Assignment 3

You need to submit the word document with filling the answers in the below question space

Part 1: Dockerizing Applications (30)

You need to dockerize below applications for different languages, you need to dockerize them i.e. create a Dockerfile, and run the container such that the name of the container is your roll-number and share the screenshot of the command and the running app, and push the image to your Dockerhub.

Q1: Python app: https://github.com/kahootali/python-auth-example

Dockerfile & Link of :

Share Dockerfile here & link of Dockerhub repo
Docker Hub repo link:
https://hub.docker.com/repository/docker/rayed14/python-auth-example/general
Docker File:

```
FROM python:3.9
WORKDIR /app
COPY . /app
RUN pip install -r requirements.txt
EXPOSE 8080
ENV Name World
CMD ["python", "app.py"]
```

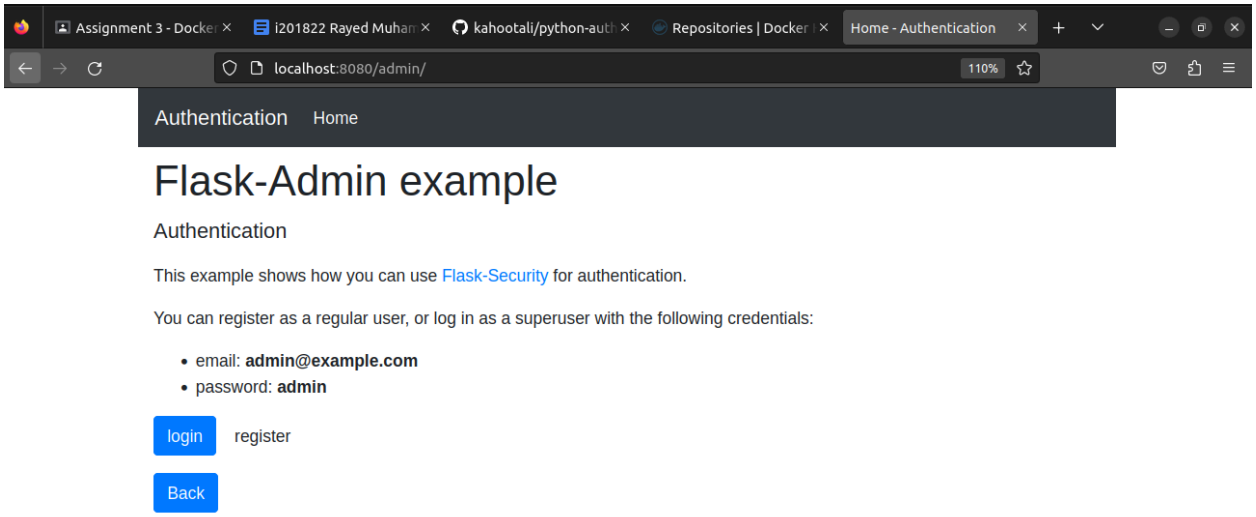
Screenshots of command & running app here:

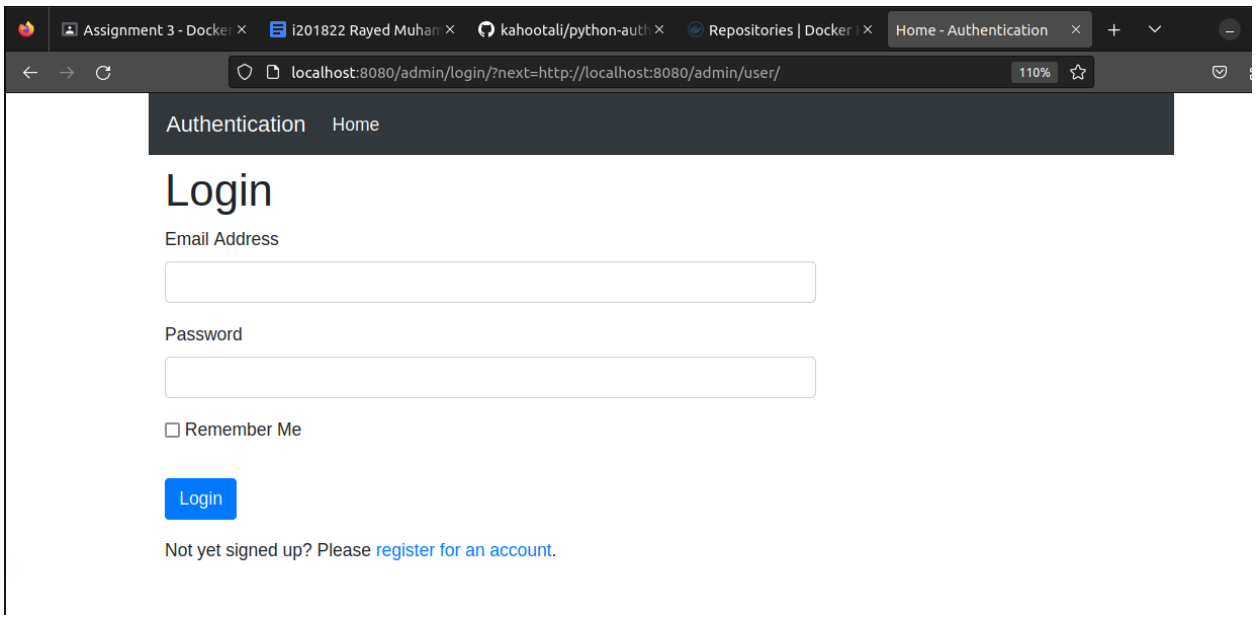
Share screenshots here

```
rayed@rayed:~/Documents/DevOps/Assignment3$ code .
rayed@rayed:~/Documents/DevOps/Assignment3$ git clone https://github.com/kahootali/python-auth-example.git
Cloning into 'python-auth-example'...
remote: Enumerating objects: 22, done.
remote: Counting objects: 100% (22/22), done.
remote: Compressing objects: 100% (19/19), done.
remote: Total 22 (delta 2), reused 18 (delta 1), pack-reused 0
Receiving objects: 100% (22/22), 7.58 KiB | 861.00 KiB/s, done.
Resolving deltas: 100% (2/2), done.
rayed@rayed:~/Documents/DevOps/Assignment3$ cd python-auth-example/
```

```
rayed@rayed:~/Documents/DevOps/Assignment3/python-auth-example$ sudo docker build -t i201822/python-auth-example .
[+] Building 235.6s (10/10) FINISHED                                docker:default
 => [internal] load build definition from Dockerfile                          0.0s
 => => transferring dockerfile: 168B                                          0.0s
 => [internal] load .dockerignore                                             0.0s
 => => transferring context: 2B                                               0.0s
 => [internal] load metadata for docker.io/library/python:3.9                 4.3s
 => [auth] library/python:pull token for registry-1.docker.io                 0.0s
 => [1/4] FROM docker.io/library/python:3.9@sha256:b6cc878074fdc6aff448  184.8s
 => => resolve docker.io/library/python:3.9@sha256:b6cc878074fdc6aff44867  0.1s
 => => sha256:8457fd5474e70835e4482983a5662355d892d5f6 49.58MB / 49.58MB  59.4s
 => => sha256:b6cc878074fdc6aff44867f42bf4cc6d18f4e71ed44 1.86kB / 1.86kB  0.0s
 => => sha256:ddf3e328f78494805eeb0c43b6754178a941ae93b26 2.01kB / 2.01kB  0.0s
 => => sha256:fc0d8a3ea4c243eaae22bf74b24b70081c526d49044 7.51kB / 7.51kB  0.0s
 => => sha256:13baa2029dde87a21b87127168a0fb50a007c07d 24.05MB / 24.05MB  28.6s
 => => sha256:325c5bf4c2f26c11380501bec4b6eef8a3ea35b5 64.13MB / 64.13MB  92.0s
 => => sha256:7e18a660069fd7f87a7a6c49ddb701449bfb9 211.06MB / 211.06MB  166.6s
 => => sha256:98a59f0ffedebe05b4e1ada824cb5389ff0552e77d 6.39MB / 6.39MB  68.3s
 => => extracting sha256:8457fd5474e70835e4482983a5662355d892d5f6f0f90a27  5.9s
 => => extracting sha256:13baa2029dde87a21b87127168a0fb50a007c07da6b5adc8  1.4s
 => => sha256:b61148e3614002874bca495603b01ff0fb4781d 15.82MB / 15.82MB  106.1s
 => => sha256:93c6f72987d4626819736c13aaeeb308326e1283581833 244B / 244B  93.1s
 => => extracting sha256:325c5bf4c2f26c11380501bec4b6eef8a3ea35b554aa1b22  6.3s
 => => sha256:7630ce7dd5392ef1f9c81a4c0f4959285199183ff7 2.85MB / 2.85MB  96.8s
 => => extracting sha256:7e18a660069fd7f87a7a6c49ddb701449bfb929c0668117  15.2s
 => => extracting sha256:98a59f0ffedebe05b4e1ada824cb5389ff0552e77d501d89  0.6s
 => => extracting sha256:b61148e3614002874bca495603b01ff0fb4781d41453e10c  1.1s
 => => extracting sha256:93c6f72987d4626819736c13aaeeb308326e1283581833ef  0.0s
 => => extracting sha256:7630ce7dd5392ef1f9c81a4c0f4959285199183ff7765dd5  0.4s
 => [internal] load build context                                             0.1s
```

```
rayed@rayed:~/Documents/DevOps/Assignment3/python-auth-example$ sudo docker run -p 8080:8080 --name i201822 i201822/python-auth-example
2023-11-03 07:50:44,267 INFO sqlalchemy.engine.Engine BEGIN (implicit)
2023-11-03 07:50:44,268 INFO sqlalchemy.engine.Engine PRAGMA main.table_info("roles_users")
2023-11-03 07:50:44,268 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,270 INFO sqlalchemy.engine.Engine PRAGMA temp.table_info("roles_users")
2023-11-03 07:50:44,270 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,271 INFO sqlalchemy.engine.Engine PRAGMA main.table_info("role")
2023-11-03 07:50:44,271 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,272 INFO sqlalchemy.engine.Engine PRAGMA temp.table_info("role")
2023-11-03 07:50:44,273 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,274 INFO sqlalchemy.engine.Engine PRAGMA main.table_info("user")
2023-11-03 07:50:44,274 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,275 INFO sqlalchemy.engine.Engine PRAGMA temp.table_info("user")
2023-11-03 07:50:44,275 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,276 INFO sqlalchemy.engine.Engine COMMIT
2023-11-03 07:50:44,277 INFO sqlalchemy.engine.Engine BEGIN (implicit)
2023-11-03 07:50:44,278 INFO sqlalchemy.engine.Engine PRAGMA main.table_info("roles_users")
2023-11-03 07:50:44,278 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,279 INFO sqlalchemy.engine.Engine PRAGMA temp.table_info("roles_users")
2023-11-03 07:50:44,279 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,280 INFO sqlalchemy.engine.Engine PRAGMA main.table_info("role")
2023-11-03 07:50:44,280 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,280 INFO sqlalchemy.engine.Engine PRAGMA temp.table_info("role")
2023-11-03 07:50:44,281 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,281 INFO sqlalchemy.engine.Engine PRAGMA main.table_info("user")
2023-11-03 07:50:44,281 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,282 INFO sqlalchemy.engine.Engine PRAGMA temp.table_info("user")
2023-11-03 07:50:44,282 INFO sqlalchemy.engine.Engine [raw sql] ()
2023-11-03 07:50:44,284 INFO sqlalchemy.engine.Engine
```






```
^Crayed@rayed:~/Documents/DevOps/Assignment3/python-auth-example$ sudo docker tag i201822/python-auth-example rayed14/python-auth-example:v1.0
rayed@rayed:~/Documents/DevOps/Assignment3/python-auth-example$ sudo docker login
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
rayed@rayed:~/Documents/DevOps/Assignment3/python-auth-example$ sudo docker push rayed14/python-auth-example:v1.0
The push refers to repository [docker.io/rayed14/python-auth-example]
12a2a390035a: Pushing [====>                                              ]  7.657MB/84.1MB
e531084ac315: Pushed
662e7227e881: Pushed
fa83a371445d: Mounted from library/python
70866f64c03e: Mounted from library/python
2d788bc47240: Waiting
86e50e0709ee: Waiting
12b956927ba2: Waiting
266def75d28e: Waiting
29e49b59edda: Waiting
1777ac7d307b: Waiting
```

Q2: Java App using Maven as package manager: https://github.com/kahootali/maven-java-monitoring-example

Dockerfile:

Share Dockerfile here & link of Dockerhub repo
Docker Hub Repo:
https://hub.docker.com/repository/docker/rayed14/maven-java-monitoring-example/general

Docker File:

```
#st1
FROM maven:3.8.4-openjdk-11 AS builder
WORKDIR /app
COPY pom.xml .
COPY src ./src
RUN mvn clean package


#st2
FROM openjdk:11-jre-slim
WORKDIR /app
COPY --from=builder /app/target/*.jar app.jar
EXPOSE 8080
CMD ["java", "-jar", "app.jar"]
```

Screenshots of command & running app here:

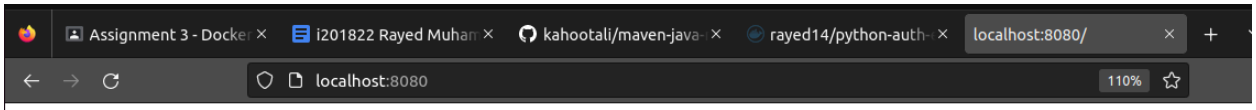
Share screenshot here

```
rayed@rayed:~/Documents/DevOps/Assignment3$ git clone https://github.com/kahootali/maven-java-monitoring-example.git
Cloning into 'maven-java-monitoring-example'...
remote: Enumerating objects: 35, done.
remote: Counting objects: 100% (35/35), done.
remote: Compressing objects: 100% (25/25), done.
remote: Total 35 (delta 1), reused 32 (delta 1), pack-reused 0
Receiving objects: 100% (35/35), 9.95 KiB | 152.00 KiB/s, done.
Resolving deltas: 100% (1/1), done.
rayed@rayed:~/Documents/DevOps/Assignment3$ cd maven-java-monitoring-example/
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ touch Dockerfile
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ sudo docker build -t i201822/maven-java-monitoring-example .
[sudo] password for rayed:
[+] Building 395.5s (16/16) FINISHED                                                                                    docker:default
 => [internal] load build definition from Dockerfile                                                                             0.0s
 => => transferring dockerfile: 282B                                                                                             0.0s
 => [internal] load .dockerignore                                                                                                0.1s
 => => transferring context: 2B                                                                                                  0.0s
 => [internal] load metadata for docker.io/library/maven:3.8.4-openjdk-11                                                        8.5s
 => [internal] load metadata for docker.io/library/openjdk:11-jre-slim                                                           3.6s
 => [auth] library/openjdk:pull token for registry-1.docker.io                                                                   0.0s
 => [auth] library/maven:pull token for registry-1.docker.io                                                                     0.0s
 => [builder 1/5] FROM docker.io/library/maven:3.8.4-openjdk-11@sha256:4b82a5896571897aab610b34c09ac326aa1d4fdf5e6993c41493bf3566a8be  278.9s
 => => resolve docker.io/library/maven:3.8.4-openjdk-11@sha256:4b82a5896571897aab610b34c09ac326aa1d4fdf5e6993c41493bf3566a8bef6          0.0s
 => => sha256:4b82a5896571897aab610b34c09ac326aa1d4fdf5e6993c41493bf3566a8bef6 549B / 549B                                       0.0s
 => => sha256:3ec6c01b0a965d2f4b41a2848d3a8f9a1d2b7573f59a6622f3a1bf4bd1fbeb29 2.42kB / 2.42kB                                   0.0s
 => => sha256:6b42b260678cbb6ffc03356d195e10a0a7732745700f4cce5ce98dd763f80d1f 8.92kB / 8.92kB                                   0.0s
 => => sha256:e4d61adff2077d048c6372d73c41b0bd68f525ad41f5530af05098a876683055 54.92MB / 54.92MB                                97.6s
 => => sha256:4ff1945c672b08a1791df62afaaf8aff14d3047155365f9c3646902937f7ffe6 5.15MB / 5.15MB                                  44.9s
 => => sha256:ff5b10aec998344606441aec43a335ab6326f32aae331aab27da16a6bb4ec2be 10.87MB / 10.87MB                                68.0s
 => => sha256:12de8c754e45686ace9e25d11bee372b070eed5b5ab20aa3b4fab8c936496d02 54.58MB / 54.58MB                               193.8s
 => => sha256:4848edf445067f98c6b8a509dedaf172cbffa5273efa89273a90cff48cffa416 5.42MB / 5.42MB                                 158.6s
 => => extracting sha256:e4d61adff2077d048c6372d73c41b0bd68f525ad41f5530af05098a876683055                                        4.4s
```

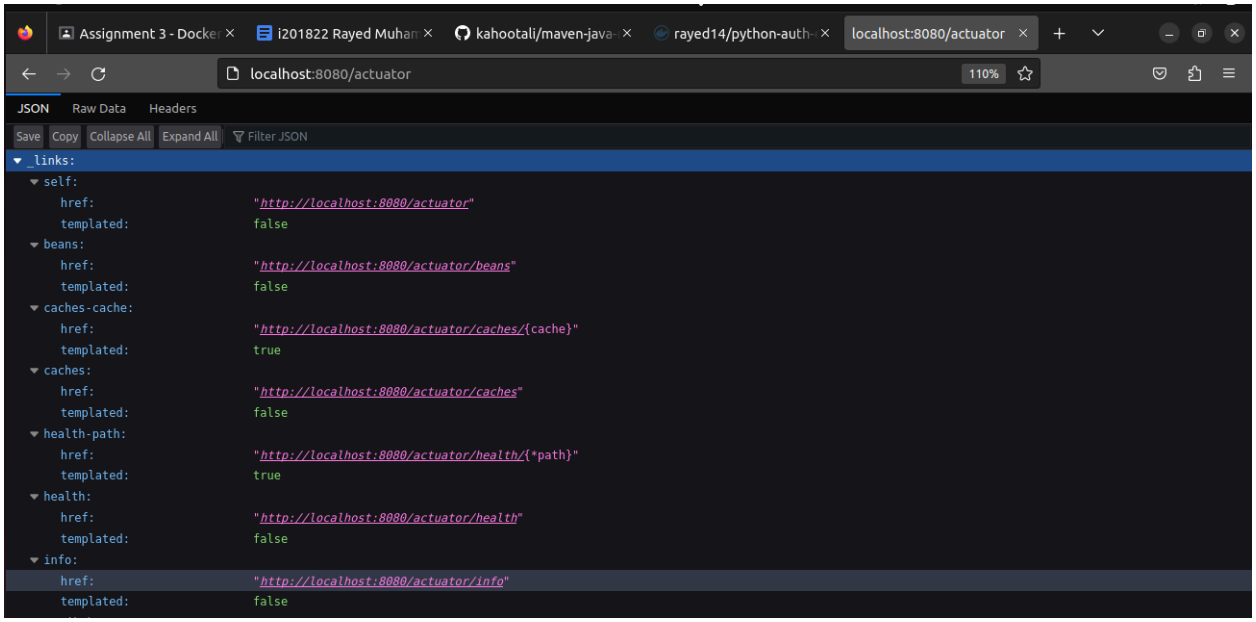
```
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ sudo docker container rm 97bc23391af6
97bc23391af6
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ sudo docker run -p 8080:8080 --name i201822 i201822/maven-java-monit
oring-example
LOGBACK: No context given for c.q.l.core.rolling.SizeAndTimeBasedRollingPolicy@503195940

  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::        (v2.2.1.RELEASE)

2023-11-03 08:39:10.634  INFO 1 --- [           main] c.e.a.ActuatorDemoApplication            : Starting ActuatorDemoApplication v0.0.1-SNAPS
HOT on e1b4a1d73a49 with PID 1 (/app/app.jar started by root in /app)
2023-11-03 08:39:10.640  INFO 1 --- [           main] c.e.a.ActuatorDemoApplication            : No active profile set, falling back to defaul
t profiles: default
2023-11-03 08:39:13.795  INFO 1 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port(s): 8080 (http)
2023-11-03 08:39:13.814  INFO 1 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2023-11-03 08:39:13.816  INFO 1 --- [           main] org.apache.catalina.core.StandardEngine  : Starting Servlet engine: [Apache Tomcat/9.0.2
7]
2023-11-03 08:39:13.914  INFO 1 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApplicationCo
ntext
2023-11-03 08:39:13.917  INFO 1 --- [           main] o.s.web.context.ContextLoader            : Root WebApplicationContext: initialization co
mpleted in 3095 ms
2023-11-03 08:39:14.788  INFO 1 --- [           main] o.s.s.concurrent.ThreadPoolTaskExecutor  : Initializing ExecutorService 'applicationTask
Executor'
2023-11-03 08:39:15.315  INFO 1 --- [           main] o.s.s.web.DefaultSecurityFilterChain     : Creating filter chain: any request, [org.spri
ngframework.security.web.context.request.async.WebAsyncManagerIntegrationFilter@76c7beb3, org.springframework.security.web.context.SecurityCon
textPersistenceFilter@569bf9eb, org.springframework.security.web.header.HeaderWriterFilter@bcec031, org.springframework.security.web.csrf.Csrf
```



Hello Guest!!




```
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ sudo docker tag i201822/maven-java-monitoring-example rayed14/maven-
java-monitoring-example:v1.0
[sudo] password for rayed:
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ sudo docker login
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$ sudo docker push rayed14/maven-java-monitoring-example:v1.0
The push refers to repository [docker.io/rayed14/maven-java-monitoring-example]
1a0dc79bffba: Pushed
89646e524e45: Pushed
d7802b8508af: Mounted from library/openjdk
e3abdc2e9252: Mounted from library/openjdk
eafe6e032dbd: Mounted from library/openjdk
92a4e8a3140f: Mounted from library/openjdk
v1.0: digest: sha256:cd73b7d24507c1ee792dbcf4e2a10ba865f71aa03baa7a2eca30338c5b92fa16 size: 1577
rayed@rayed:~/Documents/DevOps/Assignment3/maven-java-monitoring-example$
```

Q3: Any app of your choice, which you would have worked in any previous semester, add that to github

Link of app:

Share github link of the code
Github LInk:
https://github.com/Rayed14/Web-Scrapper-for-University-Websites

Dockerfile:

Share Dockerfile here & link of Dockerhub repo
Docker Hub repo:
https://hub.docker.com/repository/docker/rayed14/web-scraper/general

Docker file:

```
FROM python:3.9

# Install the Python dependencies
RUN pip install requests beautifulsoup4 networkx spacy pandas dframcy
matplotlib IPython

# Copy the application files into the image
COPY . /app

# Set the working directory
WORKDIR /app

# Expose the port that the application needs
EXPOSE 8080

# Start the application
CMD ["python", "Project.py"]
```

Screenshots of command & running app here:

Share screenshot here

```
rayed@rayed:~/Documents/DevOps/Assignment3$ git clone https://github.com/Rayed14/Web-Scrapper-for-University-Websites.git
Cloning into 'Web-Scrapper-for-University-Websites'...
remote: Enumerating objects: 15, done.
remote: Counting objects: 100% (15/15), done.
remote: Compressing objects: 100% (13/13), done.
remote: Total 15 (delta 3), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (15/15), 19.84 KiB | 95.00 KiB/s, done.
Resolving deltas: 100% (3/3), done.
rayed@rayed:~/Documents/DevOps/Assignment3$ cd Web-Scrapper-for-University-Websites/
rayed@rayed:~/Documents/DevOps/Assignment3/Web-Scrapper-for-University-Websites$ touch Dockerfile
rayed@rayed:~/Documents/DevOps/Assignment3/Web-Scrapper-for-University-Websites$ sudo docker build -t i201822/webscraper .
[+] Building 15.1s (10/10) FINISHED                                                                                    docker:default
 => [internal] load .dockerignore                                                                                              0.0s
 => => transferring context: 2B                                                                                                0.0s
 => [internal] load build definition from Dockerfile                                                                           0.0s
 => => transferring dockerfile: 340B                                                                                           0.0s
 => [internal] load metadata for docker.io/library/python:3.9                                                                  3.1s
 => [auth] library/python:pull token for registry-1.docker.io                                                                  0.0s
 => CACHED [1/4] FROM docker.io/library/python:3.9@sha256:b6cc878074fdc6aff44867f42bf4cc6d18f4e71ed44027649856355b8e23dbe4     0.0s
 => [internal] load build context                                                                                              0.1s
 => => transferring context: 217.87kB                                                                                          0.1s
 => [2/4] RUN pip install requests beautifulsoup4                                                                             11.3s
 => [3/4] COPY . /app                                                                                                          0.2s
 => [4/4] WORKDIR /app                                                                                                         0.1s
 => exporting to image                                                                                                         0.3s
 => => exporting layers                                                                                                        0.3s
 => => writing image sha256:7a6c80d7df77de75842a77aa215ccf9b4799ad16c7e63213d8e988439dac00d2                                   0.0s
```

```
rayed@rayed:~/Documents/DevOps/Assignment3/Web-Scrapper-for-University-Websites$ sudo docker build -t i201822/webscraper .
[+] Building 179.3s (10/10) FINISHED                                                                                   docker:default
 => [internal] load build definition from Dockerfile                                                                           0.0s
 => => transferring dockerfile: 389B                                                                                           0.0s
 => [internal] load .dockerignore                                                                                              0.0s
 => => transferring context: 2B                                                                                                0.0s
 => [internal] load metadata for docker.io/library/python:3.9                                                                  1.6s
 => [auth] library/python:pull token for registry-1.docker.io                                                                  0.0s
 => CACHED [1/4] FROM docker.io/library/python:3.9@sha256:b6cc878074fdc6aff44867f42bf4cc6d18f4e71ed44027649856355b8e23dbe4     0.0s
 => [2/4] RUN pip install requests beautifulsoup4 networkx spacy pandas dframcy matplotlib IPython                          171.9s
 => [internal] load build context                                                                                              0.0s
 => => transferring context: 2.38kB                                                                                            0.0s
 => [3/4] COPY . /app                                                                                                          0.2s
 => [4/4] WORKDIR /app                                                                                                         0.1s
 => exporting to image                                                                                                         5.4s
 => => exporting layers                                                                                                        5.4s
 => => writing image sha256:429cde079d6a9f9fbf1fc2d72355f1542fb59ebfa0c57c7908639cdc63761b96                                   0.0s
 => => naming to docker.io/i201822/webscraper                                                                                  0.0s
rayed@rayed:~/Documents/DevOps/Assignment3/Web-Scrapper-for-University-Websites$ sudo docker run -p 8080:8080 --name i201822 i201822/webscrape
r
Traceback (most recent call last):
  File "/app/Project.py", line 90, in <module>
    nlp = spacy.load("en_core_web_sm")
  File "/usr/local/lib/python3.9/site-packages/spacy/__init__.py", line 51, in load
    return util.load_model(
  File "/usr/local/lib/python3.9/site-packages/spacy/util.py", line 472, in load_model
    raise IOError(Errors.E050.format(name=name))
OSError: [E050] Can't find model 'en_core_web_sm'. It doesn't seem to be a Python package or a valid path to a data directory.
```

Part 2: Answer below questions (20)

Q1) What are namespaces & cgroups in containers

Answer goes here

Namespaces are linux features that provide isolation for containers making them look as if they have their own environment. They provide a process with its own isolated view of the system, such as its own file system, network, hostname.

Control groups is a linux feature that allows us to control/limit the resources of a process. This prevents resource conflict among containers on same host.

Q2) How to leverage cache using Dockerfiles

Answer goes here

1) One way is to order your layers in a way that layers that change often should be at the end of the Dockerfile.

2) Another way is to not include unnecessary files and packages. When copying files, use specific copy instructions and don't copy the entire directory.

3) Use multistage build. The Docker builder will work out dependencies between the stages and run them using the most efficient strategy. This can also reduce the size of an image.

4) Create .dockerignore file.

5) Minimize the number of layers in an Dockerfile.

Q3) What are multi-stage builds

Answer goes here

It is a docker feature that allows you to create smaller and efficient docker images. It works by using multiple stages in a single Dockerfile. Each stage can have its own set of instructions and build context and starts with FROM command.

Q4) Explain RUN vs CMD vs Entrypoint

Answer goes here

Run command is used during image build time. It is used for installing, updating packages, softwares and is not run when the container is started. It is only used to build image.

CMD is used to specify the default command that will be executed when a container is started. But it can be overridden when starting a container with different commands as arguments.

Entrypoint is similar to CMD. But it cannot be overridden. By default it is /bin/sh -c.

When Entrypoint and CMD are used together, CMD specifies the commands that need to be passed as arguments to entrypoint.