

# CS234 AWS Setup Tutorial

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## **BEFORE WE GET STARTED:**

**Please remember to stop VM instances if you are not using them!  
(by clicking Actions->Instance State->Stop on instances page)**

AWS charges you per hour when the instance is running, no matter if you are using it or not. So you will soon run out of credits if you don't stop them when done.

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# 1. Sign up for credits

We are offering \$100 AWS credit per person for your final projects.

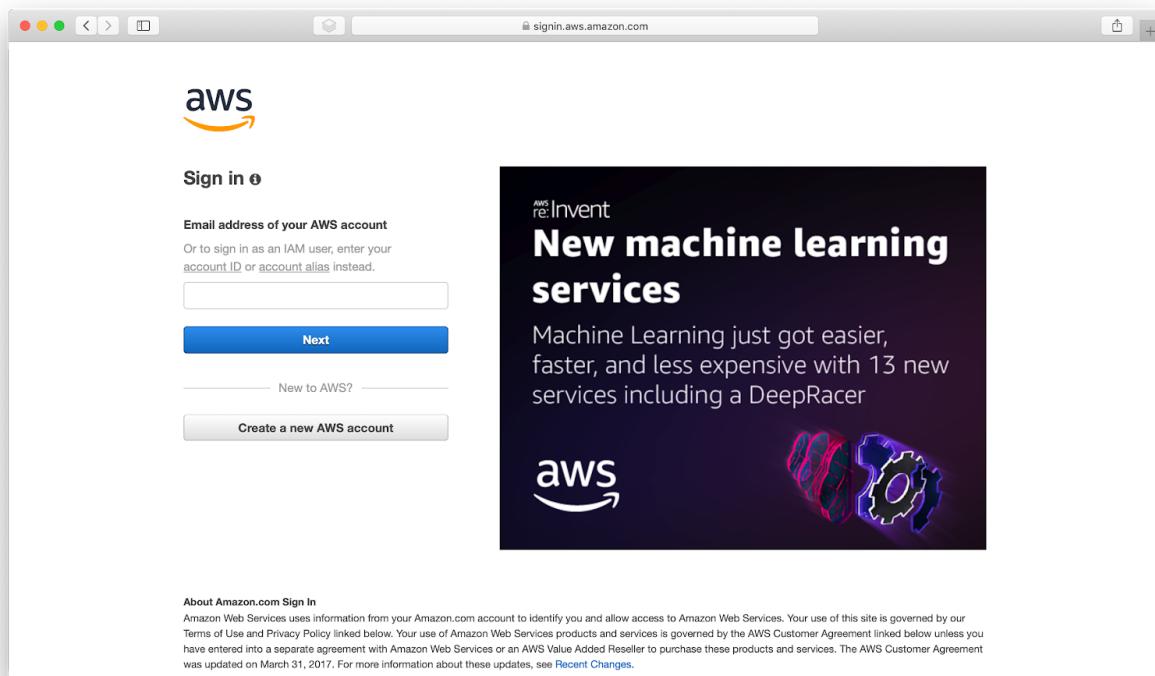
(1) Please fill out the Google Form to get promo codes (at most one per student):

<https://forms.gle/8x4KCM6YLZHpZX6F7>

(2) After filling out the form, you will soon receive an email containing your promo code, in the format of 15 digits+numbers, e.g. PC33YPIODLF8ZNS. If you didn't receive the email by Friday Feb 7, please write an email, with the title **[CS234 AWS] Credit not received**, to [benpetit@stanford.edu](mailto:benpetit@stanford.edu), include your SUNet ID in the email.

# 2. Redeem credits

(1) Log into <http://console.aws.amazon.com> with your AWS account. If you've never used AWS before, you need to create a new account first. Feel free to use your personal account or personal email, since redeeming credits doesn't require Stanford email address.



(2) After logging into the AWS console, click “Services” on the top menu:

The screenshot shows the AWS Management Console homepage. The top navigation bar has "Services" selected, indicated by a red box. Other options like "Resource Groups" and a user profile are also visible. The main content area is titled "AWS Management Console". It features a search bar for "Find Services" with the placeholder "You can enter names, keywords or acronyms." Below it, there's a section for "Recently visited services" with links to Billing, AWS Cost Explorer, EC2, and AWS Budgets. A "Build a solution" section offers options like Launch a virtual machine (With EC2), Build a web app (With Elastic Beanstalk), and Build using virtual servers (With Lightsail). To the right, there are sections for "Access resources on the go" (AWS Console Mobile App) and "Explore AWS" (Amazon SageMaker, Amazon RDS, Scalable, Durable, Secure Backup & Restore with Amazon S3).

Search for “Billing”:

The screenshot shows the AWS Services search results for "Billing". The search bar at the top contains "billing" and is highlighted with a red box. The results list "Billing" first, described as "Access, analyze, and control your AWS costs and usage.". The left sidebar shows categories like History, Console Home, Billing, EC2, AWS Cost Explorer, AWS Budgets, Storage, Database, and others. The main search results grid includes various services such as EC2, AWS RoboMaker, Athena, Alexa for Business, Lightsail, Blockchain, Amazon Managed Blockchain, EMR, CloudSearch, CloudWatch, IAM, CloudFormation, CloudTrail, Config, OpsWorks, Service Catalog, Systems Manager, GuardDuty, Inspector, Amazon Macie, AWS Organizations, and many more. A "Discover how customers are building backup & restore solutions on AWS" banner is visible at the bottom.

(3) Click “Credits” on the side menu, fill out the promo code you got in Part 1.(2)., the CAPTCHA, then click “Redeem”:

The screenshot shows the AWS Management Console Credits page. The left sidebar has 'Credits' selected. The main area has a form for entering a promo code, which is filled with 'PC33YPIODLF8ZNS'. Below it is a security check CAPTCHA field containing 'mpnxnp', with a refresh button. A message at the bottom says 'By clicking "Redeem" you indicate that you have read and agree to the terms of the AWS Promotional Credit Terms & Conditions located [here](#)'. A large blue 'Redeem' button is centered. At the bottom, a table lists redeemed credits.

Expiration Date	Credit Name	Amount Used	Amount Remaining	Applicable Products
12/31/2020	EDU_ENG_FY2018_IC_Q4_12_STANFORD_100USD	\$1.58	\$98.42	<a href="#">See complete list</a>

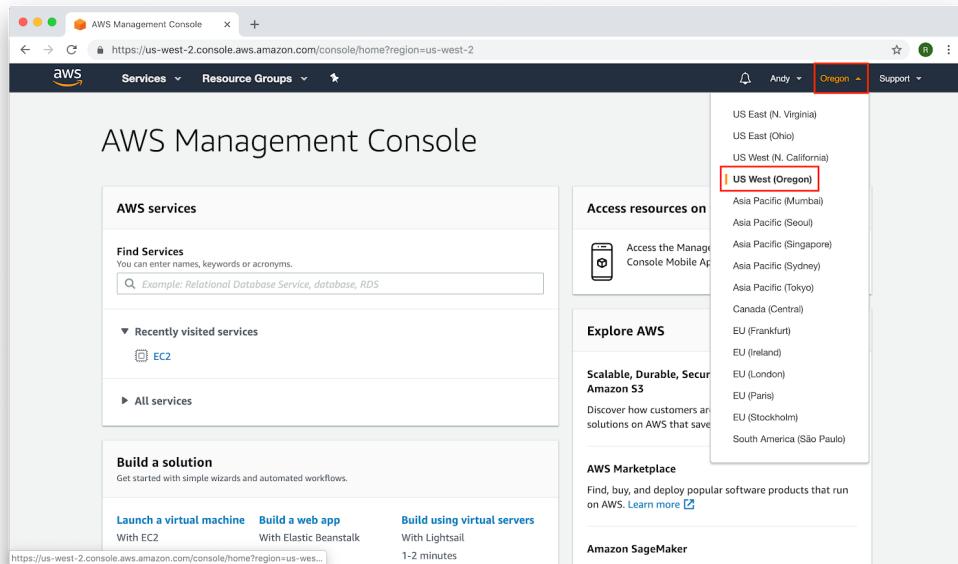
(4) You will see your successfully redeemed credits and account balance at the bottom of Credits page:

The screenshot shows the same Credits page after a successful redemption. The 'Redeem' button is now greyed out. The bottom table shows one credit entry with a total remaining amount of \$98.42. A red box highlights the bottom row of the table.

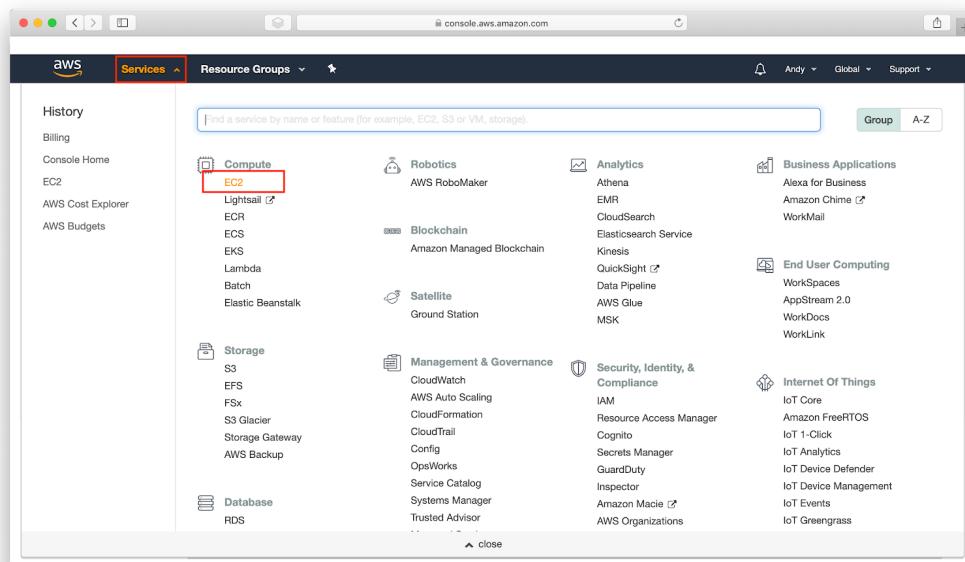
Expiration Date	Credit Name	Amount Used	Amount Remaining	Applicable Products
12/31/2020	EDU_ENG_FY2018_IC_Q4_12_STANFORD_100USD	\$1.58	\$98.42	<a href="#">See complete list</a>

### 3. Create a VM

(1) After logging into <http://console.aws.amazon.com>, click the second to the right Button (region) on the top menu and switch to **US West (Oregon)**, since some regions (like the default Ohio) don't provide GPU instances:



(2) Click “Services” on top menu, then “EC2” under “Compute”



(3) If this is the first time you use AWS, you may not be able to create a VM with GPU because AWS puts an instance limit of 0 to GPU resources. So we need to request a limit increase to continue. Click “Limits” on the side menu:

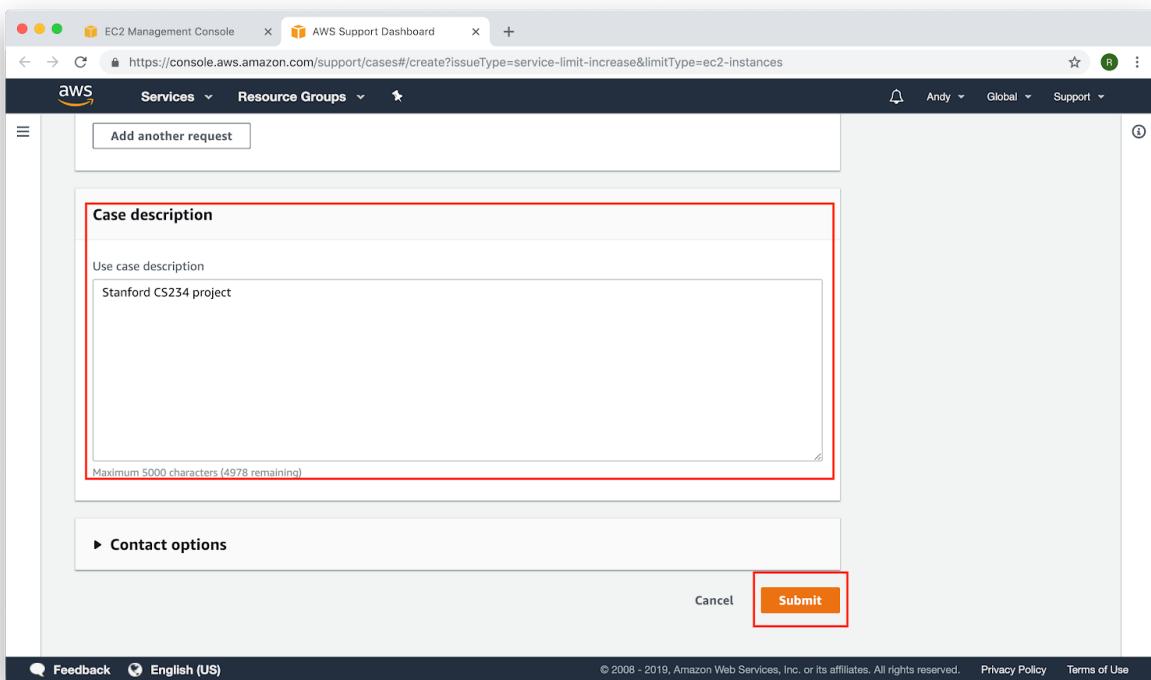
(4) Search for a specific GPU instance type, say “p2.xlarge”, then click “Request limit increase”. Note that we are demonstrating with “p2.xlarge” instance type, if you wish to use a different instance type, make sure you request a limit increase on that specific resource. See Part 3.(9) of this tutorial for a list of GPU instances and specifications.

Instance Type	Count	Action
Running On-Demand m5a.large instances	5	Request limit increase
Running On-Demand m5a.xlarge instances	5	Request limit increase
Running On-Demand m5d.12xlarge instances	0	Request limit increase
Running On-Demand m5d.24xlarge instances	0	Request limit increase
Running On-Demand m5d.2xlarge instances	1	Request limit increase
Running On-Demand m5d.4xlarge instances	0	Request limit increase
Running On-Demand m5d.large instances	5	Request limit increase
Running On-Demand m5d.xlarge instances	2	Request limit increase
Running On-Demand p2.1xlarge instances	0	Request limit increase
Running On-Demand p2.8xlarge instances	0	Request limit increase
<b>Running On-Demand p2.xlarge instances</b>	<b>1</b>	<b>Request limit increase</b>
Running On-Demand p3.16xlarge instances	0	Request limit increase
Running On-Demand p3.2xlarge instances	0	Request limit increase
Running On-Demand p3.8xlarge instances	0	Request limit increase
Running On-Demand p3dn.24xlarge instances	0	Request limit increase
Running On-Demand r3.2xlarge instances	5	Request limit increase
Running On-Demand r3.4xlarge instances	1	Request limit increase

(5) Fill out the following request form, then submit:

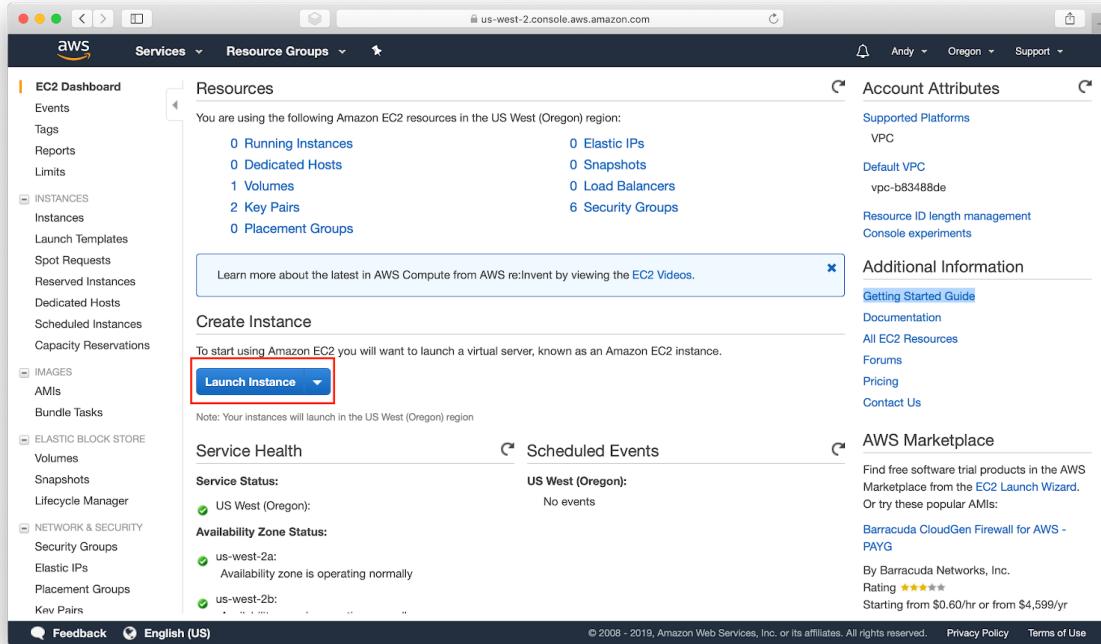
The screenshot shows the 'Create case' page in the AWS Support Dashboard. The 'Service limit increase' option is selected. In the 'Case classification' section, the 'Limit type' dropdown is set to 'EC2 Instances'. A red box highlights this dropdown. Below it, a note states: 'The severity of your service limit increase request is automatically determined by your support subscription.' In the 'Requests' section, there is a note: 'To request additional limit increases for the same limit type, choose **Add another request**. To request an increase for a different limit type, create a separate limit increase request.'

The screenshot shows the 'Requests' section of the AWS Support Dashboard. A new request has been added under 'Request 1'. The 'Region' dropdown is set to 'US West (Oregon)', the 'Primary Instance Type' dropdown is set to 'p2.xlarge', and the 'Limit' dropdown is set to 'Instance Limit'. The 'New limit value' input field contains the value '1'. A red box highlights the 'Region' dropdown. At the bottom of the request list, there is a button labeled 'Add another request'.



The request should take less than 1 business day to get approved. So plan ahead!

(6) After successfully increasing the instance limit, click “Launch Instance” on the dashboard page



(7) Search for “Deep Learning AMI (Ubuntu)” then select

Step 1: Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Deep Learning AMI (Ubuntu) Version 21.0 - ami-0b294f219d14e6a82

MXNet-1.3, TensorFlow-1.12, PyTorch-1.0, Keras-2.2, Chainer-5.1, Caffe/2-0.8, Theano-1.0 & CNTK-2.6, configured with NVIDIA CUDA, cuDNN, NCCL, Intel MKL-DNN, Docker & NVIDIA-Docker. For a fully managed experience, check: <https://aws.amazon.com/sagemaker>

Select

1 to 1 of 1 AMIs

64-bit (x86)

Quick Start (1)

My AMIs (0)

AWS Marketplace (12)

Community AMIs (53)

Free tier only

The following results for “Deep Learning AMI (Ubuntu)” were found in other catalogs:

12 results in AWS Marketplace

53 results in Community AMIs

Feedback English (US)

Privacy Policy Terms of Use

(8) Filter on “GPU instances”

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: GPU instances All generations 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
1	GPU Instances	g2.2xlarge	8	15	1 x 60 (SSD)	Yes	High	-
2	GPU Instances	g2.8xlarge	32	60	2 x 120 (SSD)	-	10 Gigabit	-
3	GPU Instances	p2.xlarge	4	61	EBS only	Yes	High	Yes
4	GPU Instances	p2.8xlarge	32	488	EBS only	Yes	10 Gigabit	Yes
5	GPU Instances	p2.16xlarge	64	732	EBS only	Yes	25 Gigabit	Yes
6	GPU Instances	p3.2xlarge	8	61	EBS only	Yes	Up to 10 Gigabit	Yes
7	GPU Instances	p3.8xlarge	32	244	EBS only	Yes	10 Gigabit	Yes
8	CPU Instances	c2.8xlarge	64	160	EBS only	Yes	25 Gigabit	Yes

Cancel Previous Review and Launch Next: Configure Instance Details

Feedback English (US)

Privacy Policy Terms of Use

(9) Select the instance type based on your project need. Refer to the [AWS Documentation](#) for a comprehensive list of instance types and specifications. Here's a brief summary:

Type	# GPUs	# vCPUs	RAM (GB)	Price(per hour)
p2.xlarge	1 K80	4	61	\$0.9
p2.8xlarge	8 K80	32	488	\$7.2
p2.16xlarge	16 K80	64	732	\$14.4
g3s.xlarge	1 M60	4	30.5	\$0.75
g3.4xlarge	1 M60	16	122	\$1.14
g3.8xlarge	2 M60	32	244	\$2.28
g3.16xlarge	4 M60	64	488	\$4.56
p3.2xlarge	1 V100	8	61	\$3.06
p3.8xlarge	4 V100	32	244	\$12.24
p3.16xlarge	8 V100	64	488	\$24.48
p3dn.24xlarge	8 V100	96	768	\$31.218

We strongly suggest you choose the instance type wisely based on actual need given the credit limit. **p2.xlarge is recommended for most projects, which provides the same compute as what we used on Azure for DQN training in assignment 2.** Make sure your instance limit on the desired instance type is not 0. See Part 3.(3)~(5) of this tutorial for how to increase instance limit.

You probably **don't** want to click "Review and Launch" right now. On the top row, there are many other configurations you might be interested in setting up before creating your VM. We will walk through some of them in the following steps.

(10) "Add Storage" tab allows you to increase boot disk capacity or add new volume to the VM. This is important if you need to store or generate tons of data for your model training:

**Step 4: Add Storage**

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

Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MB/s)	Delete on Termination	Encrypted
Root	/dev/sda1	snap-013f2dc8c2ecc97d9	74	General Purpose SSD (gp2)	222 / 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**

(11) “Configure Security Group” allows you to create network security rules. This is similar to adding network inbound rules in Azure. For example, you may want to open up 6006 port for tensorboard:

**Step 6: Configure Security Group**

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

Assign a security group:  Create a new security group  Select an existing security group

Security group name: launch-wizard-5

Description: launch-wizard-5 created 2019-02-04T01:35:14.688-08:00

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Custom 0.0.0.0/0	e.g. SSH for Admin Desktop
Custom TCP Rule	TCP	6006	Custom 0.0.0.0/0	tensorboard

**Add Rule**

**Warning**  
Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

**Cancel** **Previous** **Review and Launch**

(12) After configuring, click “Review and Launch”, make sure everything is as desired on the Review page:

**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.

**AMI Details**

**Deep Learning AMI (Ubuntu) Version 21.0 - ami-0b294f219d14e6a82**

MXNet-1.3, TensorFlow-1.12, PyTorch-1.0, Keras-2.2, Chainer-5.1, Caffe-2-0.8, Theano-1.0 & CNTK-2.6, configured with NVIDIA CUDA, cuDNN, NCCL, Intel MKL-DNN, Docker & NVIDIA-Docker. For a fully managed experience, check: <https://aws.amazon.com/sagemaker>

Root Device Type: ebs Virtualization type: hvm

**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

**Launch**

(13) Then click “Launch”. You will be asked if you want to proceed using existing key pair or create a new one, **if you haven't use AWS before, choose “Create a new key pair”, give it a name, then click “Download Key Pair”**:

**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 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](#).

**Key pair name**

aws

**Download Key Pair**

**Launch Instances**

**Make sure to keep the downloaded \*.pem file in a secure and accessible location**, as you will need it to log into your VM later. After downloading the \*.pem file, you need **change the access permission** to 400 (only readable by you) by running

```
chmod 400 <path to *.pem file>
```

Where <path to \*.pem file> is the path where you stored your \*.pem file. For example, I store my aws.pem file in ~/Downloads/aws.pem, the command to run is:

```
chmod 400 ~/Downloads/aws.pem
```

(14) Click “Launch Instance”, it may take 1~5 min for the launch to be completed:

The screenshot shows the AWS Launch Status page. At the top, there's a green success message: "Your instances are now launching" with a checkmark icon. Below it, a blue info message: "Get notified of estimated charges". Further down, there's a section titled "How to connect to your instances" with some helpful links. At the bottom, there are footer links for Feedback, English (US), Privacy Policy, and Terms of Use.

# 4. Use the VM

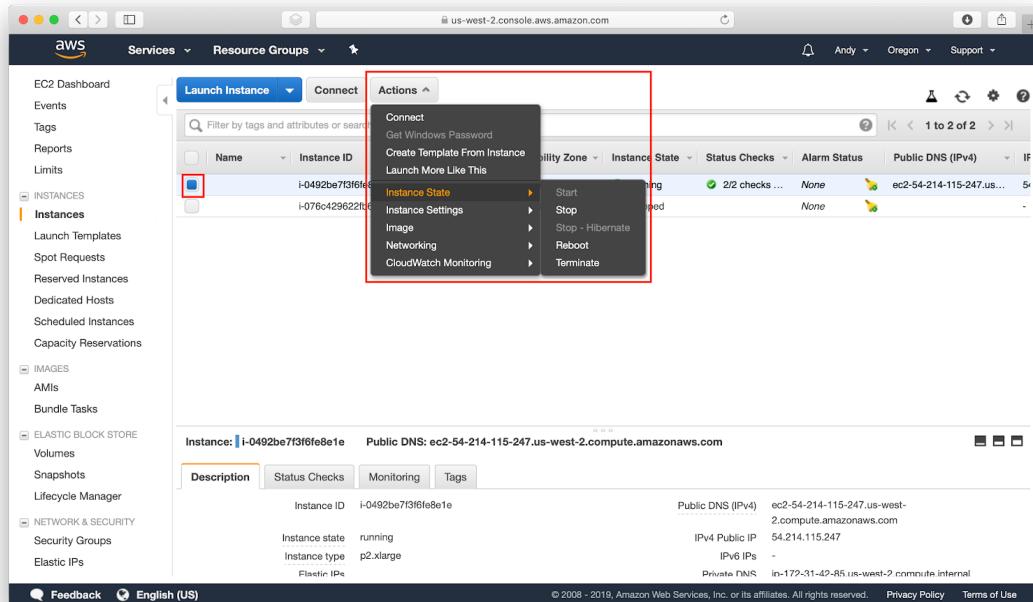
(1) After creating you the VM instance, go to “Services” -> “EC2”, then “Instances” on the side menu:

The screenshot shows the AWS EC2 Instances page. On the left, the navigation sidebar is open, with the 'Instances' section highlighted and its sub-item 'Instances' also highlighted with a red box. The main content area displays a summary of resources: 1 Running Instances, 0 Dedicated Hosts, 2 Volumes, 3 Key Pairs, 0 Placement Groups, 0 Elastic IPs, 0 Snapshots, 0 Load Balancers, and 7 Security Groups. Below this is a 'Create Instance' section with a 'Launch Instance' button. To the right, there are sections for 'Account Attributes', 'Additional Information' (including links to Getting Started Guide, Documentation, All EC2 Resources, Forums, Pricing, and Contact Us), and 'AWS Marketplace' (listing Barracuda CloudGen Firewall for AWS - PAYG). At the bottom, there's a note about launching instances in the US West (Oregon) region.

(2) You can see your instances and their information on the Instance page:

The screenshot shows the AWS EC2 Instances page. The 'Instances' section in the sidebar is highlighted with a red box. The main content area displays a table of instances. The first instance, with ID i-0492be7f3f6fe8e1e, is listed as 'running'. The second instance, with ID i-076c429622fb651e7, is listed as 'stopped'. The table includes columns for Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, Alarm Status, and Public DNS (IPv4). A search bar at the top of the table allows filtering by tags and attributes or keyword. Below the table, there's a section titled 'Select an instance above' with three small icons.

(3) Select an instance, then “Actions” -> “Instance State” contains **Start/Stop/Restart** operations for this instance:

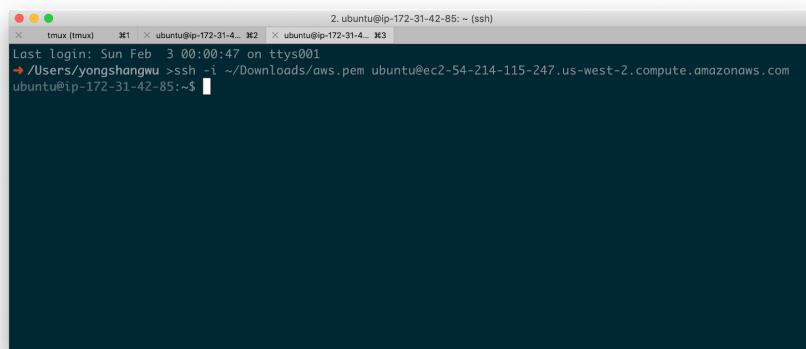


(4) After successfully starting your VM (i.e. Instance State is “running”), copy the public DNS of your instance, then use the command

```
ssh -i <path to *.pem file> ubuntu@<public DNS>
```

to connect to your VM, where **<path to \*.pem file>** is the path of the \*.pem file you downloaded in Part 3.(13). and **<public DNS>** is what you just copied. For example, I stored my aws.pem file in ~/Downloads/aws.pem and my VM’s public DNS is ec2-54-214-115-247.us-west-2.compute.amazonaws.com . The command would be

```
ssh -i ~/Downloads/aws.pem ubuntu@ec2-54-214-115-247.us-west-2.compute.amazonaws.com
```

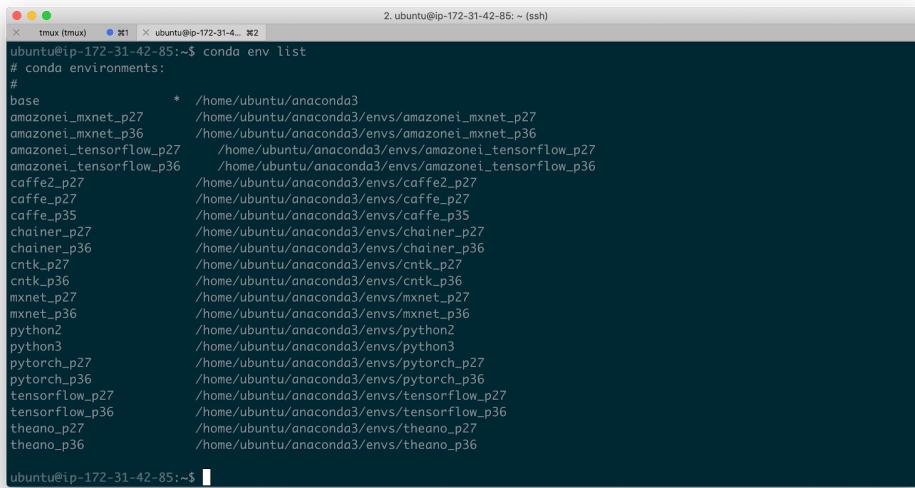


(5) Nice thing about using the Deep Learning AMI is, all the deep learning frameworks (TensorFlow, PyTorch, MXNet, etc.) and underlying dependencies (CUDA, cuDNN, etc.) have been pre-installed for you. See [the Deep Learning AMI Overview page](#) for a overview of dependencies and versions installed.

The VM uses [conda](#) to manage all the environment, command

```
conda env list
```

lists all pre-installed environments for you:



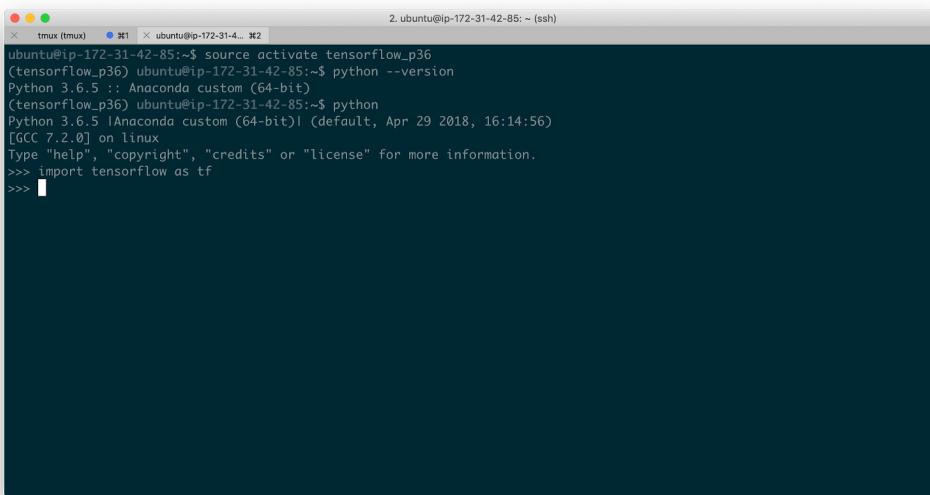
```
2. ubuntu@ip-172-31-42-85: ~ (ssh)
ubuntu@ip-172-31-42-85:~$ conda env list
# conda environments:
#
base          * /home/ubuntu/anaconda3
amazoneli_mxnet_p27      /home/ubuntu/anaconda3/envs/amazoneli_mxnet_p27
amazoneli_mxnet_p36      /home/ubuntu/anaconda3/envs/amazoneli_mxnet_p36
amazoneli_tensorflow_p27    /home/ubuntu/anaconda3/envs/amazoneli_tensorflow_p27
amazoneli_tensorflow_p36    /home/ubuntu/anaconda3/envs/amazoneli_tensorflow_p36
caffe2_p27        /home/ubuntu/anaconda3/envs/caffe2_p27
caffe_p27        /home/ubuntu/anaconda3/envs/caffe_p27
caffe_p35        /home/ubuntu/anaconda3/envs/caffe_p35
chainer_p27       /home/ubuntu/anaconda3/envs/chainer_p27
chainer_p36       /home/ubuntu/anaconda3/envs/chainer_p36
cntk_p27         /home/ubuntu/anaconda3/envs/cntk_p27
cntk_p36         /home/ubuntu/anaconda3/envs/cntk_p36
mxnet_p27         /home/ubuntu/anaconda3/envs/mxnet_p27
mxnet_p36         /home/ubuntu/anaconda3/envs/mxnet_p36
python2           /home/ubuntu/anaconda3/envs/python2
python3           /home/ubuntu/anaconda3/envs/python3
pytorch_p27       /home/ubuntu/anaconda3/envs/pytorch_p27
pytorch_p36       /home/ubuntu/anaconda3/envs/pytorch_p36
tensorflow_p27     /home/ubuntu/anaconda3/envs/tensorflow_p27
tensorflow_p36     /home/ubuntu/anaconda3/envs/tensorflow_p36
theano_p27        /home/ubuntu/anaconda3/envs/theano_p27
theano_p36        /home/ubuntu/anaconda3/envs/theano_p36

ubuntu@ip-172-31-42-85:~$
```

If you want to use, say, python 3.6 and tensorflow for your project, running

```
source activate tensorflow_p36
```

will activate the desired environment:



```
2. ubuntu@ip-172-31-42-85: ~ (ssh)
ubuntu@ip-172-31-42-85:~$ source activate tensorflow_p36
(tensorflow_p36) ubuntu@ip-172-31-42-85:~$ python --version
Python 3.6.5 :: Anaconda custom (64-bit)
(tensorflow_p36) ubuntu@ip-172-31-42-85:~$ python
Python 3.6.5 |Anaconda custom (64-bit)| (default, Apr 29 2018, 16:14:56)
[GCC 7.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import tensorflow as tf
>>>
```

## 5. FAQ

- I cannot create an instance due to instance limit 0  
See Part 3.(3)~(5) for how to increase instance limit.
- I can not log into my VM  
Make sure you save the \*.pem file when creating the VM, and the access permission is correct. See Part 3.(13). of this tutorial for details.
- What if I run out of credits  
Write an email to [benpetit@stanford.edu](mailto:benpetit@stanford.edu) with [CS234 AWS] in the title. In the email, state your SUNet ID, how much credit you have spent, what you did with these credits and how much more you need.  
Optionally, see Part 6 of the tutorial on how to sign up for AWS Educate, which will give you a \$100 credit promo code. But the approval may take 1~2 days. So if you are in urgent need, just ask us for help first ;)

## 6. [Optional] Sign up for AWS Educate

Signing up for [AWS Educate](#) (and get approved) will give you a \$100 credit. The steps for signing up is pretty easy: go to <https://www.awseducate.com/Registration>, select Student as your role then fill out your information then you will be done.

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**Again, make sure your VM instances are STOPPED while not used.**

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