

Jupyter Notebook Tutorial: How to use with AWS

What is Jupyter Notebook?

A Jupyter notebook is a web application that allows the user to write codes and rich text elements. Inside the Notebooks, you can write paragraph, equations, title, add links, figures and so on. A notebook is useful to share interactive algorithms with your audience by focusing on teaching or demonstrating a technique. Jupyter Notebook is also a convenient way to run data analysis.

In this tutorial, you will learn-

- [What is Jupyter Notebook?](#)
- [Introduction to Jupyter Notebook App](#)
- [How to use Jupyter Notebook](#)
- [Install Jupyter Notebook with AWS](#)

Introduction to Jupyter Notebook App

The Jupyter Notebook App is the interface where you can write your scripts and codes through your web browser. The app can be used locally, meaning you don't need internet access, or a remote server.



(/images/1/080418_1223_WhatisJupy1.png)

Each computation is done via a kernel. A new kernel is created each time you launch a Jupyter Notebook.

How to use Jupyter Notebook

In the session below, you will learn how to use Jupyter Notebook. You will write a simple line of code to get familiar with the environment of Jupyter.

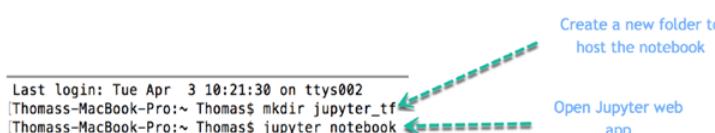
Step 1) You add a folder inside the working directory that will contains all the notebooks you will create during the tutorials about TensorFlow.

Open the Terminal and write

```
mkdir jupyter_tf
jupyter notebook
```

Code Explanation

- mkdir jupyter_tf: Create a folder names jupyter_tf
- jupyter notebook: Open Jupyter web-app

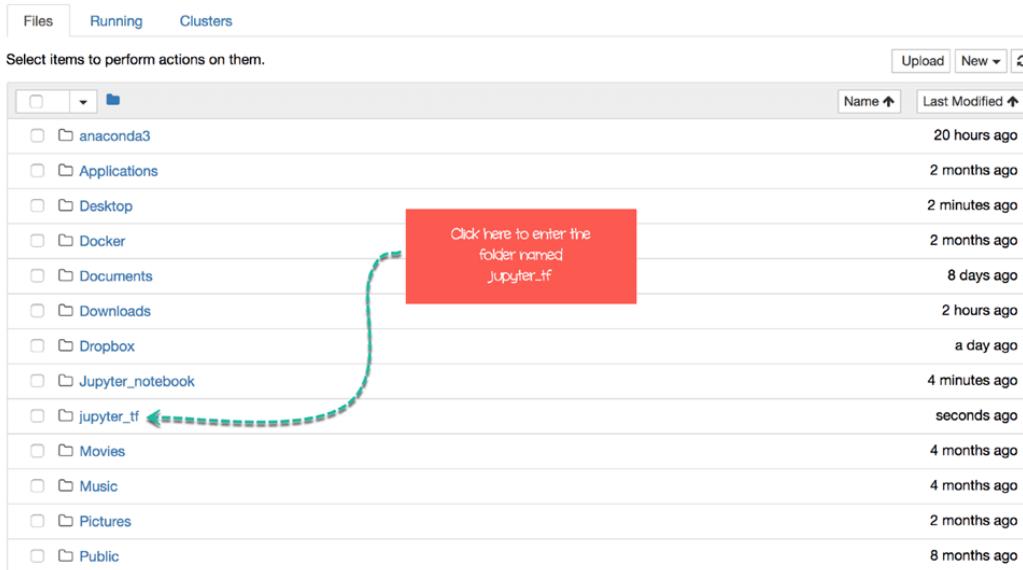


(/images/1/080418_1223_WhatisJupy2.png)

TensorFlow Tutorial

- 1) [What is TensorFlow? \(/what-is-tensorflow.html\)](#)
- 2) [Download and Install TensorFlow \(/download-install-tensorflow.html\)](#)
- 3) [What is Jupyter Notebook? \(/jupyter-notebook-tutorial.html\)](#)
- 4) [TensorFlow Basics \(/tensorflow.html\)](#)
- 5) [Tensorboard Tutorial \(/tensorboard-tutorial.html\)](#)
- 6) [Python Pandas Tutorial \(/python-pandas-tutorial.html\)](#)
- 7) [Import CSV Data \(/pandas-read-csv.html\)](#)
- 8) [Linear Regression \(/linear-regression-tensorflow.html\)](#)
- 9) [Linear Regr. for Machine Lear. \(/linear-regression-for-machine-learning.html\)](#)
- 10) [Classifier in TensorFlow \(/linear-classifier-tensorflow.html\)](#)
- 11) [Kernel Methods \(/kernel-methods-machine-learning.html\)](#)

Step 2) You can see the new folder inside the environment. Click on the folder jupyter_tf.

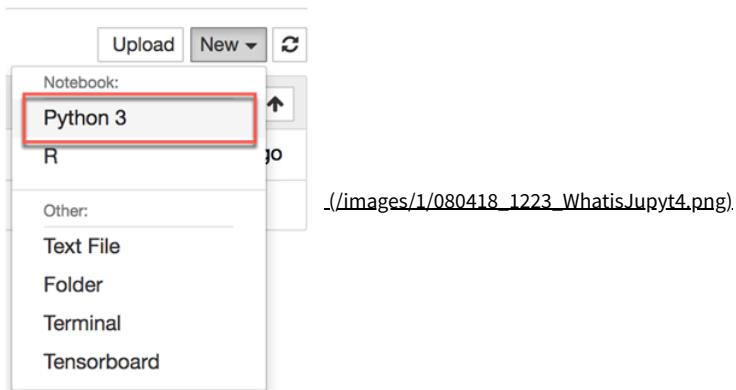


The screenshot shows a file browser interface with the following file list:

File/Folder	Last Modified
anaconda3	20 hours ago
Applications	2 months ago
Desktop	2 minutes ago
Docker	2 months ago
Documents	8 days ago
Downloads	2 hours ago
Dropbox	a day ago
Jupyter_notebook	4 minutes ago
jupyter_tf	seconds ago
Movies	4 months ago
Music	4 months ago
Pictures	2 months ago
Public	8 months ago

(/images/1/080418_1223_WhatisJupy3.png)

Step 3) Inside this folder, you will create your first notebook. Click on the button **New** and **Python 3**.

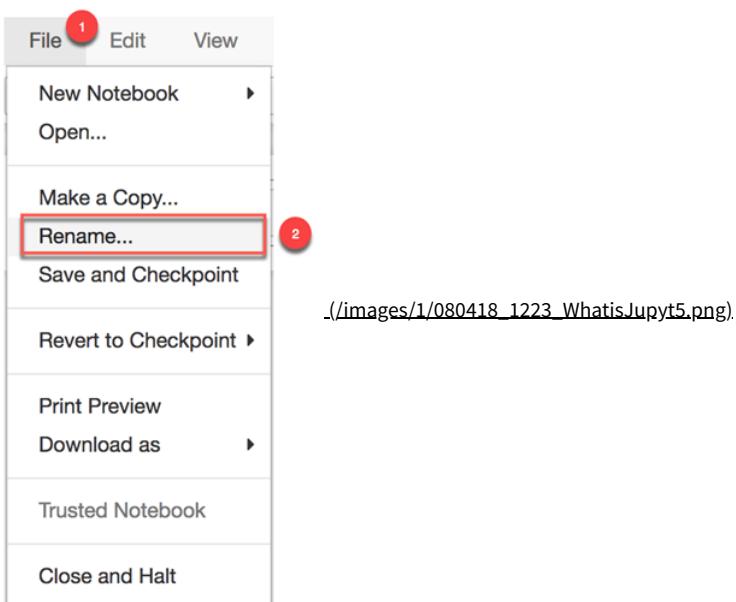


The screenshot shows a 'New' menu with the following options:

- Notebook:
 - Python 3 (highlighted with a red box)
 - R
- Other:
 - Text File
 - Folder
 - Terminal
 - Tensorboard

(/images/1/080418_1223_WhatisJupy4.png)

Step 4) You are inside the Jupyter environment. So far, your notebook is called Untitled.ipynb. This is the default name given by Jupyter. Let's rename it by clicking on **File** and **Rename**



The screenshot shows a 'File' menu with the following options:

- New Notebook
- Open...
- Make a Copy...
- Rename... (highlighted with a red box)
- Save and Checkpoint
- Revert to Checkpoint
- Print Preview
- Download as
- Trusted Notebook
- Close and Halt

(/images/1/080418_1223_WhatisJupy5.png)

You can rename it Introduction_jupyter

Rename Notebook

Enter a new notebook name:

Introduction_jupyter

1

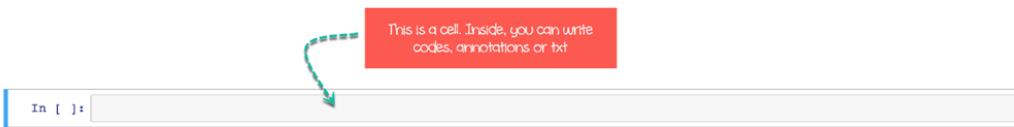
Cancel

Rename

2

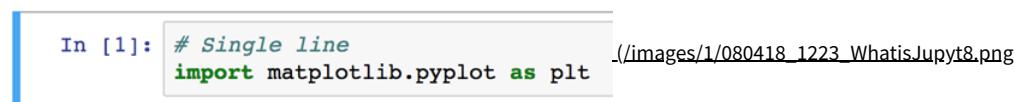
(/images/1/080418_1223_WhatisJupyter6.png)

In Jupyter Notebook, you write codes, annotation or text inside the cells.

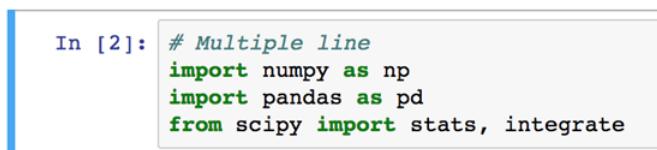


(/images/1/080418_1223_WhatisJupyter7.png)

Inside a cell, you can write a single line of code.



or multiple lines. Jupyter reads the code one line after another.



(/images/1/080418_1223_WhatisJupyter9.png)

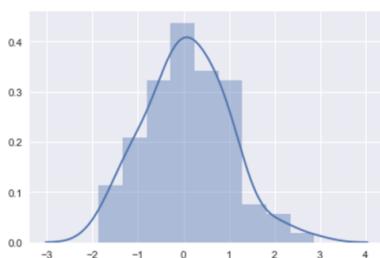
For instance, if you write following code inside a cell.

```
In [6]: # Run the code
%matplotlib inline
import seaborn as sns
sns.set(color_codes=True)
np.random.seed(sum(map(ord, "distributions")))
x = np.random.normal(size=100)
sns.distplot(x)
plt
```

(/images/1/080418_1223_WhatisJupyter10.png).

It will produce this output.

Out[6]: <module 'matplotlib.pyplot' from '/Users/Thomas/anaconda3/lib/python3.6/site-packages/matplotlib/pyplot.py'>

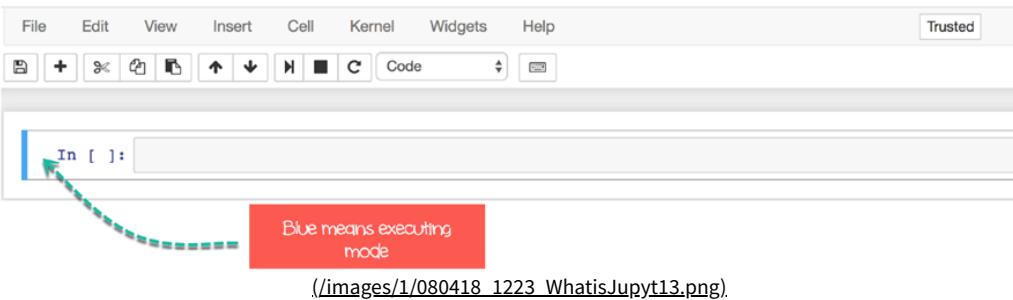


(/images/1/080418_1223_WhatisJupyter11.png).

Step 5) You are ready to write your first line of code. You can notice the cell have two colors. The green color mean you are in the **editing mode**.



The blue color, however, indicates you are in **executing mode**.



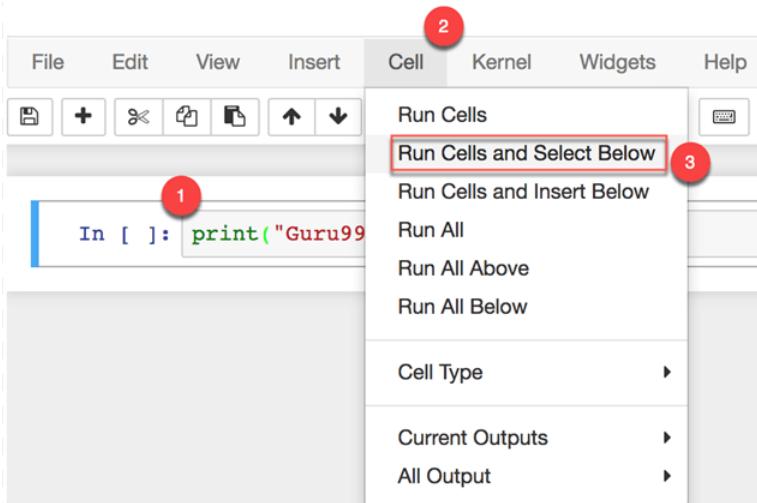
Your first line of code will be to print Guru99!. Inside the cell, you can write

```
print("Guru99!")
```

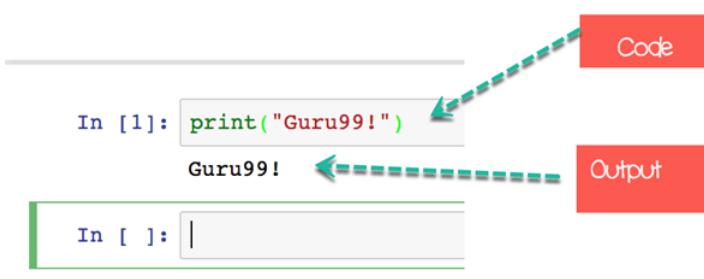
There are two ways to run a code in Jupyter:

- Click and Run
- Keyboard Shortcuts

To run the code, you can click on **Cell** and then **Run Cells and Select Below**

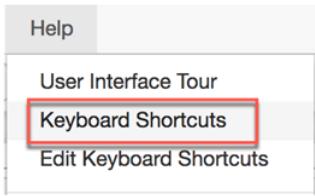


You can see the code is printed below the cell and a new cell has appeared right after the output.



(/images/1/080418_1223_WhatisJupy15.png).

A faster way to run a code is to use the **Keyboard Shortcuts**. To access the Keyboard Shortcuts, go to **Help** and **Keyboard Shortcuts**



Below the list of shortcuts for a MacOS keyboard. You can edit the shortcuts in the editor.

Keyboard shortcuts

The image shows the 'Keyboard Shortcuts' editor for Mac OS. It has two main sections: 'Command Mode (press Esc to enable)' and 'Edit Shortcuts'. The 'Command Mode' section lists various keyboard shortcuts with their descriptions. Several keys are highlighted with red boxes: ⌘ (Command), ⌘+F (find and replace), ⌘+P (open the command palette), ⌘+Shift+P (open the command palette), ⌘+Enter (enter edit mode), ⌘+Shift+Enter (run cell, select below), ⌘+Shift+Enter (run selected cells), and ⌘+Shift+Enter (run cell, insert below). The 'Edit Shortcuts' section contains additional keyboard shortcuts for cell selection and modification.

(/images/1/080418_1223_WhatisJupy17.png).

Following are shortcuts for Windows

The image shows the 'Keyboard Shortcuts' editor for Windows. It has two main sections: 'Command Mode (press Esc to enable)' and 'Edit Shortcuts'. The 'Command Mode' section lists various keyboard shortcuts for Windows. Several keys are highlighted with red boxes: Ctrl+Shift+F (open the command palette), Ctrl+Shift+P (open the command palette), Enter (enter edit mode), P (open the command palette), Shift+Enter (run cell, select below), Ctrl+Enter (run selected cells), Alt+Enter (run cell and insert below), Y (change cell to code), and Shift-Down (extend selected cells below). The 'Edit Shortcuts' section contains additional keyboard shortcuts for cell selection and modification.

(/images/1/080418_1223_WhatisJupy18.png).

Write this line

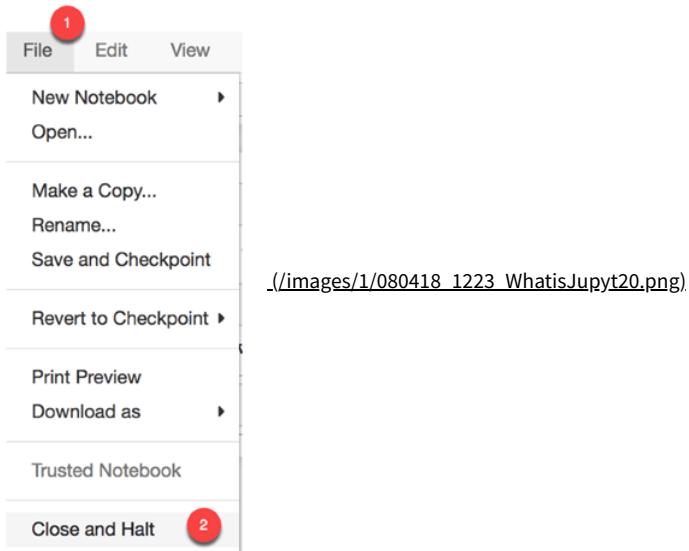
```
print("Hello world!")
```

and try to use the Keyboard Shortcuts to run the code. Use alt+enter. it will execute the cell and insert a new empty cell below, like you did before.

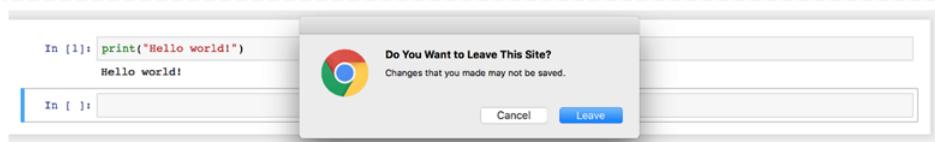
The image shows a Jupyter Notebook cell with the code 'print("Hello world!")' and its output 'Hello world!'. A red callout box points to the right of the output text, containing the text 'alt + enter: execute the cell and insert a new empty cell below'.

(/images/1/080418_1223_WhatisJupy19.png).

Step 6 It is time to close the Notebook. Go to **File** and click on **Close and Halt**



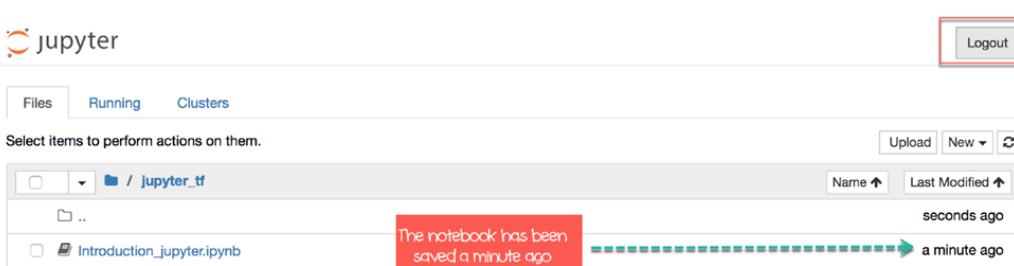
Note: Jupyter automatically saves the notebook with checkpoint. If you have the following message:



It means Jupyter didn't save the file since the last checkpoint. You can manually save the notebook



You will be redirected to the main panel. You can see your notebook has been saved a minute ago. You can safely logout.



Install Jupyter Notebook with AWS

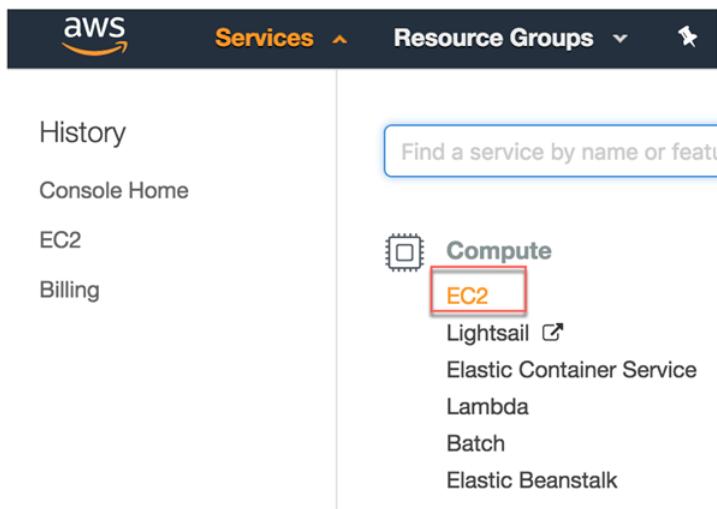
If you do not have an account at AWS, create a free account [here](https://aws.amazon.com/free) (<https://aws.amazon.com/free>).

We will proceed as follow

- [Part 1: Set up a key pair](#)
- [Part 2: Set up a security group](#)
- [Part 3: Launch instance](#)
- [Part 4: Install Docker](#)
- [Part 5: Install Jupyter](#)
- [Part 6: Close connection](#)

PART 1: Set up a key pair

Step 1) Go to Services and find EC2



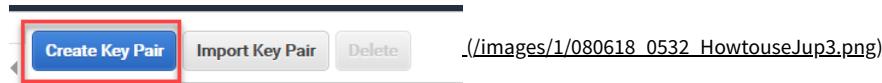
(./images/1/080618_0532_HowtouseJup1.png).

Step 2) In the panel and click on Key Pairs



(./images/1/080618_0532_HowtouseJup2.png)

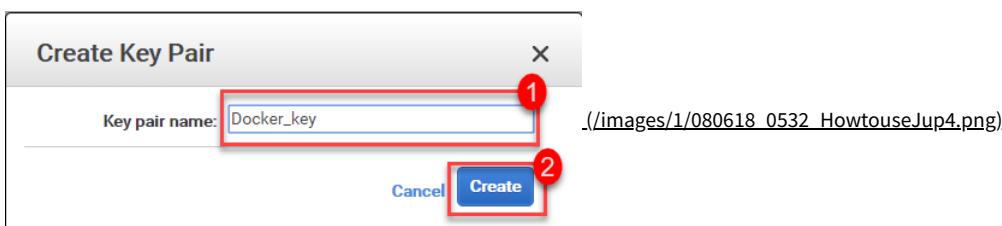
Step 3) Click Create Key Pair



(./images/1/080618_0532_HowtouseJup3.png)

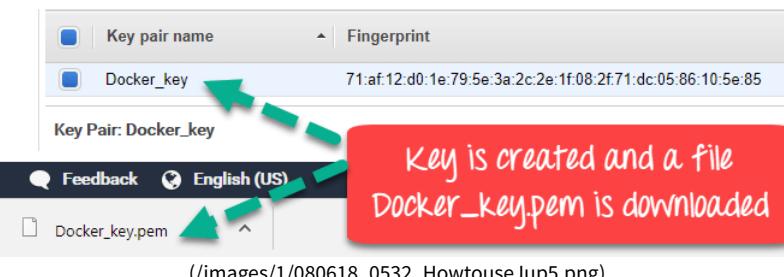
1. You can call it Docker key

2. Click Create



(./images/1/080618_0532_HowtouseJup4.png)

A file name Docker_key.pem downloads.



(./images/1/080618_0532_HowtouseJup5.png)

Step 4) Copy and paste it into the folder key. We will need it soon.

For Mac OS user only

This step concerns only Mac OS user. For Windows or Linux users, please proceed to PART 2

You need to set a working directory that will contain the file key

First of all, create a folder named key. For us, it is located inside the main folder Docker. Then, you set this path as your working directory

```
mkdir Docker/key  
cd Docker/key
```

(/images/1/080618_0532_HowtouseJup6.png).

PART 2: Set up a security group

Step 1) You need to configure a security group. You can access it with the panel



Step 2) Click on Create Security Group



Step 3) In the next Screen

1. Enter Security group name "jupyter_docker" and Description Security Group for Docker
2. You need to add 4 rules on top of

- ssh: port range 22, source Anywhere
- http: port range 80, source Anywhere
- https: port range 443, source Anywhere
- Custom TCP: port range 8888, source Anywhere

3. Click Create

1
2
3
For Jupyter

(/images/1/080618_0532_HowtouseJup9.png)

Step 4) The newly created Security Group will be listed

The screenshot shows the AWS Security Groups list. At the top, there are buttons for 'Create Security Group' and 'Actions'. Below is a search bar and a header row with columns: Name, Group ID, Group Name, VPC ID, and Description. A single row is visible, representing a security group named 'sg-c3424a89' with 'jupyter_docker' as its group name, 'vpc-620d0207' as its VPC ID, and 'Security Group for Docker' as its description. The entire row is highlighted with a red box.

Part 3: Launch instance

You are finally ready to create the instance

The screenshot shows the AWS Instances menu. It includes options like 'INSTANCES' (with 'Instances' highlighted by a red box), 'Launch Templates', 'Spot Requests', 'Reserved Instances', and 'Dedicated Hosts'. The URL for this page is [./images/1/080618_0532_HowtouseJup10.png](#).

Step 1) Click on Launch Instance

The screenshot shows the 'Launch Instance' button, which is highlighted with a red box. There are also 'Connect' and 'Actions' buttons. The URL for this page is [./images/1/080618_0532_HowtouseJup12.png](#).

The default server is enough for your need. You can choose Amazon Linux AMI. The current instance is 2018.03.0.

AMI stands for Amazon Machine Image. It contains the information required to successfully starts an instance that run on a virtual server stored in the cloud.

The screenshot shows the AWS AMI selection screen. It lists 'Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-40142d25' as the selected option. Below it, there is descriptive text about the image, including that it is EBS-backed, AWS-supported, and includes various tools and packages. It also specifies '64-bit' and the root device type as 'ebs'. The 'Select' button is visible at the top right. The URL for this page is [./images/1/080618_0532_HowtouseJup13.png](#).

Note that AWS has a server dedicated to deep learning such as:

- Deep Learning AMI (Ubuntu)
- Deep Learning AMI
- Deep Learning Base AMI (Ubuntu)

All of them Comes with latest binaries of deep learning frameworks pre-installed in separate virtual environments:

- TensorFlow,
- Caffe
- PyTorch,
- Keras,
- Theano
- CNTK.

Fully-configured with NVidia CUDA, cuDNN and NCCL as well as Intel MKL-DNN

Step 2) Choose **t2.micro**. It is a free tier server. AWS offers for free this virtual machine equipped with 1 vCPU and 1 GB of memory. This server provides a good tradeoff between computation, memory and network performance. It fits for small and medium database

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. Learn more about instance types and how they can meet your computing needs.

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)								
	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 Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.small	1	2	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.large	2	8	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.xlarge	4	16	EBS only	-	Moderate	Yes
<input type="checkbox"/>	General purpose	t2.2xlarge	8	32	EBS only	-	Moderate	Yes

Cancel Previous Review and Launch Next: Configure Instance Details

[\(/images/1/080618_0532_HowtouseJup14.png\)](#)**Step 3) Keep settings default in next screen and click Next: Add Storage****Step 3: Configure Instance Details**

Network	vpc-620d0207 (default)	<input type="button" value="Create new VPC"/>
Subnet	No preference (default subnet in any Availability Zone)	<input type="button" value="Create new subnet"/>
Auto-assign Public IP	Use subnet setting (Enable)	
Placement group	<input type="checkbox"/> Add instance to placement group.	
IAM role	None	<input type="button" value="Create new IAM role"/>
Shutdown behavior	Stop	
Enable termination protection	<input type="checkbox"/> Protect against accidental termination	
Monitoring	<input type="checkbox"/> Enable CloudWatch detailed monitoring Additional charges apply.	
Tenancy	Shared - Run a shared hardware instance	<small>Additional charges will apply for dedicated tenancy.</small>
T2 Unlimited	<input type="checkbox"/> Enable <small>Additional charges may apply</small>	

Cancel Previous Review and Launch Next: Add Storage

[\(/images/1/080618_0532_HowtouseJup15.png\)](#)**Step 4) Increase storage to 10GB and click Next****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/xvda	snap-07ad5635357ef8b3e	10	General Purpose SSD (GP2)	100 / 3000	N/A	<input checked="" type="checkbox"/>	Not Encrypted

[Add New Volume](#)

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. [Learn more](#) about free usage tier eligibility and usage restrictions.

Cancel Previous Review and Launch Next: Add Tags

[\(/images/1/080618_0532_HowtouseJup16.png\)](#)**Step 5) Keep settings default and click Next: Configure Security Group****Step 5: Add Tags**

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver.
A copy of a tag can be applied to volumes, instances or both.

Tags will be applied to all instances and volumes. [Learn more](#) about tagging your Amazon EC2 resources.

Key (1-256 characters maximum)	Value (255 characters maximum)	Instances	Volumes
--------------------------------	--------------------------------	-----------	---------

This resource currently has no tags

Choose the [Add tag](#) button or [click to add a Name tag](#).
Make sure your [IAM policy](#) includes permissions to create tags.

[Add Tag](#) (Up to 50 tags maximum)

Cancel Previous Review and Launch Next: Configure Security Group

[\(/images/1/080618_0532_HowtouseJup17.png\)](#)**Step 6) Choose the security group you created before, which is jupyter_docker**

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 1

Security Group ID	Name	Description	Actions
sg-4ee20c29	default	default VPC security group	Copy to new
sg-c3424a89	jupyter_docker	Security Group for Docker 2	Copy to new
sg-365dae27	launch-wizard-1	launch-wizard-1 created 2017-06-15T10:09:34.308+05:30	Copy to new

Inbound rules for sg-c3424a89 (Selected security groups: sg-c3424a89)				
Type	Protocol	Port Range	Source	Description
HTTP	TCP	80	0.0.0.0/0	
HTTP	TCP	80	-::/0	
Custom TCP Rule	TCP	8888	0.0.0.0/0	

(/images/1/080618_0532_HowtouseJup18.png)

Step 7) Review your settings and Click the launch button

Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

1 Improve your instances' security. Your security group, jupyter_docker, is open to the world.
Your instances may be accessible from any IP address. We recommend that you update your security group rules to allow access from known IP addresses only.
You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. [Edit security groups](#)

AMI Details

2 **Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-cfe4b2b0**
The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.

Security Group ID Name Description 3

[Cancel](#) [Previous](#) [Launch](#)

(/images/1/080618_0532_HowtouseJup19.png)

Step 8) The last step is to link the key pair to the instance.

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about [removing existing key pairs from a public AMI](#).

Choose an existing key pair 1

Select a key pair 2

Docker_key

I acknowledge that I have access to the selected private key file (Docker_key.pem), and that without this file, I won't be able to log into my instance. 3

[Cancel](#) [Launch Instances](#)

(/images/1/080618_0532_HowtouseJup20.png)

Step 8) Instance will launch



Launch Status

✓ Your instances are now launching
The following instance launches have been initiated: i-090447e9c051efdc View launch log
i Get notified of estimated charges Create billing alerts to get an email notification when estimated charges on your AWS bill exceed an amount you define (for ex:

How to connect to your instances

(/images/1/080618_0532_HowtouseJup21.png)

Step 9) Below a summary of the instances currently in use. Note the public IP

Reports	Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Public IP
Instances	i-090447e9c051efdc	t2.micro	us-east-1b	running	Initializing	None		ec2-52-23-241-75.compute-1.amazonaws.com	52.23.241.75

Instance: i-090447e9c051efdc Public DNS: ec2-52-23-241-75.compute-1.amazonaws.com

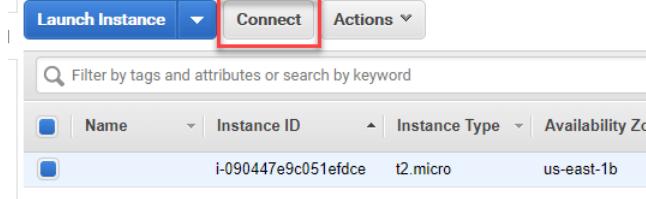
Description Status Checks Monitoring Tags

Instance ID: i-090447e9c051efdc
Instance state: running
Instance type: t2.micro
Elastic IPs:

Public DNS (IPv4): ec2-52-23-241-75.compute-1.amazonaws.com
IPv4 Public IP: 52.23.241.75
IPv6 IPs:
Private DNS: ip-172-31-57-55.ec2.internal

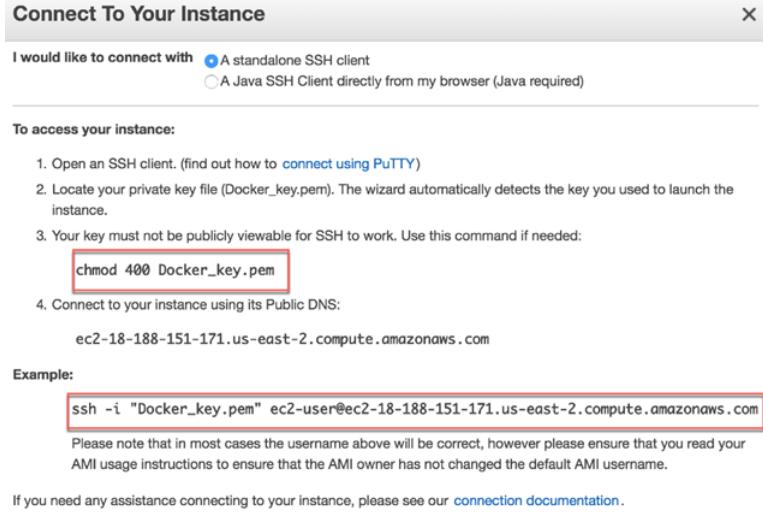
(/images/1/080618_0532_HowtouseJup22.png).

Step 9 Click on Connect



(/images/1/080618_0532_HowtouseJup23.png).

You will find the connection details



(/images/1/080618_0532_HowtouseJup24.png).

Launch your instance (Mac OS users)

At first make sure that inside the terminal, your working directory points to the folder with the key pair file docker

run the code

```
chmod 400 docker.pem
```

Open the connection with this code.

There are two codes. in some case, the first code avoids Jupyter to open the notebook.

In this case, use the second one to force the connection.

```
# If able to launch Jupyter
ssh -i "docker.pem" ec2-user@ec2-18-219-192-34.us-east-2.compute.amazonaws.com (mailto:ec2-user@ec2-18-219-192-34.us-east-2.compute.amazonaws.com)
```

```
# If not able to launch Jupyter
ssh -i "docker.pem" ec2-user@ec2-18-219-192-34.us-east-2.compute.amazonaws.com (mailto:ec2-user@ec2-18-219-192-34.us-east-2.compute.amazonaws.com) -L 8888:127.0.0.1:8888
```

The first time, you are prompted to accept the connection

```

Thomass-MacBook-Pro:key Thomas$ ssh -i "Docker_key.pem" ec2-user@ec2-18-188-151-171.us-east-2.compute.amazonaws.com
-L 8888:127.0.0.1:8888
The authenticity of host 'ec2-18-188-151-171.us-east-2.compute.amazonaws.com' (IP: 18.188.151.171) can't be established.
ECDSA key fingerprint is SHA256:UuNljpxxnup20pilz0T1LL6021o3TdyE86kB6Pmujf0.
Are you sure you want to continue connecting [yes/no]? 
```

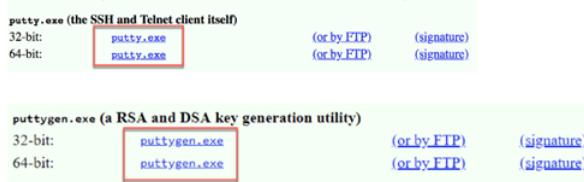
(/images/1/080618_0532_HowtouseJup25.png).

Launch your instance (Windows users)

Step 1) Go to this website to download PuTTY and PuTTYgen [PuTTY](https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html) (<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>)

You need to download

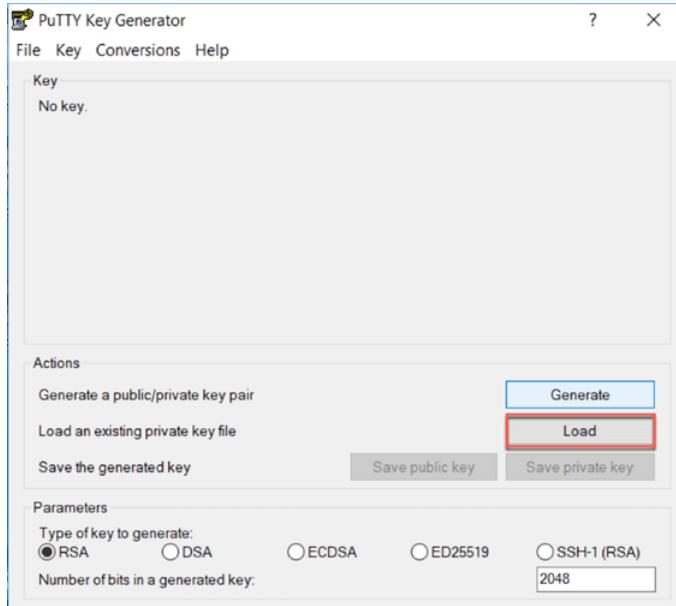
- PuTTY: launch the instance
- PuTTYgen: convert the pem file to ppk



(/images/1/080618_0532_HowtouseJup26.png).

Now that both software are installed, you need to convert the .pem file to .ppk. PuTTY can only read .ppk. The pem file contains the unique key created by AWS.

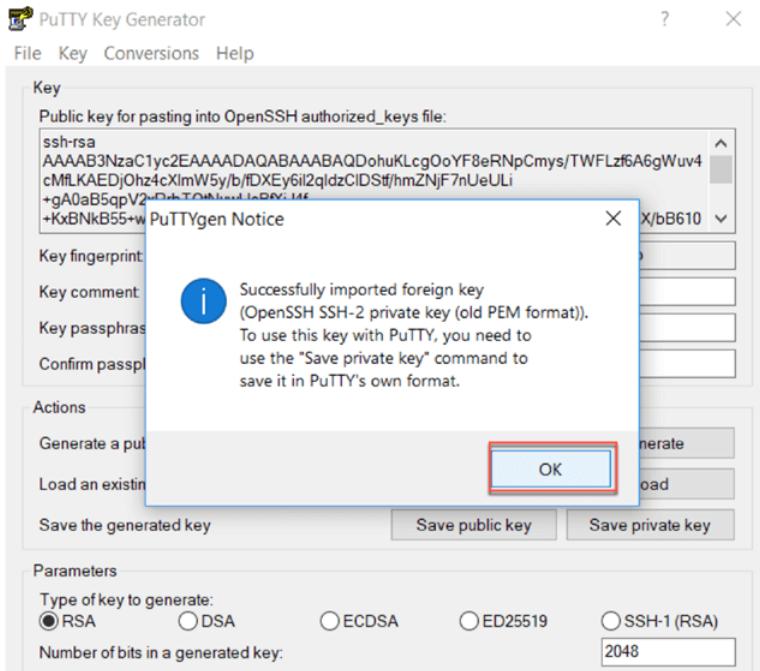
Step 2) Open PuTTYgen and click on Load. Browse the folder where the .pem file is located.



(/images/1/080618_0532_HowtouseJup27.png).

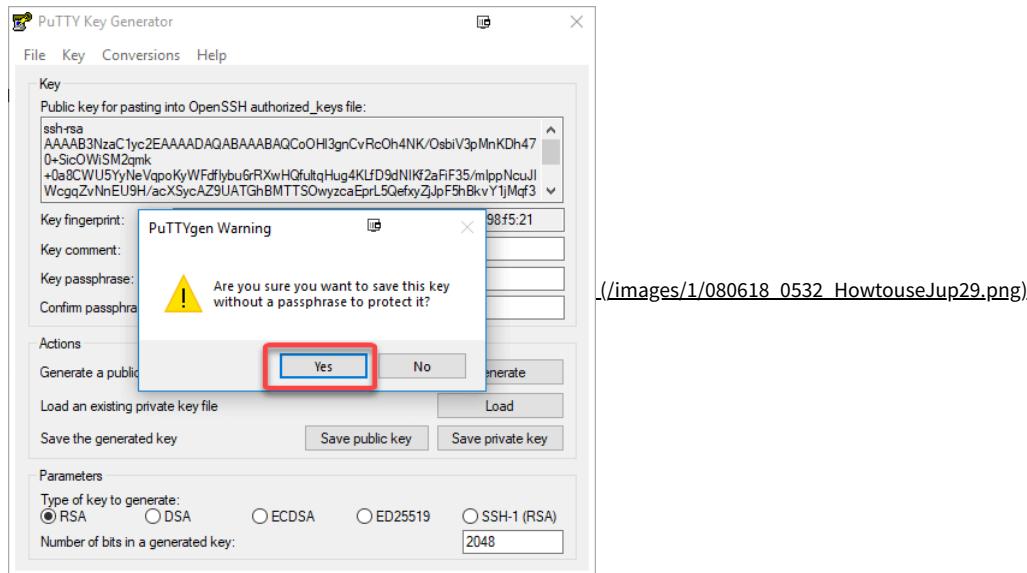
Step 3) After you loaded the file, you should get a notice informing you that the key has been successfully imported.

Click on OK



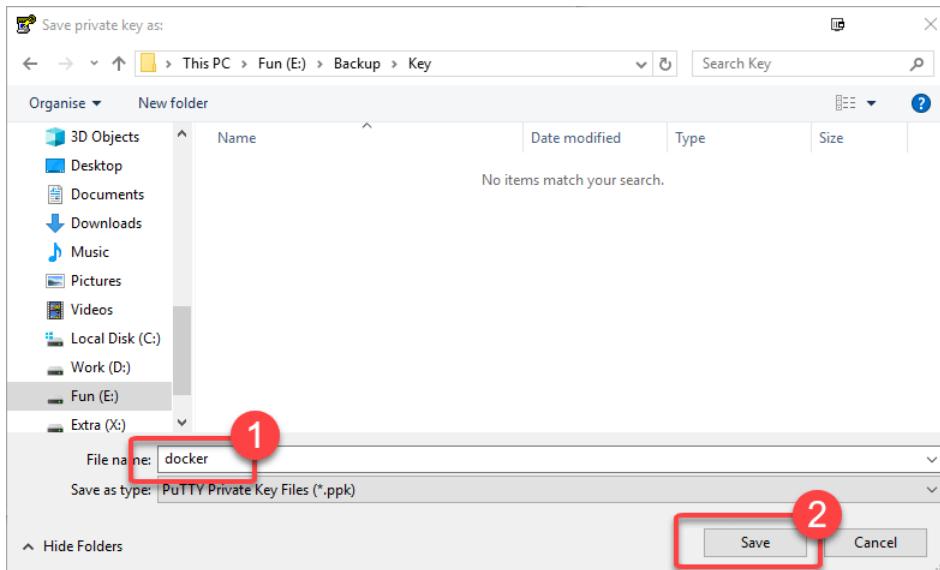
(./images/1/080618_0532_HowtouseJup28.png)

Step 4) Then click on Save private key. You are asked if you want to save this key without a passphrase. Click on yes.



(./images/1/080618_0532_HowtouseJup29.png)

Step 5) Save the Key



(./images/1/080618_0532_HowtouseJup30.png)

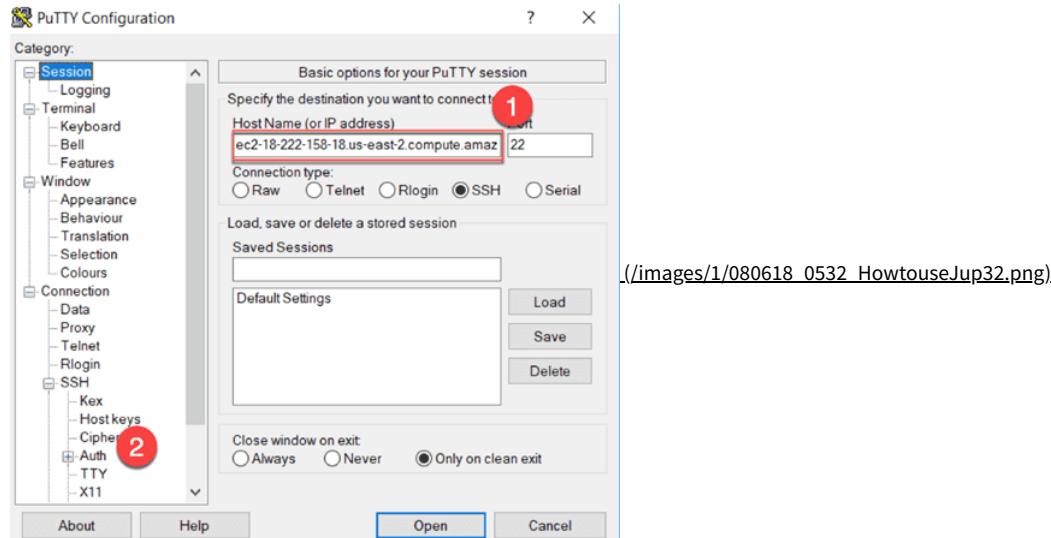
Step 6) Go to AWS and copy the public DNS

4. Connect to your instance using its Public DNS:

ec2-13-59-162-131.us-east-2.compute.amazonaws.com

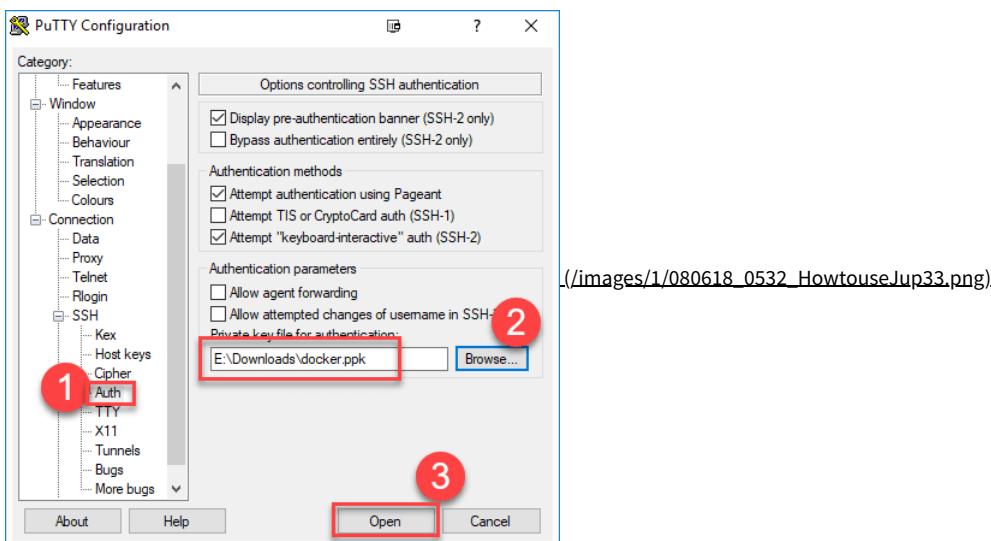
(/images/1/080618_0532_HowtouseJup31.png).

Open PuTTY and paste the Public DNS in the Host Name



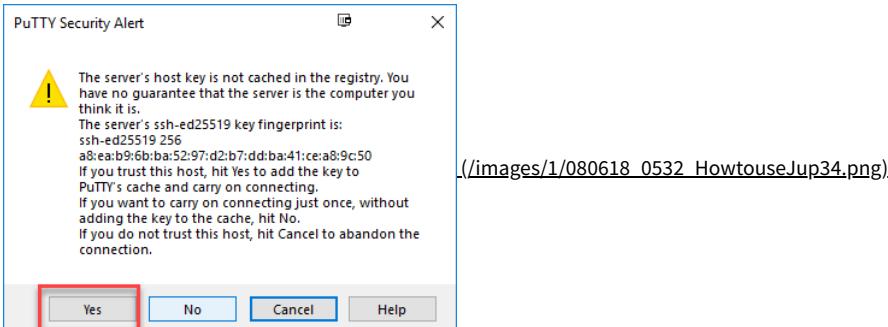
Step 7)

1. On the left panel, unfold SSH and open Auth
2. Browse the Private Key. You should select the .ppk
3. Click on Open.



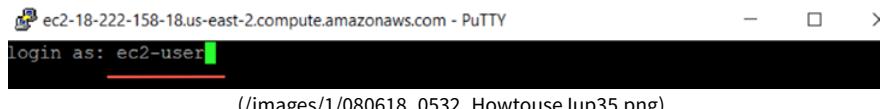
Step 8)

When this step is done, a new window will be opened. Click Yes if you see this pop-up



Step 9)

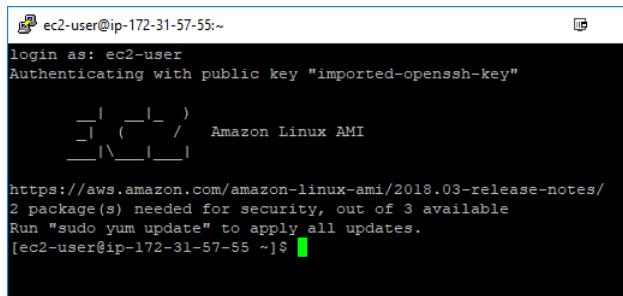
You need to login as: ec2-user



ec2-18-222-158-18.us-east-2.compute.amazonaws.com - PuTTY
login as: ec2-user
(/images/1/080618_0532_HowtouseJup35.png)

Step 10)

You are connected to the Amazon Linux AMI.



ec2-user@ip-172-31-57-55:~
login as: ec2-user
Authenticating with public key "imported-openssh-key"
Amazon Linux AMI
<https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/>
2 package(s) needed for security, out of 3 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-57-55 ~]\$

(/images/1/080618_0532_HowtouseJup36.png)

Part 4: Install Docker

While you are connected with the server via Putty/Terminal, you can install **Docker** container.

Execute the following codes

```
sudo yum update -y  
sudo yum install -y docker  
sudo service docker start  
sudo user-mod -a -G docker ec2-user  
exit
```

Launch again the connection

```
ssh -i "docker.pem" ec2-user@ec2-18-219-192-34.us-east-2.compute.amazonaws.com (mailto:ec2-user@ec2-18-219-192-34.us-east-2.compute.amazonaws.com) -L 8888:127.0.0.1:8888
```

Windows users use SSH as mentioned above

Part 5: Install Jupyter

Step 1) Create Jupyter with a pre-built image

```
## Tensorflow  
docker run -v ~/work:/home/jovyan/work -d -p 8888:8888 jupyter/tensorflow-notebook  
## Sparkdocker  
run -v ~/work:/home/jovyan/work -d -p 8888:8888 jupyter/pyspark-notebook
```

Code Explanation

- docker run: Run the image
- v: attach a volume
- ~/work:/home/jovyan/work: Volume
- 8888:8888: port
- jupyter/datascience-notebook: Image

For other pre-build images, go [here](https://github.com/jupyter/docker-stacks).

Allow preserving Jupyter notebook

```
sudo chown 1000 ~/work
```

Step 2) Install tree to see our working directory next

```
sudo yum install -y tree
```

```
[ec2-user@ip-172-31-16-239 ~]$ tree
|-- work
./images/1/080618_0532_HowtouseJup37.png)
1 directory, 0 files
```

Step 3)

1. Check the container and its name (changes with every installation) Use command

```
docker ps
```

2. Get the name and use the log to open Jupyter. In the tutorial, the container's name is `vigilant_easley`. Use command

```
docker logs vigilant_easley
```

3. Get the URL

```
[ec2-user@ip-172-31-57-55:~]
[ec2-user@ip-172-31-57-55 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS               NAMES
90a3c09282d6        jupyter/tensorflow-notebook   "jupyter notebook --allow-root & start-notebook.sh"   3 minutes ago    Up 3 minutes        0.0.0.0:8888->8888/tcp   vigilant_easley
[ec2-user@ip-172-31-57-55 ~]$ docker logs vigilant_easley
/usr/local/bin/start-notebook.sh: ignoring /usr/local/share/jupyter/lab/notebook.d/*
Container must be run with group "root" to update passwd file
Executing the command: jupyter notebook
[I 09:06:47.206 NotebookApp] Writing notebook server cookie secret to /home/jovyan/.local/share/jupyter/runtime/notebook_cookie_secret
[W 09:06:47.671 NotebookApp] WARNING: The notebook server is listening on all IP addresses and not using encryption. This is not recommended.
[I 09:06:47.724 NotebookApp] JupyterLab extension loaded from /opt/conda/lib/python3.6/site-packages/jupyterlab
[I 09:06:47.724 NotebookApp] JupyterLab application directory is /opt/conda/share/jupyter/lab
[I 09:06:47.738 NotebookApp] Serving notebooks from local directory: /home/jovyan
[I 09:06:47.738 NotebookApp] The Jupyter Notebook is running at:
[I 09:06:47.738 NotebookApp] http://(90a3c09282d6 or 127.0.0.1):8888/?token=f460f1e79ab74c382b19f90fe3fd55f9f99c5222365eceed
[I 09:06:47.738 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 09:06:47.738 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
http://(90a3c09282d6 or 127.0.0.1):8888/?token=f460f1e79ab74c382b19f90fe3fd55f9f99c5222365eceed
[ec2-user@ip-172-31-57-55 ~]$
```

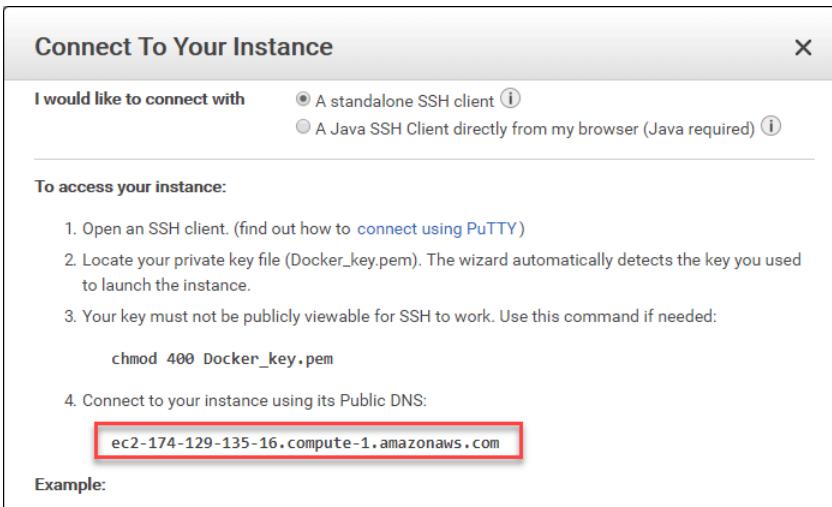
(/images/1/080618_0532_HowtouseJup38.png).

Step 4)

In the URL

[http://\(90a3c09282d6 or 127.0.0.1\):8888/?token=f460f1e79ab74c382b19f90fe3fd55f9f99c5222365eceed](http://(90a3c09282d6 or 127.0.0.1):8888/?token=f460f1e79ab74c382b19f90fe3fd55f9f99c5222365eceed)

Replace (90a3c09282d6 or 127.0.0.1) with Public DNS of your instance



Step 5)

The new URL becomes

<http://ec2-174-129-135-16.compute-1.amazonaws.com:8888/?token=f460f1e79ab74c382b19f90fe3fd55f9f99c5222365eceed>

Step 6) Copy and paste the URL into your browser. Jupyter Opens

(./images/1/080618_0532_HowtouseJup40.png)

Step 7)

You can write a new Notebook in the work folder

(./images/1/080618_0532_HowtouseJup41.png)

Part 6: Close connection

Close the connection in the terminal

Go back to AWS and stop the server.

(./images/1/080618_0532_HowtouseJup42.png)

Troubleshooting

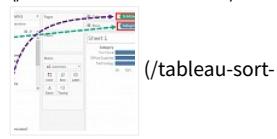
If ever docker doesnot work, try to rebuilt image using

Summary

- Jupyter notebook is a web application where you can run your Python and R codes. It is easy to share and deliver rich data analysis with Jupyter.
- To launch jupyter, write in the terminal: jupyter notebook
- You can save your notebook wherever you want
- A cell contains your Python code. The kernel will read the code one by one.
- You can use the shortcut to run a cell. By default: Ctrl+Enter

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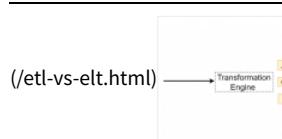
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