

Discussion 8: Introduction to AWS and Linux Commands

EE599 Deep Learning
Kuan-Wen (James) Huang
Spring 2020

AWS

- Register an account

<https://aws.amazon.com/console/>

- Request for EC2 P instances limit increase

<http://aws.amazon.com/contact-us/ec2-request>

AWS

AWS Management Console

AWS services

Find Services
You can enter names, keywords or acronyms.

Example: Relational Database Service, database, RDS

▼ Recently visited services

 EC2  Support  Billing

► All services

Build a solution
Get started with simple wizards and automated workflows.

Launch a virtual machine **Build a web app**

With EC2 With Elastic Beanstalk

2-3 minutes 6 minutes

 

Build using virtual servers

With Lightsail

1-2 minutes



Access resources on the go

 Access the Management Console using the AWS Console Mobile App. [Learn more](#)

Explore AWS

Amazon EMR
The EMR runtime for Apache Spark is up to 32X faster, delivering improved performance and lowering costs.
[Learn more](#)

AWS IQ
Connect with AWS Certified third-party experts for on-demand consultations and project help. [Get started](#)

Free Digital Training
Get access to 350+ self-paced online courses covering AWS products and services. [Learn more](#)

Amazon CloudWatch

AWS

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

Step 1: Choose an Amazon Machine Image (AMI)

[Cancel and Exit](#)

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes



Microsoft Windows Server 2019 Base - ami-0d7d80db021ba0d11

[Select](#)

Windows

Free tier eligible

Microsoft Windows 2019 Datacenter edition. [English]

64-bit (x86)

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes



Deep Learning AMI (Ubuntu 16.04) Version 26.0 - ami-07728e9e2742b0662

[Select](#)

MXNet-1.6.0rc0, Tensorflow-2.0 &1.15, PyTorch-1.3.1, Keras-2.2, & other frameworks, configured with Neuron, NVIDIA CUDA, cuDNN, NCCL, Intel MKL-DNN, Docker & NVIDIA-Docker. For fully managed experience, check: <https://aws.amazon.com/sagemaker>

64-bit (x86)

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes



Deep Learning AMI (Amazon Linux) Version 26.0 - ami-00da9ade5fa7b8a23

[Select](#)

Amazon Linux

MXNet-1.6.0rc0, Tensorflow-2.0 &1.15, PyTorch-1.3.1, Keras-2.2, & other frameworks, configured with Elastic Inference, NVIDIA CUDA, cuDNN, NCCL, Intel MKL-DNN, Docker & NVIDIA-Docker. For fully managed experience, check: <https://aws.amazon.com/sagemaker>

64-bit (x86)

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes



Deep Learning Base AMI (Ubuntu 16.04) Version 21.0 - ami-0e57002aaaf42113

[Select](#)

Comes with foundational platform of Nvidia CUDA, cuDNN, NCCL, GPU Drivers, Intel MKL-DNN and other system libraries to deploy your own custom deep learning environment. For a fully managed experience, check: <https://aws.amazon.com/sagemaker>

64-bit (x86)

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes



Deep Learning Base AMI (Amazon Linux) Version 21.0 - ami-07bbc6633f3fc9631

[Select](#)

AWS

1.

Choose AMI

2.

Choose Instance Type

3.

Configure Instance

4.

Add Storage

5.

Add Tags

6.

Configure Security Group

7.

Review

Step 2: Choose an Instance Type

<input type="checkbox"/>	GPU instances	g3.16xlarge	64	488	EBS only	Yes	25 Gigabit	Yes
<input type="checkbox"/>	GPU instances	g4dn.xlarge	4	16	1 x 125 (SSD)	Yes	Up to 25 Gigabit	Yes
<input type="checkbox"/>	GPU instances	g4dn.2xlarge	8	32	1 x 225 (SSD)	Yes	Up to 25 Gigabit	Yes
<input type="checkbox"/>	GPU instances	g4dn.4xlarge	16	64	1 x 225 (SSD)	Yes	Up to 25 Gigabit	Yes
<input type="checkbox"/>	GPU instances	g4dn.8xlarge	32	128	1 x 900 (SSD)	Yes	50 Gigabit	Yes
<input type="checkbox"/>	GPU instances	g4dn.12xlarge	48	192	1 x 900 (SSD)	Yes	50 Gigabit	Yes
<input type="checkbox"/>	GPU instances	g4dn.16xlarge	64	256	1 x 900 (SSD)	Yes	50 Gigabit	Yes
<input checked="" type="checkbox"/>	GPU instances	p2.xlarge	4	61	EBS only	Yes	High	Yes
<input type="checkbox"/>	GPU instances	p2.8xlarge	32	488	EBS only	Yes	10 Gigabit	Yes
<input type="checkbox"/>	GPU instances	p2.16xlarge	64	732	EBS only	Yes	25 Gigabit	Yes
<input type="checkbox"/>	GPU instances	p3.2xlarge	8	61	EBS only	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	GPU instances	p3.8xlarge	32	244	EBS only	Yes	10 Gigabit	Yes
<input type="checkbox"/>	GPU instances	p3.16xlarge	64	488	EBS only	Yes	25 Gigabit	Yes

[Cancel](#)[Previous](#)[Review and Launch](#)[Next: Configure Instance Details](#)

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 lower pricing, assign an access management role to the instance, and more.

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

Purchasing option [\(i\)](#) Request Spot instances

Network [\(i\)](#) [Create new VPC](#)

Subnet [\(i\)](#) [Create new subnet](#)

Auto-assign Public IP [\(i\)](#)

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

Capacity Reservation [\(i\)](#) [Create new Capacity Reservation](#)

IAM role [\(i\)](#) [Create new IAM role](#)

CPU options [\(i\)](#) Specify CPU options

Shutdown behavior [\(i\)](#)

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

Monitoring [\(i\)](#) Enable CloudWatch detailed monitoring

[Cancel](#)[Previous](#)[Review and Launch](#)[Next: Add Storage](#)

AWS

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 <small>i</small>	Device <small>i</small>	Snapshot <small>i</small>	Size (GiB) <small>i</small>	Volume Type <small>i</small>	IOPS <small>i</small>	Throughput (MB/s) <small>i</small>	Delete on Termination <small>i</small>	Encryption <small>i</small>
Root	/dev/xvda	snap-0be19581867748d3	200	General Purpose SSD (gp2)	270 / 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

AWS

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

Step 7: Review Instance Launch

AMI Details

[Edit AMI](#)

Deep Learning AMI (Amazon Linux) Version 26.0 - ami-00da9ade5fa7b8a23

 MXNet-1.6.0rc0, Tensorflow-2.0 &1.15, PyTorch-1.3.1, Keras-2.2, & other frameworks, configured with Elastic Inference, NVIDIA CUDA, cuDNN, NCCL, Intel MKL-DNN, Docker & NVIDIA-Docker. For fully managed experience, check: <https://aws.amazon.com/sagemaker>
Root Device Type: ebs Virtualization type: hvm

Instance Type

[Edit instance type](#)

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
p2.xlarge	11.75	4	61	EBS only	Yes	High

Security Groups

[Edit security groups](#)

Instance Details

[Edit instance details](#)

Storage

[Edit storage](#)

Volume Type <small>(i)</small>	Device <small>(i)</small>	Snapshot <small>(i)</small>	Size (GiB) <small>(i)</small>	Volume Type <small>(i)</small>	IOPS <small>(i)</small>	Throughput (MB/s) <small>(i)</small>	Delete on Termination <small>(i)</small>	Encrypt
Root	/dev/xvda	snap-0be19581867748d30	200	gp2	600 / 3000	N/A	Yes	Not En...

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

AWS

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

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 instances may be accessible from the Internet. You can also open additional ports in your security group to make your instances more accessible.

⚠ Your instance configuration is restricted

To launch an instance that's eligible for the free usage tier, you must meet certain restrictions.

AMI Details

Deep Learning AMI (Amazon Linux)

MXNet-1.6.0rc0, Tensorflow-2.0 & 1.15, PyTorch-1.2.0, Keras, TensorFlow, Caffe, Chainer, Theano, TensorFlow-Serving, DNN, Docker & NVIDIA-Docker. For full details, see the Deep Learning AMI documentation.

Root Device Type: ebs Virtualization type: hvm

Instance Type

Instance Type	ECUs	vCPUs	Memory (GiB)
p2.xlarge	11.75	4	61

Security Groups

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](#).

Create a new key pair

Key pair name

Download Key Pair

You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel

Launch Instances

ses only.

Edit security groups

e about [free usage tier](#) eligibility and usage

[Don't show me this again](#)

Edit AMI

KL-

Edit instance type

formance

Edit security groups

Cancel

Previous

Launch

AWS

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with navigation links like EC2 Dashboard, Events, Tags, Reports, Limits, and a expanded section for Instances with sub-links: Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Scheduled Instances, and Capacity Reservations. At the top, there are buttons for Launch Instance, Connect, and Actions. A context menu is open over the first instance in the list, showing options: Connect, Get Windows Password, Create Template From Instance, Launch More Like This, Instance State, Instance Settings, Image, Networking, and CloudWatch Monitoring.

New EC2 Experience
Tell us what you think

Launch Instance Connect Actions

EC2 Dashboard New

Events

Tags

Reports

Limits

INSTANCES

Instances

Instance Types

Launch Templates New

Spot Requests

Savings Plans

Reserved Instances

Dedicated Hosts

Scheduled Instances

Capacity Reservations

Filter by tags and attributes or search by keyword

1 to 2 of 2

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)
<input checked="" type="checkbox"/>	i-01c1ae9f382c00b06	p2.xlarge	us-west-2a	Running	None		ec2-54-202-23-83.us-west-
<input type="checkbox"/>	i-0e3ceab290bcde79c	p2.xlarge	us-west-2c	Running	None		

Connect

Get Windows Password

Create Template From Instance

Launch More Like This

Instance State

Instance Settings

Image

Networking

CloudWatch Monitoring

AWS

Connect to your instance

Connection method

- A standalone SSH client [\(i\)](#)
- Session Manager [\(i\)](#)
- EC2 Instance Connect (browser-based SSH connection) [\(i\)](#)

To access your instance:

1. Open an SSH client. (find out how to [connect using PuTTY](#))
2. Locate your private key file (uscee599.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 uscee599.pem`
4. Connect to your instance using its Public DNS:
`ec2-54-202-23-83.us-west-2.compute.amazonaws.com`

Example:

```
ssh -i "uscee599.pem" ec2-user@ec2-54-202-23-83.us-west-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](#).

[Close](#)

AWS

- AWS EC2 instance types

<https://aws.amazon.com/ec2/instance-types/>

- Pricing

<https://aws.amazon.com/ec2/pricing/on-demand/>

SSH and SCP

- SSH (Secure Shell) is a protocol that allows secure connections between computers.
- `ssh -i <key> username@ip_address`
- SCP (Secure Copy Protocol) is a means of securely transferring computer files between computers.
- `scp -i <key> local_file username@ip_address:remote_destination`
- `scp -i <key> -r local_folder username@ip_address:remote_destination`

Cyberduck (cloud storage browser)

- Provides GUI for scp
- Easy drag and drop
- <https://cyberduck.io/>



Setting up Environment

- conda create -n new_env python=3.7 anaconda
- source activate new_env
- pip install tensorflow

View and Set Tensorflow with GPU

- Run python:
 - `from tensorflow.python.client import device_lib`
 - `print(device_lib.list_local_devices())`
- Set GPU
 - `import os`
 - `os.environ['CUDA_DEVICE_ORDER']='PCI_BUS_ID'`
 - `os.environ['CUDA_VISIBLE_DEVICES']='0'`
- Note that it may be faster on a CPU if it doesn't involve CNN.
 - `os.environ['CUDA_VISIBLE_DEVICES']='' # Don't use GPU`

Viewing Files and Directories

- ls: list your files in the current directory
- ls -l: list your files in the current directory in long format
- ls -a: list your files including hidden ones
- pwd: present working directory
- mkdir <dir_name>: make a new directory
- mkdir -p <dir_name>: make a new directory (no error if it exists)
- cd <dir_name>: go to directory
- cd .. : go to one level higher
- cd ~ : go to home directory
- cd / : go to root directory

Move, Copy and Delete

- `mv filename1 filename2`: Rename a file
- `mv filename dir_name`: Move file to a directory
- `cp filename1 filename2`: Copy a file with a new name
- `cp filename dir_name`: Copy a file to a directory
- `cp -r dir_name1 dir_name2`: Copy entire folder
- `rm filename`: Delete a file
- `rm -r dir_name`: Delete everything inside the folder

tmux sessions

- tmux: Creates a session that runs on remote machine
- Remains working even you lost ssh connection
- <https://tmuxcheatsheet.com/>
- Basic
 - tmux: new session
 - tmux ls: list all tmux session
 - tmux a: attach to latest entered session
 - tmux a -t <number> : attach to session number
 - ctrl + b, then d: detach from current session
 - ctrl + d: kill current session

More on Unix/Linux Commands

- Lots of online resources:
 1. <https://www.unixtutorial.org/basic-unix-commands>
 2. <https://www.guru99.com/must-know-linux-commands.html>
 3. <http://mally.stanford.edu/~sr/computing/basic-unix.html>

More on Unix/Linux Commands

- vi (or vim) text editor
 - vi filename: open a file, if it doesn't exist, create a new file
 - Inside the editor:
 - i: insert mode
 - ESC, then :w ENTER: save file
 - ESC, then :wq ENTER: save and quit vi

More on Unix/Linux Commands

- `wc [-l] filename`: word count of file, option `-l` shows number of lines
- `head [-n] filename`: show first n lines
- `tail [-n] filename`: show last n lines
- `cat filename`: print full file
- `grep [options] pattern [filename/dir]`: print lines matching a pattern

More on Unix/Linux Commands

- Standard input, standard output and standard error
 - Check: <http://www.learnlinux.org.za/courses/build/shell-scripting/ch01s04.html>
 - Basics:
 - > : stdout (write)
 - >> : stdout (append)
 - < : stdin
 - Example: ls -al > list.txt