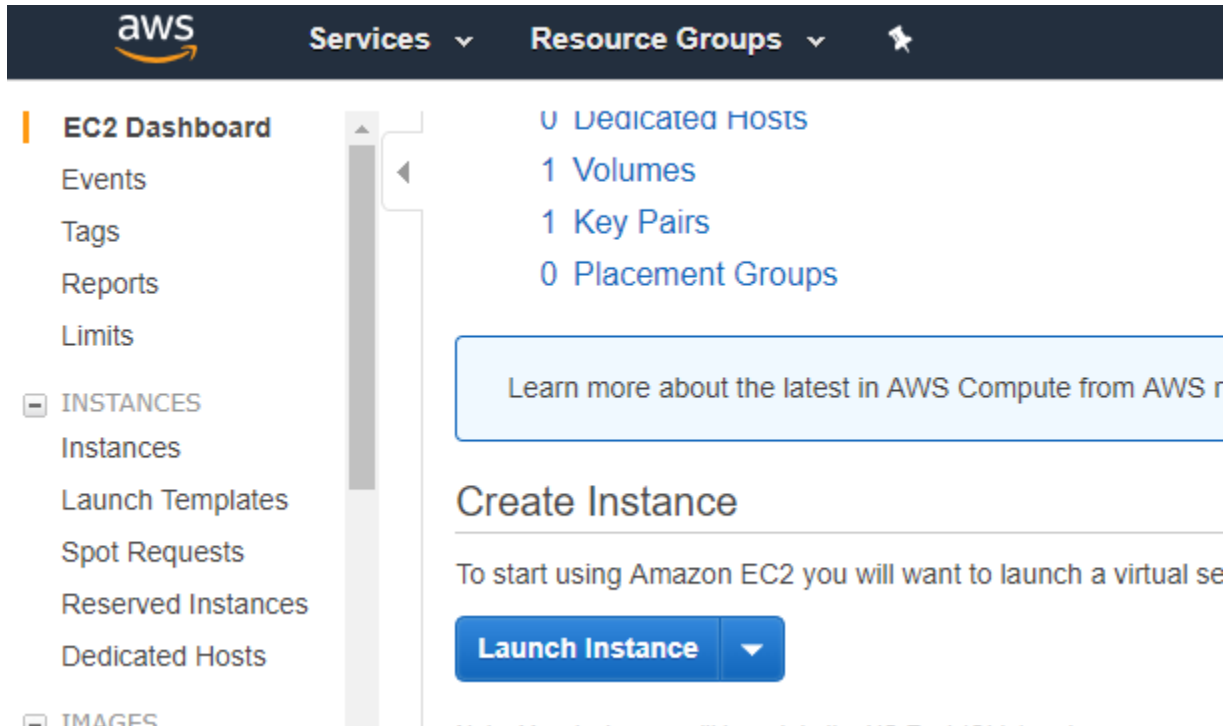
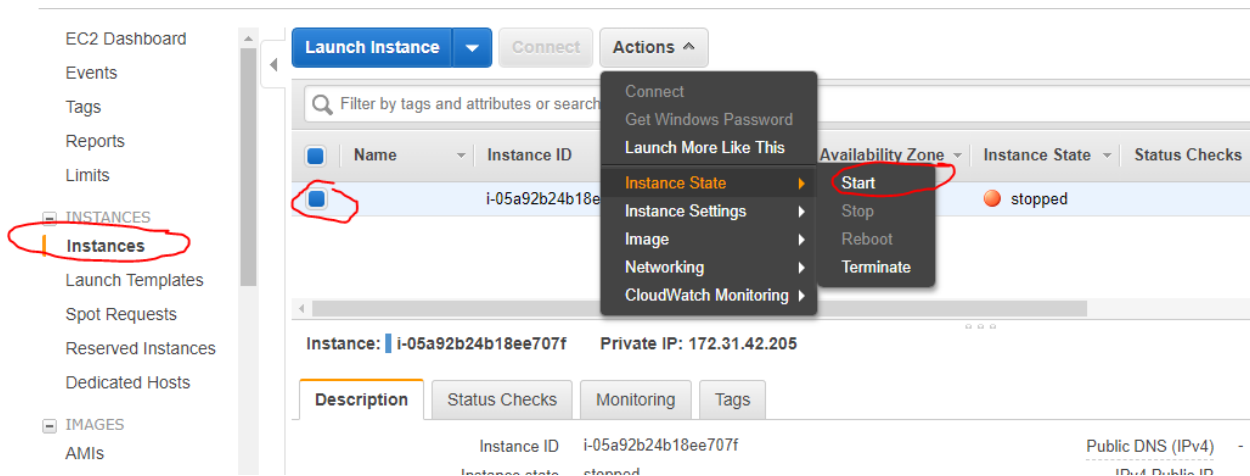


Running Jupyter Notebook in AWS instance

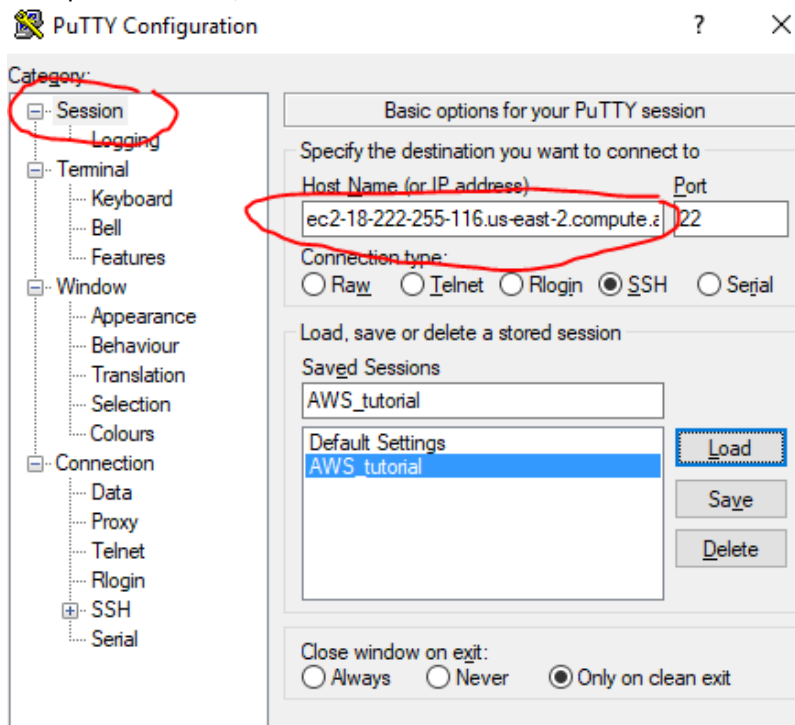
1. Go to EC2 site and launch instance



2. Relaunch the previous instance
 - a. Click on Instances
 - b. Select the previous instance, which is stopped
 - c. Go to "Actions" and click on "Instance State" and "Start"



3. Use "PuTTY" to connect to AWS instance
 - a. Open "Putty"
 - b. Set up "Host Name/IP address" in "PuTTY"



Go to "Connect" in the instance and copy instance address to PuTTY

To access your instance:

1. Open an SSH client. (find out how to [connect using PuTTY](#))
2. Locate your private key file (AWS_tutorial.pem). The wizard automatically detects the key you used to launch the instance.
3. Your key must not be publicly viewable for SSH to work. Use this command if needed:

```
chmod 400 AWS_tutorial.pem
```

4. Connect to your instance using its Public DNS:

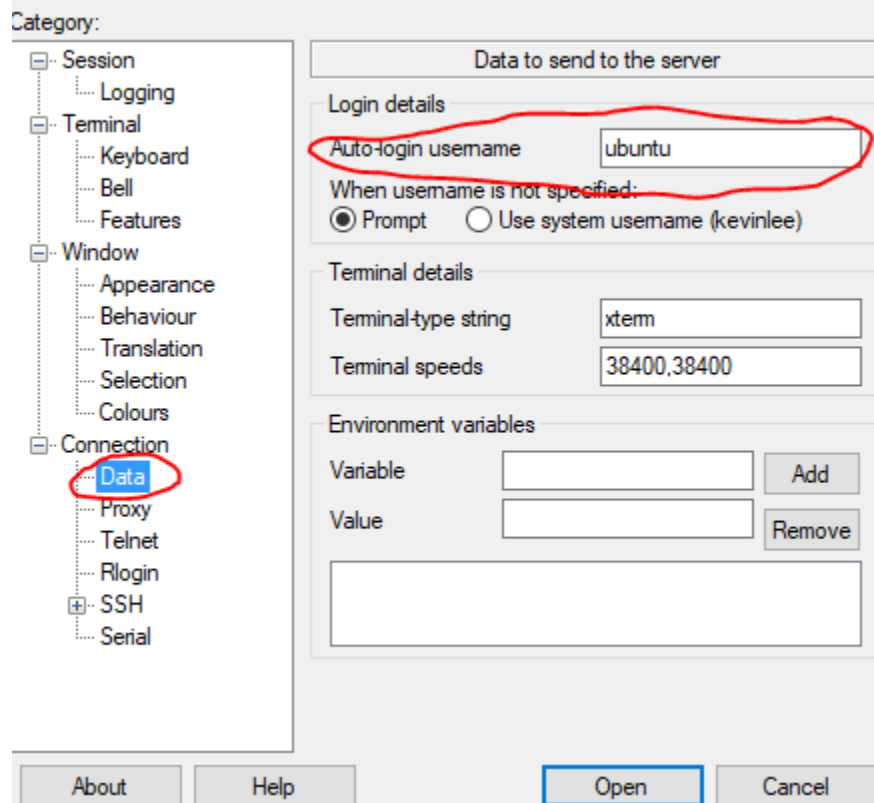
```
ec2-52-14-169-206.us-east-2.compute.amazonaws.com
```

Example:

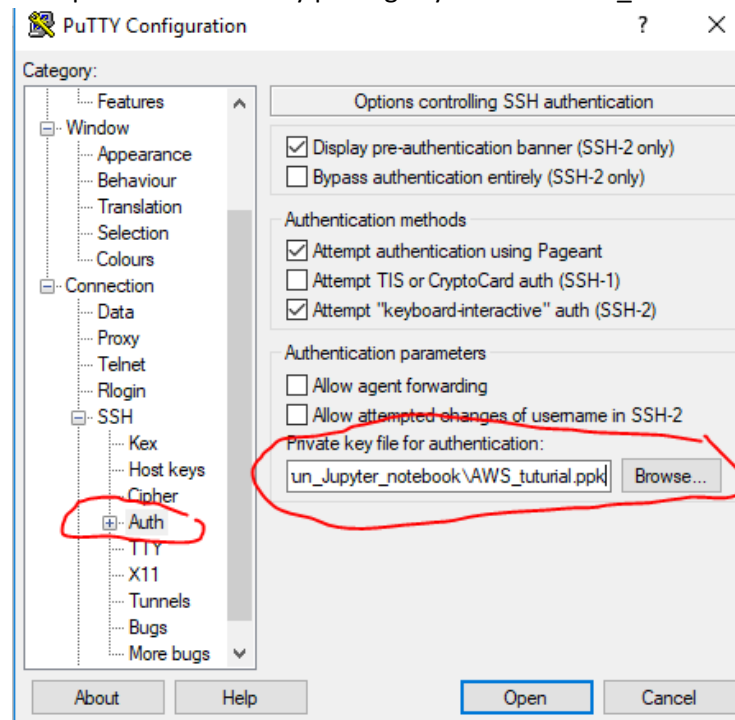
```
ssh -i "AWS_tutorial.pem" ubuntu@ec2-52-14-169-206.us-east-2.compute.amazonaws.com
```

Please note that in most cases the username above will be correct, however please ensure that you read your AMI usage instructions to ensure that the AMI owner has not changed the default AMI username.

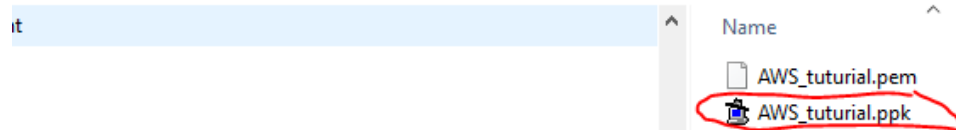
- c. Set up "Username". It should be same as AWS Instance username



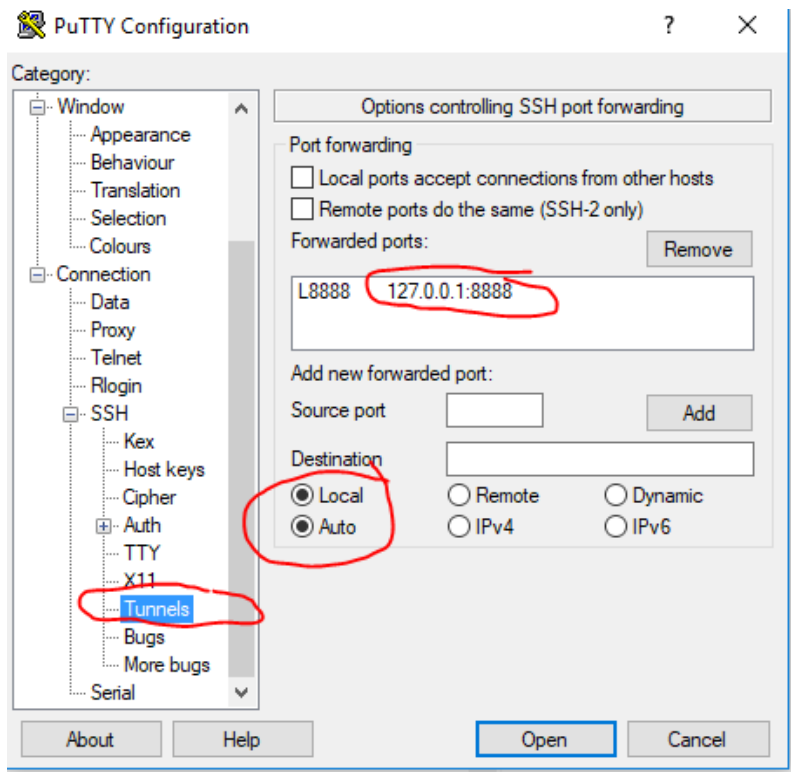
- d. Set up Authentication by picking key term of "AWS_tutorial"



> This PC > Windows (C:) > KL > AWS > run_Jupyter_notebook



- e. Set up “Tunnels” and local host. Here the local host will be 127.0.0.1:8888. When using browser, <http://localhost:8888/?token...> Here localhost is 127.0.0.1. Since the local host is set up in PuTTY, you don’t need to manually type it on web-browser.



- f. Click “Open” to connect and it will show command line

```
ubuntu@ip-172-31-42-205: ~  
Using username "ubuntu".  
Authenticating with public key "imported-openssh-key"  
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.4.0-1066-aws x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
9 packages can be updated.  
0 updates are security updates.  
  
Last login: Sun Sep  9 22:54:58 2018 from 108.2.168.76  
ubuntu@ip-172-31-42-205:~$
```

- g. For further information on how to use “PuTTY” to connect to AWS instance, see https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/putty.html?icmpid=docs_ec2_console.

4. Run Jupyter Notebook

- In "PuTTY", list already-installed packages
- In "PuTTY", run "jupyter notebook"

```
using username "ubuntu".
Authenticating with public key "imported-openssh-key"
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.4.0-1066-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

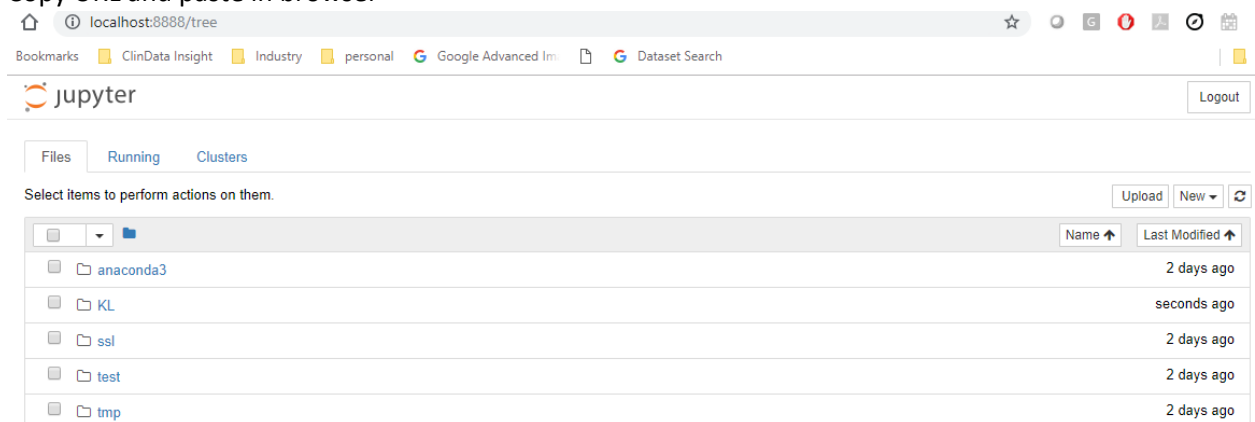
Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

9 packages can be updated.
0 updates are security updates.

Last login: Sun Sep  9 22:54:58 2018 from 108.2.168.76
ubuntu@ip-172-31-42-205:~$ ls
anaconda3  ssl  test  tmp
ubuntu@ip-172-31-42-205:~$ jupyter notebook
[I 15:54:57.674 NotebookApp] Writing notebook server cookie secret to /run/user/1000/jupyter/notebook_cookie_secret
[I 15:54:57.754 NotebookApp] JupyterLab alpha preview extension loaded from /home/ubuntu/anaconda3/lib/python3.6/site-packages/jupyterlab
JupyterLab v0.27.0
Known labextensions:
[I 15:54:57.757 NotebookApp] Running the core application with no additional extensions or settings
[I 15:54:57.762 NotebookApp] Serving notebooks from local directory: /home/ubuntu
[I 15:54:57.762 NotebookApp] 0 active kernels
[I 15:54:57.762 NotebookApp] The Jupyter Notebook is running at: http://localhost:8888/?token=0a3cfff2c2ae582b5bd2fal0a41f647ee66c75a5e9e95d8d9
[I 15:54:57.762 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[W 15:54:57.762 NotebookApp] No web browser found: could not locate runnable browser.
[C 15:54:57.763 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time, to login with a token:
http://localhost:8888/?token=0a3cfff2c2ae582b5bd2fal0a41f647ee66c75a5e9e95d8d9
```

c. Copy URL and paste in browser

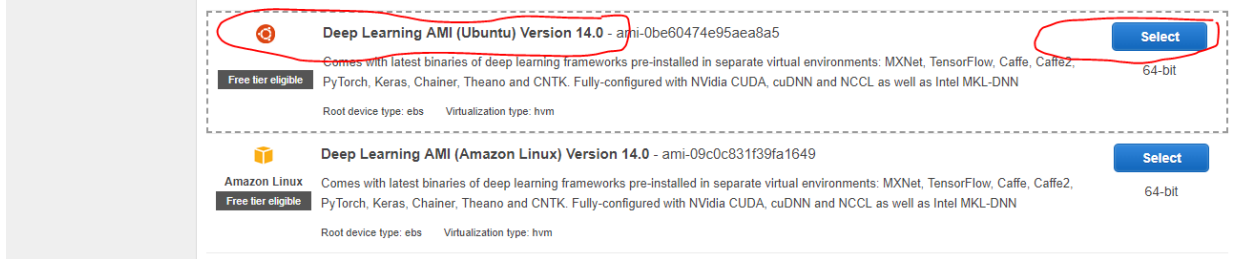


d. You can upload files and run Jupyter Notebook

How to set up Deep Learning AWS instance and run Jupyter Notebook

1. Choose Amazon Machine Image on “Deep Learning AMI(Ubuntu)”

Step 1: Choose an Amazon Machine Image (AMI)



2. Select Instance Type on “t2.micro”. It is free-tier, but for better computing power, you can select more powerful instance.

| | Family | Type | vCPUs | Memory (GiB) | Instance Storage (GB) | EBS-Optimized Available | Network Performance | IPv6 Support |
|-------------------------------------|-----------------|----------|-------|--------------|-----------------------|-------------------------|---------------------|--------------|
| <input type="checkbox"/> | General purpose | t2.nano | 1 | 0.5 | EBS only | - | Low to Moderate | Yes |
| <input checked="" type="checkbox"/> | General purpose | t2.micro | 1 | 1 | EBS only | - | Low to Moderate | Yes |
| <input type="checkbox"/> | General purpose | t2.small | 1 | 2 | EBS only | - | Low to Moderate | Yes |

3. Keep the default setting of instance and go on to “Add storage”

Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the low cost.

Number of instances [Launch into Auto Scaling Group](#)

Purchasing option ☐ Request Spot instances

Network [Create new VPC](#)

Subnet [Create new subnet](#)

Auto-assign Public IP

Placement group ☐ Add instance to placement group.

IAM role [Create new IAM role](#)

Shutdown behavior

Enable termination protection ☐ Protect against accidental termination

Monitoring ☐ Enable CloudWatch detailed monitoring
[Additional charges apply.](#)

Tenancy
[Additional charges will apply for dedicated tenancy.](#)

T2/T3 Unlimited ☐ Enable
[Additional charges may apply](#)

► [Advanced Details](#)

4. Keep the default of setting of storage

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. [Learn more](#) about storage options in Amazon EC2.

| Volume Type | Device | Snapshot | Size (GiB) | Volume Type | IOPS | Throughput (MB/s) | Delete on Termination | Encrypted |
|----------------|-----------|------------------------|------------|---------------------------|------------|-------------------|-------------------------------------|---------------|
| Root | /dev/sda1 | snap-0e276974ad1c47b67 | 75 | General Purpose SSD (GP2) | 225 / 3000 | N/A | <input checked="" type="checkbox"/> | Not Encrypted |
| Add New Volume | | | | | | | | |

5. Create “Custom TCP Rule on port range 8888” (yellow-highlighted) that will talk to remote Jupyter Notebook using “Add Rule”

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a new security group

☐ Select an existing security group

Security group name:

Description:

| Type | Protocol | Port Range | Source | Description |
|------------|----------|------------|--------------------|----------------------------|
| SSH | TCP | 22 | Custom 0.0.0.0/0 | e.g. SSH for Admin Desktop |
| Custom TCP | TCP | 8888 | Anywhere 0.0.0.0/0 | e.g. SSH for Admin Desktop |
| Add Rule | | | | |

6. Download Key pair and launch DLAMI instance

7. Wait until your instance is running

EC2 Dashboard

Events

Tags

Reports

Limits

INSTANCES

Instances

Launch Instance

Connect

Actions

Filter by tags and attributes or search by keyword

<<

1 to 2 of 2

>>

| <input type="checkbox"/> | Name | Instance ID | Instance Type | Availability Zone | Instance State | Status Checks | Alarm Status | Public DNS (IPv4) | IPv4 Public IP | IPv6 IF |
|-------------------------------------|------|---------------------|---------------|-------------------|-------------------------------|--------------------------------------|----------------------------|--|------------------------------------|-------------------------|
| <input checked="" type="checkbox"/> | | i-0559e61d6dca8c2af | t2.micro | us-east-2c | <div><div></div>running</div> | <div><div></div>2/2 checks ...</div> | <div><div></div>None</div> | <div><div></div>ec2-52-14-12-165 us-e...</div> | <div><div></div>52.14.12.165</div> | <div><div></div>-</div> |
| <input type="checkbox"/> | | i-05a92b24b18ee707f | t2.micro | us-east-2c | <div><div></div>stopped</div> | | <div><div></div>None</div> | <div><div></div></div> | <div><div></div>-</div> | <div><div></div>-</div> |

8. Open “PuTTYGen”, load existing private key (“DeepLearning_key.pem”), save private key and generate key pair (“DeepLearning_key.ppk”).

PuTTY Key Generator

File Key Conversions Help

Key

Public key for pasting into OpenSSH authorized_keys file:

```
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQCTPT7cd6FN0nVVNU/zLjhBzliNH7MQAAsFia4bFNJzxyo9BEmnws2eDF3HWCRMhvUy138wPqufvmmB7hnqOo/SxR8OqQQw38QdwN/sBAsvSUJco2j+W4uuZY/vyv65i2UyZCil8ZeRsCXaMDUP3K9dlhOZuUMYPri2tPi9zAxK/tphskzNo
```

Key fingerprint:

Key comment:

Key passphrase:

Confirm passphrase:

Actions

Generate a public/private key pair

Load an existing private key file

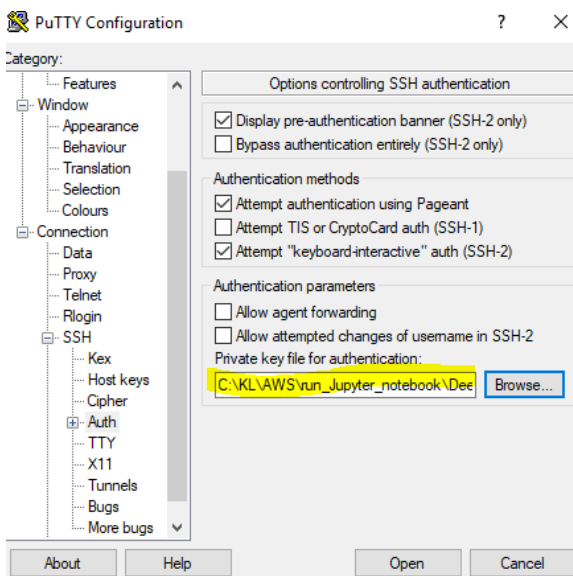
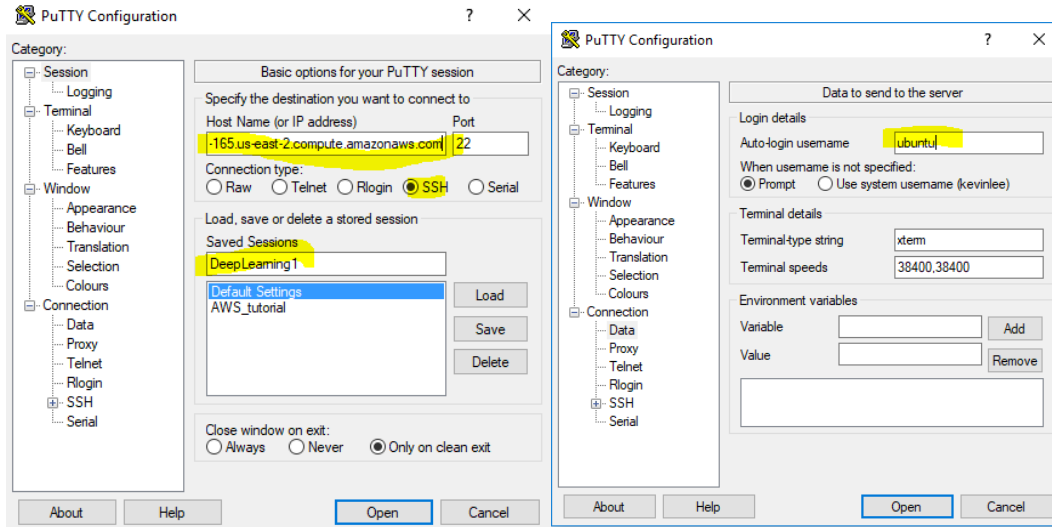
Save the generated key

Parameters

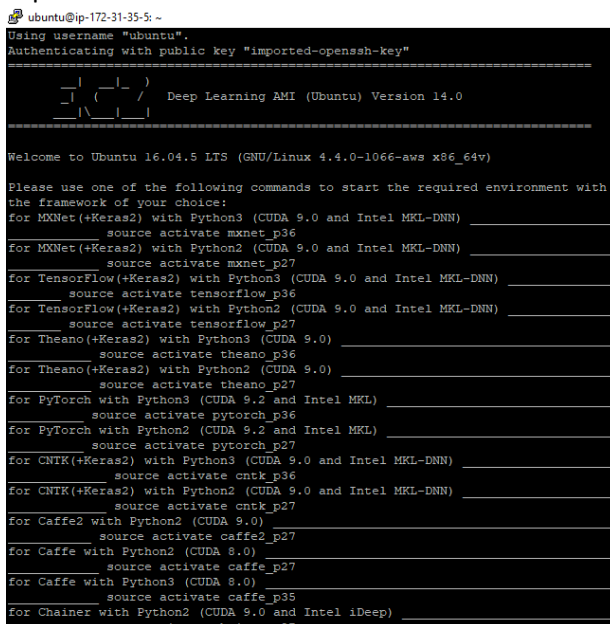
Type of key to generate: ☒ RSA ☐ DSA ☐ ECDSA ☐ ED25519 ☐ SSH-1 (RSA)

Number of bits in a generated key:

9. Open “PuTTY” and set up the necessary setting to connect to AWS instance



10. Open “PuTTY”

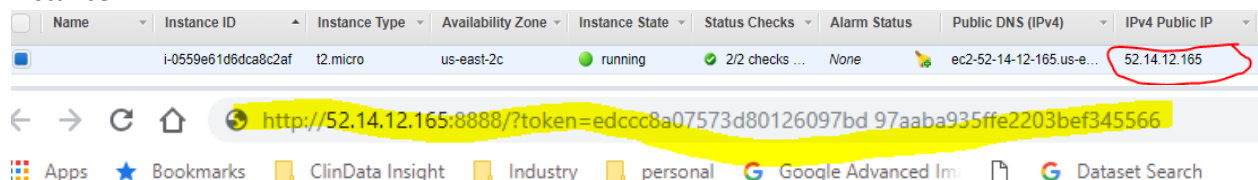


11. Run “jupyter notebook” in PuTTY

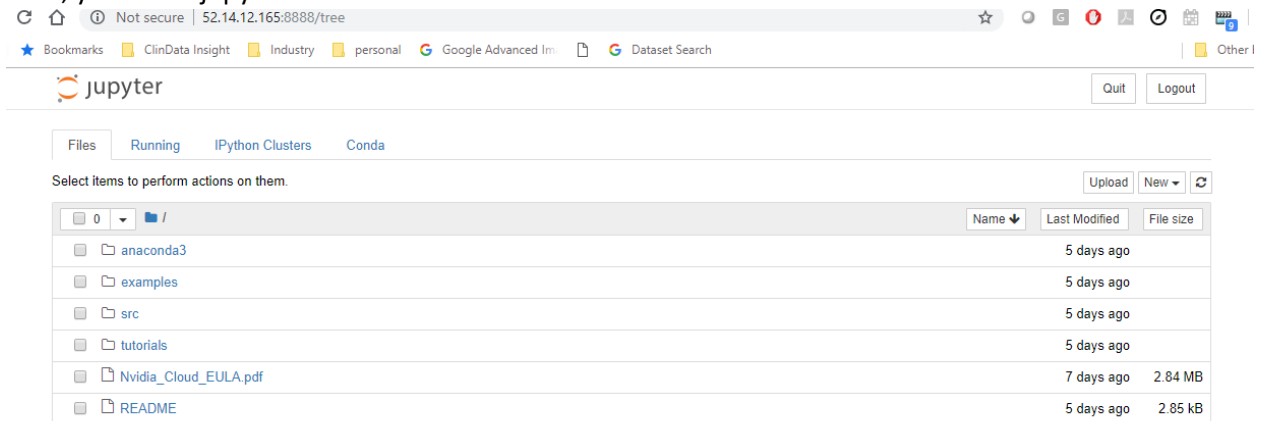
```
ubuntu@ip-172-31-35-5:~$ jupyter notebook --ip=0.0.0.0
[I 04:24:18.400 NotebookApp] Using EnvironmentKernelSpecManager...
[I 04:24:18.401 NotebookApp] Started periodic updates of the kernel list (every
3 minutes).
[I 04:24:18.604 NotebookApp] Loading IPython parallel extension
[I 04:24:18.628 NotebookApp] JupyterLab beta preview extension loaded from /home
/ubuntu/anaconda3/lib/python3.6/site-packages/jupyterlab
[I 04:24:18.628 NotebookApp] JupyterLab application directory is /home/ubuntu/a
conda3/share/jupyter/lab
[I 04:24:18.790 NotebookApp] [nb_conda] enabled
[I 04:24:18.790 NotebookApp] Serving notebooks from local directory: /home/ubuntu
u
[I 04:24:18.790 NotebookApp] The Jupyter Notebook is running at:
[I 04:24:18.790 NotebookApp] http://(ip-172-31-35-5 or 127.0.0.1):8888/?token=ed
ccc8a07573d80126097bd97aaba935ffe2203bef345566
[I 04:24:18.791 NotebookApp] Use Control-C to stop this server and shut down all
kernels (twice to skip confirmation).
[W 04:24:18.791 NotebookApp] No web browser found: could not locate runnable bro
wser.
[C 04:24:18.791 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
http://(ip-172-31-35-5 or 127.0.0.1):8888/?token=edccc8a07573d80126097bd
97aaba935ffe2203bef345566
[I 04:24:18.791 NotebookApp] Starting initial scan of virtual environments...
[I 04:24:20.566 NotebookApp] Found new kernels in environments: conda_tensorflow
_p36, conda_caffe_p27, conda_theano_p36, conda_cntk_p27, conda_python3, conda_ch
ainer_p36, conda_caffe2_p27, conda_python2, conda_pytorch_p36, conda_theano_p27,
conda_cntk_p36, conda_mxnet_p27, conda_mxnet_p36, conda_anaconda3, conda_chaine
r_p27, conda_caffe_p35, conda_pytorch_p27, conda_tensorflow_p27
^C[I 04:24:29.622 NotebookApp] interrupted
Serving notebooks from local directory: /home/ubuntu
0 active kernels
The Jupyter Notebook is running at:
http://(ip-172-31-35-5 or 127.0.0.1):8888/?token=edccc8a07573d80126097bd97aaba93
5ffe2203bef345566
Shutdown this notebook server (y/[n])? n
resuming operation...
[I 04:26:06.992 NotebookApp] 302 GET /?token=edccc8a07573d80126097bd97aaba935ffe
2203bef345566 (108.2.168.76) 0.72ms
```

12. Copy and paste link to web browser and replace IP address with “IPv4 Public IP address” in DLAMI instance.



13. Now, you are in jupyter notebook



The screenshot shows the Jupyter Notebook web interface. At the top, there's a browser address bar with the URL `52.14.12.165:8888/tree`. Below the browser, the Jupyter logo is visible. The interface has tabs for 'Files', 'Running', 'IPython Clusters', and 'Conda'. The 'Files' tab is active, showing a file browser. The file browser displays a list of files and folders in the current directory. The files are:

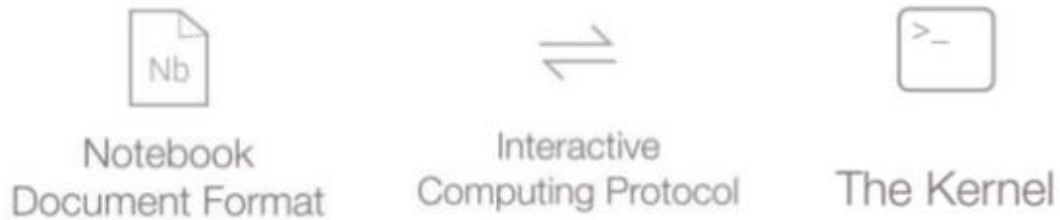
| Name | Last Modified | File size |
|-----------------------|---------------|-----------|
| anaconda3 | 5 days ago | |
| examples | 5 days ago | |
| src | 5 days ago | |
| tutorials | 5 days ago | |
| Nvidia_Cloud_EULA.pdf | 7 days ago | 2.84 MB |
| README | 5 days ago | 2.85 kB |

14. If you want to use tensorflow, type `source activate tensorflow_p36` in PuTTY and go into Jupyter notebook

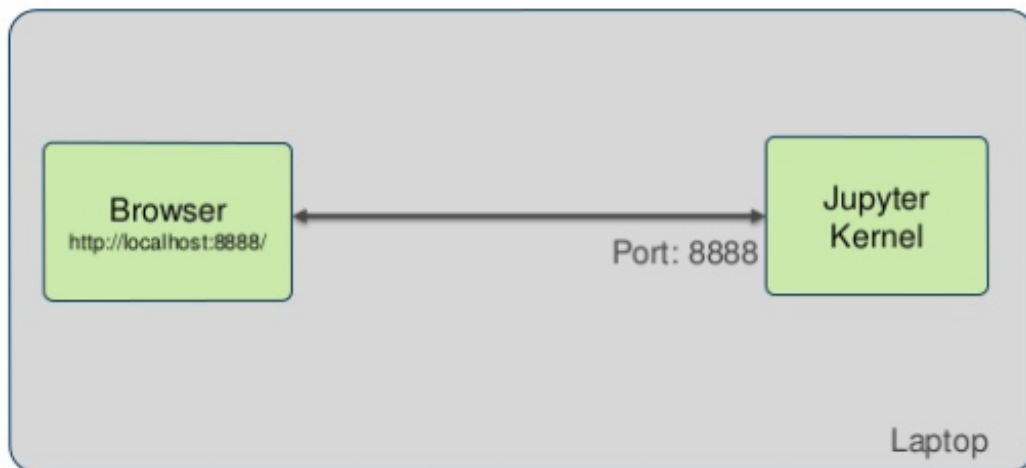
```
ubuntu@ip-172-31-35-5:~$ source activate tensorflow_p36
WARNING: First activation might take some time (1+ min).
Installing TensorFlow optimized for your Amazon EC2 instance.....
Env where framework will be re-installed: tensorflow_p36
% Total      % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
100      8 100      8    0     0    800      0 --:--:-- --:--:-- --:--:--    800
Uninstalling tensorflow-gpu-1.10.0:
  Successfully uninstalled tensorflow-gpu-1.10.0
Instance t2.micro is identified as a CPU instance, uninstalling tensorflow-cpu,
installing optimized version of the Deep Learning framework.
Processing ./dl_binaries/tensorflow/cpu_3.6/tensorflow-1.10.0-cp36-cp36m-linux_x86_64.whl
Requirement already satisfied: numpy<=1.14.5,>=1.13.3 in ./anaconda3/envs/tensorflow_p36/lib/python3.6/site-packages (from tensorflow==1.10.0->-r /home/ubuntu/.dl_binaries/tensorflow/cpu_3.6/file_with_whl_file_name_for_pip (line 1)) (1.14.5)
Requirement already satisfied: wheel>=0.26 in ./anaconda3/envs/tensorflow_p36/lib/python3.6/site-packages (from tensorflow==1.10.0->-r /home/ubuntu/.dl_binaries/tensorflow/cpu_3.6/file_with_whl_file_name_for_pip (line 1)) (0.31.1)
Requirement already satisfied: absl-py>=0.1.6 in ./anaconda3/envs/tensorflow_p36/lib/python3.6/site-packages (from tensorflow==1.10.0->-r /home/ubuntu/.dl_binaries/tensorflow/cpu_3.6/file_with_whl_file_name_for_pip (line 1)) (0.4.1)
Requirement already satisfied: six>=1.10.0 in ./anaconda3/envs/tensorflow_p36/lib/python3.6/site-packages (from tensorflow==1.10.0->-r /home/ubuntu/.dl_binaries/tensorflow/cpu_3.6/file_with_whl_file_name_for_pip (line 1)) (1.11.0)
Requirement already satisfied: astor>=0.6.0 in ./anaconda3/envs/tensorflow_p36/lib/python3.6/site-packages (from tensorflow==1.10.0->-r /home/ubuntu/.dl_binaries/tensorflow/cpu_3.6/file_with_whl_file_name_for_pip (line 1)) (0.6.0)
```

Introduction of Jupyter Notebook Architecture

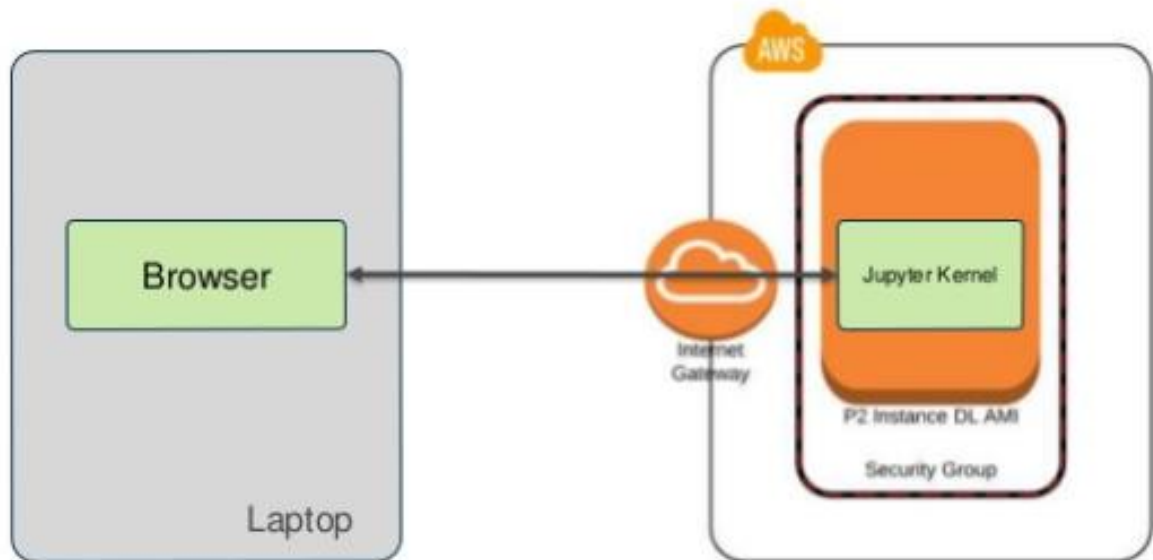
What is Jupyter notebook?



Jupyter running on your own computer



Architecture - Jupyter on single instance



SSH tunnel explained

