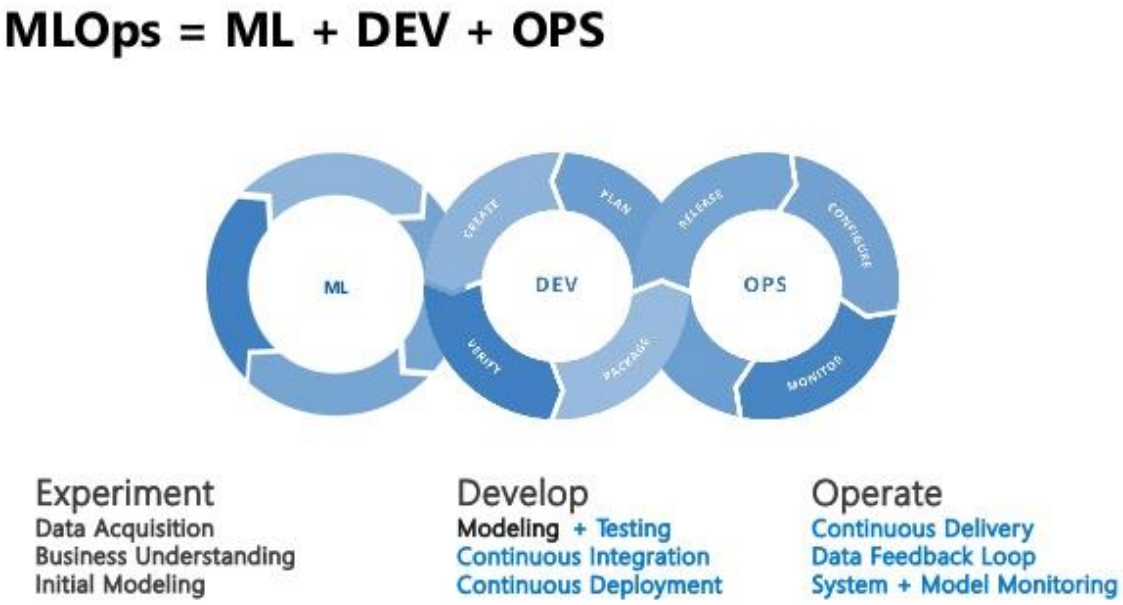



# TASK 3- Machine Learning Integration With DevOps (to select best Hyperparameter for dataset)

*Automation with Jenkins and Docker-Container*

In Machine Learning or Deep Learning, data scientists need to change the model several times to find the best accuracy model manually. This took a lot of time and manpower for making a machine learning or deep learning model precisely. In data science, there is no shortage of cool stuff to do the shiny new algorithms to throw at data.

**Now we can find the best accuracy model automatically by integrating with Jenkins and Docker-Container.**

## Task Overview:

**1.** Create a container image that has Python3 and Keras or numpy installed using dockerfile.

**2.** When we launch this image, it should automatically starts train the model in the container.

**3.** Create a job chain of job1, job2, job3, job4 and job5 using build pipeline plugin in Jenkins

**4.** Job1 : Pull the Github repo automatically when some developers push repo to Github.

**5.** Job2 : By looking at the code or program file, Jenkins should automatically start the respective machine learning software installed interpreter install image container to deploy code and start training( eg. If code uses CNN, then Jenkins should start the container that has already installed all the software required for the CNN processing).

**6.** Job3 : Train your model and predict accuracy or metrics. If metrics accuracy is less than 80%, then tweak the machine learning model architecture. Retrain the model and get the train model.

**7.** Job4: This job sent the notification to developer.

**9.** Create One extra job job5 for monitor: If container, where app is running, fails due to any reason then this job should automatically start the container again. And also sent a mail to developer.

## Project Description:

### 1. Build Docker images for TensorFlow and sklearn installed using Dockerfile:

I use Rhel8 as BaseOs and CentOS for creating my Dockerfile.

### → Dockerfile for keras models:

Open

Dockerfile
/sklearn

```
FROM centos:latest

RUN yum install python36 -y

RUN python3 -m pip  install --upgrade pip
RUN pip3 install --upgrade setuptools

RUN yum install -y epel-release
RUN yum groupinstall "development tools" -y
RUN yum install -y python36-devel

RUN pip3 install keras
RUN pip3 install numpy
RUN pip3 install pandas
RUN pip3 install matplotlib
RUN pip3 install pillow
RUN pip3 install opencv-python
RUN pip3 install --upgrade tensorflow

ENTRYPOINT [ "python3" ]

CMD [ "/mycode/main.py" ]
```

Run command ***"docker build -t keras:v1 ."*** for creating your image

Open

Docke
/me

```
FROM centos:latest

RUN yum install python36 -y

RUN python3 -m pip  install --upgrade pip

RUN pip3 install --upgrade setuptools

RUN pip3 install pandas

RUN pip3 install numpy

RUN pip3 install sklearn

RUN pip3 install joblib

RUN pip3 install matplotlib
```

**Run command "*docker build -t sklearn:v1 .*" for creating the image.**

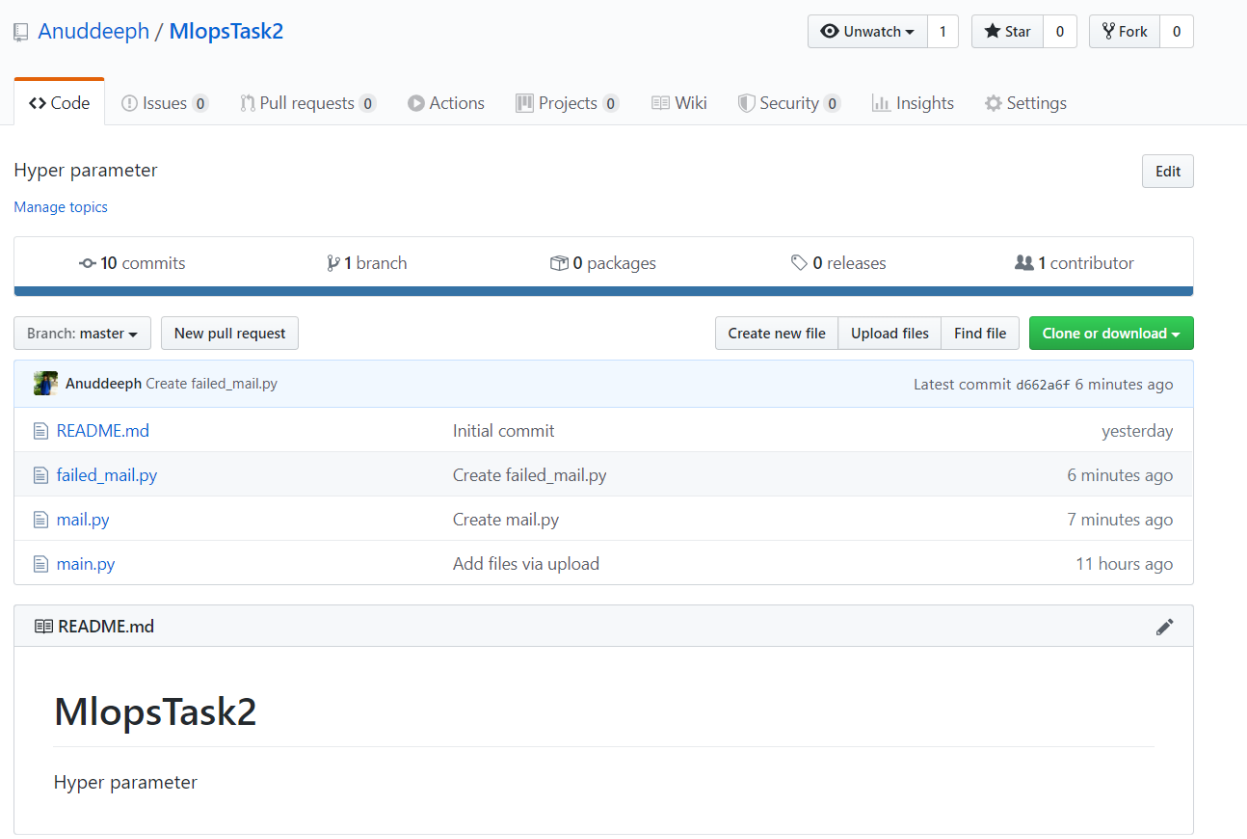
Finally my docker images is created.

## *2. Jobs in Jenkins:*

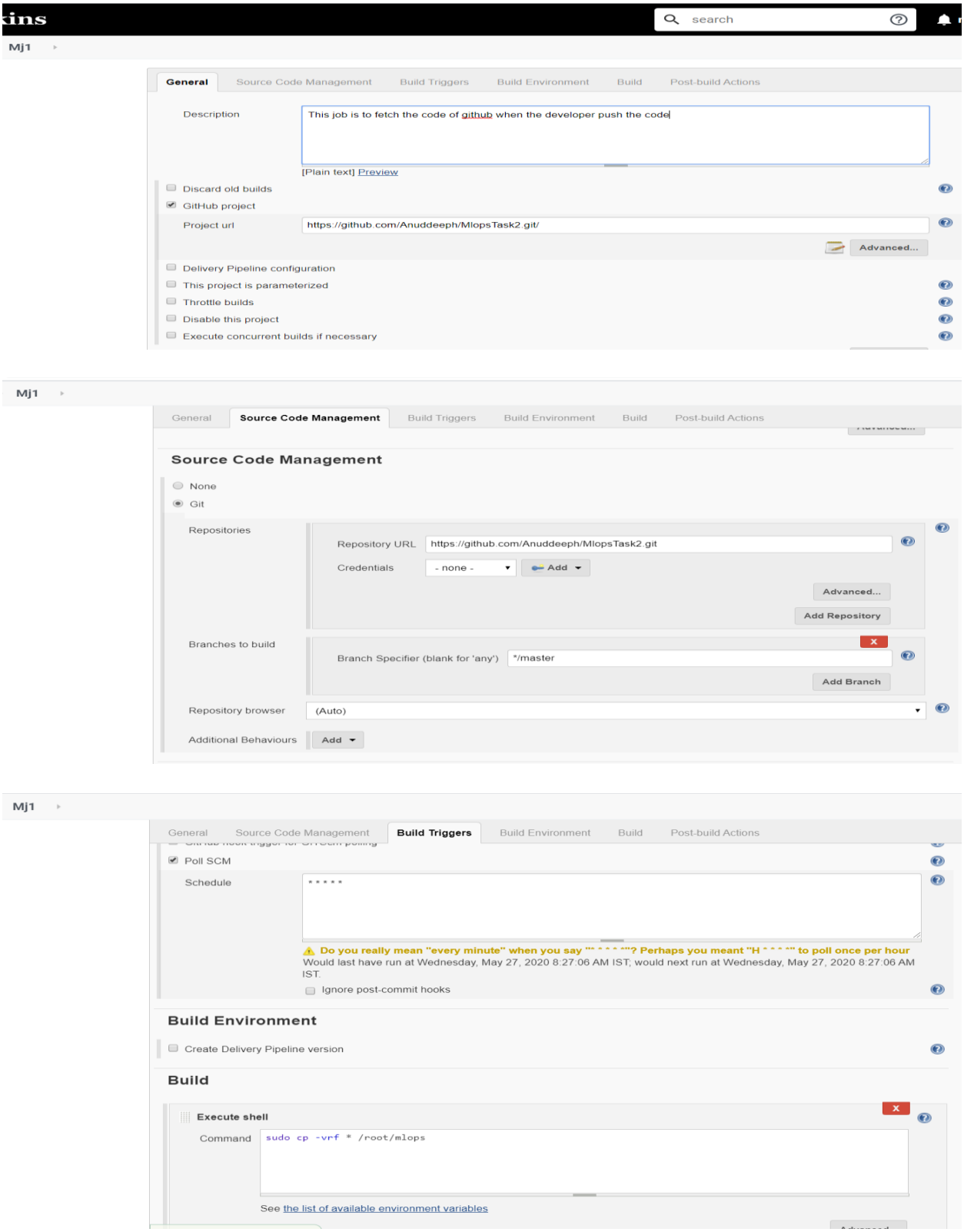
### → Job1(Copy github code):

I use MNIST dataset to deploy this model. You can check the code from here...

https://github.com/Anuddeeph/MlopsTask2.git




Whenever developer push any code in Github, this job automatically detect and copy in host OS.



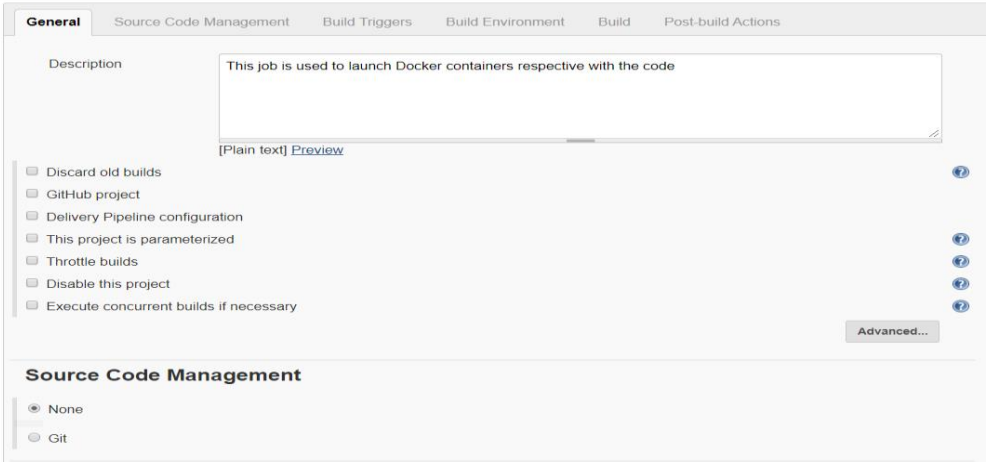

This job creates a directory **mlops** and copy the GitHub code in that directory.

## ➔ Job2(Deploy container for model_train):

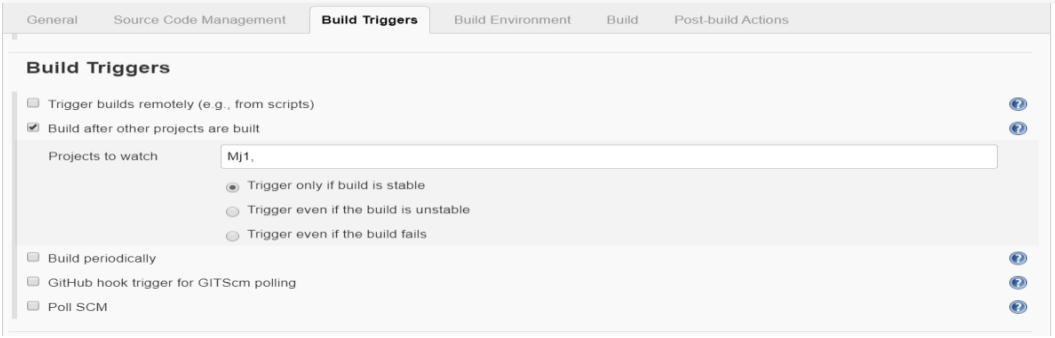
If my job1 is successfully built, it triggers job2 and launches the container. By looking at the code or program file, this job automatically launch the respective docker container(either Keras os Sklearn).

---

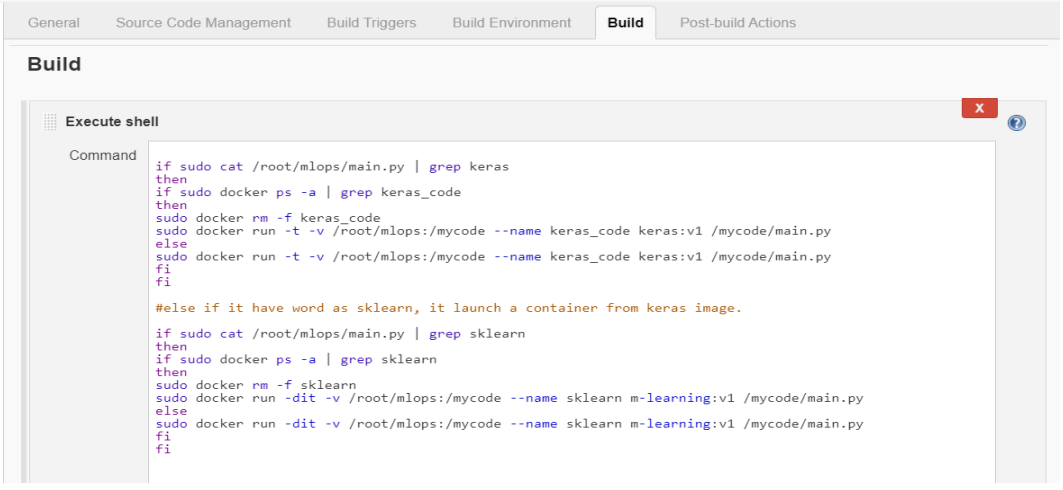
Mj2 ▸

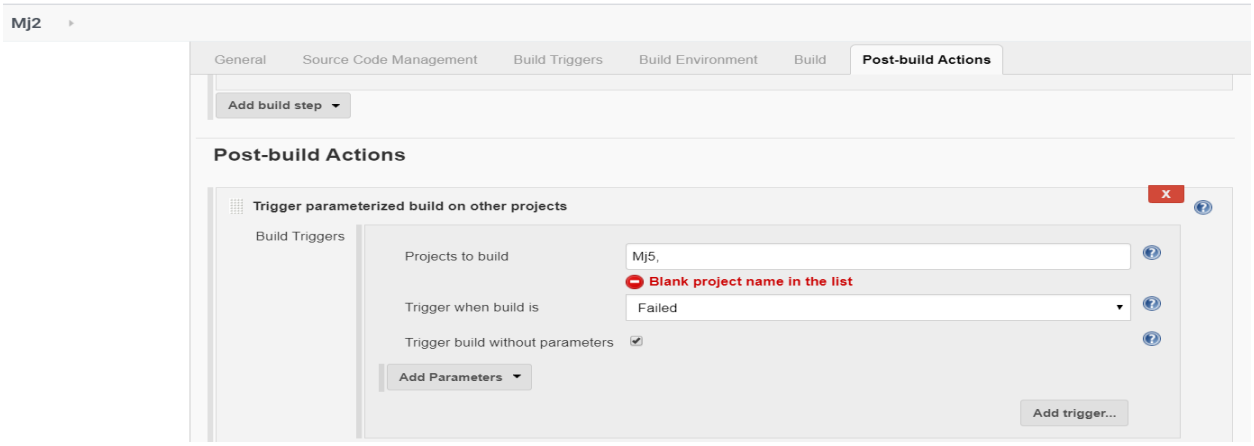



Mj2 ▸




Mj2 ▸






This is code which I written in this job.

```
#check the code if it have words related to keras, it launch a container from
keras image

if sudo cat /root/mlops/main.py | grep keras
then
if sudo docker ps -a | grep keras_code
then
sudo docker rm -f keras_code
sudo docker run -t -v /root/mlops:/mycode --name keras_code keras:v1
/mycode/main.py
else
sudo docker run -t -v /root/mlops:/mycode --name keras_code keras:v1
/mycode/main.py
fi
fi

#else if it have word as sklearn, it launch a container from keras image.

if sudo cat /root/mlops/main.py | grep sklearn
then
if sudo docker ps -a | grep sklearn
then
sudo docker rm -f sklearn
sudo docker run -dit -v /root/mlops:/mycode --name sklearn m-learning:v1
/mycode/main.py
else
sudo docker run -dit -v /root/mlops:/mycode --name sklearn m-learning:v1
/mycode/main.py
fi
fi
```

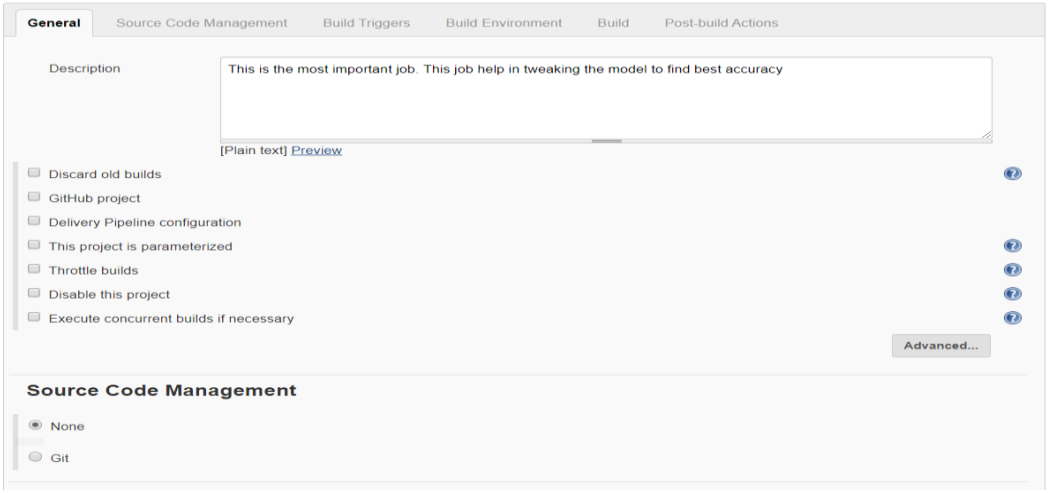
### ➔ Job3(Check the accuracy and tweak the code and again run until it found the required accuracy):

This is the most important job of whole project. This job check the accuracy of model which I trained in job2 and if accuracy is below from required, this

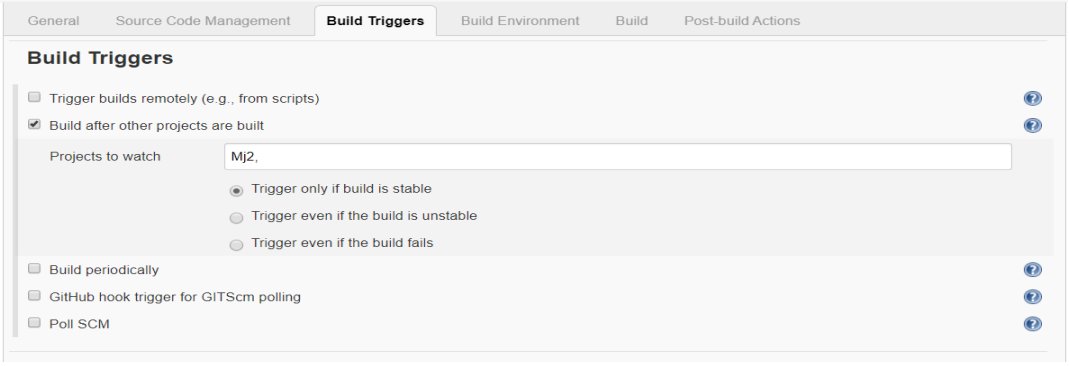
do some changes in code and run again the container to find until required accuracy.

---

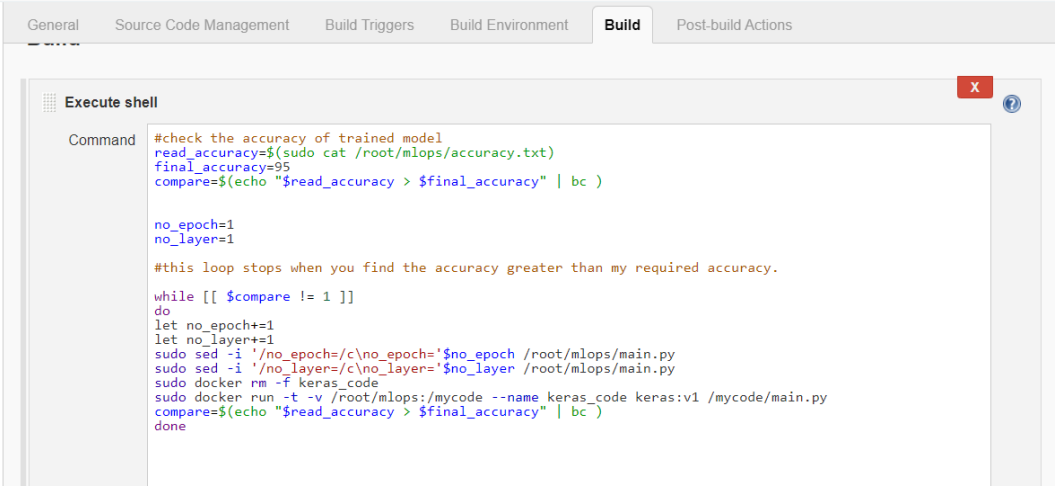
Mj3

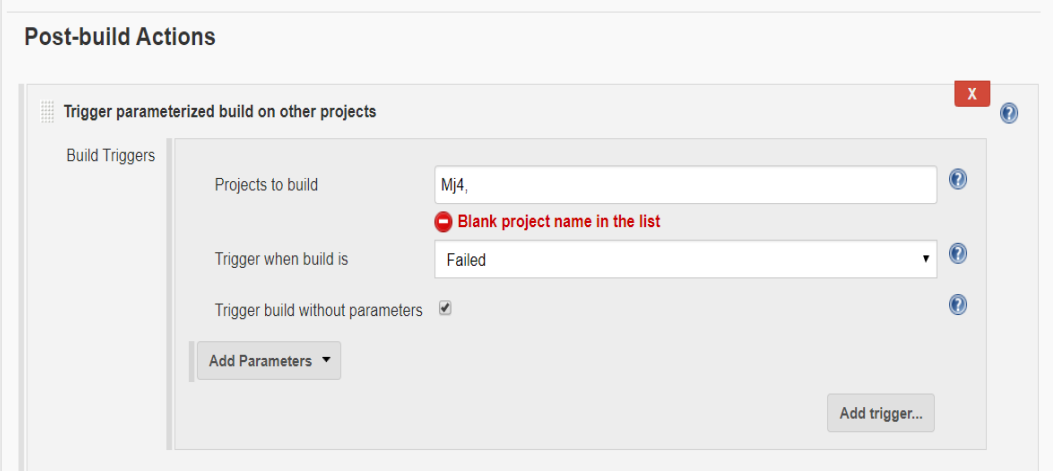



Mj3




Mj3






I take number of epoch and number of convolve layer as a parameter increase them by one each time after train the dataset.

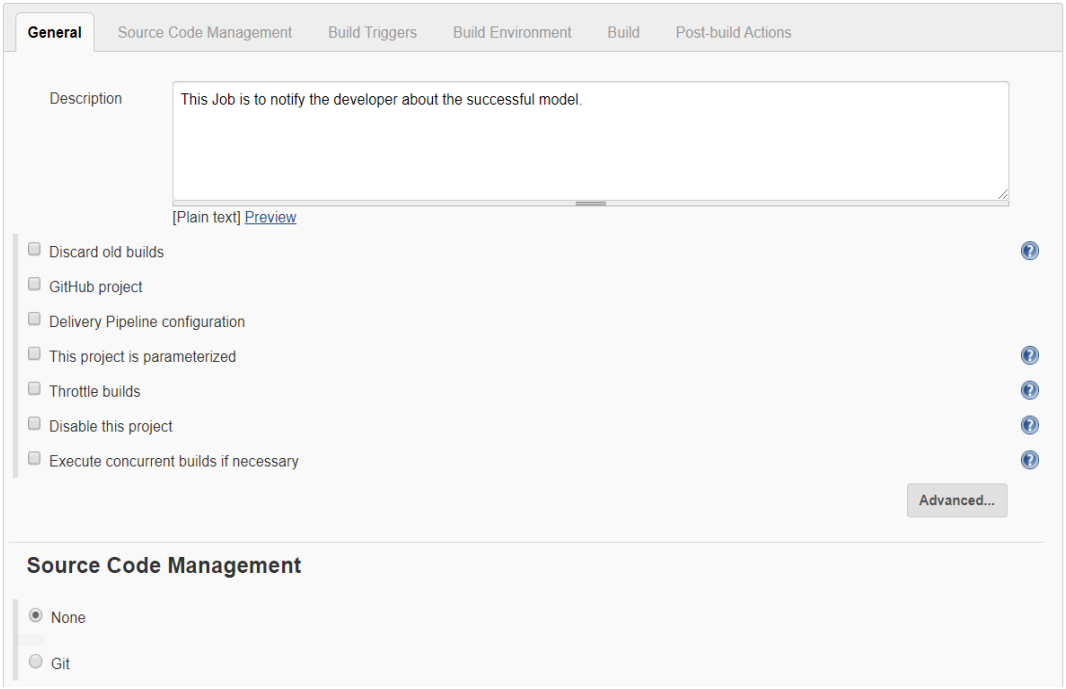
```
#check the accuracy of trained model
read_accuracy=$(sudo cat /root/mlops/accuracy.txt)
final_accuracy=95
compare=$(echo "$read_accuracy > $final_accuracy" | bc )


no_epoch=1
no_layer=1

#this loop stops when you find the accuracy greater than my required
accuracy.

while [[ $compare != 1 ]]
do
let no_epoch+=1
let no_layer+=1
sudo sed -i '/no_epoch=/c\no_epoch='$no_epoch /root/mlops/main.py
sudo sed -i '/no_layer=/c\no_layer='$no_layer /root/mlops/main.py
sudo docker rm -f keras_code
sudo docker run -t -v /root/mlops:/mycode --name keras_code keras:v1
/mycode/main.py
compare=$(echo "$read_accuracy > $final_accuracy" | bc )
done
```

If anything goes wrong, it triggers to job4.

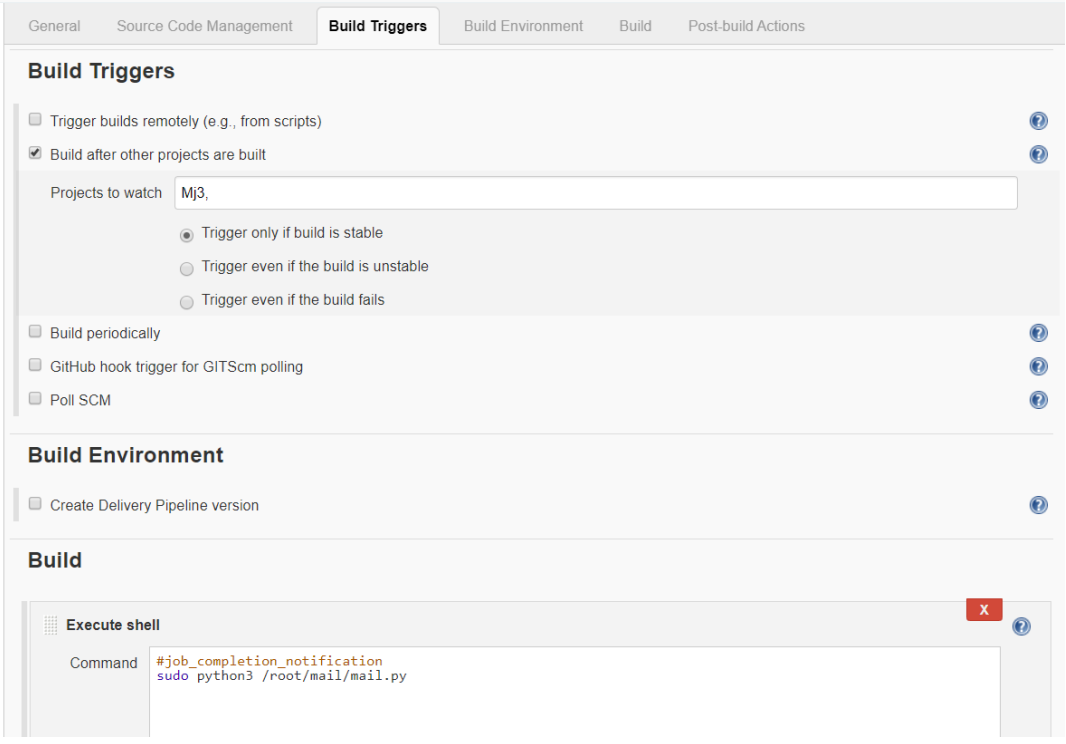
### ➔ Job4 (This job sent a mail to the developer for successful train of model):

After getting the required accuracy, it sent a mail to developer.

Mj4 ▸


General
Source Code Management
Build Triggers
Build Environment
Build
Post-build Actions
Description
This Job is to notify the developer about the successful model.
[Plain text] Preview
Discard old builds
GitHub project
Delivery Pipeline configuration
This project is parameterized
Throttle builds
Disable this project
Execute concurrent builds if necessary
Advanced...
Source Code Management
None
Git

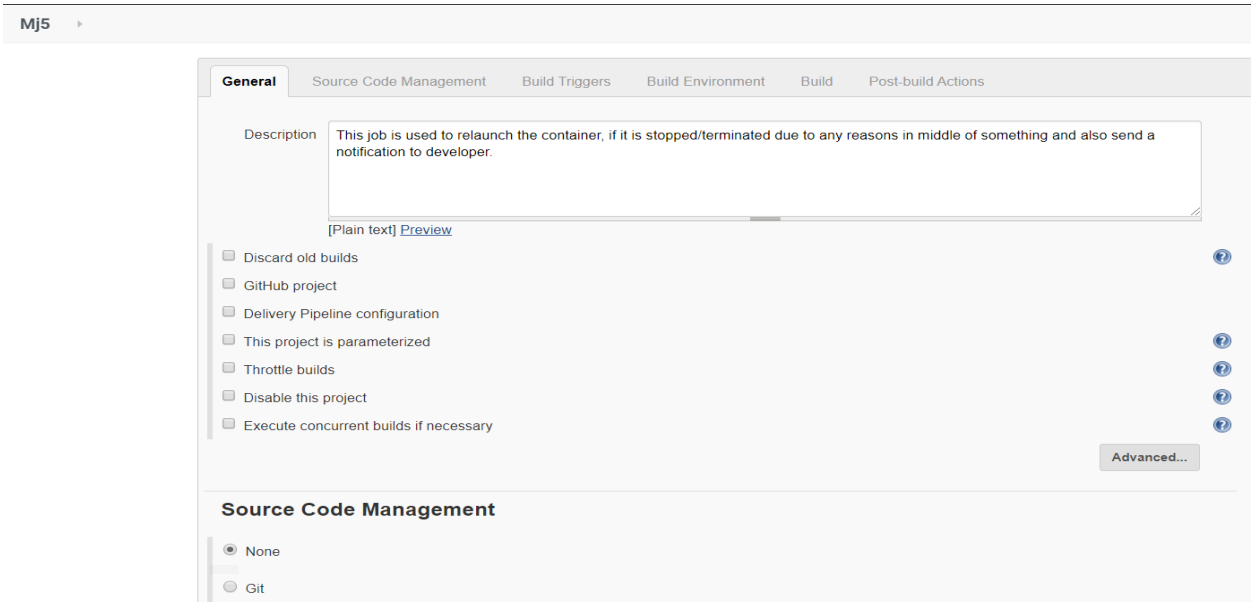
Mj4 ▸

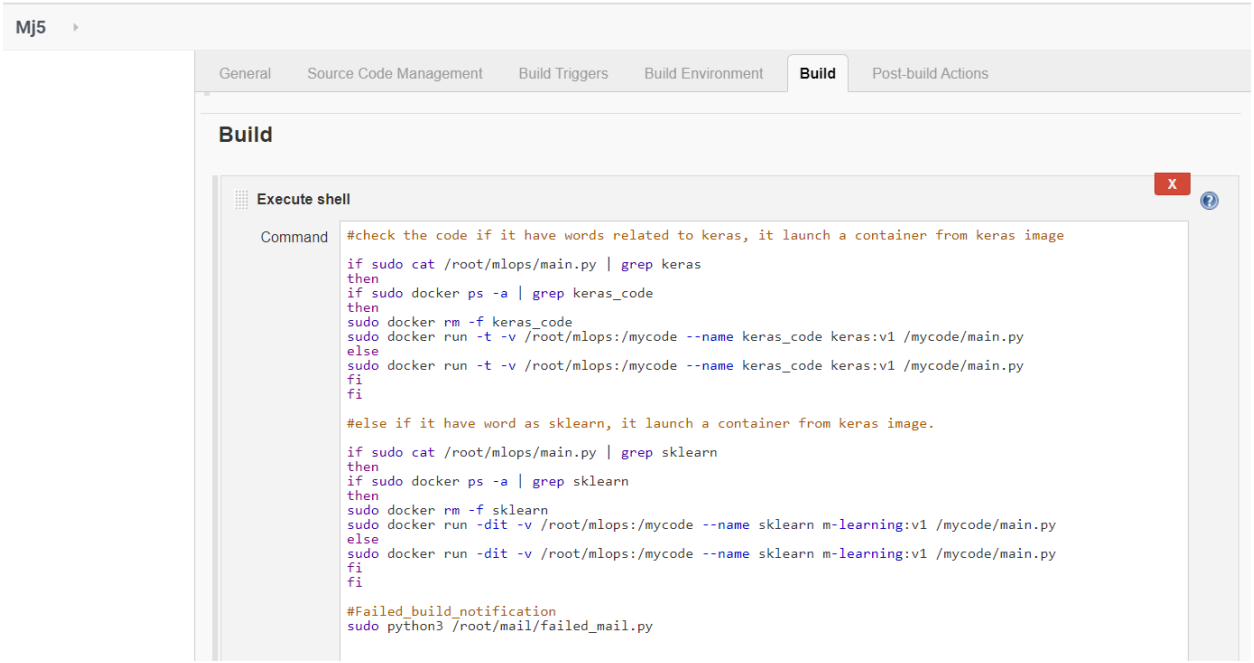

General
Source Code Management
Build Triggers
Build Environment
Build
Post-build Actions
Build Triggers
Trigger builds remotely (e.g., from scripts)
Build after other projects are built
Projects to watch
Mj3,
Trigger only if build is stable
Trigger even if the build is unstable
Trigger even if the build fails
Build periodically
GitHub hook trigger for GITScm polling
Poll SCM
Build Environment
Create Delivery Pipeline version
Build
Execute shell
Command
#job_completion_notification
sudo python3 /root/mail/mail.py

```
#mail.py
    import smtplib

        # creates SMTP session
        s = smtplib.SMTP('smtp.gmail.com', 587)

        # start TLS for security
        s.starttls()

        # Authentication
        s.login("sender_email", "password")

        # message to be sent
        message = "Hey Developer, Finally we got the model trained. "

        # sending the mail

        s.sendmail("sender_mail", "developr_mail", message)
        # terminating the session

        s.quit()
```

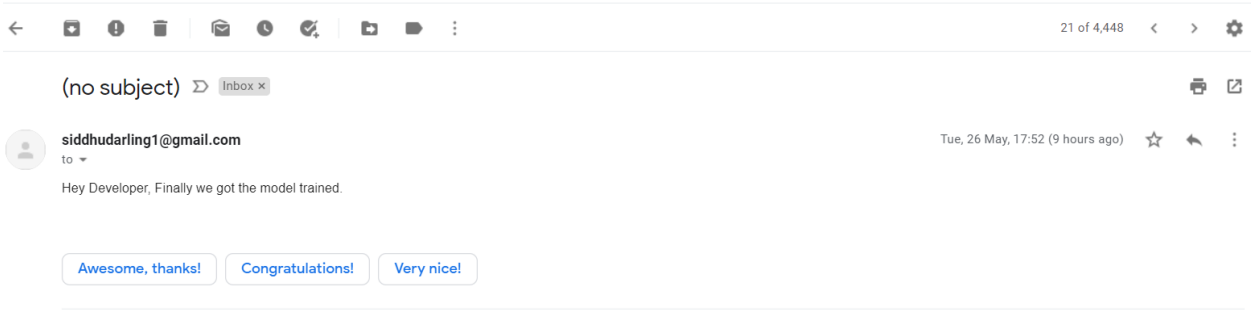
➔ **Job5(This job is for monitoring the job2 and job3, if any container failed, it rebuild the container):**

This job relaunch the container, if any of container get failed and also sent a email for failure the job.

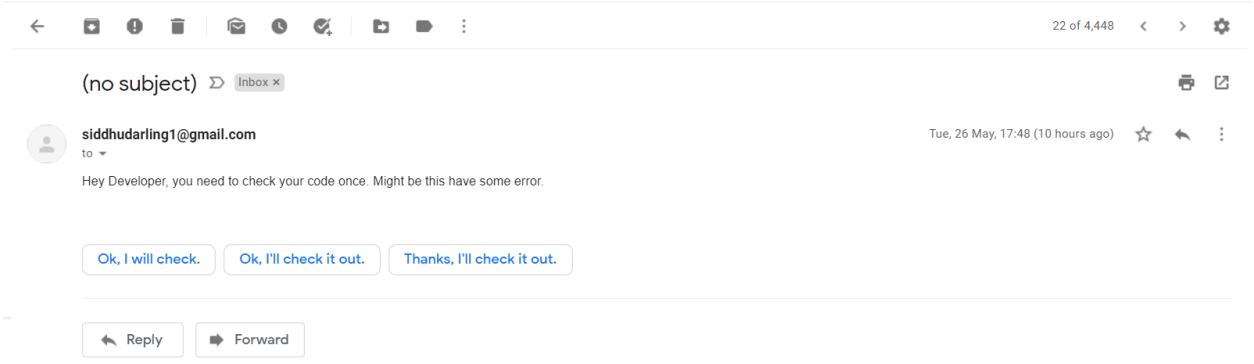




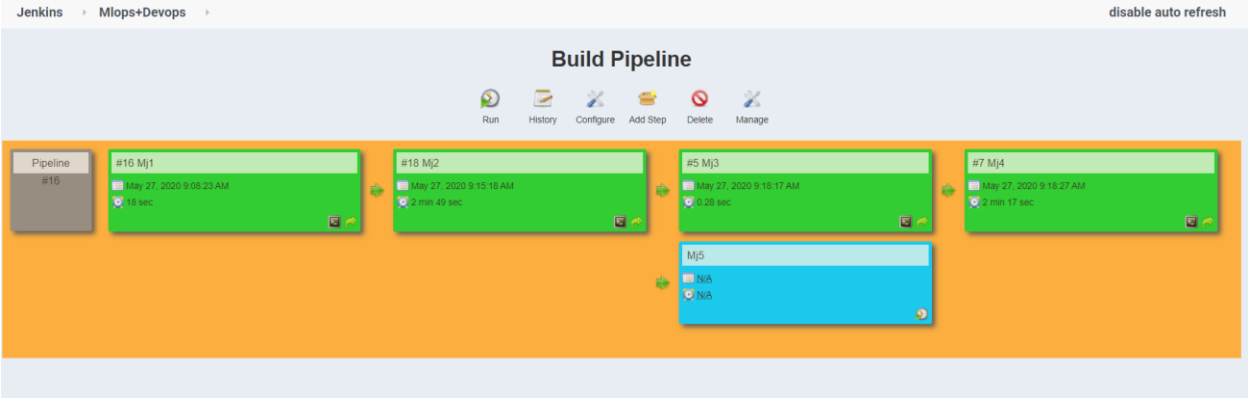

#when code is successful and achieved good accuracy, then the developer get the mail as




##when code is unsuccessful and error in code,then the developer get the mail as



#The Build pipe line is




Here when ever the code fails, then the Mj5 will execute otherwise it stays idle.

For code you can go to the GitHub repo,
https://github.com/Anuddeeph/MlopsTask2.git

You can also ping me or comment below if you have any problem in code...

Thank You…