

Running X server on UBUNTU- 18.04

This is a multi-part blog, wherein I will show various steps to be followed to run GUI based application on AWS.

When we talk about AI, computer vision is one of the top applications in people's minds. Hype aside, I have always been fascinated by it because it pertains to human sight, arguably the most important organ of human sense. I have come across plenty of computer vision projects involving the human face and/or body.

Computer vision (CV) is a field of Artificial Intelligence (AI) that processes all types of digital images or videos, extracting the relevant information and allowing us to identify some of the elements or objects in those images/videos. To identify these elements, we apply mathematical models that struggle with the pixel positions, colour layers, and the relations between every different neighbourhood or colour of the pixel. All these tasks are made by different algorithmic structures, like decision trees, hashes, neural networks (NN), or graphs, and other techniques, like greedy algorithms, divide and conquer, dynamic algorithms, searching techniques, sorting techniques, etc.

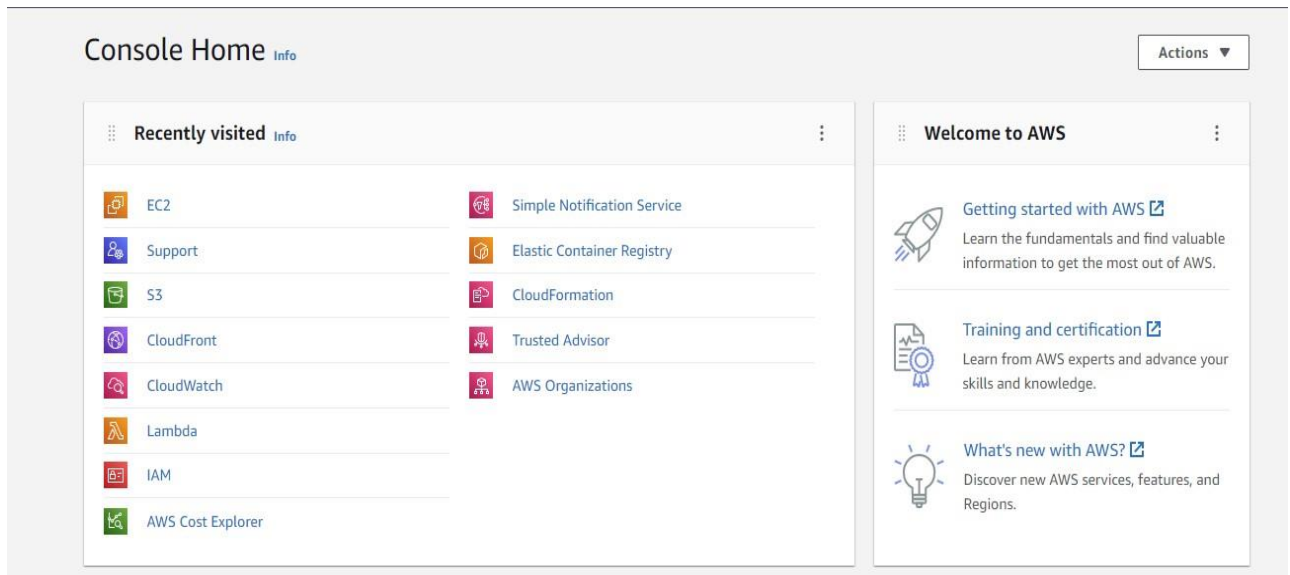
The reason why I worked on this topic is, I want to run my project on AWS server which has involvement of CV. So, Initially I had a very hard time to run such GUI based video rendering on AWS Instance (server), It took my crucial time in investigating/researching on the topic, then at one novel day when I was doing research one thing catches my eye.

So, I want community won't waste time in finding the same.

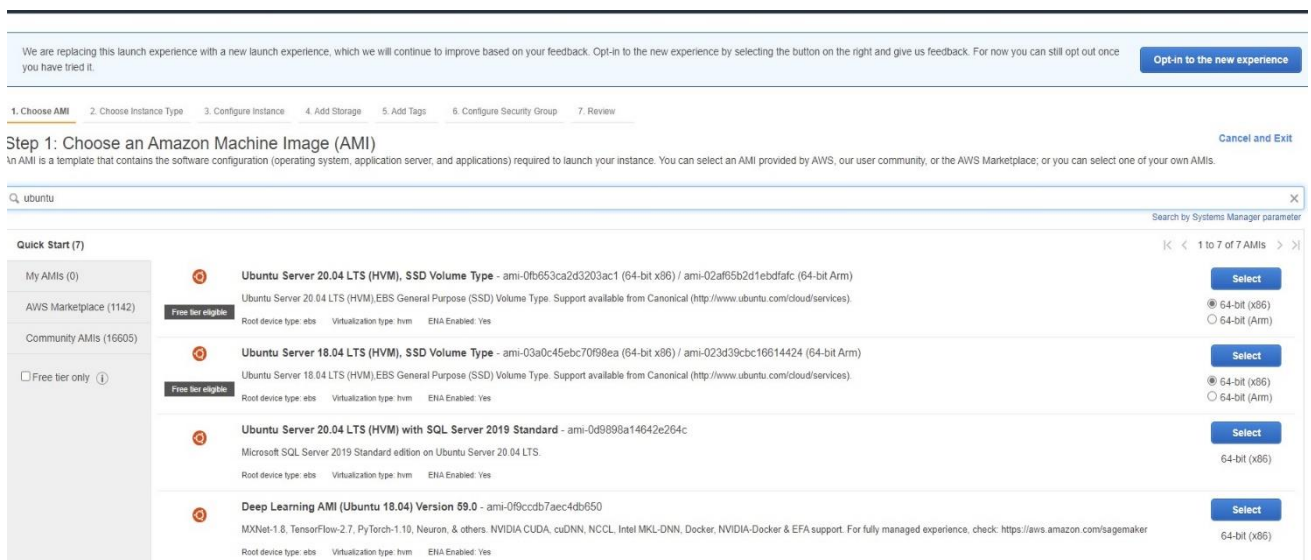
So, kindly follow my blog step by step to get GUI based video rendering application to be run on the server. Today, I'll be showing each and every process from very beginning.

So, lets get cracking,

Step 1: You need to have a AWS account. If you have one you are good to go, if not create one from <https://aws.amazon.com/console/> and login to console.



Step 2: As soon as you will get the console you would have to spin up a EC2 instance, I am using Ubuntu – 18.04 free tier eligible instance (server).



To launch an instance, you need to follow the below specified steps:

Step 1: Login to the aws console

Step 2: Choose Launch Instance

Step 3: Choose AMI

Step 4: Choose EC2 Instance Types

Step 5: Configure Instance Details

Step 6: Add Storage of Ec2 Instance (Storage 30 GB)

Step 7: Tag Instance of Ec2 Instance

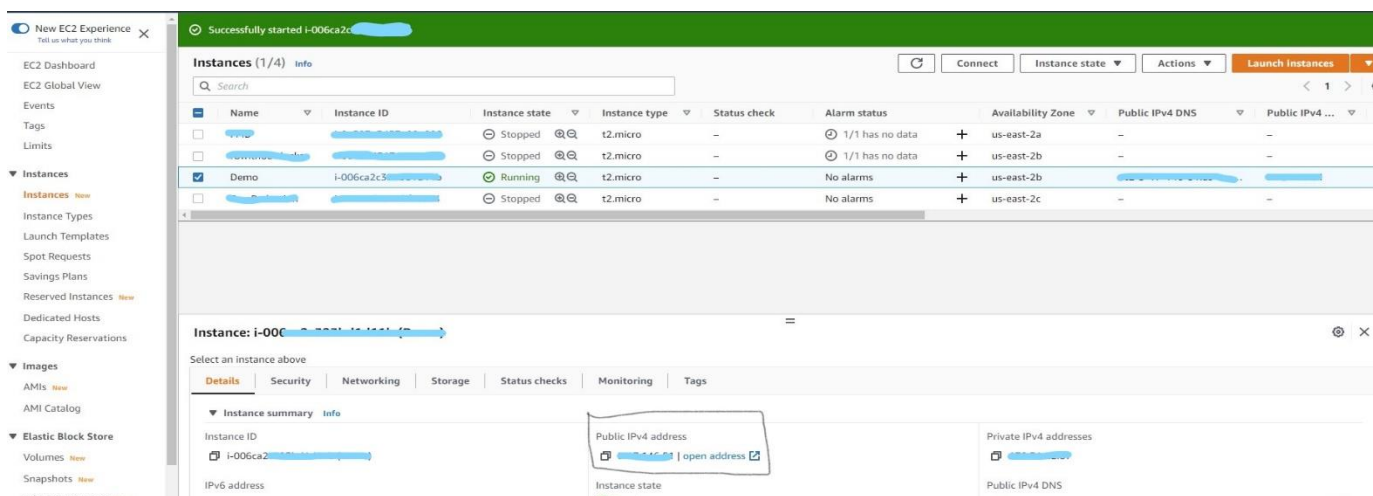
Step 8: Configure Security Groups

Step 9: Review Instances

Step 10: Create Key-Pair For Instance Access (and download pem key)

Step 11: Type Ec2 Instance Public Ip On Browser

Step 3: You need to connect to the instance to access the instance as soon as it comes in running state.



You can connect it by the below command running on shell.

```
ssh: could not resolve hostname public_ipv4_address: Name or service not known
(fb) richard@richard-VirtualBox:~$ ssh -i "key.pem" ubuntu@public_ipv4_address
```

\$ ssh -i "pem key(Step 2 → Step 10)" ubuntu@instance_public_IPV4_address

And then hit enter. And boom, you will be in the AWS server.

Step 4: Now you need to type the below command to update the installed stuffs in the instance.

\$ sudo apt-get update

Step 5: You need to install **curl** to download the other dependencies from the internet in the instance.

\$ sudo apt-get wget curl

Step 6: Now, If you want, you can also install **Anaconda software** to the instance, by the following gist:

```
$ wget https://repo.continuum.io/archive/Anaconda2-4.1.1-Linux-x86\_64.sh
```

Step 7: Now you need to install the downloaded anaconda software by following command.

```
$ bash Anaconda2-4.1.1-Linux-x86_64.sh
```

Step 8: Thereafter, you need to activate the software by following command.

```
$ source .bashrc
```

Step 9: Now check the conda version.

```
$ conda --version
```

Step 10: If you already have anaconda installed, you can update to latest version by the below commands.

```
$ conda update conda
```

```
$ conda update anaconda
```

Now you need to install python latest version in the instance to run the CV projects on the AWS server.

Step 11: So, you can do the same by the following command.

```
$ conda install python==3.9.0
```

If this conda command doesn't work than don't worry, I have one another approach to install the same.

Kindly follow the below steps.

```
Step I: $ sudo add-apt-repository ppa:deadsnakes/ppa
```

```
Step II: $ sudo apt-get update
```

```
Step III: $ apt list | grep python3.9
```

```
Step IV: $ sudo apt-get install python3.9
```

```
Step V: $ sudo update-alternatives --install /usr/bin/python3 python3 /usr/bin/python3.6 1
```

```
Step VI: $ sudo update-alternatives --install /usr/bin/python3 python3 /usr/bin/python3.9 2
```

```
Step VII: $ sudo update-alternatives --config python3
```

```
Step VIII: $ python -V
```

So, here at this stage we have updated python version from 3.6.1 to the version 3.9.

Note: **Optional part** (from Step IX to Step XII)

If you will get error like below,

Error: import apt_pkg ModuleNotFoundError: No module named 'apt_pkg'

Then below are the steps,

```
$ sudo apt remove --purge python3-apt
```

```
$ sudo apt autoclean
```

```
$ sudo apt install python3-apt
```

```
$ sudo apt install python3.9-distutils
```

```
$ curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py
```

```
$ sudo python3.9 get-pip.py
```

As python version is upgraded, we need to install upgraded dependencies for it as well.

So, let's continue with the commands.

```
Step IX: $ sudo apt install python3.9-distutils
```

```
Step X: $ pip3 install --upgrade setuptools
```

```
Step XI: $ sudo apt-get install --reinstall python3-apt
```

```
Step XII:$ pip3 install --upgrade distlib
```

Now, here comes an interesting step, as we want to run/deploy our **Computer Vision project** on the AWS server.

So, follow along with me.

Step 12: we need to run qt files on the instance, and it requires some dependencies. So, install them by below commands.

```
$ sudo apt-get install ffmpeg libsm6 libxext6 -y
```

```
$ sudo apt remove python3-apt
```

Now, the punch, the most required thing on the instance to run the GUI based python application on the instance, which is **enabling X – server on the instance**.

Step 13: You can install x11 by the following command, to enable X11 forwarding to the instance.

```
$ sudo apt install x11-apps
```

Now you should restart your instance.

Step 14: Some required steps to be followed to allow x11 forwarding to the instance are as under. Also, we need to check whether ubuntu has permission or not.

If ubuntu has permission, it'll will be seen like at some point like below.

Ubuntu Ubuntu .Xauthority

So let's check the permission by the following command.

```
$ ls -la
```

Step 15: If you have permission, then proceed with me by following steps.

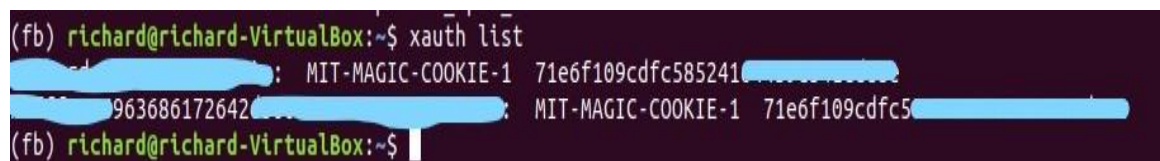
Step I: `$ sudo vi /etc/ssh/sshd_config`

Step II: `$ sudo cat /etc/ssh/sshd_config | grep -i X11Forwarding`

Step III: `$ sudo service ssh restart`

Step IV: `$ xauth list`

Here after the above command you will be able to see some magic cookies, which means you can now be able to see GUI based video/output from CV project. If you unable to see magic cookie, you can try restarting the instance.



```
(fb) richard@richard-VirtualBox:~$ xauth list
richard@richard-VirtualBox: MIT-MAGIC-COOKIE-1 71e6f109cdfc585241
963686172642 MIT-MAGIC-COOKIE-1 71e6f109cdfc5
```

Step 16: If you do not have permission, I'm here with you, just follow below steps to give permission.

Step I: `$ sudo chown ubuntu:ubuntu .Xauthority`

After above command you would notice something like below at some point.

Ubuntu Ubuntu .Xauthority

Step II: `$ mv $HOME/.Xauthority -n /var/tmp/`

Step III: `$ mv $HOME/.Xauthority /var/tmp/`

Step IV: `$ xauth list`

Here after the above command you will be able to see some magic cookies, which means you can now be able to see GUI based video/output from CV project.

Step 17: Now you need to exit/logout your instance by the following command.

```
$ exit
```

Step 18: Now again, login to the instance and this time you need to tell your instance explicitly that you have to forward X server for viewing GUI based output of your CV model. The below is the command you must use, if you want to get GUI based output on the instance.

```
$ ssh -X -i "pem key" ubuntu@instance_public_IPV4_address -y
```

Step 19: After ssh/accessing your instance you can run your python project of CV by following command.

```
$ python3 python file -video video_path
```

For example, Suppose I want to detect dog from the video file.

Step 20: So below is my command to run python file which takes video path to detect human face.

```
$ python3 dog_detection.py -video ./mix _video.mp4
```

Happy Learning !!!

Thank you for reading and stay tuned for our next technical post!!!