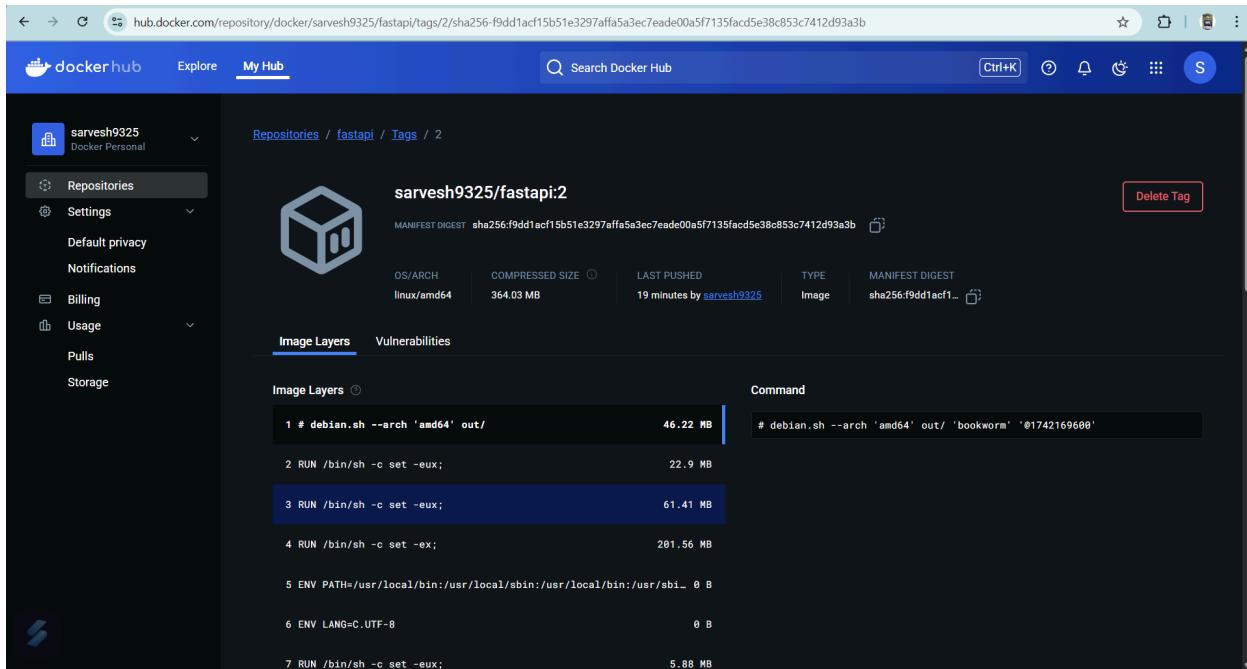
@app.post("/insert")
def insert_document(document:str=Form(...)):
    response=requests.post(f"{backendurl}/insert",json={"document":document})
    return response.json()

@app.get("/get")
def get_best_document():
    response=requests.get(f"{backendurl}/get")
    return response.json()

```

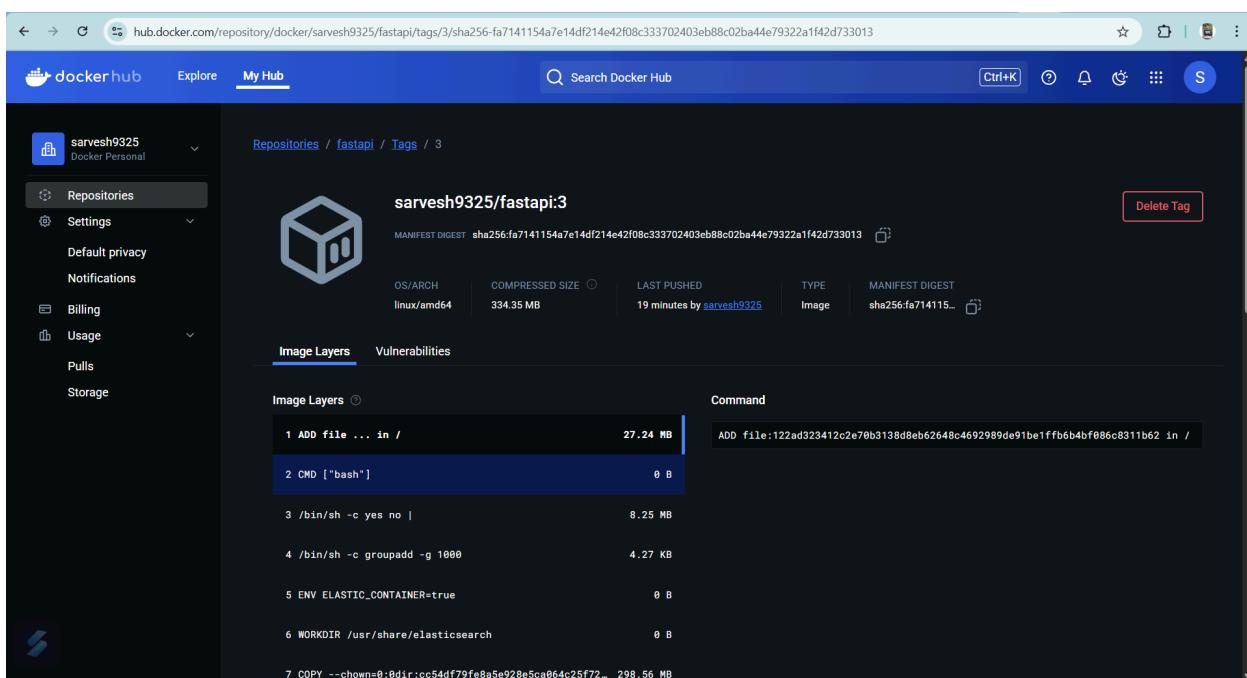
Screenshots of docker image from images





Screenshot of the Docker Hub interface showing the image layers for the tag `2` of the repository `sarvesh9325/fastapi`. The image has a manifest digest of `sha256:f9dd1acf15b51e3297affa5a3ec7ead00a5f7135facd5e38c853c7412d93a3b` and was last pushed 19 minutes ago by `sarvesh9325`. The image is of type `Image` and has a compressed size of 364.03 MB. The image layers are listed below:

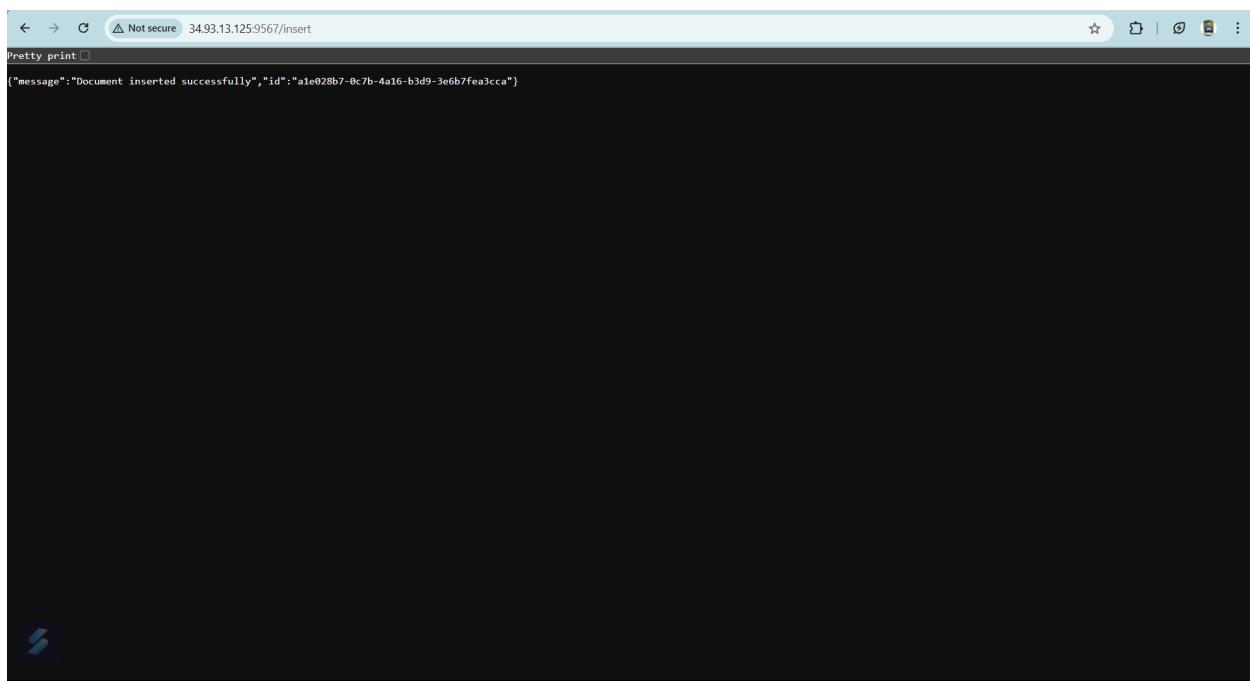
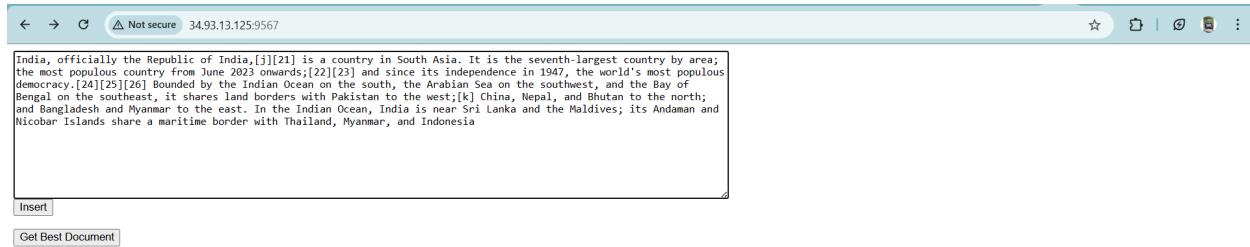
Image Layer	Command	Size
1 # debian.sh --arch 'amd64' out/	<code># debian.sh --arch 'amd64' out/ 'bookworm' '@1742169600'</code>	46.22 MB
2 RUN /bin/sh -c set -eux;		22.9 MB
3 RUN /bin/sh -c set -eux;		61.41 MB
4 RUN /bin/sh -c set -ex;		281.56 MB
5 ENV PATH=/usr/local/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin/ 0 B		0 B
6 ENV LANG=C.UTF-8		0 B
7 RUN /bin/sh -c set -eux;		5.88 MB

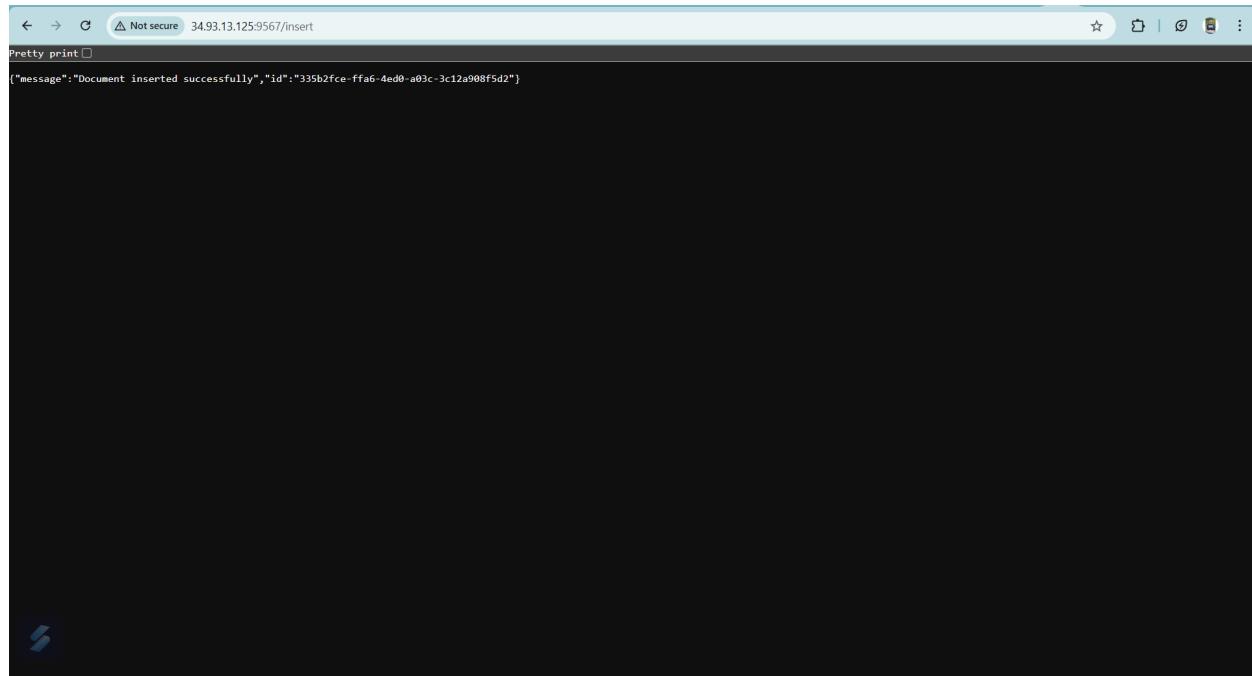
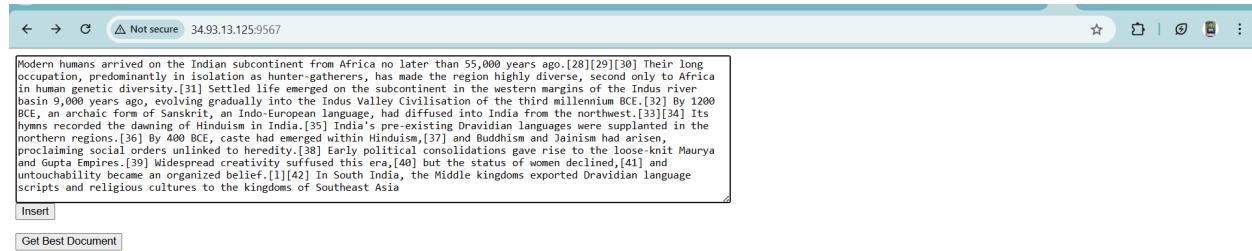


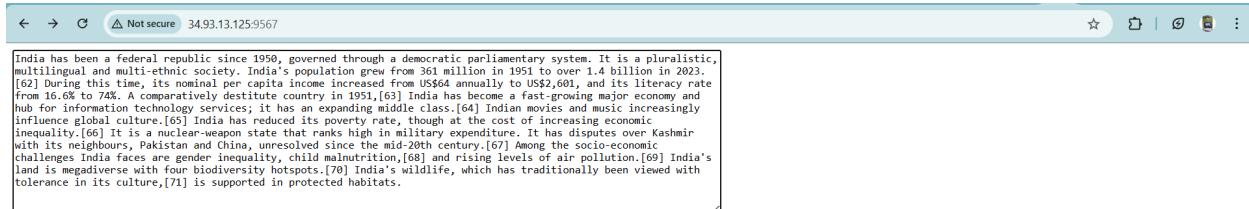
Screenshot of the Docker Hub interface showing the image layers for the tag `3` of the repository `sarvesh9325/fastapi`. The image has a manifest digest of `sha256:fa7141154a7e14df214e42f08c333702403eb88c02ba44e79322a1f42d733013` and was last pushed 19 minutes ago by `sarvesh9325`. The image is of type `Image` and has a compressed size of 334.35 MB. The image layers are listed below:

Image Layer	Command	Size
1 ADD file ... in /	<code>ADD file:122ad323412c2e70b3138d8eb62648c4692989de91be1ff6b4bf086c8311b62 in /</code>	27.24 MB
2 CMD ["bash"]		0 B
3 /bin/sh -c yes no		8.25 MB
4 /bin/sh -c groupadd -g 1000		4.27 KB
5 ENV ELASTIC_CONTAINER=true		0 B
6 WORKDIR /usr/share/elasticsearch		0 B
7 COPY --chown=0:0dir:cc54df79fe8a5e928e5ca064c25f72...		298.56 MB

Inserting the documents



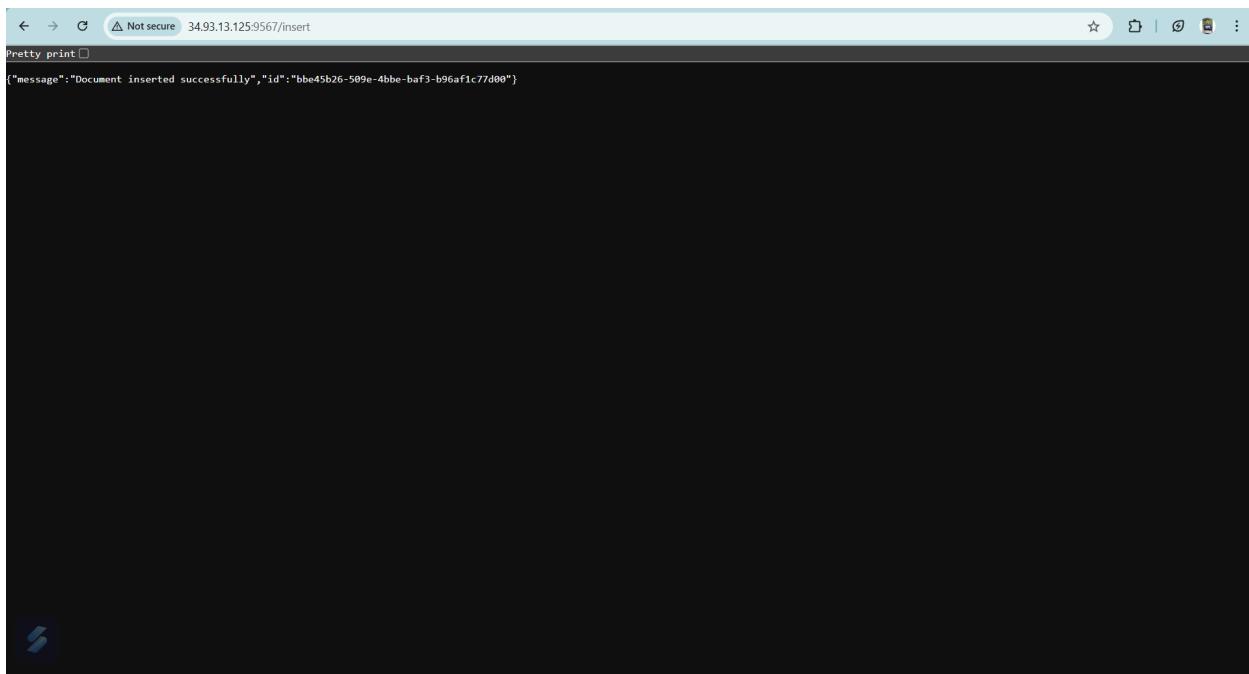




India has been a federal republic since 1950, governed through a democratic parliamentary system. It is a pluralistic, multilingual and multi-ethnic society. India's population grew from 361 million in 1951 to over 1.4 billion in 2023.^[62] During this time, its nominal per capita income increased from US\$64 annually to US\$2,601, and its literacy rate from 16.6% to 74%. A comparatively destitute country in 1951,^[63] India has become a fast-growing major economy and hub for information technology services; it has an expanding middle class.^[64] Indian movies and music increasingly influence global culture.^[65] India has reduced its poverty rate, although the rate of rural poverty is still high.^[66] India is an emerging power.^[66] It is a nuclear-weapon state that ranks high in military expenditure. It has disputes over Kashmir with its neighbours, Pakistan and China, unresolved since the mid-20th century.^[67] Among the socio-economic challenges India faces are gender inequality, child malnutrition,^[68] and rising levels of air pollution.^[69] India's land is megadiverse with four biodiversity hotspots.^[70] India's wildlife, which has traditionally been viewed with tolerance in its culture,^[71] is supported in protected habitats.

Insert

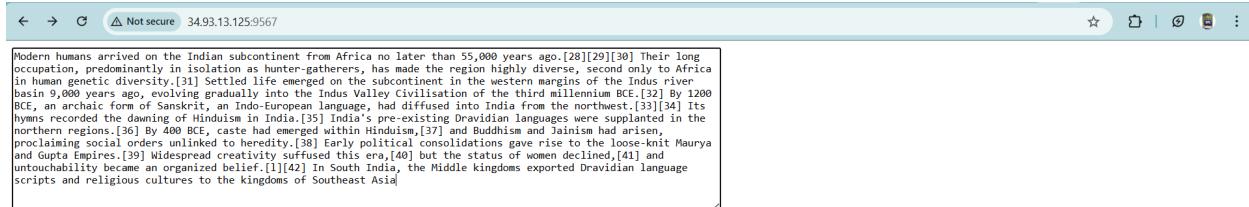
Get Best Document



Pretty print □

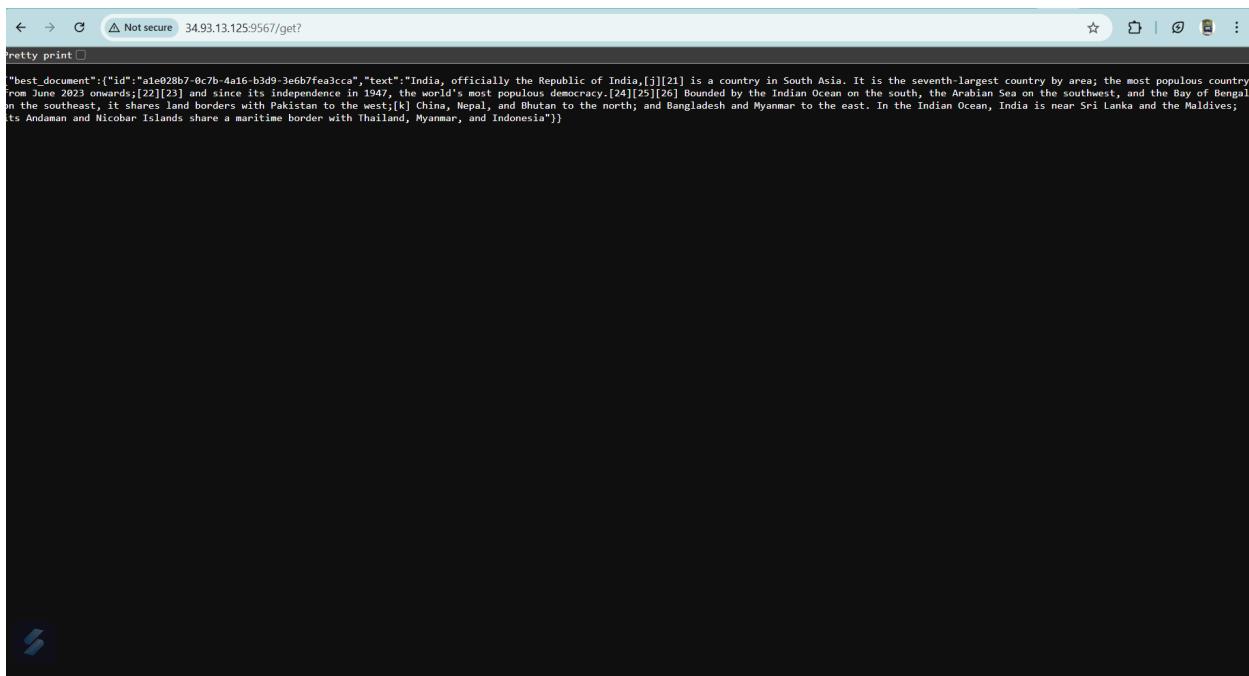
```
{"message": "Document inserted successfully", "id": "bbe45b26-509e-4bbe-baf3-b96af1c77d00"}
```

Test Query



Insert

Get Best Document



- VM creation steps are taken, and screenshots are on Google Cloud or Kutrim.

Project name *

C3203Group08



Project ID: c3203group08. It cannot be changed later. [Edit](#)

Organization *

iitgn.ac.in



Select an organization to attach it to a project. This selection can't be changed later.

Location *

iitgn.ac.in

[Browse](#)

Parent organization or folder

[Create](#)

[Cancel](#)

Project name *

CS203Group08



Project ID: cs203group08. It cannot be changed later. [Edit](#)

Organization *

iitgn.ac.in



Select an organization to attach it to a project. This selection can't be changed later.

Location *

iitgn.ac.in

[Browse](#)

Parent organization or folder

[Create](#)

[Cancel](#)

console.cloud.google.com/compute/instances?project=cs203group08&supportedpurview=project&tab=instances

Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Dismiss Start free

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more

Compute Engine VM Instances Create instance Import VM Refresh Learn

Instances Observability Instance schedules

VM instances

Filter Enter property name or value

Status Name ↑ Zone Recommendations In use by Internal IP External IP Connect

VM Instances

Compute Engine lets you use virtual machines that run on Google's infrastructure. Create micro-VMs or larger instances running Debian, Windows, or other standard images. Create your first VM instance, import it using a migration service, or try the quickstart to build a sample app.

Get started with Compute Engine

Deploy a website or application, back up and restore VMs and disks, configure secure access, and design for scalability

Create a website or application

Create a "hello world" website on IIS

Create a "hello world" website on Apache

Transfer files to a Windows VM

Transfer files to a Linux VM

Enable ingress traffic

Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Dismiss Start free

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more

Create an instance Create VM from...

Machine configuration

Name * instance-20250321-090415

Region * asia-south1 (Mumbai) Zone * asia-south1-a

Region is permanent Zone is permanent

General purpose Compute optimized Memory optimized Storage optimized GPUs

Machine types for common workloads, optimized for cost and flexibility

Series	Description	vCPUs	Memory	CPU Platform
C4	Consistently high performance	2 - 192	4 - 1,488 GB	Intel Emerald
C4A	Arm-based consistently high performance	1 - 72	2 - 576 GB	Google Axion
N4	Flexible & cost-optimized	2 - 80	4 - 640 GB	Intel Emerald
C3	Consistently high performance	4 - 192	8 - 1,536 GB	Intel Sapphire
C3D	Consistently high performance	4 - 360	8 - 2,880 GB	AMD Genoa
E2	Low cost, day-to-day computing	0.25 - 32	1 - 128 GB	Intel Broadwell
N2	Balanced price & performance	2 - 128	2 - 864 GB	Intel Cascade
N2D	Balanced price & performance	2 - 224	2 - 896 GB	AMD Milan
T2A	Scale-out workloads	1 - 48	4 - 192 GB	Ampere Altra

Create Cancel Equivalent code

Monthly estimate

\$29.86 That's about \$0.04 hourly

Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$29.38
10 GB standard persistent disk	\$0.48
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$29.86

Compute Engine pricing Cloud Operations pricing

Less

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more Search

[Create an instance](#) [Create VM from...](#) [Equivalent code](#)

Machine configuration e2-medium, asia-south1-b

- Machine configuration e2-medium, asia-south1-b
- OS and storage Debian GNU/Linux 12 (bookworm)
- Data protection Snapshot schedules
- Networking 1 network interface
- Observability Install Ops Agent
- Security
- Advanced

Machine type
Choose a machine type with preset amounts of vCPUs and memory that suit most workloads. Or, you can create a custom machine for your workload's particular needs. [Learn more](#)

[Preset](#) [Custom](#)

e2-medium (2 vCPU, 1 core, 4 GB memory)

	vCPU	Memory
	1-2 vCPU (1 shared core)	4 GB

[Advanced configurations](#)

[Create](#) [Cancel](#) [Equivalent code](#)

Monthly estimate
\$30.58
That's about \$0.04 hourly
Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$29.38
10 GB balanced persistent disk	\$1.20
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$30.58

[Compute Engine pricing](#) [Cloud Operations pricing](#) [Less](#)

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more Search

[Create an instance](#) [Create VM from...](#) [Equivalent code](#)

Machine configuration e2-medium, asia-south1-b

- Machine configuration e2-medium, asia-south1-b
- OS and storage Debian GNU/Linux 12 (bookworm)
- Data protection Snapshot schedules
- Networking 1 network interface
- Observability Install Ops Agent
- Security
- Advanced

Machine type
Choose a machine type with preset amounts of vCPUs and memory that suit most workloads. Or, you can create a custom machine for your workload's particular needs. [Learn more](#)

[Preset](#) [Custom](#)

e2-medium (2 vCPU, 1 core, 4 GB memory)

	vCPU	Memory
	1-2 vCPU (1 shared core)	4 GB

[Advanced configurations](#)

[Create](#) [Cancel](#) [Equivalent code](#)

Monthly estimate
\$30.58
That's about \$0.04 hourly
Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$29.38
10 GB balanced persistent disk	\$1.20
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$30.58

[Compute Engine pricing](#) [Cloud Operations pricing](#) [Less](#)

[Create an instance](#) [Create VM from...](#) [Equivalent code](#)

Operating system and storage

Name	instance-20250321-090415
Type	New balanced persistent disk
Size	10 GB
Snapshot schedule	default-schedule-1
License type	Free
Image	Debian GNU/Linux 12 (bookworm)

[Change](#)

Additional disks

[+ Add new disk](#) [+ Attach existing disk](#) [+ Add local SSD](#)

Container [Deploy container](#)

Deploy a container image to this VM instance

[Create](#) [Cancel](#) [Equivalent code](#)

Monthly estimate

\$30.58
That's about \$0.04 hourly
Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$29.38
10 GB balanced persistent disk	\$1.20
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$30.58

[Compute Engine pricing](#) [Cloud Operations pricing](#)

[Less](#)

Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

[Dismiss](#) [Start free](#)

Google Cloud [CS203Group08](#) [Search](#)

Compute Engine [Create instance](#) [Import VM](#) [Refresh](#) [Learn](#)

[Overview](#) [Virtual machines](#) [VM instances](#) [Observability](#) [Instance schedules](#)

VM instances

Status	Name	Zone	Recommendations	In use by	Internal IP	Connect
Green	instance-20250321-090415	asia-south1-b			10.160.0.2 (nic0)	SSH

Related actions

[Explore Backup and DR](#)

[View billing report](#)

[Monitor VMs](#)

[Explore VM logs](#)

[Set up firewall rules](#)

[Patch management](#)

[Load balance between VMs](#)

[Set up Load Balancing for your applications as your traffic and users](#)

Get started with Compute Engine

Deploy a website or application, back up and restore VMs and disks, configure secure access, and design for scalability

Create a website or application

[Create a "hello world" website on IIS](#) Tutorial 25 min
Create an IIS web server VM using Compute Engine.

[Create a "hello world" website on Apache](#) Tutorial 10 min
Create an Apache web server on a Linux VM.

[Transfer files to a Windows VM](#) Tutorial 10 min
Upload and download files from the Cloud Storage bucket to the Windows VM.

[Transfer files to a Linux VM](#) Tutorial 5 min
Learn how to transfer files to or from a Linux VM.

[Enable ingress traffic](#)

Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more

Compute Engine VM instances Create instance Import VM Refresh Learn

Instances Observability Instance schedules

VM instances

Status	Name	Zone	Recommendations	In use by	Internal IP	Connect
<input type="checkbox"/>	instance-20250322-051058	asia-south1-b			10.160.0.3 (nic0)	SSH
<input type="checkbox"/>	instance-20250322-054743	asia-south1-b			10.160.0.4 (nic0)	SSH

Related actions

- Explore Backup and DR New Backup up your VMs and set up disaster recovery
- View billing report View and manage your Compute Engine billing
- Monitor VMs View outlier VMs across metrics like CPU and network
- Explore VM logs View, search, analyze, and download VM instance logs
- Set up firewall rules Control traffic to and from a VM instance
- Patch management Schedule patch updates and view patch compliance on VM instances
- Load balance between VMs Set up Load Balancing for your

Get started with Compute Engine

Create a website or application

- Create a "hello world" website on IIS Tutorial 25 min Create an IIS web server VM using Compute Engine.
- Create a "hello world" website on Apache Tutorial 10 min Create an Apache web server on a Linux VM.
- Transfer files to a Windows VM Tutorial 10 min Upload and download files from the Cloud Storage bucket to the Windows VM
- Transfer files to a Linux VM Tutorial 5 min Learn how to transfer files to or from a Linux VM.
- Enable ingress traffic Help document

Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more

Network Security Create a firewall rule

Secure Web Proxy

Cloud Armor

Cloud IDS

- IDS Dashboard
- IDS Endpoints
- IDS Threats

Cloud NGFW

- Dashboard
- Firewall policies Selected
- Threats
- Firewall endpoints

Common components

- Address groups
- Security profiles
- TLS inspection policies
- SSL policies

Logs

Turning on firewall logs can generate a large number of logs which can increase costs in Logging. [Learn more](#)

On Off

Network default

Priority 1000 Compare

Direction of traffic Ingress Ingress Egress

Action on match

Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Dismiss Start free

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more

Network Security 

Secure Web Proxy

Cloud Armor

Cloud IDS

- IDS Dashboard
- IDS Endpoints
- IDS Threats

Cloud NGFW

- Dashboard
- Firewall policies** 
- Threats
- Firewall endpoints

Common components

- Address groups
- Security profiles
- TLS inspection policies
- SSL policies

Priority can be 0 - 65535

Direction of traffic  

Action on match  

Targets **All instances in the network**

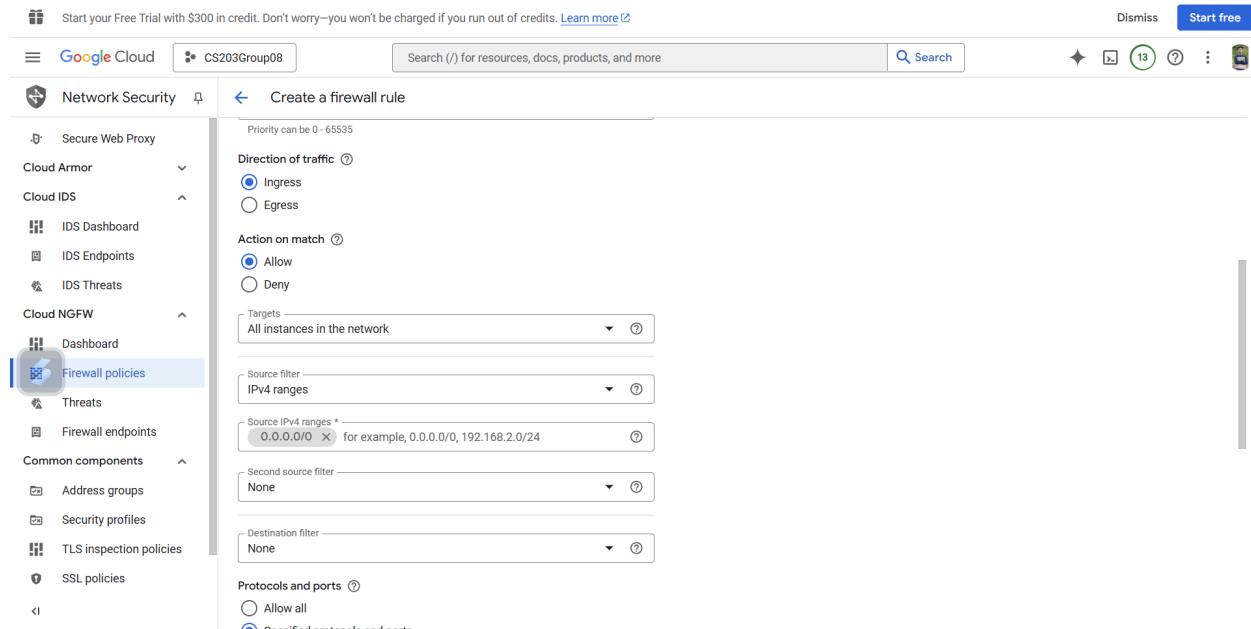
Source filter **IPv4 ranges**

Source IPv4 ranges * **0.0.0.0/0**  for example, 0.0.0.0/0, 192.168.2.0/24

Second source filter **None**

Destination filter **None**

Protocols and ports  



Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Dismiss Start free

Google Cloud CS203Group08 Search (/) for resources, docs, products, and more

Network Security 

Secure Web Proxy

Cloud Armor

Cloud IDS

- IDS Dashboard
- IDS Endpoints
- IDS Threats

Cloud NGFW

- Dashboard
- Firewall policies** 
- Threats
- Firewall endpoints

Common components

- Address groups
- Security profiles
- TLS inspection policies
- SSL policies

Priority can be 0 - 65535

Direction of traffic  

Action on match  

Targets **All instances in the network**

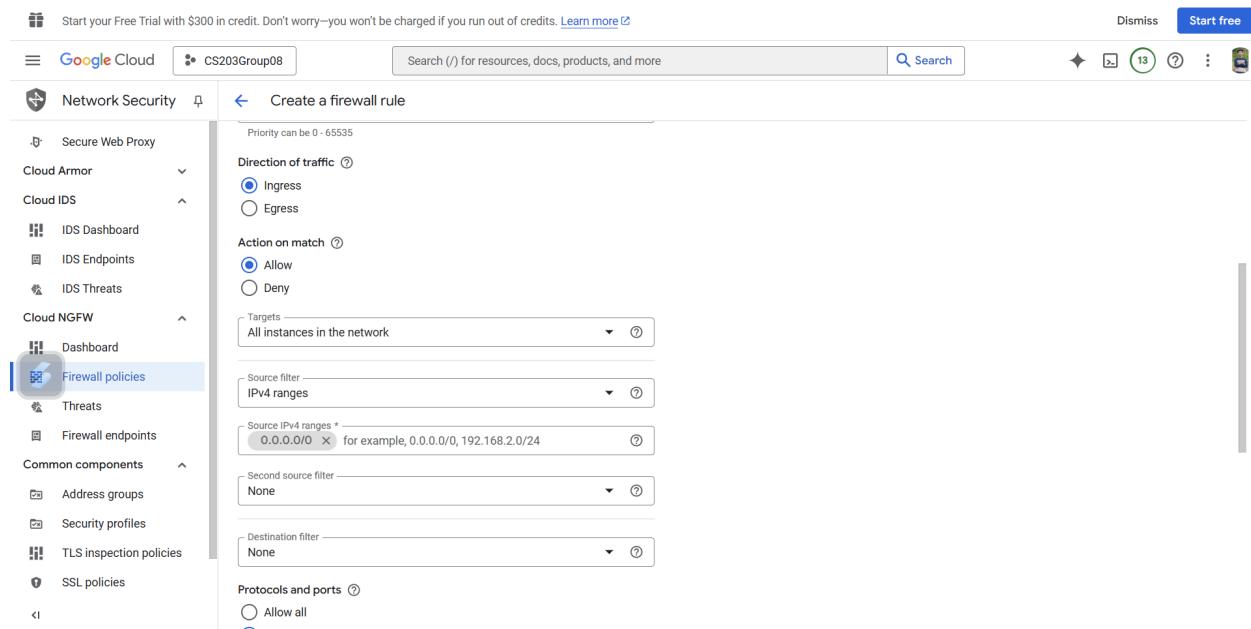
Source filter **IPv4 ranges**

Source IPv4 ranges * **0.0.0.0/0**  for example, 0.0.0.0/0, 192.168.2.0/24

Second source filter **None**

Destination filter **None**

Protocols and ports  



Start your Free Trial with \$300 in credit. Don't worry—you won't be charged if you run out of credits. [Learn more](#)

Dismiss Start free

Google Cloud CS203Group08 Search () for resources, docs, products, and more Search

Network Security Create a firewall rule

Secure Web Proxy

Cloud Armor

Cloud IDS

- IDS Dashboard
- IDS Endpoints
- IDS Threats

Cloud NGFW

- Dashboard
- Firewall policies**
- Threats
- Firewall endpoints

Common components

- Address groups
- Security profiles
- TLS inspection policies
- SSL policies

IPv4 ranges

Source IPv4 ranges * 0.0.0.0/0 for example, 0.0.0.0/0, 192.168.2.0/24

Second source filter None

Destination filter None

Protocols and ports

Allow all

Specified protocols and ports

TCP Ports 9567 E.g. 20, 50-60

UDP Ports E.g. all

SCTP Ports E.g. 20, 50-60