

Instructor: Qasim A

Develop and Deploy a Machine Learning Application using Docker

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Step 1: Set Up the VM

1. Update the System

```
sudo apt update sudo apt upgrade -y
```

```
ssh://google.com/42/ssh/projects/gcp:ssh-csr=02f21d3c:/dev/null@ssh-20241002-032436?auth=0&w=en_US&projectNumber=5026344389&useAndProxy=true
SSH-in-browser [UPLOAD FILE] [DOWNLOAD FILE] [ ] [ ] [ ] [ ]

linux instance-20241002-032436 5.16.0-02-cloud-amd64 #1 SMP Debian 5.10.223-1 (2024-06-18) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.

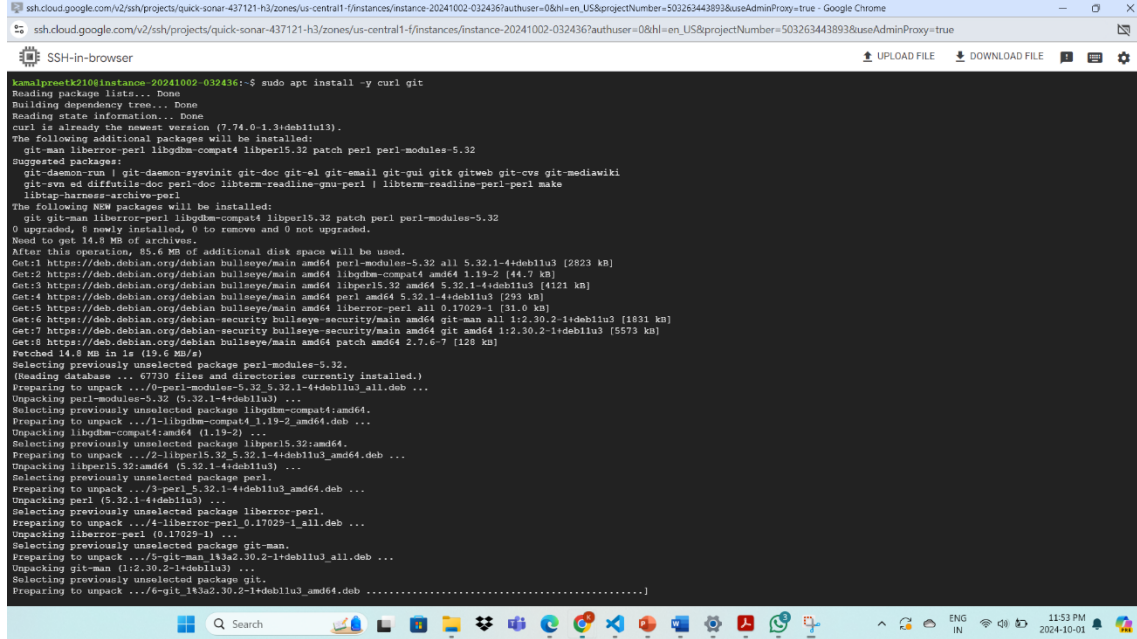
kmalprwt@kali:~$ ssh instance-20241002-032436 -S sudo apt update
Hit:1 https://deb.debian.org/debian bullseye InRelease
Hit:2 https://packages.cloud.google.com/apt google-compute-engine-bullseye-stable InRelease [1321 kB]
Get:3 https://deb.debian.org/debian-security bullseye-security InRelease [27.2 kB]
Get:4 https://deb.debian.org/debian bullseye-updates InRelease [44.1 kB]
Get:5 https://packages.cloud.google.com/apt cloud-sdr-bullseye InRelease [1604 B]
Get:6 https://deb.debian.org/debian bullseye-backports InRelease [49.0 kB]
Get:7 https://packages.cloud.google.com/apt google-compute-engine-bullseye-stable/main amd64 Packages [3117 B]
Get:8 https://deb.debian.org/debian-security bullseye-security/main sources [104 kB]
Get:9 https://deb.debian.org/debian-security bullseye-security/main amd64 Packages [296 kB]
Get:10 https://deb.debian.org/debian-security bullseye-security/main Translation-en [190 kB]
Get:11 https://packages.cloud.google.com/apt cloud-sdr-bullseye/main amd64 Packages [2305 kB]
Get:12 https://packages.cloud.google.com/apt cloud-sdr-bullseye/main all Packages [1061 kB]
Fetched 5715 kB in 1s (6759 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
# packages can be upgraded. Run 'apt list --upgradable' to see them.

kmalprwt@kali:~$ ssh instance-20241002-032436 -S
```

[illegible]

2. Install Necessary Packages

sudo apt install -y curl git



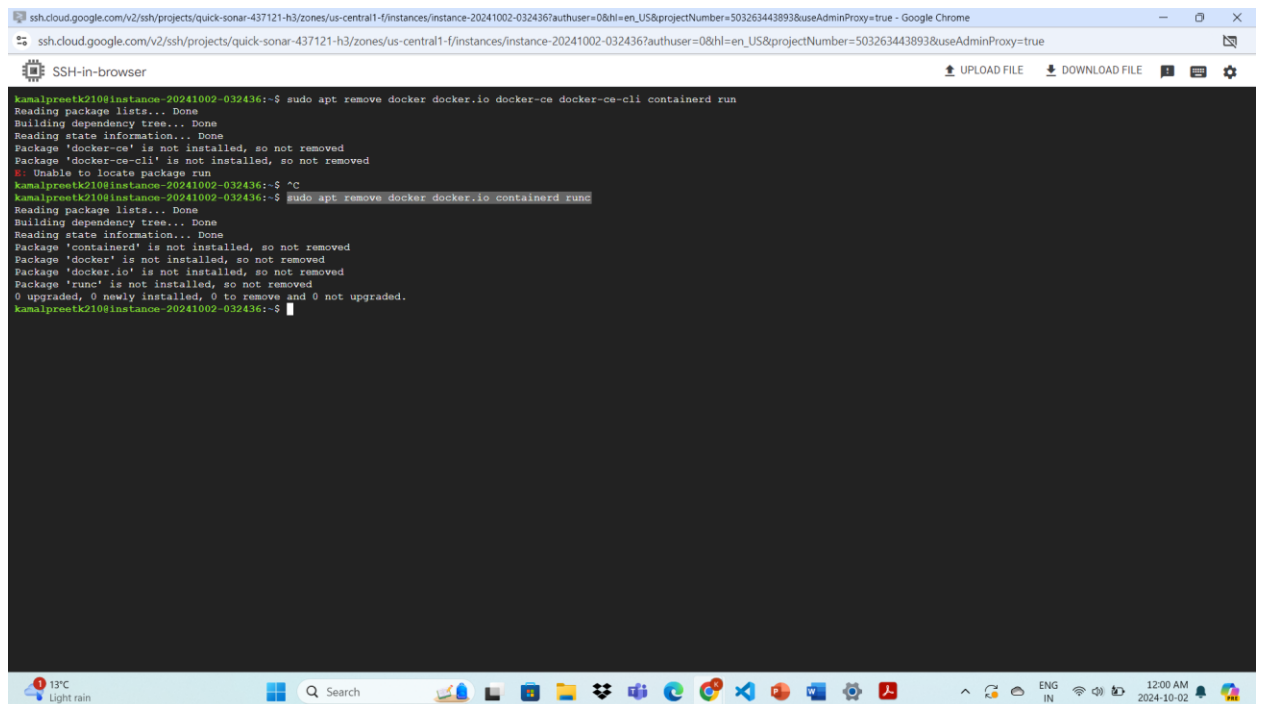
```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true

SSH-in-browser

kamalpreetk210@instance-20241002-032436:~$ sudo apt install -y curl git
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
curl is already the newest version (7.74.0-1.3+deb11u13).
The following additional packages will be installed:
git-man liberror-perl libqdm-compat4 libperl5.32 patch perl perl-modules-5.32
Suggested packages:
git-daemon-run | git-daemon-symlinks git-doc git-el git-email git-gui gitk gitweb git-cvs git-mediawiki
git-svn ed diffutils-doc perl-doc libterm-readline-gnu-perl | libterm-readline-perl-perl make
libtap-harness-archive-perl
The following NEW packages will be installed:
git git-man liberror-perl libqdm-compat4 libperl5.32 patch perl perl-modules-5.32
0 upgraded, 8 newly installed, 0 to remove and 0 not upgraded.
Need to get 14.8 MB of archives.
After this operation, 85.6 MB of additional disk space will be used.
Get:1 https://deb.debian.org/debian bullseye/main amd64 perl-modules-5.32 all 5.32.1-4+deb11u3 [2823 kB]
Get:2 https://deb.debian.org/debian bullseye/main amd64 libqdm-compat4 amd64 1.19-2 [44.7 kB]
Get:3 https://deb.debian.org/debian bullseye/main amd64 libperl5.32 amd64 5.32.1-4+deb11u3 [4121 kB]
Get:4 https://deb.debian.org/debian bullseye/main amd64 perl amd64 5.32.1-4+deb11u3 [292 kB]
Get:5 https://deb.debian.org/debian bullseye/main amd64 liberror-perl all 0.17029-1 [31.0 kB]
Get:6 https://deb.debian.org/debian-security bullseye-security/main amd64 git-man all 1:2.30.2-1+deb11u3 [1831 kB]
Get:7 https://deb.debian.org/debian-security bullseye-security/main amd64 git amd64 1:2.30.2-1+deb11u3 [5573 kB]
Get:8 https://deb.debian.org/debian bullseye/main amd64 patch amd64 2.7.6-7 [120 kB]
Fetched 14.8 MB in 1s (19.6 MB/s)
Selecting previously unselected package perl-modules-5.32.
(Reading database ... 6730 files and directories currently installed.)
Preparing to unpack .../0-perl-modules-5.32_5.32.1-4+deb11u3_all.deb ...
Unpacking perl-modules-5.32 (5.32.1-4+deb11u3) ...
Selecting previously unselected package libqdm-compat4.
Preparing to unpack .../1-libqdm-compat4_1.19-2_amd64.deb ...
Unpacking libqdm-compat4:amd64 (1.19-2) ...
Selecting previously unselected package libperl5.32:amd64.
Preparing to unpack .../2-libperl5.32_5.32.1-4+deb11u3_amd64.deb ...
Unpacking libperl5.32:amd64 (5.32.1-4+deb11u3) ...
Selecting previously unselected package perl.
Preparing to unpack .../3-perl_5.32.1-4+deb11u3_amd64.deb ...
Unpacking perl (5.32.1-4+deb11u3) ...
Selecting previously unselected package liberror-perl.
Preparing to unpack .../4-liberror-perl_0.17029-1_all.deb ...
Unpacking liberror-perl (0.17029-1) ...
Selecting previously unselected package git-man.
Preparing to unpack .../5-git-man_1:2.30.2-1+deb11u3_all.deb ...
Unpacking git-man (1:2.30.2-1+deb11u3) ...
Selecting previously unselected package git.
Preparing to unpack .../6-git_1:2.30.2-1+deb11u3_amd64.deb ...
Preparing to unpack .../6-git_1:2.30.2-1+deb11u3_amd64.deb ...
```

Step 2: Install Docker

1. Remove Old Versions: sudo apt remove docker docker-engine docker.io containerd runc



```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true

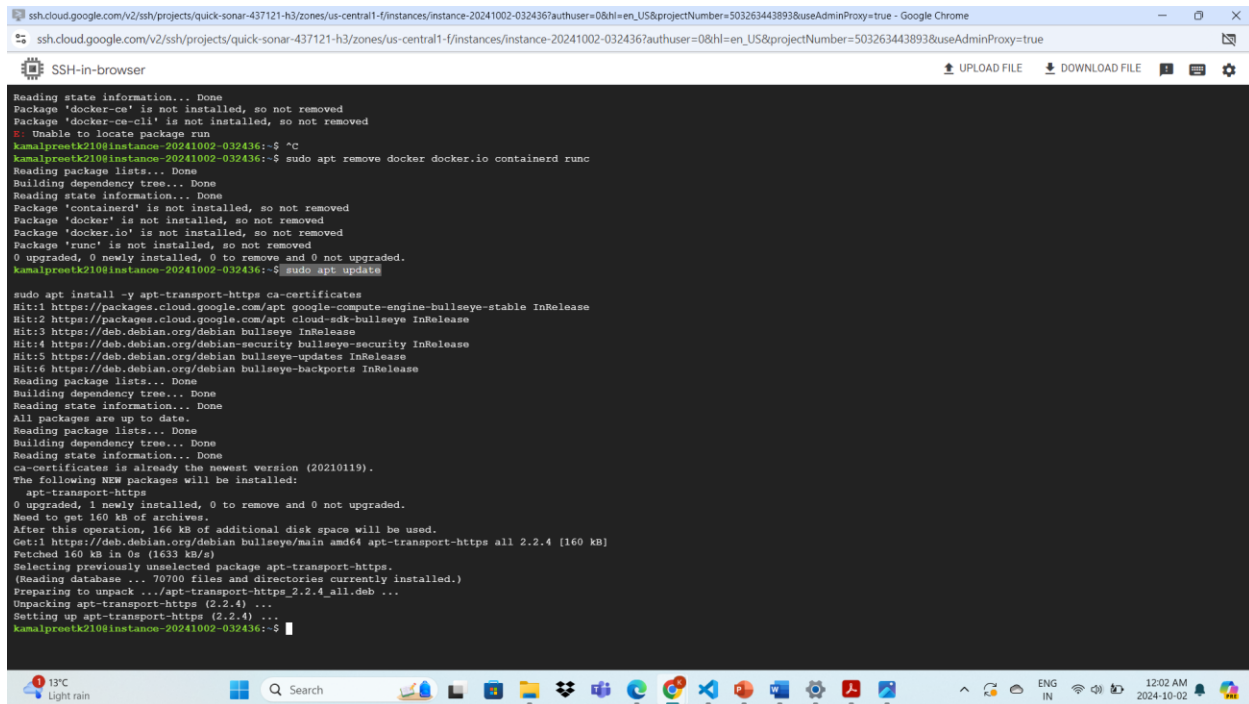
SSH-in-browser

kamalpreetk210@instance-20241002-032436:~$ sudo apt remove docker docker.io docker-ce docker-ce-cli containerd runc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'docker-ce' is not installed, so not removed
Package 'docker-ce-cli' is not installed, so not removed
Unable to locate package runc
kamalpreetk210@instance-20241002-032436:~$ ^C
kamalpreetk210@instance-20241002-032436:~$ sudo apt remove docker docker.io containerd runc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'containerd' is not installed, so not removed
Package 'docker' is not installed, so not removed
Package 'docker.io' is not installed, so not removed
Package 'runc' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
kamalpreetk210@instance-20241002-032436:~$
```

2. Set Up the Docker Repository

sudo apt update

sudo apt install -y apt-transport-https ca-certificates



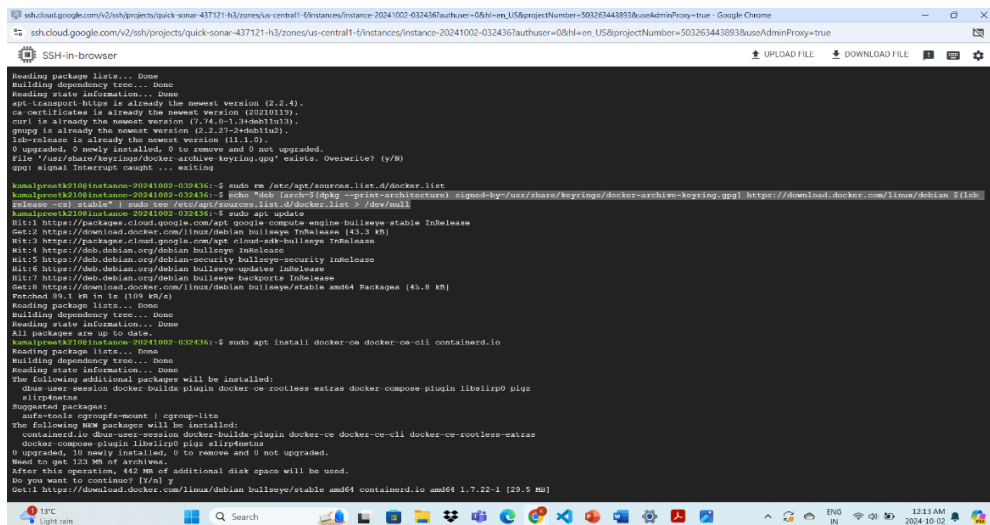
```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true

SSH-in-browser

Reading state information... Done
Package 'docker-ce' is not installed, so not removed
Package 'docker-ce-cli' is not installed, so not removed
E: Unable to locate package runC
kamalpreetk210@instance-20241002-032436:~$ ^C
kamalpreetk210@instance-20241002-032436:~$ sudo apt remove docker docker.io containerd runc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'containerd' is not installed, so not removed
Package 'docker' is not installed, so not removed
Package 'docker.io' is not installed, so not removed
Package 'runc' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
kamalpreetk210@instance-20241002-032436:~$ sudo apt update

sudo apt install -y apt-transport-https ca-certificates
Hit:1 https://packages.cloud.google.com/apt/google-compute-engine-bullseye-stable InRelease
Hit:2 https://packages.cloud.google.com/apt/cloud-sdk-bullseye InRelease
Hit:3 https://deb.debian.org/debian bullseye InRelease
Hit:4 https://deb.debian.org/debian-security bullseye-security InRelease
Hit:5 https://deb.debian.org/debian bullseye-updates InRelease
Hit:6 https://deb.debian.org/debian bullseye-backports InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20210119).
The following NEW packages will be installed:
  apt-transport-https
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 160 kB of archives.
After this operation, 166 kB of additional disk space will be used.
Get:1 https://deb.debian.org/debian bullseye/main amd64 apt-transport-https all 2.2.4 [160 kB]
Fetched 160 kB in 0s (1633 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 70700 files and directories currently installed.)
Preparing to unpack .../apt-transport-https_2.2.4_all.deb ...
Unpacking apt-transport-https (2.2.4) ...
Setting up apt-transport-https (2.2.4) ...
kamalpreetk210@instance-20241002-032436:~$
```

```
echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable" | sudo tee/etc/apt/sources.list.d/docker.list > /dev/null
```



```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true

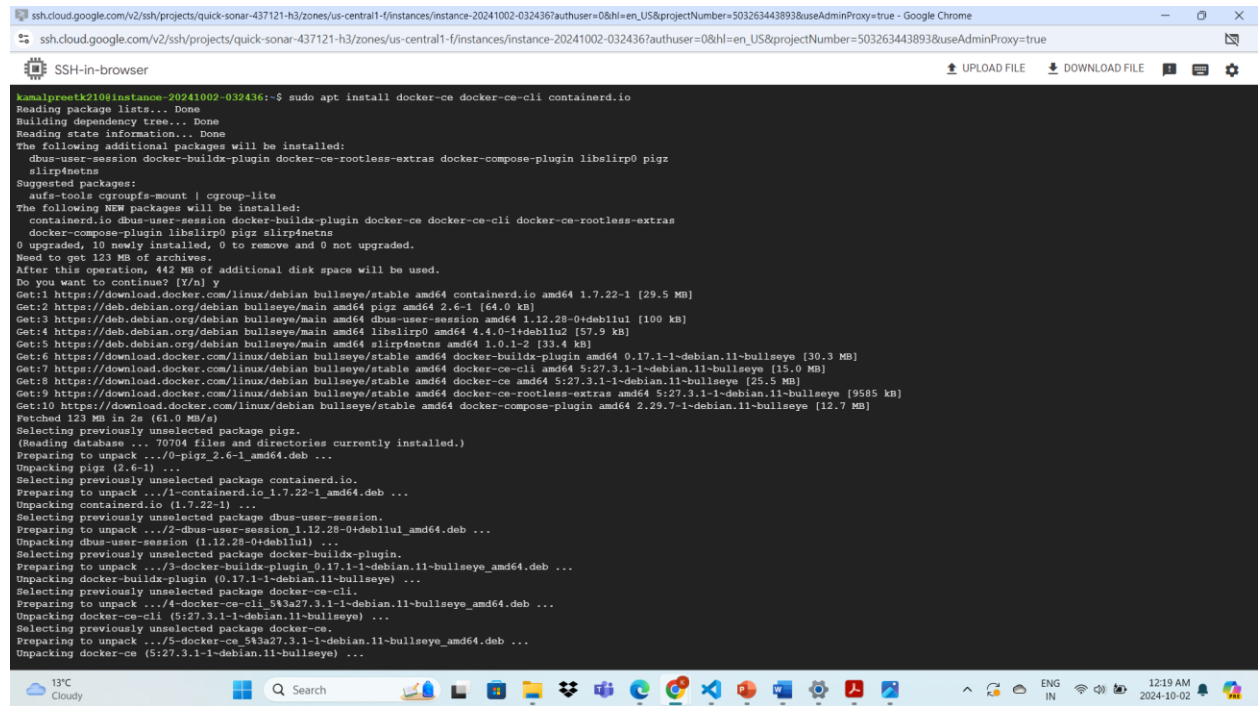
SSH-in-browser

Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
apt-transport-https is already the newest version (2.2.4).
ca-certificates is already the newest version (20210119).
curl is already the newest version (7.74.0-1.3+deb11u3).
gnupg is already the newest version (2.2.27-2+deb11u2).
jq is already the newest version (1.6-9).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
File '/usr/share/keyrings/docker-archive-keyring.gpg' exists. Overwrite? (y/N)
q) signal Interrupt caught... exiting

kamalpreetk210@instance-20241002-032436:~$ sudo rm /etc/apt/sources.list.d/docker.list
kamalpreetk210@instance-20241002-032436:~$ echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/debian $(lsb_release -cs) stable" | sudo tee/etc/apt/sources.list.d/docker.list > /dev/null
kamalpreetk210@instance-20241002-032436:~$ sudo apt update
Hit:1 https://packages.cloud.google.com/apt/google-compute-engine-bullseye-stable InRelease
Hit:2 https://download.docker.com/linux/debian bullseye InRelease (43.3 kB)
Hit:3 https://packages.cloud.google.com/apt/cloud-sdk-bullseye InRelease
Hit:4 https://deb.debian.org/debian bullseye InRelease
Hit:5 https://deb.debian.org/debian-security bullseye-security InRelease
Hit:6 https://deb.debian.org/debian bullseye-updates InRelease
Hit:7 https://deb.debian.org/debian bullseye-backports InRelease
Get:8 https://download.docker.com/linux/debian bullseye/stable amd64 Packages [45.8 kB]
Fetched 45.3 kB in 1s (109 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
kamalpreetk210@instance-20241002-032436:~$ sudo apt install docker-ce docker-ce-cli containerd.io
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  dbus-user-session docker-buildx-plugin docker-ce-rootless-extras docker-compose-plugin libbtrfs-plugin
Suggested packages:
  aufs-tools cgroupfs-mount | cgroup-lite
The following NEW packages will be installed:
  containerd.io dbus-user-session docker-buildx-plugin docker-ce docker-ce-cli docker-ce-rootless-extras
  docker-compose-plugin libbtrfs-plugin
0 upgraded, 10 newly installed, 0 to remove and 0 not upgraded.
Need to get 122 MB of archives.
After this operation, 442 MB of additional disk space will be used.
Do you want to continue? (y/n) y
Get:1 https://download.docker.com/linux/debian bullseye/stable amd64 containerd.io amd64 1.7.22-1 [29.5 MB]
```

3. Install Docker Engine

`sudo apt update`
`sudo apt install -y docker-ce docker-ce-cli containerd.io`



```
kamalpreetk210@instance-20241002-032436:~$ sudo apt install docker-ce docker-ce-cli containerd.io
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  dbus-user-session docker-buildx-plugin docker-ce-rootless-extras docker-compose-plugin liblslrp0 pigz
  slurp4netns
Suggested packages:
  aufs-tools cgroups-mount | cgroup-lite
The following NEW packages will be installed:
  containerd.io dbus-user-session docker-buildx-plugin docker-ce docker-ce-cli docker-ce-rootless-extras
  docker-compose-plugin liblslrp0 pigz slurp4netns
0 upgraded, 10 newly installed, 0 to remove and 0 not upgraded.
Need to get 123 MB of archives.
After this operation, 442 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 https://deb.debian.org/debian bullseye/stable amd64 containerd.io amd64 1.7.22-1 [29.5 MB]
Get:2 https://deb.debian.org/debian bullseye/main amd64 pigz amd64 2.6-1 [64.0 kB]
Get:3 https://deb.debian.org/debian bullseye/main amd64 dbus-user-session amd64 1.12.28-0+deb11u1 [100 kB]
Get:4 https://deb.debian.org/debian bullseye/main amd64 liblslrp0 amd64 4.4.0-1+deb11u2 [57.9 kB]
Get:5 https://deb.debian.org/debian bullseye/main amd64 slurp4netns amd64 1.0.1-2 [33.4 kB]
Get:6 https://download.docker.com/linux/debian bullseye/stable amd64 docker-buildx-plugin amd64 0.17.1-1-debian.11-bullseye [30.3 MB]
Get:7 https://download.docker.com/linux/debian bullseye/stable amd64 docker-ce-cli amd64 5:27.3.1-1-debian.11-bullseye [15.0 MB]
Get:8 https://download.docker.com/linux/debian bullseye/stable amd64 docker-ce amd64 5:27.3.1-1-debian.11-bullseye [25.5 MB]
Get:9 https://download.docker.com/linux/debian bullseye/stable amd64 docker-ce-rootless-extras amd64 5:27.3.1-1-debian.11-bullseye [9585 kB]
Get:10 https://download.docker.com/linux/debian bullseye/stable amd64 docker-compose-plugin amd64 2.29.7-1-debian.11-bullseye [12.7 MB]
Fetched 123 MB in 2s (61.0 MB/s)
Selecting previously unselected package pigz.
(Reading database ... 70704 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package containerd.io.
Preparing to unpack .../1-containerd.io_1.7.22-1_amd64.deb ...
Unpacking containerd.io (1.7.22-1) ...
Selecting previously unselected package dbus-user-session.
Preparing to unpack .../2-dbus-user-session_1.12.28-0+deb11u1_amd64.deb ...
Unpacking dbus-user-session (1.12.28-0+deb11u1) ...
Selecting previously unselected package docker-buildx-plugin.
Preparing to unpack .../3-docker-buildx-plugin_0.17.1-1-debian.11-bullseye_amd64.deb ...
Unpacking docker-buildx-plugin (0.17.1-1-debian.11-bullseye) ...
Selecting previously unselected package docker-ce-cli.
Preparing to unpack .../4-docker-ce-cli_5:27.3.1-1-debian.11-bullseye_amd64.deb ...
Unpacking docker-ce-cli (5:27.3.1-1-debian.11-bullseye) ...
Selecting previously unselected package docker-ce.
Preparing to unpack .../5-docker-ce_5:27.3.1-1-debian.11-bullseye_amd64.deb ...
Unpacking docker-ce (5:27.3.1-1-debian.11-bullseye) ...
Preparing to unpack .../6-docker-ce-rootless-extras_5:27.3.1-1-debian.11-bullseye_amd64.deb ...
Unpacking docker-ce-rootless-extras (5:27.3.1-1-debian.11-bullseye) ...
Preparing to unpack .../7-docker-compose-plugin_2.29.7-1-debian.11-bullseye_amd64.deb ...
Unpacking docker-compose-plugin (2.29.7-1-debian.11-bullseye) ...
Setting up slurp4netns (1.0.1-2) ...
Setting up dbus-user-session (1.12.28-0+deb11u1) ...
Setting up containerd.io (1.7.22-1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.
Setting up docker-compose-plugin (2.29.7-1-debian.11-bullseye) ...
Setting up docker-ce-cli (5:27.3.1-1-debian.11-bullseye) ...
Setting up liblslrp0:amd64 (4.4.0-1+deb11u2) ...
Setting up pigz (2.6-1) ...
Setting up docker-ce-rootless-extras (5:27.3.1-1-debian.11-bullseye) ...
Setting up docker-ce (5:27.3.1-1-debian.11-bullseye) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for man-db (2.9.4-2) ...
Processing triggers for libc-bin (2.31-13+deb11u1) ...
kamalpreetk210@instance-20241002-032436:~$ sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
c1ec31eb5944: Pull complete
Digest: sha256:91fbb4418273d5a3273b6d587d62d518300a6ad268b28628f74997b93171b2
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

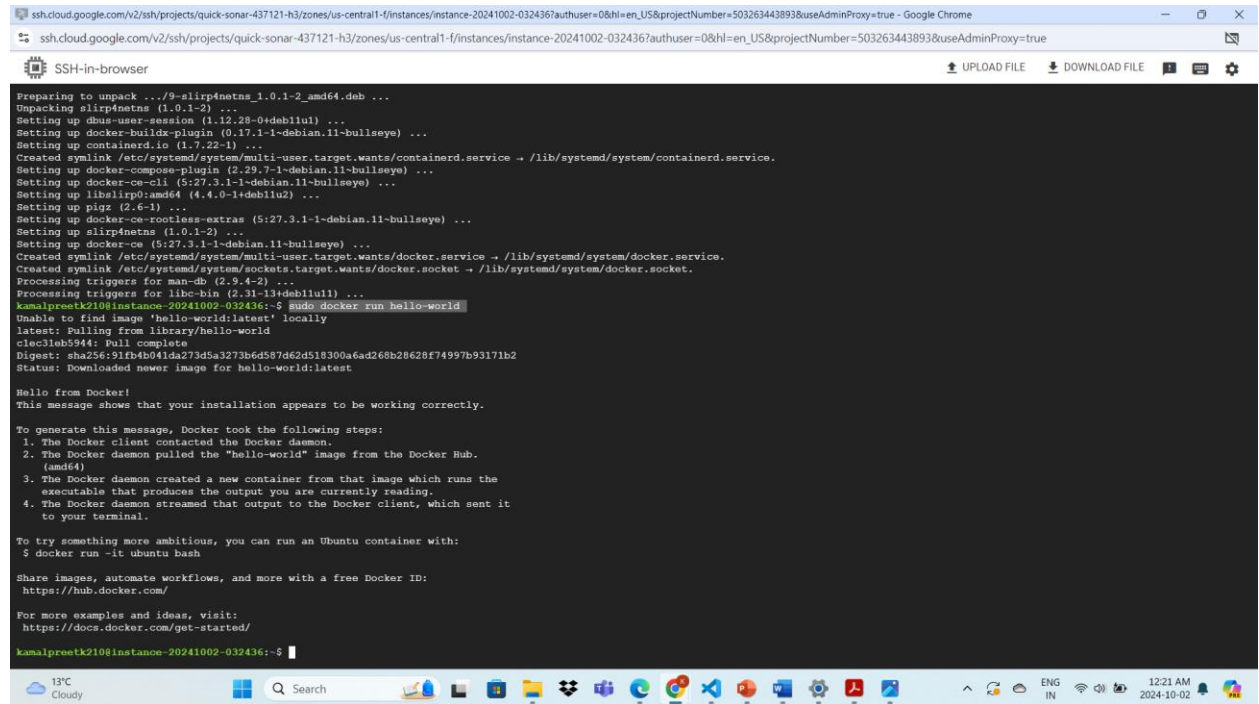
To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
kamalpreetk210@instance-20241002-032436:~$
```

4. Verify Docker Installation

`sudo docker run hello-world`



```
kamalpreetk210@instance-20241002-032436:~$ sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
c1ec31eb5944: Pull complete
Digest: sha256:91fbb4418273d5a3273b6d587d62d518300a6ad268b28628f74997b93171b2
Status: Downloaded newer image for hello-world:latest

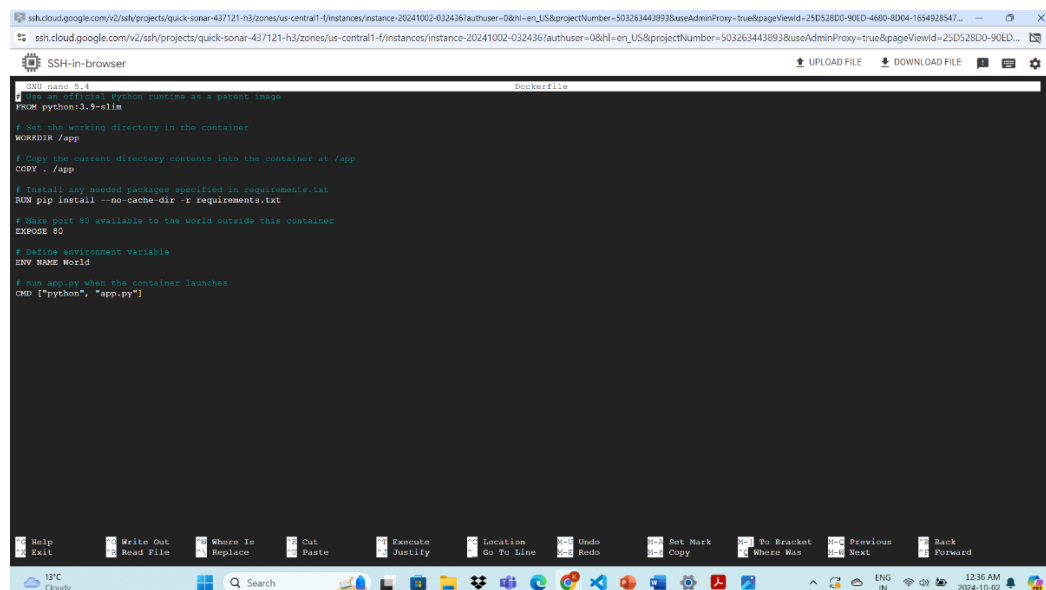
Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

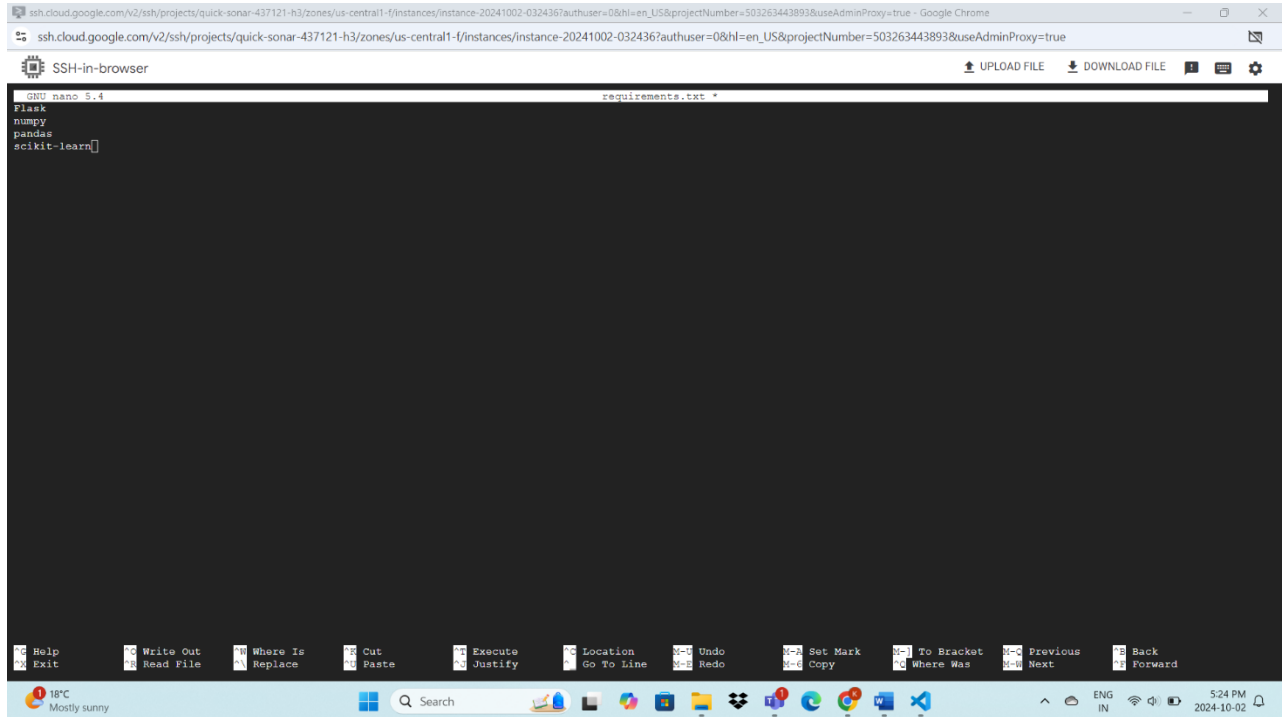
To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
kamalpreetk210@instance-20241002-032436:~$
```



3. Create requirements.txt File



Step 4: Develop the Machine Learning Application

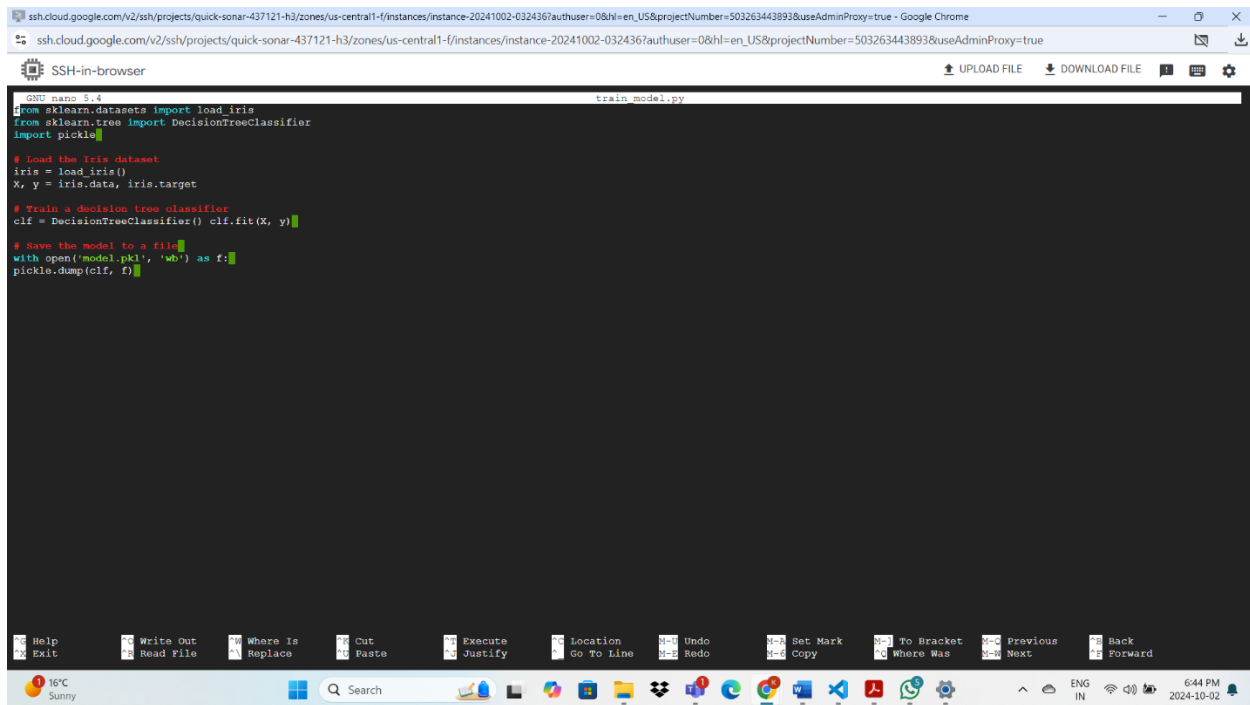
1. Create a Simple ML Model

```
from sklearn.datasets import load_iris
from sklearn.tree import DecisionTreeClassifier
import pickle
```

```
# Load the Iris dataset
iris = load_iris()
X, y = iris.data, iris.target
```

```
# Train a decision tree classifier
clf = DecisionTreeClassifier()
clf.fit(X, y)
```

```
# Save the model to a file
with open('model.pkl', 'wb') as f:
    pickle.dump(clf, f)
```



```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-0324367?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-0324367?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true
SSH-in-browser
train_model.py
GNU nano 5.4
from sklearn.datasets import load_iris
from sklearn.tree import DecisionTreeClassifier
import pickle

# Load the iris dataset
iris = load_iris()
X, y = iris.data, iris.target

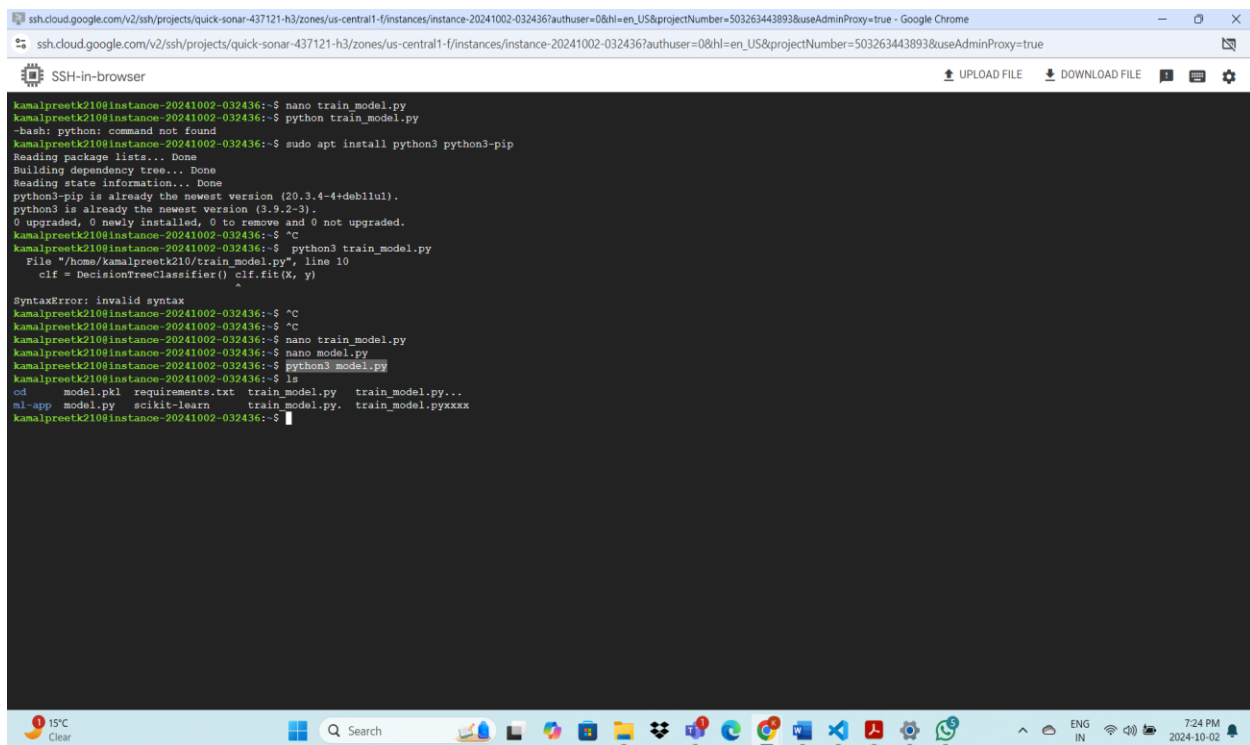
# Train a decision tree classifier
clf = DecisionTreeClassifier()
clf.fit(X, y)

# Save the model to a file
with open('model.pkl', 'wb') as f:
    pickle.dump(clf, f)
```

2. Run the Model Training Script

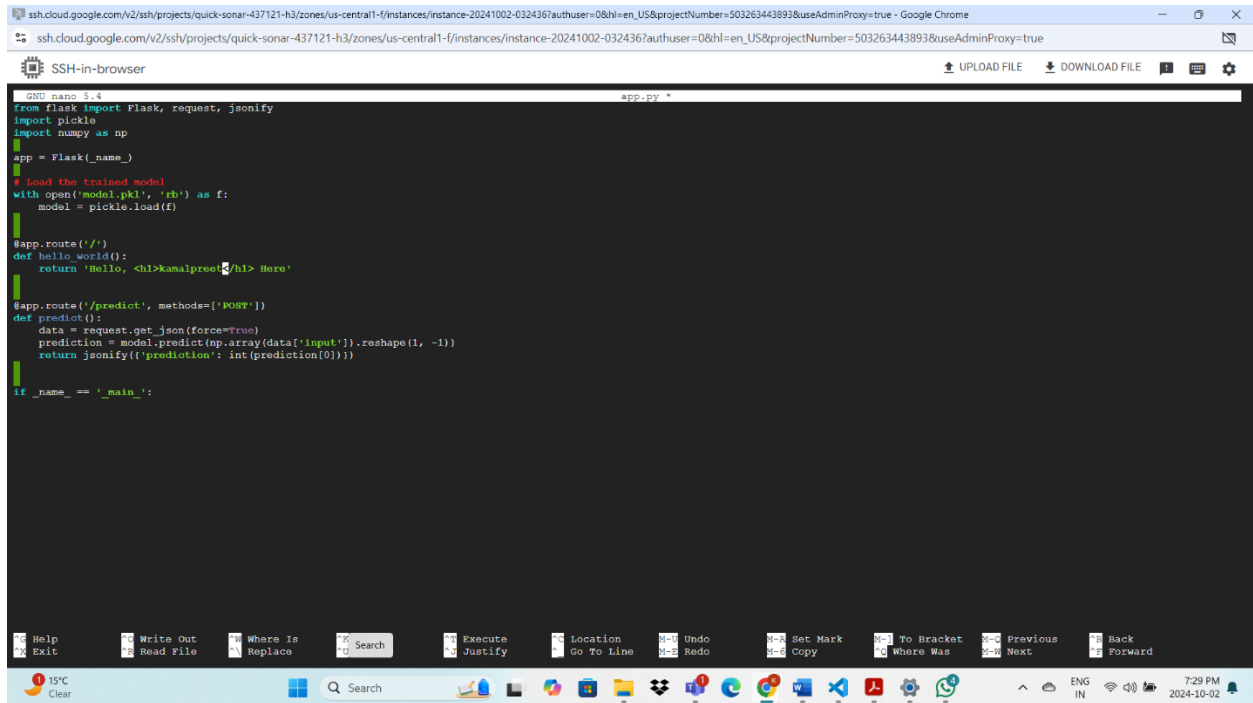
python train_model.py

nano



```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-0324367?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-0324367?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true
SSH-in-browser
Kamalpreetk210@instance-20241002-032436:~$ nano train_model.py
Kamalpreetk210@instance-20241002-032436:~$ python train_model.py
-bash: python: command not found
Kamalpreetk210@instance-20241002-032436:~$ sudo apt install python3 python3-pip
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3-pip is already the newest version (20.3.4-4+deb11u1).
python3 is already the newest version (3.9.2-3).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Kamalpreetk210@instance-20241002-032436:~$ ^C
Kamalpreetk210@instance-20241002-032436:~$ python3 train_model.py
File "/home/kamalpreetk210/train_model.py", line 10
    clf = DecisionTreeClassifier()
                                ^
SyntaxError: invalid syntax
Kamalpreetk210@instance-20241002-032436:~$ ^C
Kamalpreetk210@instance-20241002-032436:~$ ^C
Kamalpreetk210@instance-20241002-032436:~$ nano train_model.py
Kamalpreetk210@instance-20241002-032436:~$ nano model.py
Kamalpreetk210@instance-20241002-032436:~$ python3 model.py
Kamalpreetk210@instance-20241002-032436:~$ ls
cd  model.pkl  requirements.txt  train_model.py  train_model.py...
ml-app  model.py  scikit-learn  train_model.py.  train_model.pyxxxx
Kamalpreetk210@instance-20241002-032436:~$
```

3. Integrate the Model into the Flask App



```
GNU nano 5.4 app.py
from flask import Flask, request, jsonify
import pickle
import numpy as np

app = Flask(__name__)

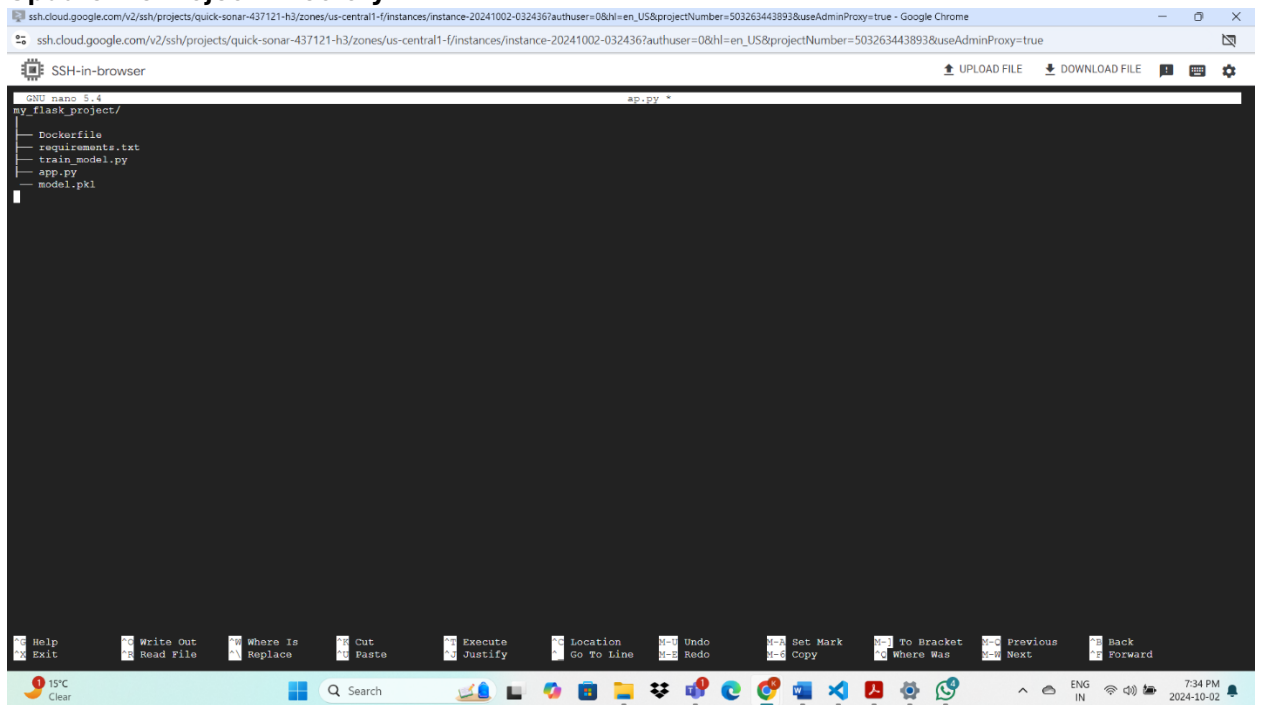
# Load the trained model
with open('model.pkl', 'rb') as f:
    model = pickle.load(f)

@app.route('/')
def hello_world():
    return 'Hello, <h>kamalproot</h> Here'

@app.route('/predict', methods=['POST'])
def predict():
    data = request.get_json(force=True)
    prediction = model.predict(np.array(data['input']).reshape(1, -1))
    return jsonify({'prediction': int(prediction[0])})

if __name__ == '__main__':
```

4. Update the Project Directory

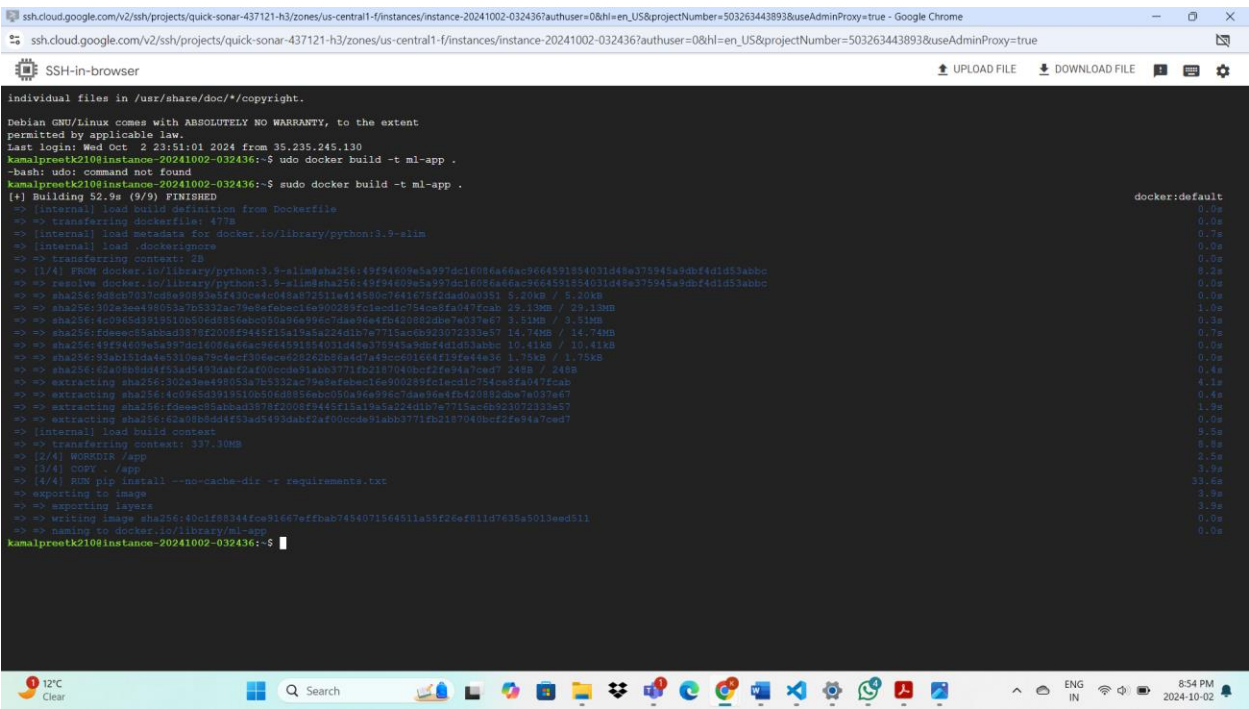


```
GNU nano 5.4
ay_flask_project/
├── Dockerfile
├── requirements.txt
├── train_model.py
├── app.py
└── model.pkl
```

Step 5: Build and run the Docker Container

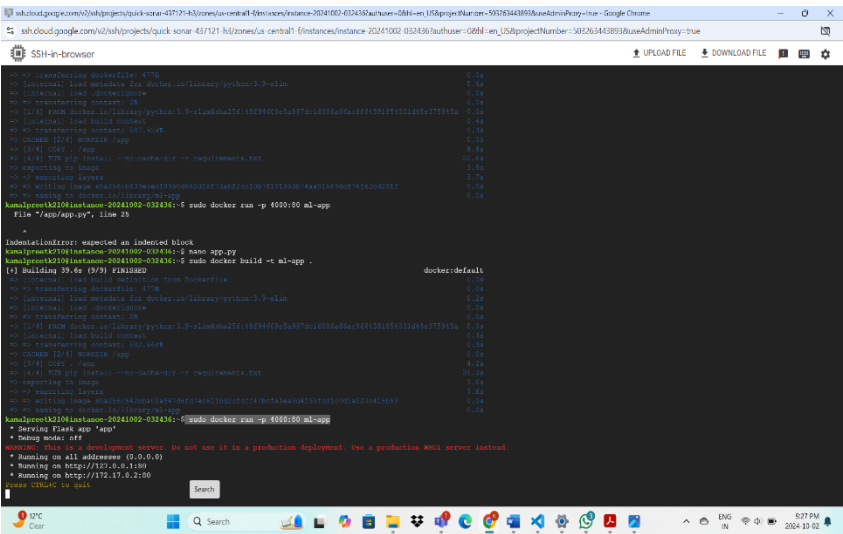
1. Build the Docker Image

sudo docker build -t ml-app .



2. Run the Docker Container

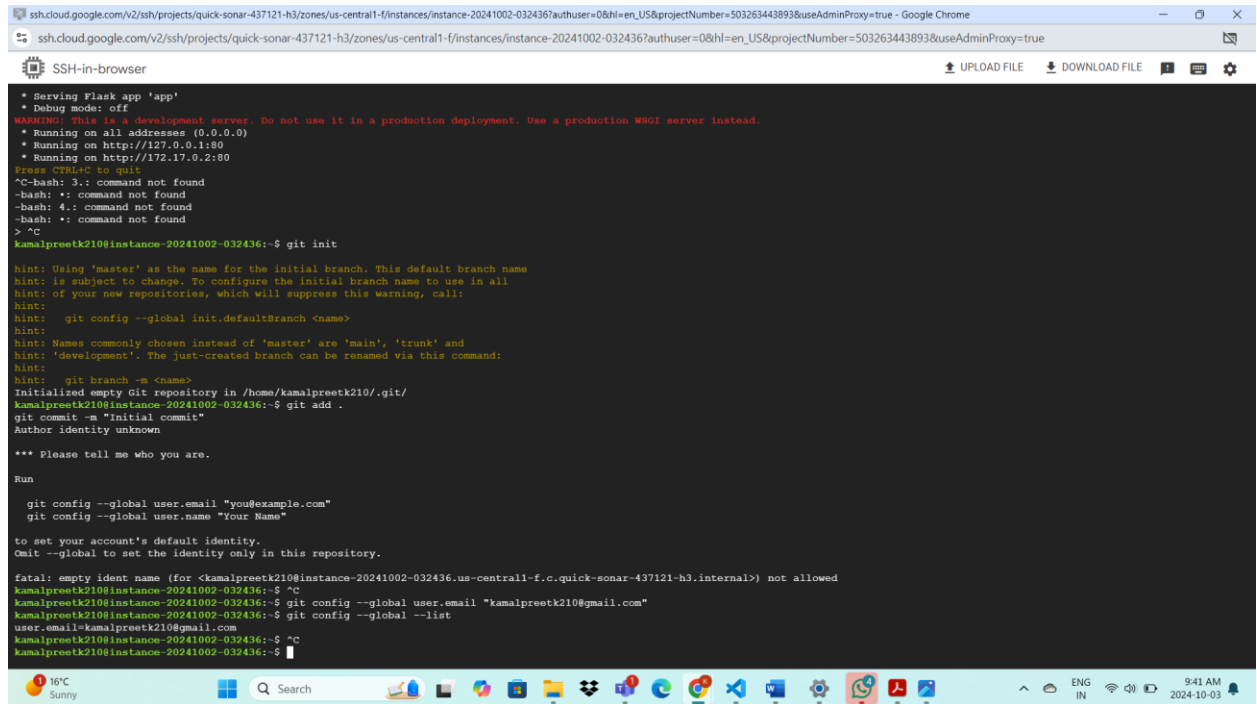
sudo docker run -p 4000:80 ml-app



Step 6: Deploy the Application to GitHub

1. Initialize a Git Repository

git init



```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true

SSH-in-browser

* Serving Flask app 'app'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:80
* Running on http://172.17.0.2:80
Press CTRL+C to quit
^C-bash: 3: command not found
-bash: *: command not found
-bash: 4: command not found
-bash: *: command not found
> ^C
kamalpreetk210@instance-20241002-032436:~$ git init

hint: Using 'master' as the name for the initial branch. This default branch name
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:   git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
hint: 'development'. The just-created branch can be renamed via this command:
hint:
hint:   git branch -m <name>
Initialized empty Git repository in /home/kamalpreetk210/.git/
kamalpreetk210@instance-20241002-032436:~$ git add .
git commit -m "Initial commit"
Author identity unknown

*** Please tell me who you are.

Run

git config --global user.email "you@example.com"
git config --global user.name "Your Name"

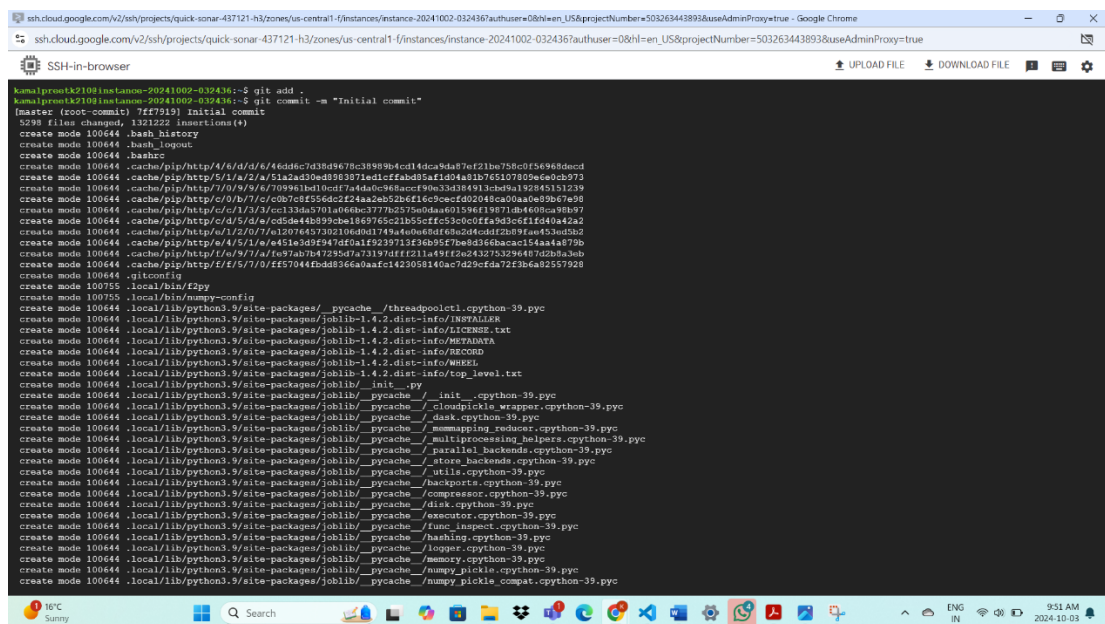
to set your account's default identity.
Omit --global to set the identity only in this repository.

fatal: empty ident name (for <kamalpreetk210@instance-20241002-032436.us-central1-f.c.quick-sonar-437121-h3.internal>) not allowed
kamalpreetk210@instance-20241002-032436:~$ ^C
kamalpreetk210@instance-20241002-032436:~$ git config --global user.email "kamalpreetk210@gmail.com"
kamalpreetk210@instance-20241002-032436:~$ git config --global --list
user.email=kamalpreetk210@gmail.com
kamalpreetk210@instance-20241002-032436:~$ ^C
kamalpreetk210@instance-20241002-032436:~$
```

2. Add All Files and Commit

git add .

git commit -m "Initial commit"



```
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true - Google Chrome
ssh.cloud.google.com/v2/ssh/projects/quick-sonar-437121-h3/zones/us-central1-f/instances/instance-20241002-032436?authuser=0&hl=en_US&projectNumber=503263443893&useAdminProxy=true

SSH-in-browser

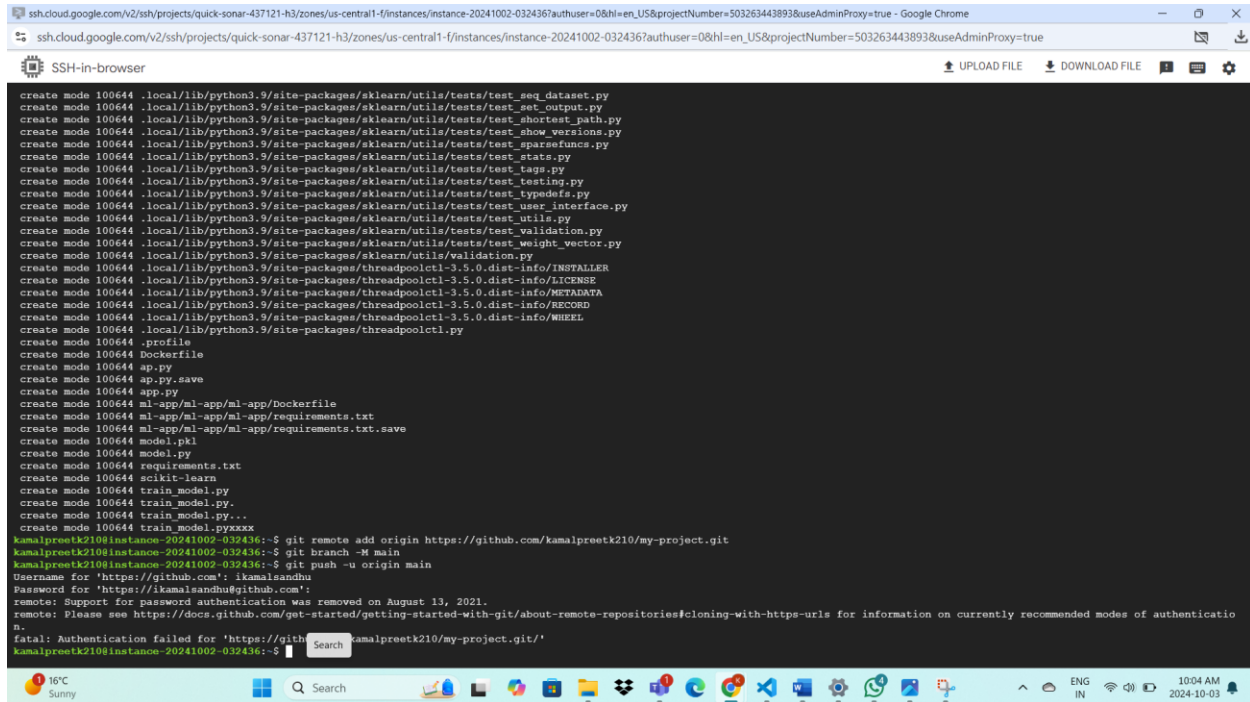
kamalpreetk210@instance-20241002-032436:~$ git add .
kamalpreetk210@instance-20241002-032436:~$ git commit -m "Initial commit"
[master (root-commit) 7f7f919] initial commit
5298 files changed, 1321222 insertions(+)
create mode 100644 .bash_history
create mode 100644 .bash_logout
create mode 100644 .bashrc
create mode 100644 .cache/pip/http/4/a/d/a/6/46dd8c7d38d9678c398984cd14dca9da87ef21be758c0f56968decdd
create mode 100644 .cache/pip/http/5/1/a/2/a/51a2ad30ed8983071edc1ffab8dfaf1d4a4a1b765107809a6e0cb973
create mode 100644 .cache/pip/http/5/0/9/a/4/670981bb10c1f1d4e46e4cc9b0a3d3848112cb9a11924a5131239
create mode 100644 .cache/pip/http/5/0/b/7/c/c0b7c8f556dc2f24a2eb52b6f16c9cccfcd02048ca0aa0e09b67e98
create mode 100644 .cache/pip/http/5/c/1/3/3/cc133da5701a066bc377b2575eb5aa60156ef19871db4608ca98b97
create mode 100644 .cache/pip/http/5/d/4/5/d/4cd5d448990b0e1e69745c21b55ffcc53eb0efca943dcff1f440a42a2
create mode 100644 .cache/pip/http/5/1/2/0/7/a/12076457302106dd01749a4e0e8dfe6a2d4d8df2b9fae453ed5b2
create mode 100644 .cache/pip/http/5/a/5/1/a/5a51e3d9f947df0a1f5239713f3eb95f7be8d366acac154aa4a879b
create mode 100644 .cache/pip/http/5/a/9/7/a/7a97ab747238487f31974ff2211a94f62d4327532940b02d9b4eb
create mode 100644 .cache/pip/http/5/f/5/7/9/f57044fb48836a0aafrc142305814ca7d29cfda72f36a82557928
create mode 100644 .gitconfig
create mode 100755 .local/bin/f2py
create mode 100755 .local/bin/mypy-config
create mode 100644 .local/lib/python3.9/site-packages/_pycache_/threadpoolctl.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib-1.4.2.dist-info/INSTALLER
create mode 100644 .local/lib/python3.9/site-packages/joblib-1.4.2.dist-info/LICENSE.txt
create mode 100644 .local/lib/python3.9/site-packages/joblib-1.4.2.dist-info/METADATA
create mode 100644 .local/lib/python3.9/site-packages/joblib-1.4.2.dist-info/RECORD
create mode 100644 .local/lib/python3.9/site-packages/joblib-1.4.2.dist-info/SECURITY
create mode 100644 .local/lib/python3.9/site-packages/joblib-1.4.2.dist-info/top_level.txt
create mode 100644 .local/lib/python3.9/site-packages/joblib/_init_.py
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/__init__.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/cloudpickle_wrapper.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/dask.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/mapping_reducer.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/multiprocessing_helpers.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/parallel_backends.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/store_backends.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/utils.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/backports.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/compressor.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/disk.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/executor.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/func_inspect.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/hashing.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/logger.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/memory.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/mypy_pickle.cpython-39.pyc
create mode 100644 .local/lib/python3.9/site-packages/joblib/_pycache_/numpy_pickle_compat.cpython-39.pyc
```

3. Create a New Repository on GitHub

git remote add origin https://github.com/yourusername/your-repository.git

git branch -M main

git push -u origin main



```
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_seq_dataset.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_set_output.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_shortest_path.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_show_versions.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_sparsefuncs.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_stats.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_tags.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_testing.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_typedefs.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_user_interface.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_utils.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_validation.py
create mode 100644 .local/lib/python3.9/site-packages/sklearn/utils/tests/test_weight_vector.py
create mode 100644 .local/lib/python3.9/site-packages/threadpoolctl-3.5.0.dist-info/INSTALLER
create mode 100644 .local/lib/python3.9/site-packages/threadpoolctl-3.5.0.dist-info/LICENSE
create mode 100644 .local/lib/python3.9/site-packages/threadpoolctl-3.5.0.dist-info/METADATA
create mode 100644 .local/lib/python3.9/site-packages/threadpoolctl-3.5.0.dist-info/RECORD
create mode 100644 .local/lib/python3.9/site-packages/threadpoolctl-3.5.0.dist-info/WHHEEL
create mode 100644 .local/lib/python3.9/site-packages/threadpoolctl.py
create mode 100644 .profile
create mode 100644 Dockerfile
create mode 100644 ap.py
create mode 100644 ap.py.save
create mode 100644 app.py
create mode 100644 ml-app/ml-app/ml-app/Dockerfile
create mode 100644 ml-app/ml-app/ml-app/requirements.txt
create mode 100644 ml-app/ml-app/ml-app/requirements.txt.save
create mode 100644 model.pkl
create mode 100644 model.py
create mode 100644 requirements.txt
create mode 100644 scikit-learn
create mode 100644 train_model.py
create mode 100644 train_model.py...
create mode 100644 train_model.py...
create mode 100644 train_model.py...
kamlpreetk210@instance-20241002-032436:~$ git remote add origin https://github.com/kamlpreetk210/my-project.git
kamlpreetk210@instance-20241002-032436:~$ git branch -M main
kamlpreetk210@instance-20241002-032436:~$ git push -u origin main
Username for 'https://github.com': ikamalsandhu
Password for 'https://ikamalsandhu@github.com':
remote: Support for password authentication was removed on August 13, 2021.
remote: Please see https://docs.github.com/get-started/getting-started-with-git/about-remote-repositories#cloning-with-https-urls for information on currently recommended modes of authentication.
fatal: Authentication failed for 'https://github.com:kamlpreetk210/my-project.git/'
kamlpreetk210@instance-20241002-032436:~$
```

Step 7: Document the Process

1. Create a README.md File

- Document the process in a **README.md** file in your repository. Include the following:
 - Overview of the project
 - Instructions to build and run the Docker container