Practical-6

Aim: Deployment of ML project in docker using Flask

Flask deployment within Docker in an ML lab is essential for creating portable and scalable environments. It allows ML models, along with their web interfaces, to be containerized, ensuring consistent performance and easier collaboration.

Docker ensures reproducibility, while Flask offers a simple way to build interactive APIs or applications around machine learning models, making them accessible to both researchers and end-users within a standardized environment.

Perform the following tasks:

Task 1: Ensure that the required libraries are installed:

● Install the Docker Command Line Interface Tool from: https://docs.docker.com/desktop/

● Install Flask library (https://flask.palletsprojects.com/en/2.3.x/installation/)

```
(base) arthjani@Arths-MacBook-Air ~ % pip install flask
Requirement already satisfied: flask in ./anaconda3/lib/python3.10/site-packages (2.3.2)
Requirement already satisfied: Werkzeug>=2.3.3 in ./anaconda3/lib/python3.10/site-packages (from flask) (2.3.6)
Requirement already satisfied: Jinja2>=3.1.2 in ./anaconda3/lib/python3.10/site-packages (from flask) (3.1.2)
Requirement already satisfied: itsdangerous>=2.1.2 in ./anaconda3/lib/python3.10/site-packages (from flask) (2.1.2)
```

● Install gunicorn library (https://docs.gunicorn.org/en/latest/install.html)

```
(base) arthjani@Arths-MacBook-Air ~ % pip install gunicorn
Requirement already satisfied: gunicorn in ./anaconda3/lib/python3.10/site-packages (20.1.0)
Requirement already satisfied: setuptools>=3.0 in ./anaconda3/lib/python3.10/site-packages (from gunicorn) (65.6.3)
(base) arthjani@Arths-MacBook-Air ~ %
```

Task 2: Create the docker file using the steps described in theory material.

a) Create a Dockerfile :

FROM python:3.10
WORKDIR /app
COPY RequiredFilesForDocker ./

RUN pip install -r requirements.txt

EXPOSE 8501

ENTRYPOINT ["streamlit", "run", "script1.py", "--server.port=8501", "--server.address=0.0.0.0"]

b) Create a requirement.txt file :

scikit-learn==0.24.2

pandas==1.3.3
numpy==1.21.2
flask==2.1.0
gunicorn==20.1.0

Task 3: Create the docker image using docker build command.

```
[+] Building 65.7s (8/9)
 => => sha256:1fb7efcf9eab7803298874aca4438f97958ccef72e9d62bf6c7654b5d9c92c40 3.51MB / 3.51MB
 => => sha256:ec9a8be8d55c26df0ad6648b4a2cf81563a89cd042b0d16f0ab58eef2cf0e4ac 13.75MB / 13.75MB
 => => sha256:0b0ea7fc90f399b2ca372776ea4b1b7ce28c725e86a2b96066262846942c68fd 245B / 245B
 => => sha256:8b9b67f59e57ed7961ac441a98c5e7481c9ddb658dc2df313fe14931f032f1c3 3.14MB / 3.14MB
 => => extracting sha256:1f7ce2fa46ab3942feabee654933948821303a5a821789dddab2d8c3df59e227
 => => extracting sha256:1fb7efcf9eab7803298874aca4438f97958ccef72e9d62bf6c7654b5d9c92c40
 => => extracting sha256:ec9a8be8d55c26df0ad6648b4a2cf81563a89cd042b0d16f0ab58eef2cf0e4ac
 => => extracting sha256:0b0ea7fc90f399b2ca372776ea4b1b7ce28c725e86a2b96066262846942c68fd
 => => extracting sha256:8b9b67f59e57ed7961ac441a98c5e7481c9ddb658dc2df313fe14931f032f1c3
 => [internal] load build context
 => => transferring context: 752.28MB
 => [2/4] WORKDIR /app
 => [3/4] COPY . /app
 => [4/4] RUN pip install --no-cache-dir -r requirements.txt
 => => # Collecting six>=1.5
 => => #   Downloading six-1.16.0-py2.py3-none-any.whl (11 kB)
```

Check the image is created or not :

```
REPOSITORY    TAG       IMAGE ID       CREATED          SIZE
project       latest    75ebfac9ab69   5 minutes ago    1.23GB
dockerfile    latest    ee193e6cc1a7   12 days ago      509MB
ubuntu        latest    e4c58958181a   7 weeks ago      77.8MB
hello-world   latest    9c7a54a9a43c   6 months ago     13.3kB
```

Task 4: Run the docker container to execute the docker image and host the machine learning model using gunicorn wsgi server.

```
PS D:\Capstone Project-1\UI\New UI> docker build -t projecta .
[+] Building 0.0s (0/0)
[+] Building 39.8s (10/10) FINISHED
 => [internal] load build definition from Dockerfile
 => => transferring dockerfile: 589B
 => [internal] load .dockerignore
 => => transferring context: 2B
 => [internal] load metadata for docker.io/library/python:3.8-slim
 => [auth] library/python:pull token for registry-1.docker.io
 => [1/4] FROM docker.io/library/python:3.8-slim@sha256:19e07fa24813e88b04e606772213bd03ba044637cc939a211e28ccf997a9162a
 => [internal] load build context
 => => transferring context: 13.14MB
```

Task 5: Compare the performance of the model in docker container and flask script deployment.

```
D:\Capstone Project-1\UI\New UI>
D:\Capstone Project-1\UI\New UI>docker run -p 4000:80 projecta
[2023-11-23 11:17:21 +0000] [1] [INFO] Starting gunicorn 20.1.0
[2023-11-23 11:17:21 +0000] [1] [INFO] Listening at: http://0.0.0.0:80 (1)
[2023-11-23 11:17:21 +0000] [1] [INFO] Using worker: sync
[2023-11-23 11:17:21 +0000] [8] [INFO] Booting worker with pid: 8
```