

# 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.

[Files](#) [Running](#) [Clusters](#)

Select items to perform actions on them.

[Upload](#) [New](#)

<input type="checkbox"/> 0	/	Name	Last Modified
<input type="checkbox"/>	anaconda3		19 hours ago
<input type="checkbox"/>	Applications		2 months ago
<input type="checkbox"/>	Desktop		9 minutes ago
<input type="checkbox"/>	Docker		2 months ago
<input type="checkbox"/>	Documents		8 days ago
<input type="checkbox"/>	Downloads		an hour ago
<input type="checkbox"/>	Dropbox		a day ago
<input type="checkbox"/>	Jupyter_notebook		18 minutes ago
<input type="checkbox"/>	Movies		4 months ago
<input type="checkbox"/>	Music		4 months ago
<input type="checkbox"/>	Pictures		2 months ago
<input type="checkbox"/>	Public		8 months ago



(/images/1/080418\_1223\_WhatIsJupyter1.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 contain 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

The image shows a terminal window on a Mac OS X system. The command history at the bottom of the window is as follows:

```
Last login: Tue Apr  3 10:21:30 on ttys002  
[Thomass-MacBook-Pro:~ Thomas$ mkdir jupyter_tf  
[Thomass-MacBook-Pro:~ Thomas$ jupyter notebook
```

Two annotations are present:

- A blue dashed arrow points from the text "Create a new folder to host the notebook" to the command "mkdir jupyter\_tf".
- A blue dashed arrow points from the text "Open Jupyter web app" to the command "jupyter notebook".

(./images/1/080418\_1223\_WhatisJupyter2.png)

**Step 2)** You can see the new folder inside the environment. Click on the folder jupyter\_tf.

[Files](#)[Running](#)[Clusters](#)

Select items to perform actions on them.

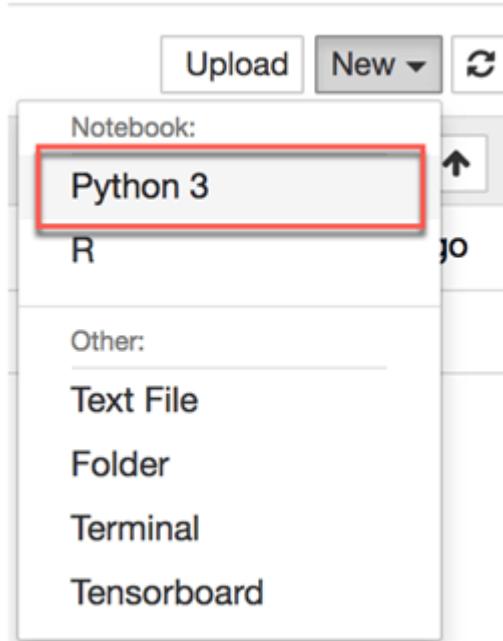
[Upload](#)[New ▾](#)

<input type="checkbox"/>	<input type="checkbox"/>		Name ↑	Last Modified ↑
<input type="checkbox"/>	<input type="checkbox"/>	anaconda3		20 hours ago
<input type="checkbox"/>	<input type="checkbox"/>	Applications		2 months ago
<input type="checkbox"/>	<input type="checkbox"/>	Desktop		2 minutes ago
<input type="checkbox"/>	<input type="checkbox"/>	Docker		2 months ago
<input type="checkbox"/>	<input type="checkbox"/>	Documents		8 days ago
<input type="checkbox"/>	<input type="checkbox"/>	Downloads		2 hours ago
<input type="checkbox"/>	<input type="checkbox"/>	Dropbox		a day ago
<input type="checkbox"/>	<input type="checkbox"/>	Jupyter_notebook		4 minutes ago
<input type="checkbox"/>	<input type="checkbox"/>	jupyter_tf	 Click here to enter the folder named Jupyter_tf	seconds ago
<input type="checkbox"/>	<input type="checkbox"/>	Movies		4 months ago
<input type="checkbox"/>	<input type="checkbox"/>	Music		4 months ago
<input type="checkbox"/>	<input type="checkbox"/>	Pictures		2 months ago
<input type="checkbox"/>	<input type="checkbox"/>	Public		8 months ago



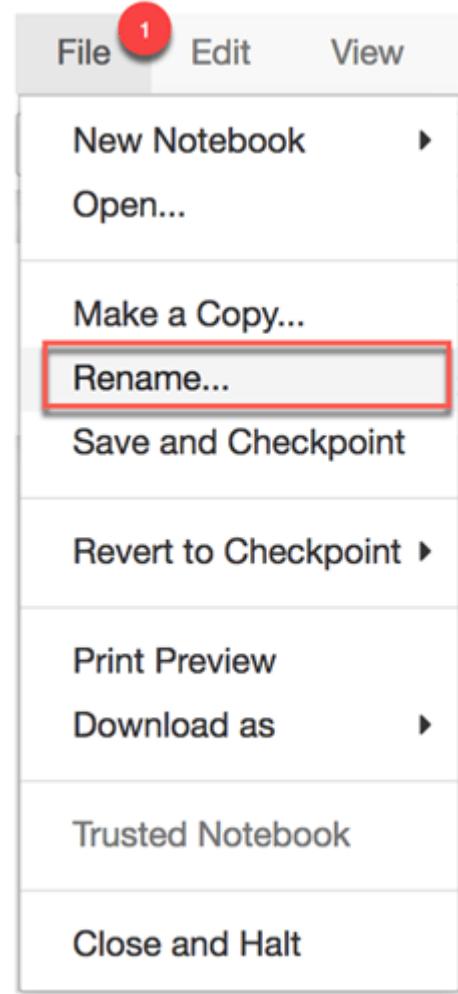
(./images/1/080418\_1223\_WhatisJupy3.png)

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



[./images/1/080418\\_1223\\_WhatisJupyter4.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**



(/images/1/080418\_1223\_WhatisJupy5.png).

You can rename it Introduction\_jupyter

## Rename Notebook

X

Enter a new notebook name:

Introduction\_jupyter

1

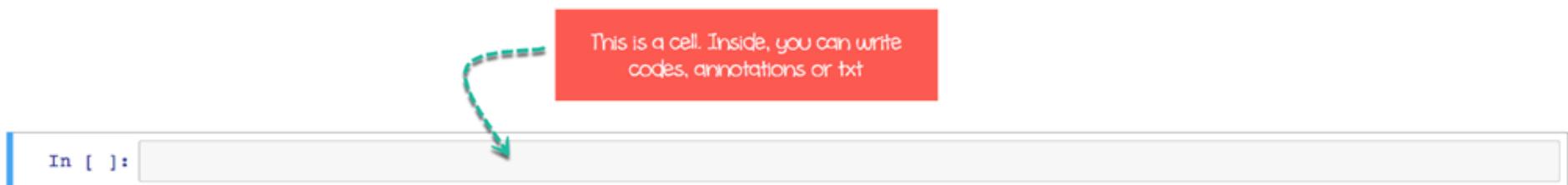
Cancel

Rename

2

(/images/1/080418\_1223\_WhatisJupy6.png)

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



(/images/1/080418\_1223\_WhatisJupy7.png)

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

```
In [1]: # Single line  
import matplotlib.pyplot as plt
```

(/images/1/080418\_1223\_WhatisJupyter8.png)

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

```
In [2]: # Multiple line  
import numpy as np  
import pandas as pd  
from scipy import stats, integrate
```

(/images/1/080418\_1223\_WhatisJupyter9.png)

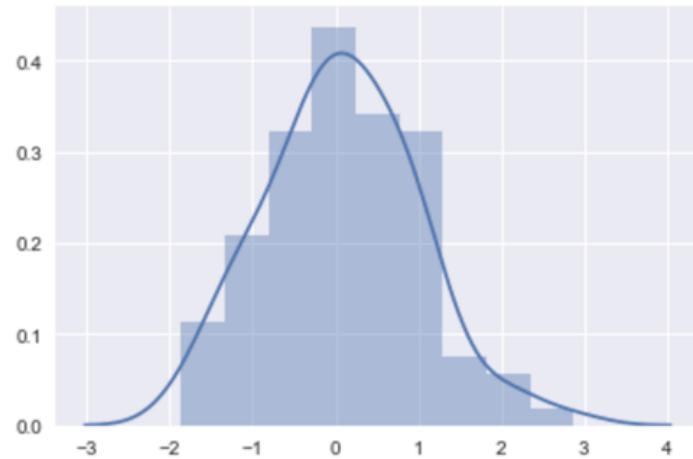
For instance, if you write following code inside a cell.

```
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).

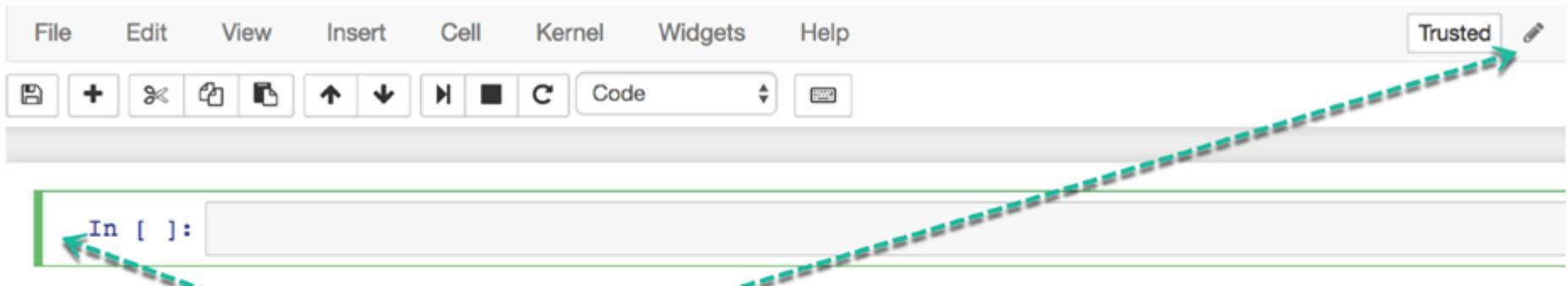
It will produce this output.

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



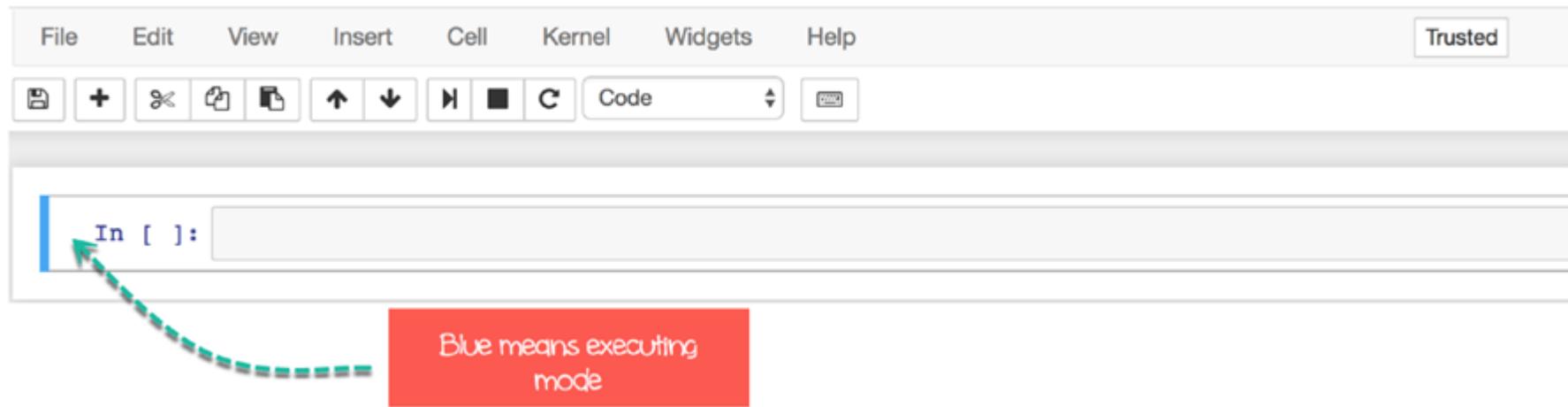
(./images/1/080418\_1223\_WhatisJupyter11.png).

**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.



([./images/1/080418\\_1223\\_WhatisJupy12.png](#)).

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



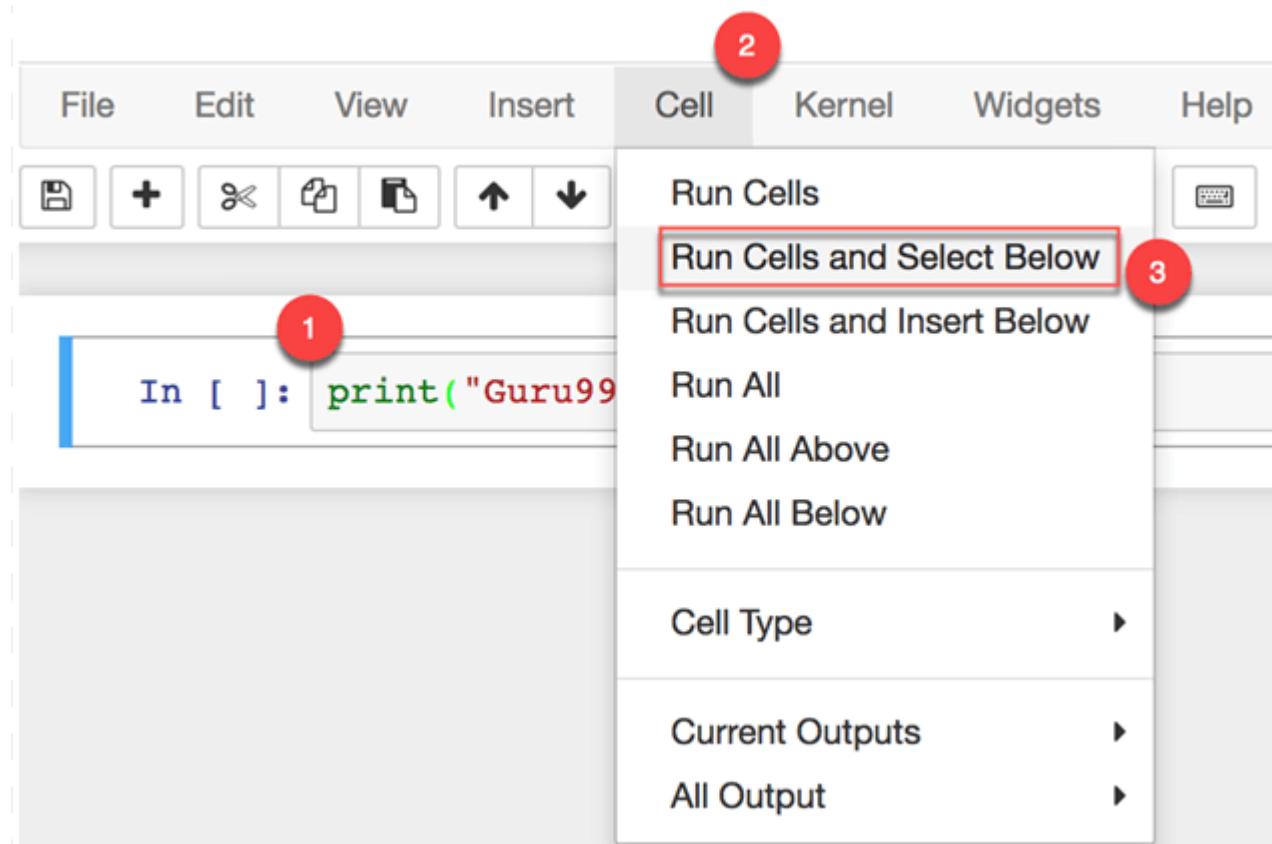
You first line of code will be to print Guru99!. Inside the cell, you can write

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

There are two ways to run a code in Jupyter:

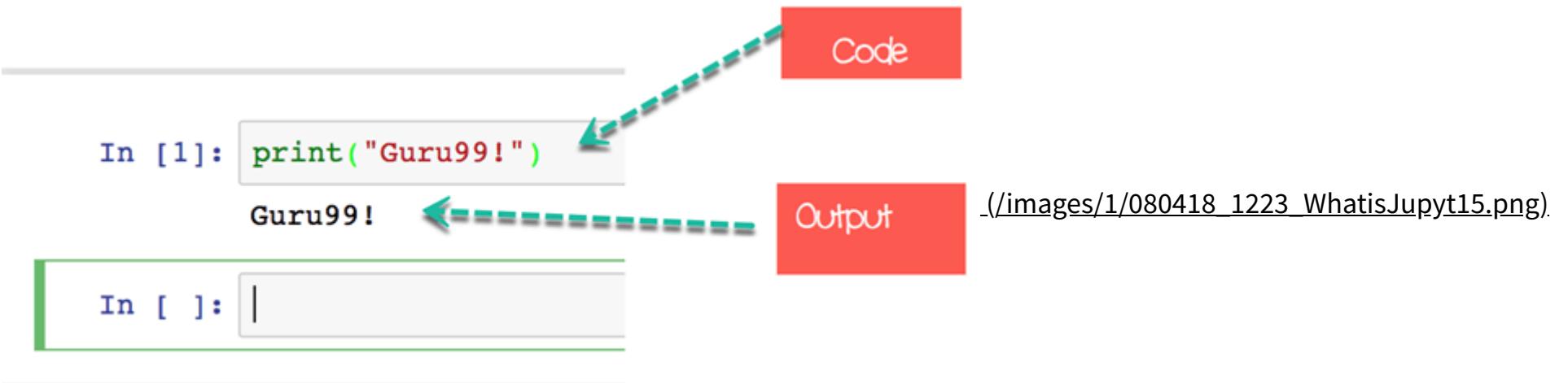
- Click and Run
- Keyboard Shortcuts

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

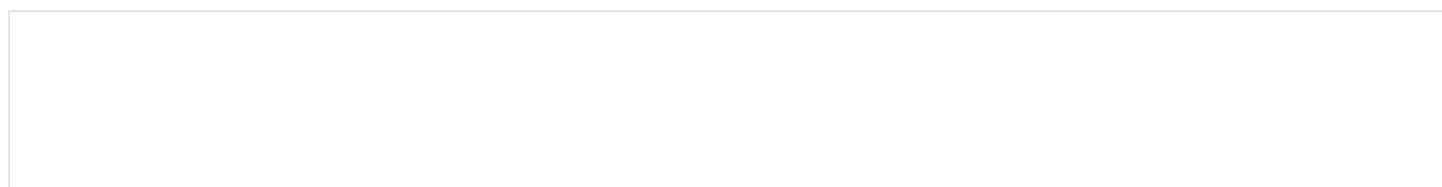


(./images/1/080418\_1223\_WhatisJupyter14.png)

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



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



[\(/images/1/080418\\_1223\\_WhatisJupyter16.png\).](#)

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

## Keyboard shortcuts

X

### Command Mode (press **Esc** to enable)

[Edit Shortcuts](#)

<b>F</b> : find and replace	<b>↑↓</b> : extend selected cells below
<b>↶</b> : enter edit mode	<b>↑J</b> : extend selected cells below
<b>⌘↑F</b> : open the command palette	<b>A</b> : insert cell above
<b>⌘↑P</b> : open the command palette	<b>B</b> : insert cell below
<b>P</b> : open the command palette	<b>X</b> : cut selected cells
<b>↑↶</b> : run cell, select below	<b>C</b> : copy selected cells
<b>⌘↶</b> : run selected cells	<b>↑V</b> : paste cells above
<b>↖↶</b> : run cell, insert below	<b>V</b> : paste cells below

(./images/1/080418\_1223\_WhatisJupyter17.png).

Following are shortcuts for Windows

### Command Mode (press **Esc** to enable)

[Edit Shortcuts](#)

<b>F</b> : find and replace	<b>Shift-Down</b> : extend selected cells below
<b>Ctrl-Shift-F</b> : open the command palette	<b>Shift-J</b> : extend selected cells below
<b>Ctrl-Shift-P</b> : open the command palette	<b>A</b> : insert cell above
<b>Enter</b> : enter edit mode	<b>B</b> : insert cell below
<b>P</b> : open the command palette	<b>X</b> : cut selected cells
<b>Shift-Enter</b> : run cell, select below	<b>C</b> : copy selected cells
<b>Ctrl-Enter</b> : run selected cells	<b>Shift-V</b> : paste cells above
<b>Alt-Enter</b> : run cell and insert below	<b>V</b> : paste cells below
<b>Y</b> : change cell to code	<b>Z</b> : undo cell deletion
<b>...</b>	<b>...</b>

(./images/1/080418\_1223\_WhatisJupyter18.png).

Write this line

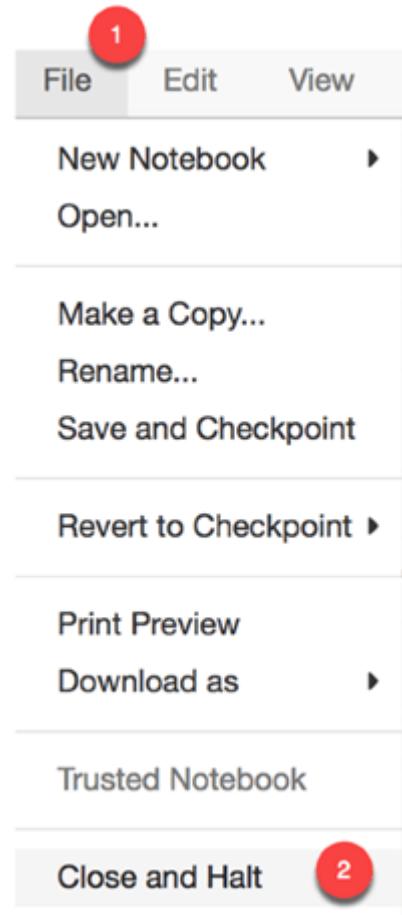
```
print("Hello world!")
```

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.



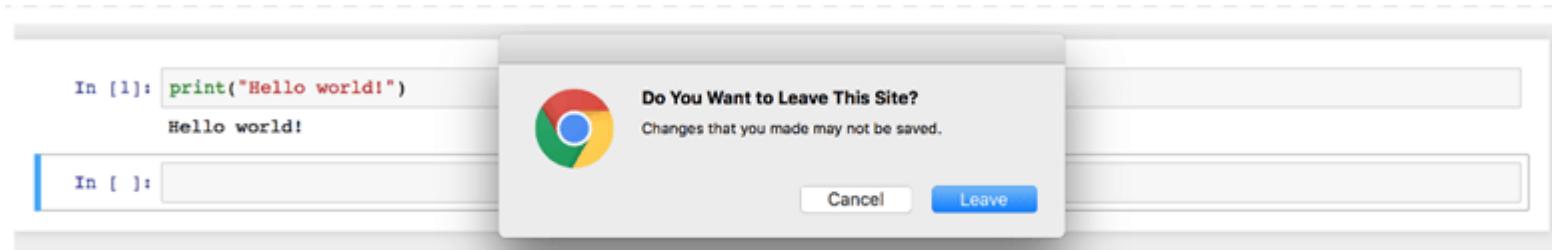
(./images/1/080418\_1223\_WhatisJupyter19.png)

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



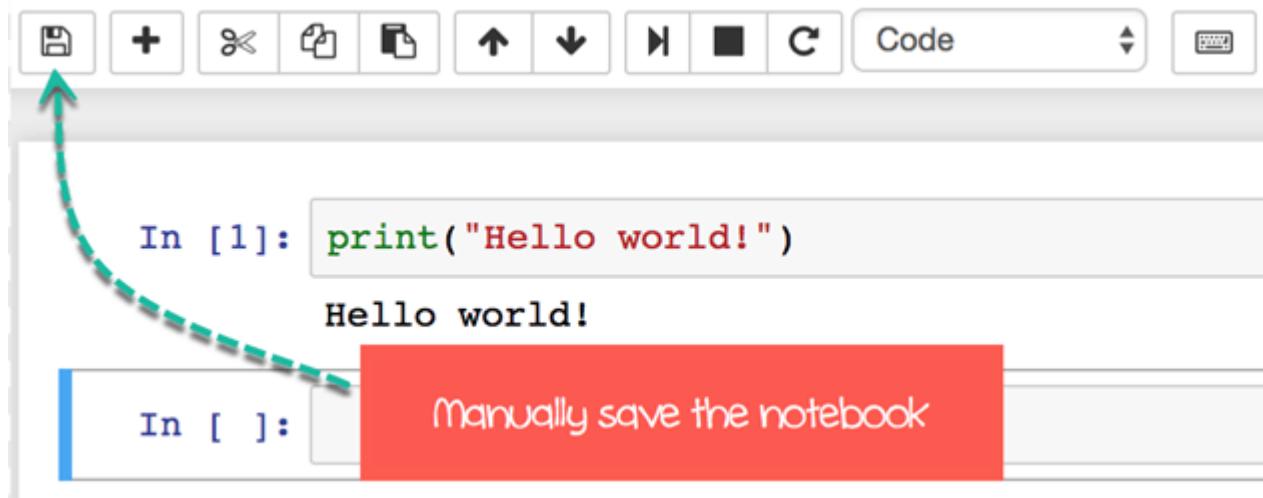
(/images/1/080418\_1223\_WhatisJupy20.png).

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



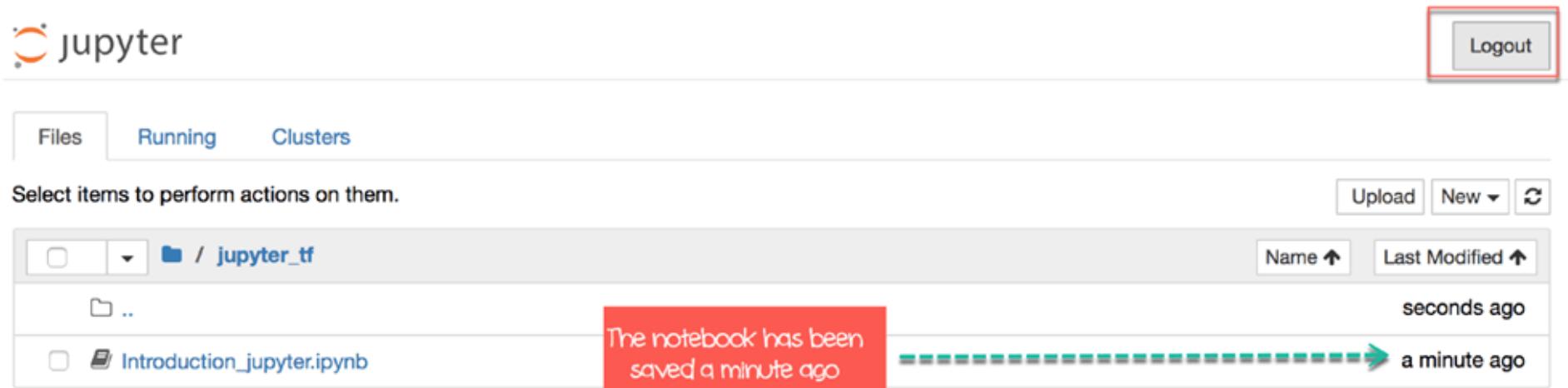
(/images/1/080418\_1223\_WhatisJupy21.png)

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



(./images/1/080418\_1223\_WhatIsJupyter22.png)

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



(./images/1/080418\_1223\_WhatIsJupyter23.png)

## 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**



Services ▾

Resource Groups ▾



History

Console Home

EC2

Billing

Find a service by name or feature



Compute

EC2

Lightsail

Elastic Container Service

Lambda

Batch

Elastic Beanstalk

(/images/1/080618\_0532\_HowtouseJup1.png).

**Step 2)** In the panel and click on **Key Pairs**

NETWORK & SECURITY

Security Groups

Elastic IPs

Placement Groups

Key Pairs

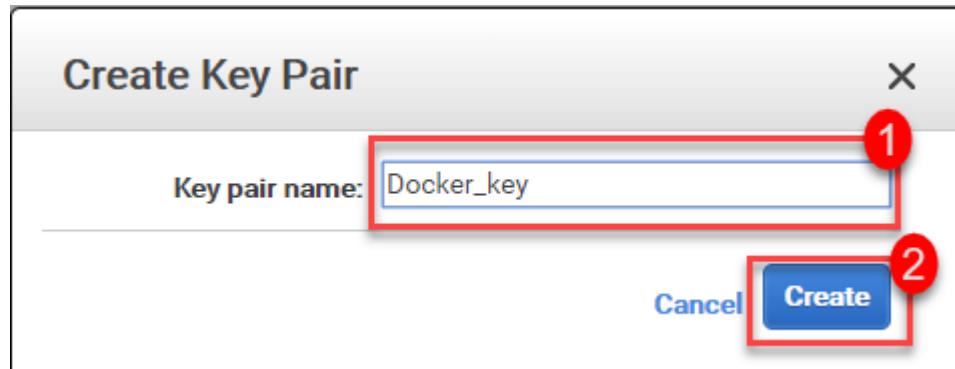
Network Interfaces

(/images/1/080618\_0532\_HowtouseJup2.png).

### Step 3) Click Create Key Pair



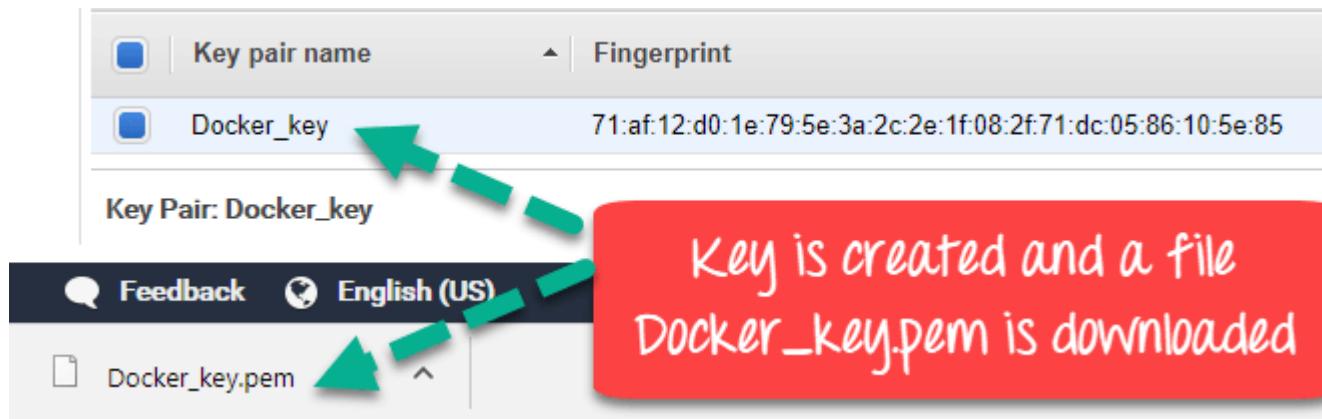
1. You can call it Docker key
2. Click Create



1. Key pair name: Docker\_key  
2. Create

(/images/1/080618\_0532\_HowtouseJup4.png).

A file name Docker\_key.pem downloads.



Key pair name: Docker\_key  
Fingerprint: 71:af:12:d0:1e:79:5e:3a:2c:2e:1f:08:2f:71:dc:05:86:10:5e:85  
Key Pair: Docker\_key  
Feedback English (US)  
Docker\_key.pem

Key is created and a file Docker\_key.pem is downloaded

(/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

NETWORK & SECURITY

Security Groups

Elastic IPs

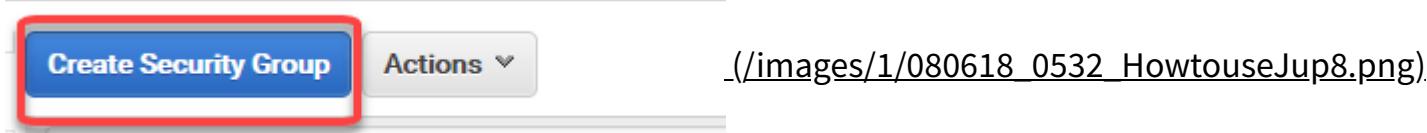
Placement Groups

Key Pairs

Network Interfaces

(/images/1/080618\_0532\_HowtouseJup7.png).

**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

### Create Security Group

1

Security group name: jupyter\_docker  
Description: Security Group for Docker  
VPC: vpc-620d0207 (default)

2

Inbound Outbound

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Custom	CIDR, IP or Security Group e.g. SSH for Admin Desktop
HTTP	TCP	80	Custom	0.0.0.0/0, ::/0 e.g. SSH for Admin Desktop
HTTPS	TCP	443	Custom	0.0.0.0/0, ::/0 e.g. SSH for Admin Desktop
Custom TCP F	TCP	8888	Custom	CIDR, IP or Security Group e.g. SSH for Admin Desktop

Add Rule

For Jupyter

3

Cancel Create

(/images/1/080618\_0532\_HowtouseJup9.png).

Step 4) The newly created Security Group will be listed

[Create Security Group](#) [Actions ▾](#)

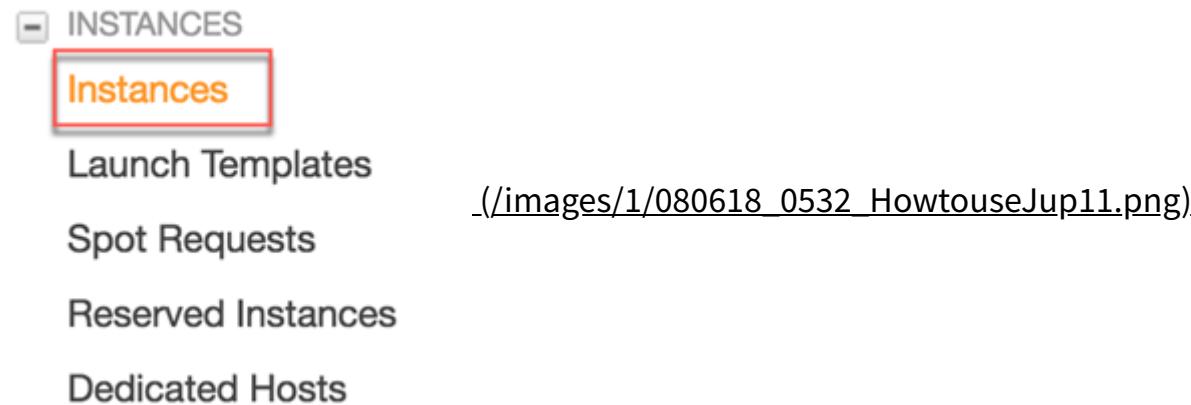
Filter by tags and attributes or search by keyword

<input type="checkbox"/>	Name	Group ID	Group Name	VPC ID	Description
<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>					
<input type="checkbox"/>	sg-c3424a89		jupyter_docker	vpc-620d0207	Security Group for Docker

(/images/1/080618\_0532\_HowtouseJup10.png).

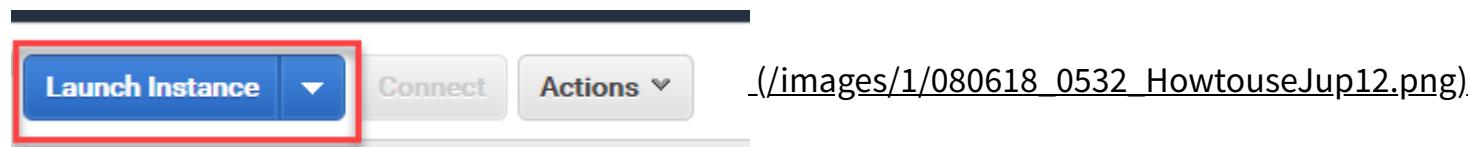
### Part 3: Launch instance

You are finally ready to create the instance



(/images/1/080618\_0532\_HowtouseJup11.png).

#### Step 1) Click on Launch Instance



(/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.

Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-40142d25

Select

Amazon Linux

Free tier eligible

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.

64-bit

Root device type: ebs Virtualization type: hvm

(/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.

Filter by: All instance types ▾ Current generation ▾ Show/Hide Columns

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 <small>Free tier eligible</small>	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

Step 3) Keep settings default in next screen and click Next: Add Storage

[1. Choose AMI](#)[2. Choose Instance Type](#)[3. Configure Instance](#)[4. Add Storage](#)[5. Add Tags](#)[6. Configure Security Group](#)[7. Review](#)

## Step 3: Configure Instance Details

Network [i](#) vpc-620d0207 (default) [C](#) Create new VPC

Subnet [i](#) No preference (default subnet in any Availability Zone) [Create new subnet](#)

Auto-assign Public IP [i](#) Use subnet setting (Enable)

Placement group [i](#)  Add instance to placement group.

IAM role [i](#) None [C](#) Create new IAM role

Shutdown behavior [i](#) Stop

Enable termination protection [i](#)  Protect against accidental termination

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

Tenancy [i](#) Shared - Run a shared hardware instance  
Additional charges will apply for dedicated tenancy.

T2 Unlimited [i](#)  Enable  
Additional charges may apply

[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-07ad5635357af8b3e	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 2

(/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	(127 characters maximum)	Value	(255 characters maximum)	Instances	Volumes
<i>This resource currently has no tags</i>					

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 2

(/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	<a href="#">Copy to new</a>
sg-c3424a89	jupyter_docker	Security Group for Docker 2	<a href="#">Copy to new</a>
sg-565dae27	launch-wizard-1	launch-wizard-1 created 2017-06-15T10:09:34.308+05:30	<a href="#">Copy to new</a>

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	

Cancel Previous Review and Launch 3

(/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.

**⚠ 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 [Edit AMI](#)

Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-cfe4b2b0  
Free tier eligible Root Device Type: ebs Virtualization type: hvm

Security Group ID	Name	Description
sg-c3424a89	jupyter_docker	Security Group for Docker

Cancel Previous Launch 4

(/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

X

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

Select a key pair

1

Docker\_key

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

Cancel

Launch Instances

3

---

(/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-090447e9c051efdce [View launch log](#)



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 example, \$100).

### 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

The screenshot shows the AWS Management Console with the EC2 service selected. On the left, the navigation pane is visible with options like Reports, Limits, INSTANCES, Instances, Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts, Scheduled Instances, and IMAGES AMIs. The Instances section is currently active.

The main content area displays a table of instances. One instance is listed:

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Public IP
	i-090447e9c051efdce	t2.micro	us-east-1b	running	Initializing	None	ec2-52-23-241-75.compute-1.amazonaws.com	52.23.241.75

Below the table, a detailed view of the selected instance (i-090447e9c051efdce) is shown. The Public DNS (IPv4) is listed as ec2-52-23-241-75.compute-1.amazonaws.com, and the IPv4 Public IP is highlighted with a red box and labeled as 52.23.241.75.

([/images/1/080618\\_0532\\_HowtouseJup22.png](#)).

### Step 9) Click on Connect

The screenshot shows the AWS Lambda console interface. At the top, there are three buttons: 'Launch Instance' (blue), 'Connect' (highlighted with a red box), and 'Actions'. Below these is a search bar with placeholder text 'Filter by tags and attributes or search by keyword'. Underneath is a table with columns: Name, Instance ID, Instance Type, and Availability Zone. A single row is visible, showing 'i-090447e9c051efdce' for Instance ID, 't2.micro' for Instance Type, and 'us-east-1b' for Availability Zone.

You will find the connection details

The screenshot shows the 'Connect To Your Instance' wizard. It asks 'I would like to connect with' and has two options: 'A standalone SSH client' (selected) and 'A Java SSH Client directly from my browser (Java required)'. It then provides instructions to access the instance:

- Open an SSH client. (find out how to [connect using PuTTY](#))
- Locate your private key file (Docker\_key.pem). The wizard automatically detects the key you used to launch the instance.
- Your key must not be publicly viewable for SSH to work. Use this command if needed:  
`chmod 400 Docker_key.pem`

4. Connect to your instance using its Public DNS:  
`ec2-18-188-151-171.us-east-2.compute.amazonaws.com`

Example:  
`ssh -i "Docker_key.pem" ec2-user@ec2-18-188-151-171.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.

If you need any assistance connecting to your instance, please see our [connection documentation](#).

(/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 (18.188.151.171)' can't be established.
ECDSA key fingerprint is SHA256:UuNljpxxnup20pilz0T1LL60Z1o3TdyE86kB6Pmujf0.
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>).

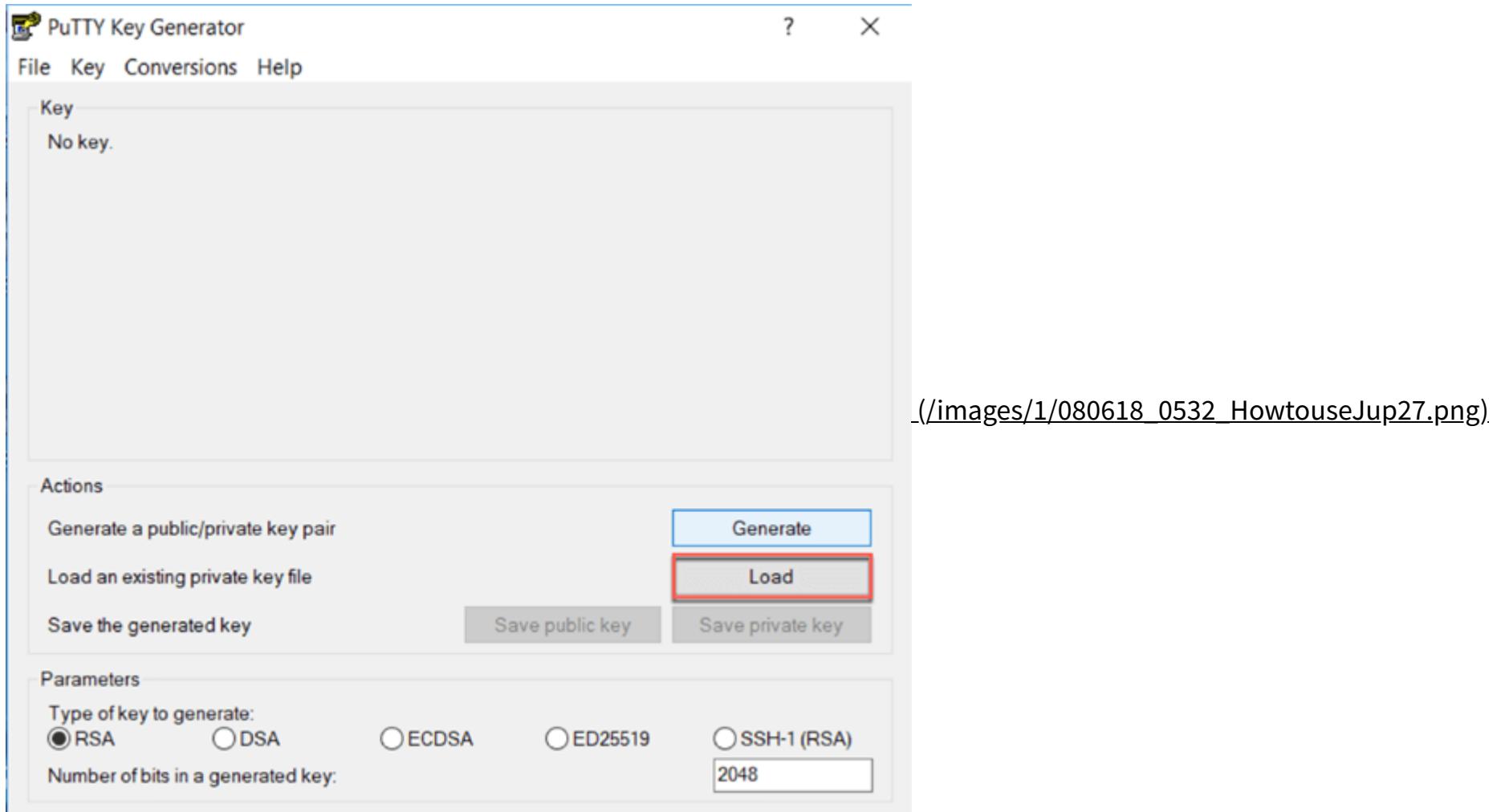
You need to download

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

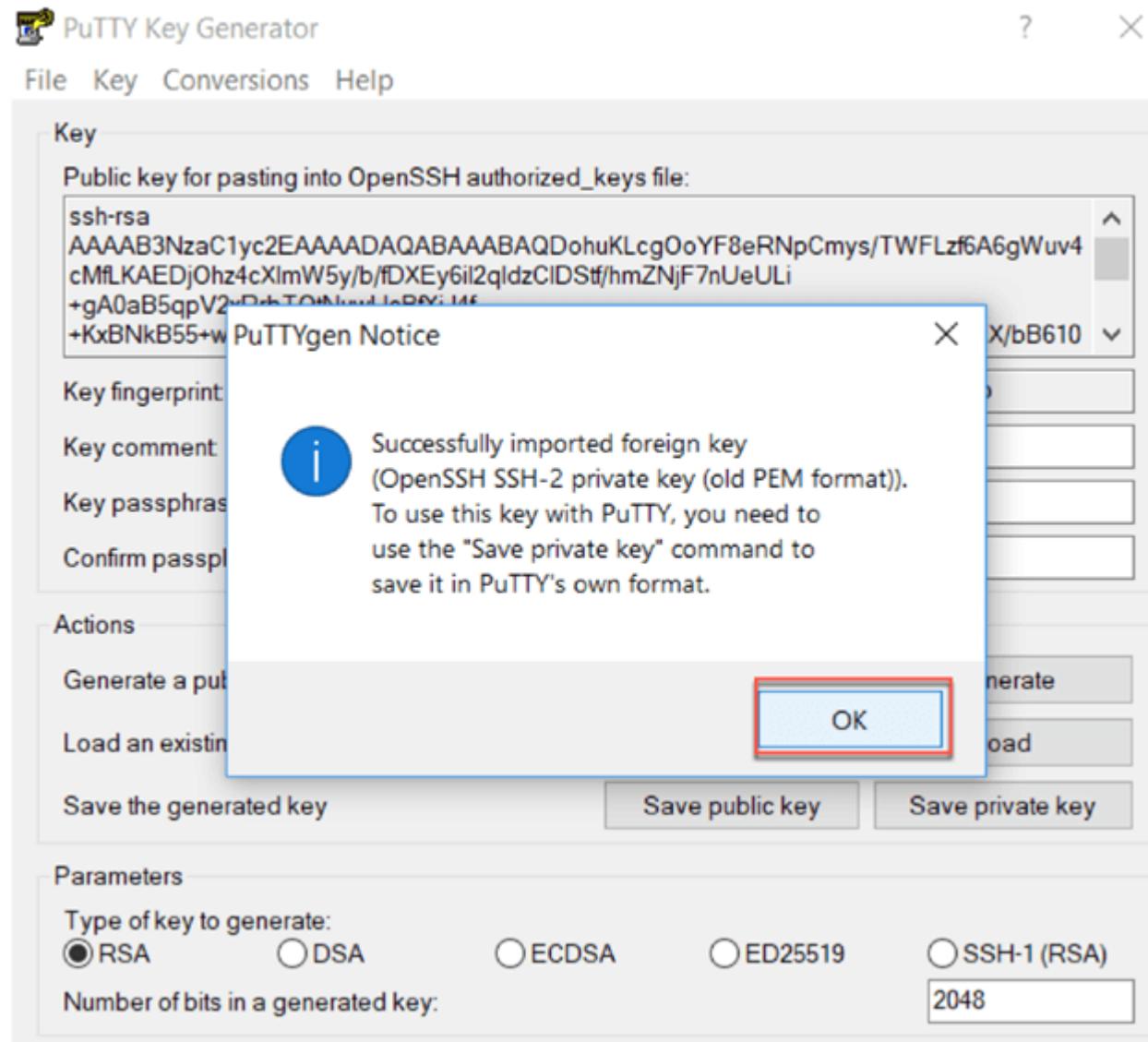


Now that both software are installed, you need to convert the .pem file to .ppk. PuTTY can only read .ppk. The pem file contains the unique key created by AWS.

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

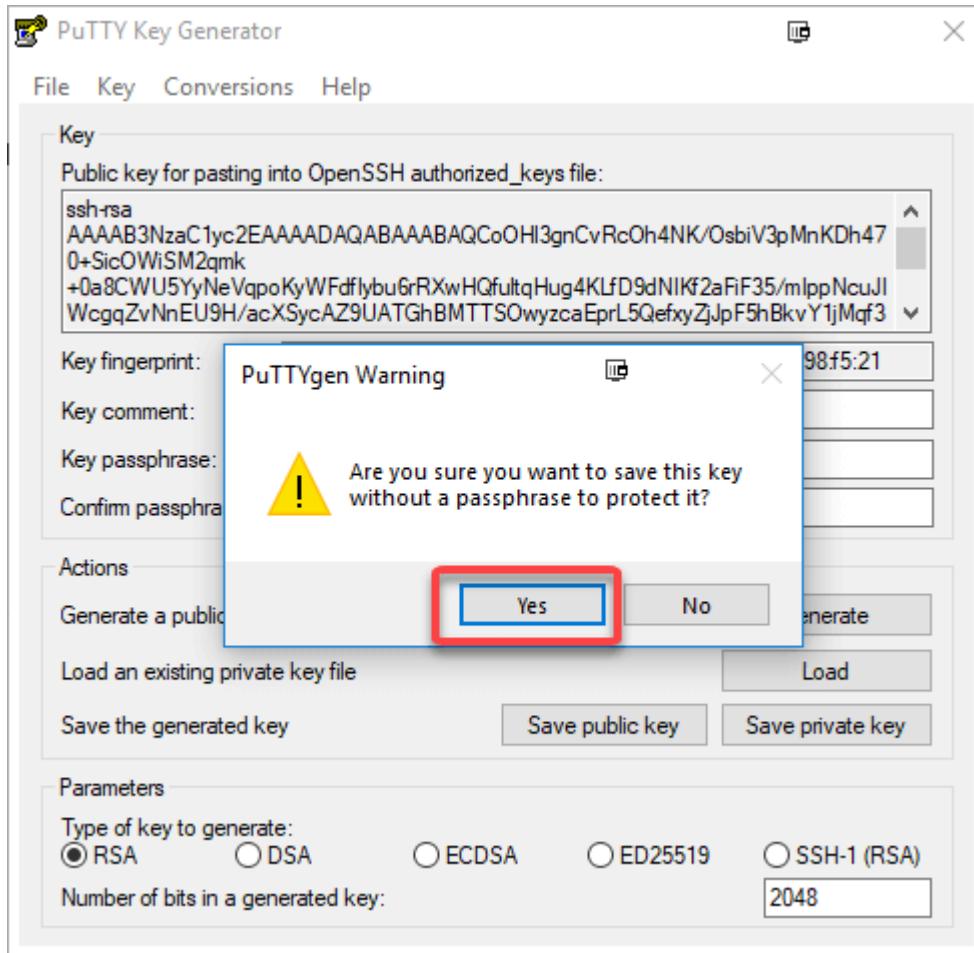


**Step 3)** After you loaded the file, you should get a notice informing you that the key has been successfully imported. Click on OK



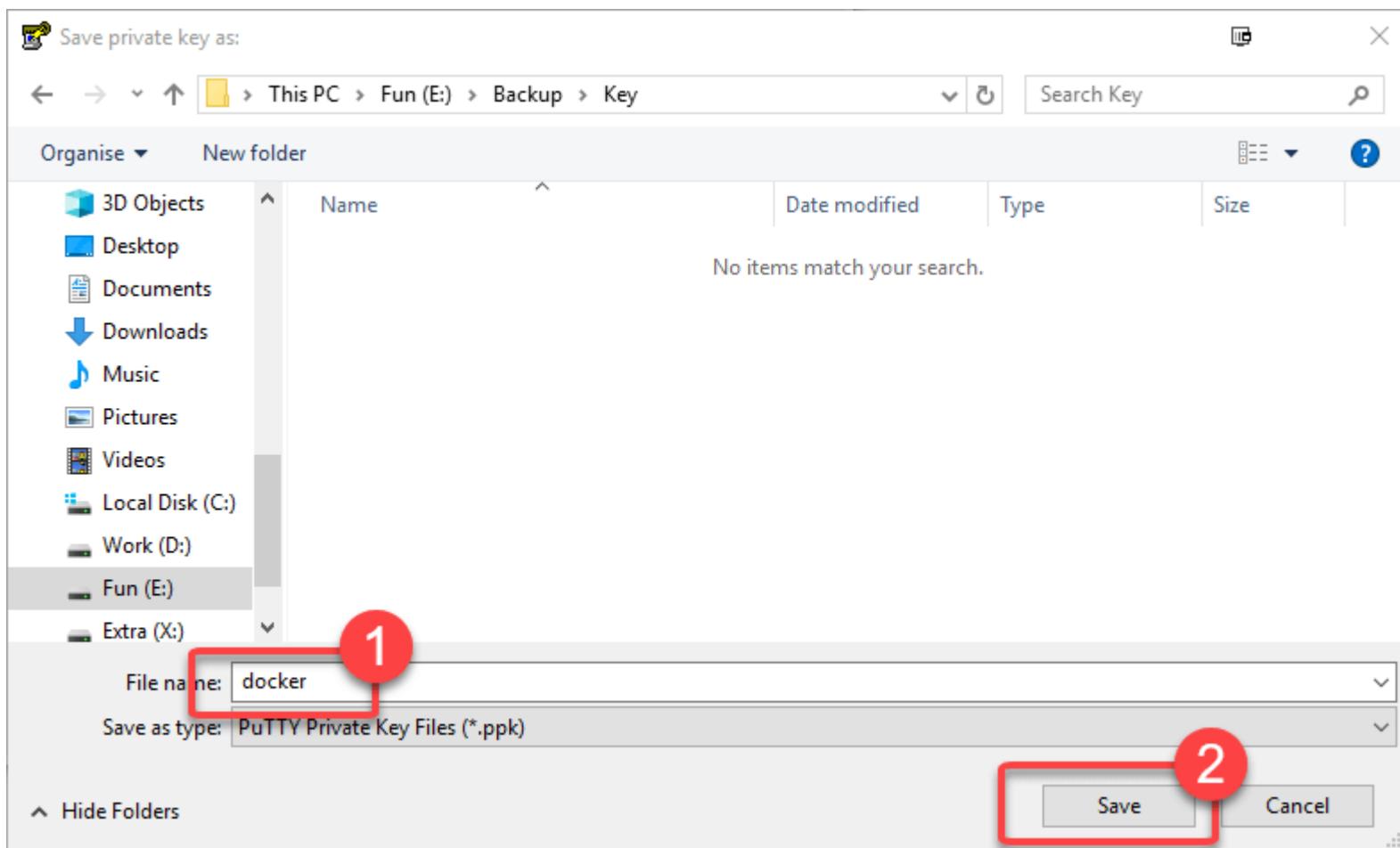
(/images/1/080618\_0532\_HowtouseJup28.png).

**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).

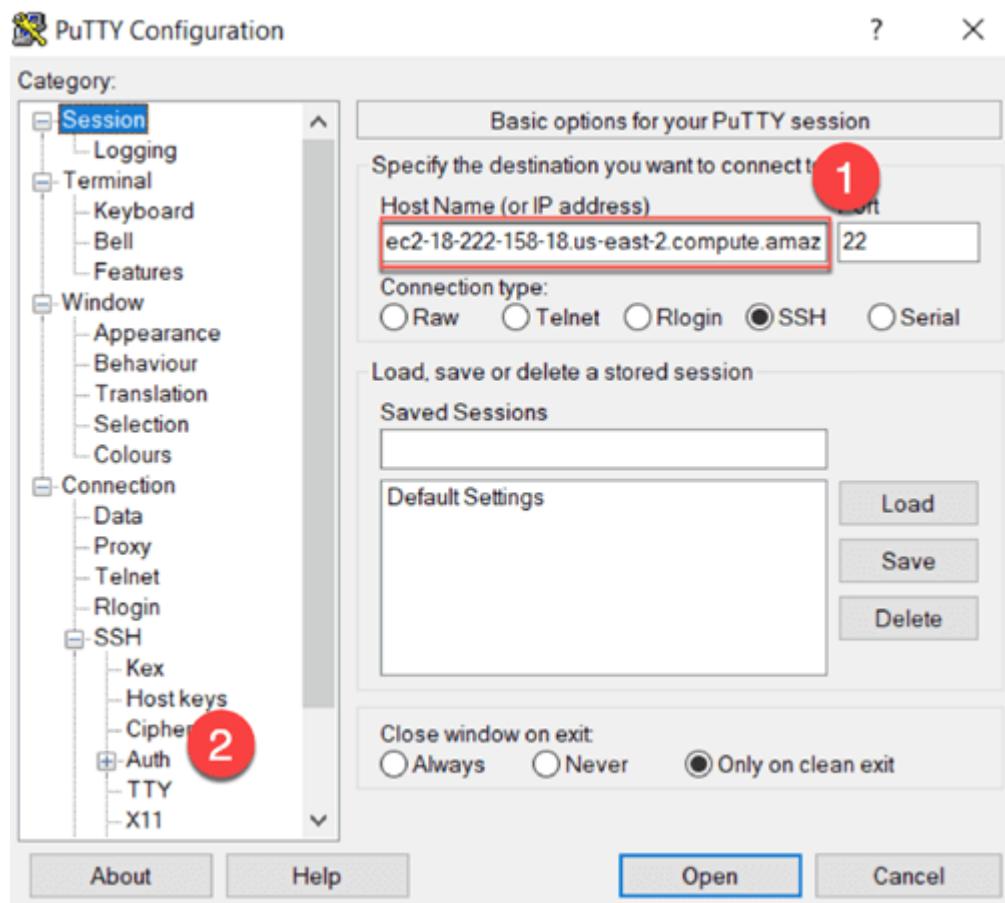
## Step 6) Go to AWS and copy the public DNS

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).

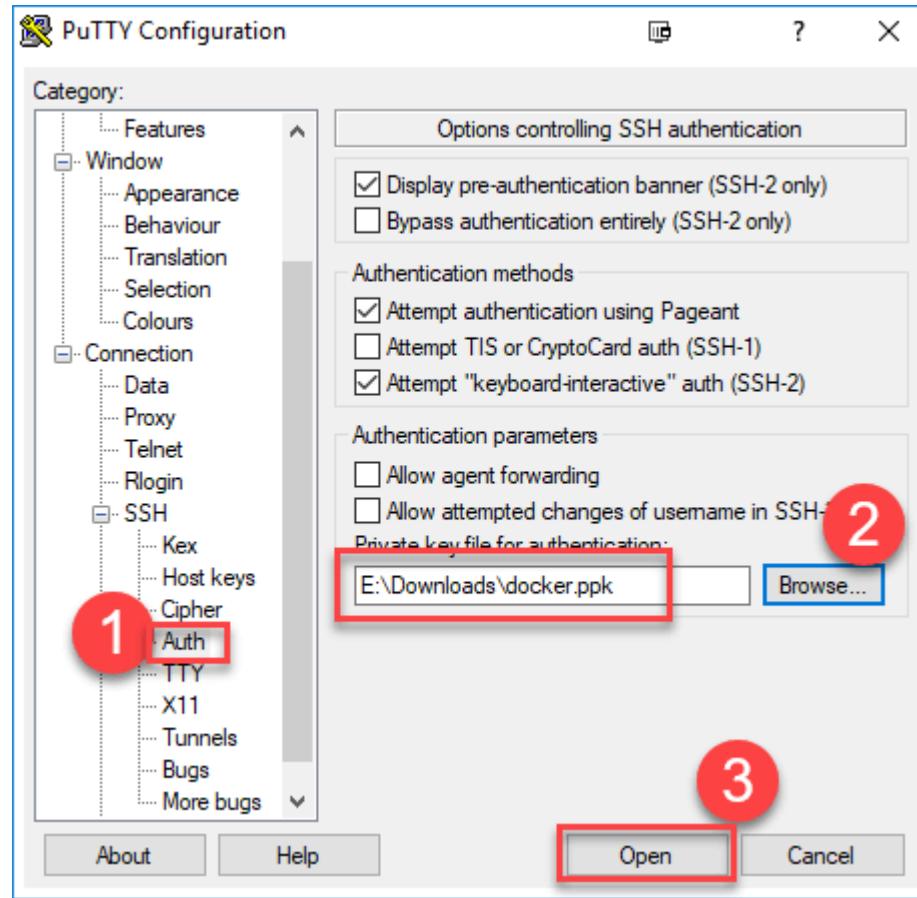
Open PuTTY and paste the Public DNS in the Host Name



(/images/1/080618\_0532\_HowtouseJup32.png)

## Step 7)

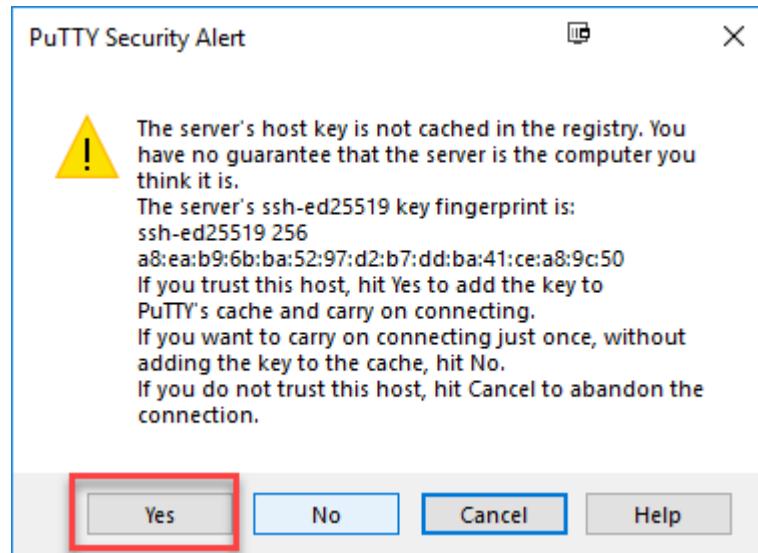
1. On the left panel, unfold SSH and open Auth
2. Browse the Private Key. You should select the .ppk
3. Click on Open.



(/images/1/080618\_0532\_HowtouseJup33.png)

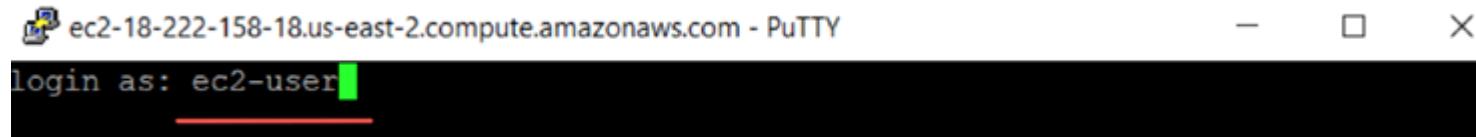
## Step 8)

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



### Step 9)

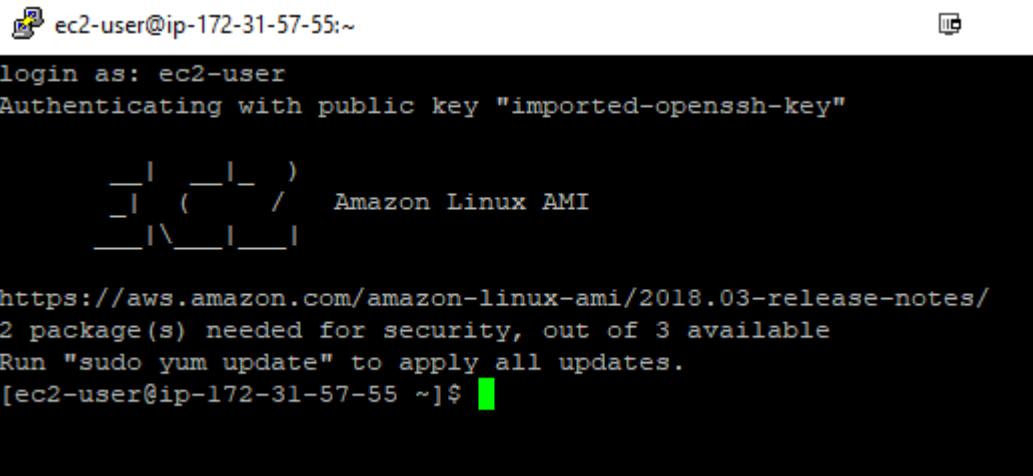
You need to login as: ec2-user



(/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/databricks-notebook: Image

For other pre-build images, go [here](https://github.com/jupyter/docker-stacks) (<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  
  
1 directory, 0 files
```

(/images/1/080618\_0532\_HowtouseJup37.png).

### 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:~]$ docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS               NAMES
90a3c09282d6        jupyter/tensorflow-notebook   "tini -g - start-no..."   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/bin/start-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 09:06:47.725 NotebookApp] JupyterLab application directory is /opt/conda/share/jupyter/lab
[I 09:06:47.735 NotebookApp] Serving notebooks from local directory: /home/jovyan
[I 09:06:47.735 NotebookApp] The Jupyter Notebook is running at:
[I 09:06:47.735 NotebookApp] http://(90a3c09282d6 or 127.0.0.1):8888/?token=f460f1e79ab74c382b19f90fe3fd55f9f99c5222365eceed
[I 09:06:47.735 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 09:06:47.736 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:~]$
```

## 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

## Connect To Your Instance

X

I would like to connect with

A standalone SSH client [\(i\)](#)

A Java SSH Client directly from my browser (Java required) [\(i\)](#)

To access your instance:

1. Open an SSH client. (find out how to [connect using PuTTY](#))
2. Locate your private key file (Docker\_key.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 Docker_key.pem
```

4. Connect to your instance using its Public DNS:

`ec2-174-129-135-16.compute-1.amazonaws.com`

Example:

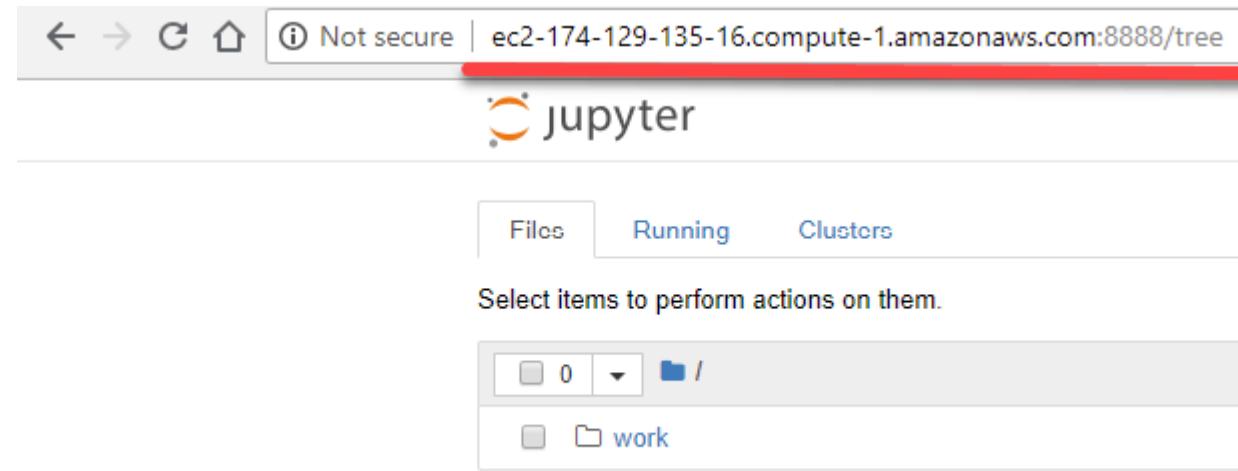
([/images/1/080618\\_0532\\_HowtouseJup39.png](#)).

### Step 5)

The new URL becomes

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

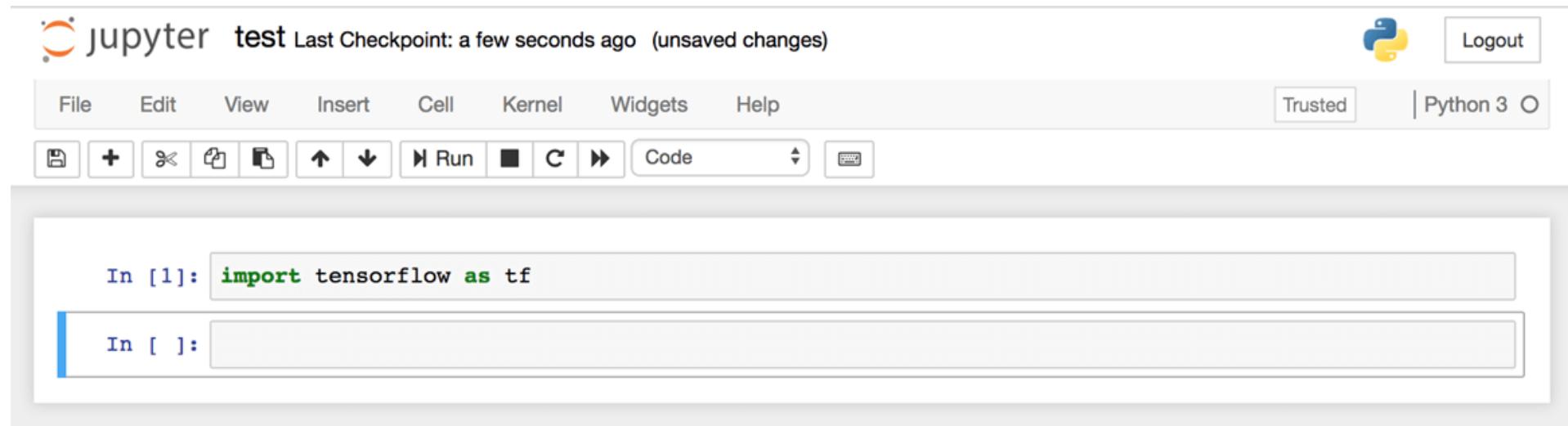
### Step 6) Copy and paste the URL into your browser. Jupyter Opens



(/images/1/080618\_0532\_HowtouseJup40.png).

### Step 7)

You can write a new Notebook in the work folder



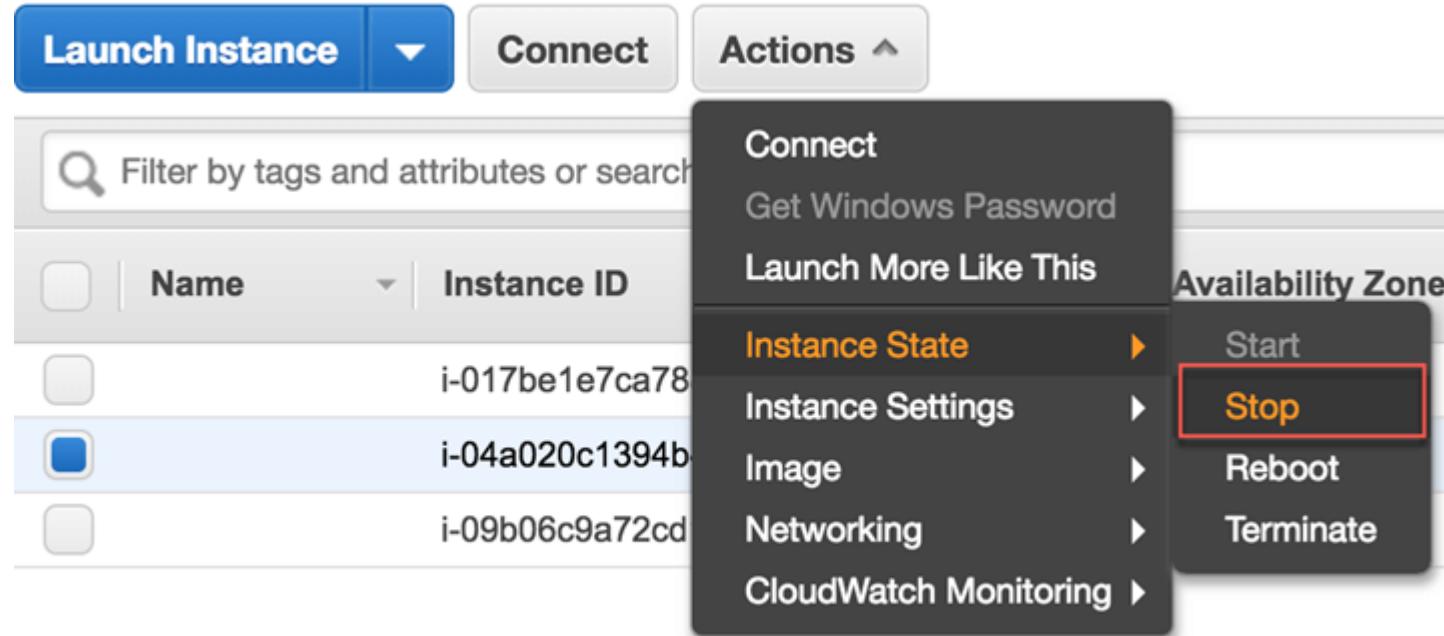
(/images/1/080618\_0532\_HowtouseJup41.png).

## Part 6: Close connection

Close the connection in the terminal

```
exit
```

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

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

## 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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