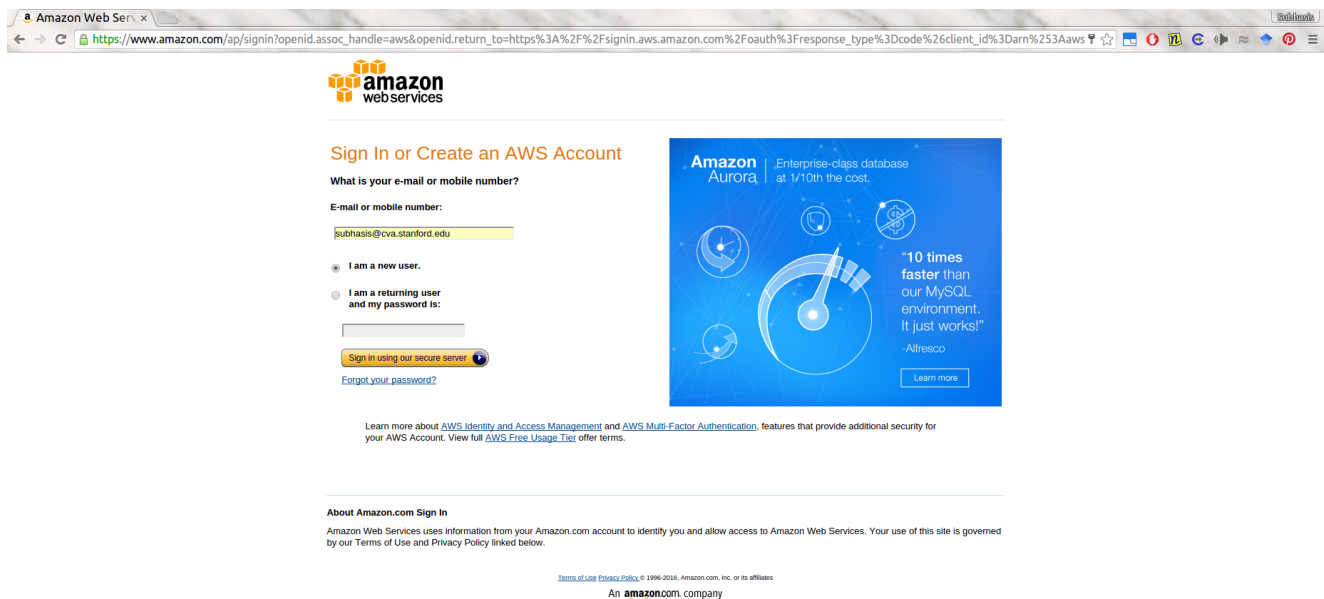


## AWS Tutorial

For GPU instances, we also have an Amazon Machine Image (AMI) that you can use to launch GPU instances on Amazon EC2. This tutorial goes through how to set up your own EC2 instance with the provided AMI. **We do not currently distribute AWS credits to CS231N students but you are welcome to use this snapshot on your own budget.**

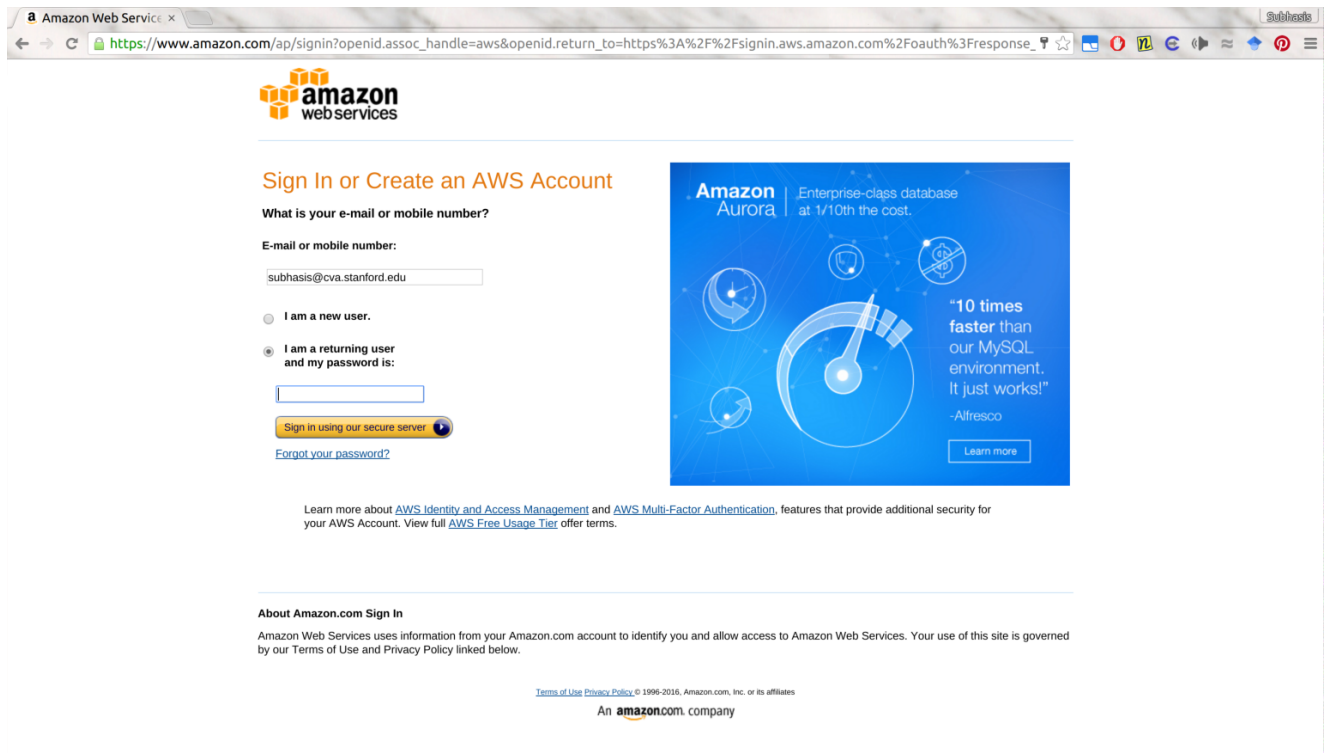
**TL;DR** for the AWS-savvy: Our image is `cs231n_caffe_torch7_keras_lasagne_v2`, AMI ID: `ami-125b2c72` in the us-west-1 region. Use a `g2.2xlarge` instance. Caffe, Torch7, Theano, Keras and Lasagne are pre-installed. Python bindings of caffe are available. It has CUDA 7.5 and CuDNN v3.

First, if you don't have an AWS account already, create one by going to the [AWS homepage](#), and clicking on the yellow "Sign In to the Console" button. It will direct you to a signup page which looks like the following.



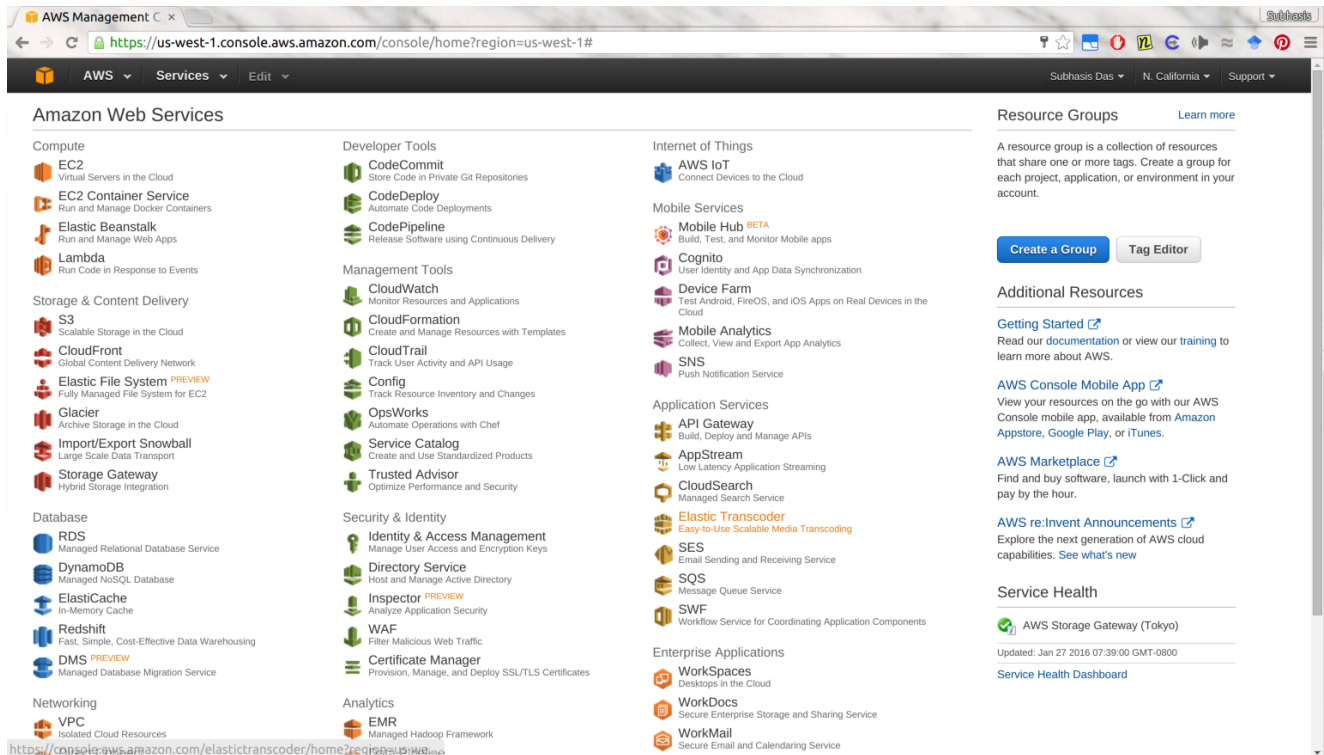
Select the “I am a new user” checkbox, click the “Sign in using our secure server” button, and follow the subsequent pages to provide the required details. They will ask for a credit card information, and also a phone verification, so have your phone and credit card ready.

Once you have signed up, go back to the [AWS homepage](#), click on “Sign In to the Console”, and this time sign in using your username and password.



The screenshot shows the Amazon Web Services sign-in page in a web browser. The browser's address bar displays the URL: [https://www.amazon.com/ap/signin?openid.assoc\\_handle=aws&openid.return\\_to=https%3A%2F%2Fsignin.aws.amazon.com%2Foauth%3Fresponse\\_](https://www.amazon.com/ap/signin?openid.assoc_handle=aws&openid.return_to=https%3A%2F%2Fsignin.aws.amazon.com%2Foauth%3Fresponse_). The page features the Amazon Web Services logo at the top left. Below the logo, the heading "Sign In or Create an AWS Account" is displayed. Underneath, the text "What is your e-mail or mobile number?" is followed by a text input field containing the email address "subhasis@cva.stanford.edu". Below the input field, there are two radio buttons: "I am a new user." and "I am a returning user and my password is:". The "I am a returning user" option is selected. Below this, there is a password input field. A yellow button with the text "Sign in using our secure server" and a right-pointing arrow is positioned below the password field. To the left of this button is a link that says "Forgot your password?". To the right of the sign-in form is a blue promotional banner for Amazon Aurora. The banner includes the text "Amazon Aurora | Enterprise-class database at 1/10th the cost." and a quote: "10 times faster than our MySQL environment. It just works!" attributed to -Atresco. Below the banner, there is a link to "Learn more". At the bottom of the page, there is a section titled "About Amazon.com Sign In" which states: "Amazon Web Services uses information from your Amazon.com account to identify you and allow access to Amazon Web Services. Your use of this site is governed by our Terms of Use and Privacy Policy linked below." Below this text are links for "Terms of Use" and "Privacy Policy". At the very bottom, it says "© 1996-2016, Amazon.com, Inc. or its affiliates" and "An amazon.com company".

Once you have signed in, you will be greeted by a page like this:



Make sure that the region information on the top right is set to N. California. If it is not, change it to N. California by selecting from the dropdown menu there.

(Note that the subsequent steps requires your account to be “Verified” by Amazon. This may take up to 2 hrs, and you may not be able to launch instances until your account verification is complete.)

Next, click on the EC2 link (first link under the Compute category). You will go to a dashboard page like this:

EC2 Management Console screenshot showing the Resources section. The Resources section displays a list of EC2 resources in the US West (N. California) region:

- 0 Running Instances
- 0 Elastic IPs
- 0 Dedicated Hosts
- 0 Snapshots
- 0 Volumes
- 0 Load Balancers
- 0 Key Pairs
- 1 Security Groups
- 0 Placement Groups

A notification banner states: "Need fast, reliable, scalable, fully-managed message queuing? Try Amazon Simple Queue Service."

The "Create Instance" section is visible, with a "Launch Instance" button. Below it, the "Service Health" section shows the status of the US West (N. California) region, indicating that the service is operating normally.

The "Account Attributes" section on the right shows supported platforms, default VPC, and additional information.

Click the blue "Launch Instance" button, and you will be redirected to a page like the following:

EC2 Management Console screenshot showing the "Launch Instance Wizard" page. The page is titled "Step 1: Choose an Amazon Machine Image (AMI)".

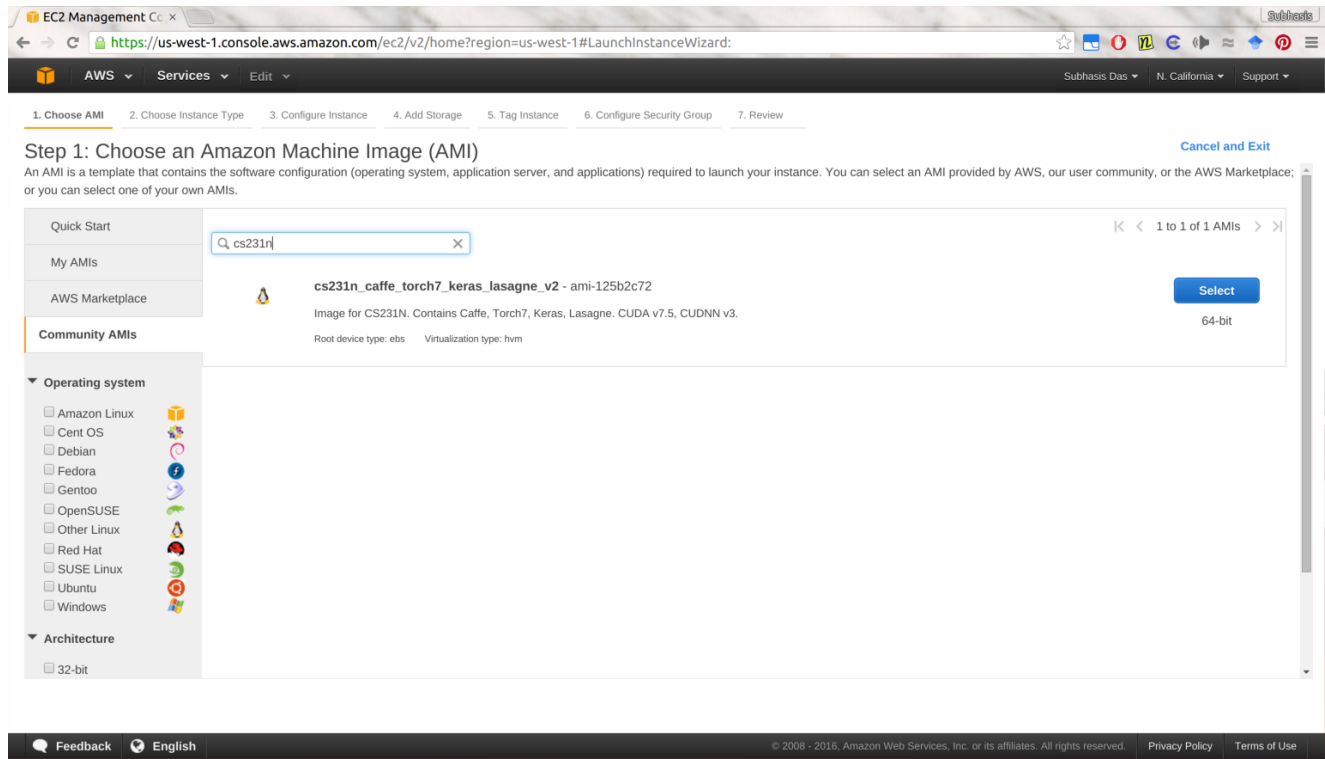
The wizard steps are: 1. Choose AMI, 2. Choose Instance Type, 3. Configure Instance, 4. Add Storage, 5. Tag Instance, 6. Configure Security Group, 7. Review.

The "Quick Start" section lists several AMIs:

- Amazon Linux AMI 2015.09.1 (HVM), SSD Volume Type** - ami-d5ea86b5. Select button.
- Red Hat Enterprise Linux 7.2 (HVM), SSD Volume Type** - ami-d1315fb1. Select button.
- SUSE Linux Enterprise Server 12 SP 1 (HVM), SSD Volume Type** - ami-6d701b0d. Select button.
- Ubuntu Server 14.04 LTS (HVM), SSD Volume Type** - ami-06116566. Select button.
- Microsoft Windows Server 2012 R2 Base** - ami-e7e78d87. Select button.

The "Free tier eligible" badge is visible next to the Amazon Linux, Red Hat, SUSE, and Ubuntu AMIs.

Click on the “Community AMIs” link on the left sidebar, and search for “cs231n” in the search box. You should be able to see the AMI `cs231n_caffe_torch7_keras_lasagne_v2` (AMI ID: `ami-125b2c72`). Select that AMI, and continue to the next step to choose your instance type.



Choose the instance type `g2.2xlarge`, and click on “Review and Launch”.

EC2 Management

Subhasis

https://us-west-1.console.aws.amazon.com/ec2/v2/home?region=us-west-1#LaunchInstanceWizard:

AWS

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N. California

Support

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Tag Instance

6. Configure Security Group

7. Review

Step 2: Choose an Instance Type

<input type="checkbox"/>	Compute optimized	c3.xlarge	4	7.5	2 x 40 (SSD)	Yes	Moderate
<input type="checkbox"/>	Compute optimized	c3.2xlarge	8	15	2 x 80 (SSD)	Yes	High
<input type="checkbox"/>	Compute optimized	c3.4xlarge	16	30	2 x 160 (SSD)	Yes	High
<input type="checkbox"/>	Compute optimized	c3.8xlarge	32	60	2 x 320 (SSD)	-	10 Gigabit
<input checked="" type="checkbox"/>	GPU instances	<b>g2.2xlarge</b>	<b>8</b>	<b>15</b>	<b>1 x 60 (SSD)</b>	<b>Yes</b>	<b>High</b>
<input type="checkbox"/>	GPU instances	g2.8xlarge	32	60	2 x 120 (SSD)	-	10 Gigabit
<input type="checkbox"/>	Memory optimized	r3.large	2	15	1 x 32 (SSD)	-	Moderate
<input type="checkbox"/>	Memory optimized	r3.xlarge	4	30.5	1 x 80 (SSD)	Yes	Moderate
<input type="checkbox"/>	Memory optimized	r3.2xlarge	8	61	1 x 160 (SSD)	Yes	High
<input type="checkbox"/>	Memory optimized	r3.4xlarge	16	122	1 x 320 (SSD)	Yes	High
<input type="checkbox"/>	Memory optimized	r3.8xlarge	32	244	2 x 320 (SSD)	-	10 Gigabit
<input type="checkbox"/>	Storage optimized	i2.xlarge	4	30.5	1 x 800 (SSD)	Yes	Moderate
<input type="checkbox"/>	Storage optimized	i2.2xlarge	8	61	2 x 800 (SSD)	Yes	High
<input type="checkbox"/>	Storage optimized	i2.4xlarge	16	122	4 x 800 (SSD)	Yes	High

Cancel

Previous

Review and Launch

Next: Configure Instance Details

Feedback

English

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In the next page, click on Launch.

EC2 Management

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https://us-west-1.console.aws.amazon.com/ec2/v2/home?region=us-west-1#LaunchInstanceWizard:

AWS

Services

Edit

Subhasis Das

N. California

Support

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Tag Instance

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 security group, launch-wizard-1, 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](#)

⚠

Your instance configuration is not eligible for the free usage tier  
To launch an instance that's eligible for the free usage tier, check your AMI selection, instance type, configuration options, or storage devices. Learn more about [free usage tier](#) eligibility and usage restrictions.

Don't show me this again

AMI Details

**cs231n\_caffe\_torch7\_keras\_lasagne\_v2 - ami-125b2c72**  
Image for CS231N. Contains Caffe, Torch7, Keras, Lasagne. CUDA v7.5, CUDNN v3.  
Root Device Type: ebs    Virtualization type: hvm

[Edit AMI](#)

Instance Type

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
g2.2xlarge	26	8	15	1 x 60	Yes	High

[Edit instance type](#)

Security Groups

Security group name	launch-wizard-1
---------------------	-----------------

[Edit security groups](#)

Cancel

Previous

Launch

Feedback

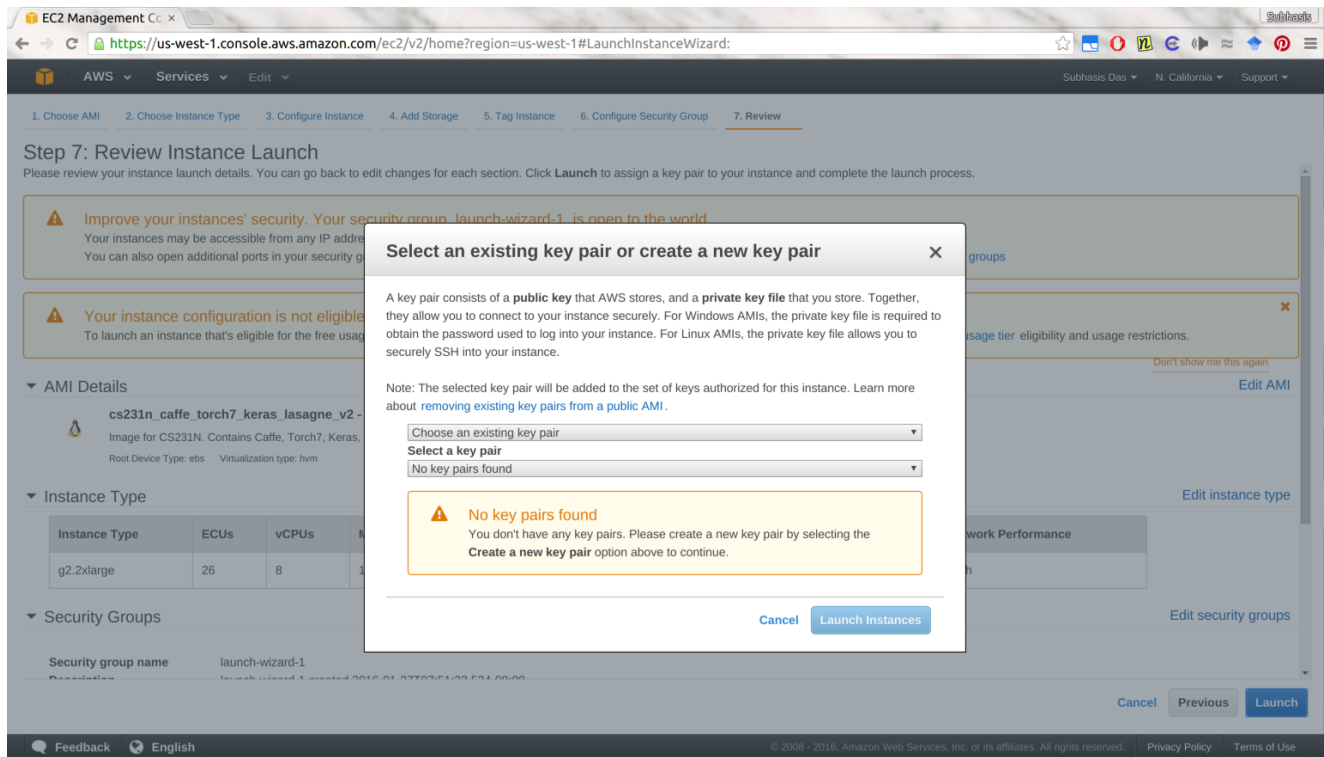
English

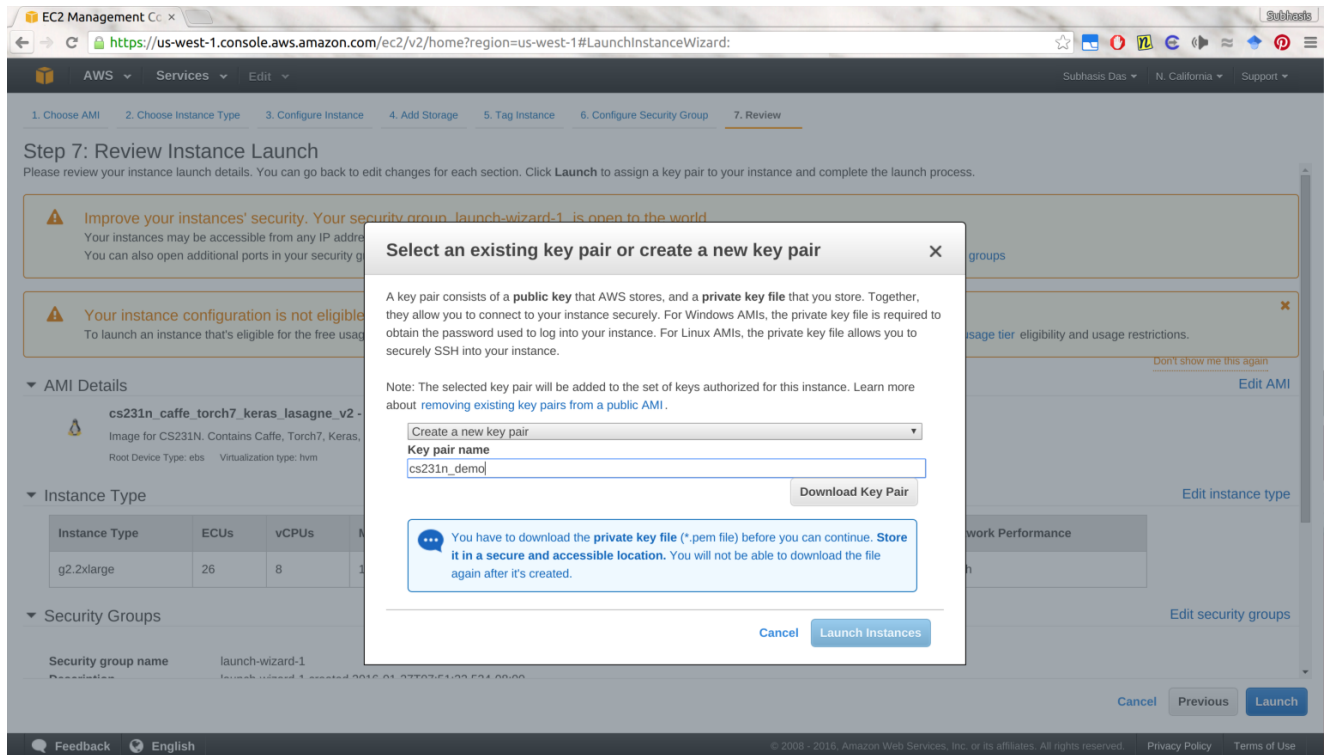
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You will be then prompted to create or use an existing key-pair. If you already use AWS and have a key-pair, you can use that, or alternately you can create a new one by choosing “Create a new key pair” from the drop-down menu and giving it some name of your choice. You should then download the key pair, and keep it somewhere that you won’t accidentally delete. Remember that there is **NO WAY** to get to your instance if you lose your key.





Once you download your key, you should change the permissions of the key to user-only RW, In Linux/OSX you can do it by:

```
$ chmod 600 PEM_FILENAME
```

Here `PEM_FILENAME` is the full file name of the .pem file you just downloaded.

After this is done, click on “Launch Instances”, and you should see a screen showing that your instances are launching:



EC2 Management x

← → <https://us-west-1.console.aws.amazon.com/ec2/v2/home?region=us-west-1#LaunchInstanceWizard>

AWS Services Edit

Subhasis Das N. California Support

### Launch Status

✓ Your instances are now launching

The following instance launches have been initiated: [i-a41511d](#) [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 example, if you exceed the free usage tier).

#### How to connect to your instances

Your instances are launching, and it may take a few minutes until they are in the **running** state, when they will be ready for you to use. Usage hours on your new instances will start immediately and continue to accrue until you stop or terminate your instances. Click **View Instances** to monitor your instances' status. Once your instances are in the **running** state, you can **connect** to them from the Instances screen. [Find out](#) how to connect to your instances.

▼ Here are some helpful resources to get you started

- How to connect to your Linux instance
- Learn about AWS Free Usage Tier

- Amazon EC2: User Guide
- Amazon EC2: Discussion Forum

While your instances are launching you can also

Create status check alarms to be notified when these instances fail status checks. (Additional charges may apply)

Create and attach additional EBS volumes (Additional charges may apply)

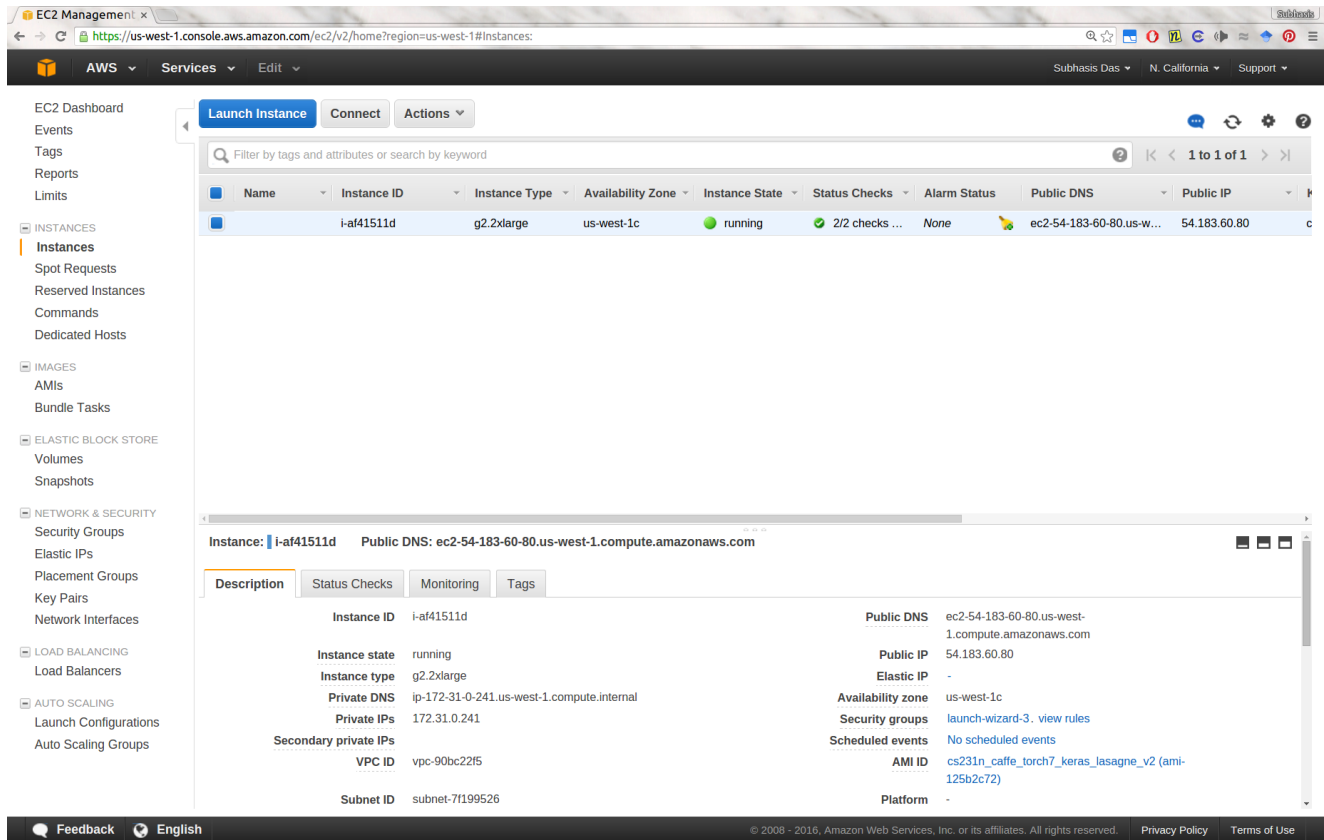
Manage security groups

View Instances

Feedback English

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Click on “View Instances” to see your instance state. It should change to “Running” and “2/2 status checks passed” as shown below within some time. You are now ready to ssh into the instance.



First, note down the Public IP of the instance from the instance listing. Then, do:

```
ssh -i PEM_FILENAME ubuntu@PUBLIC_IP
```

Now you should be logged in to the instance. You can check that Caffe is working by doing:

```
$ cd caffe
$ ./build/tools/caffe time --gpu 0 --model examples/mnist/lenet.prototxt
```

We have Caffe, Theano, Torch7, Keras and Lasagne pre-installed. Caffe python bindings are also available by default. We have CUDA 7.5 and CuDNN v3 installed.

If you encounter any error such as

```
Check failed: error == cudaSuccess (77 vs. 0) an illegal memory access was
```

you might want to terminate your instance and start over again. I have observed this rarely, and I am not sure what causes this.

About how to use these instances:

- The root directory is only 12GB, and only ~ 3GB of that is free.
- There should be a 60GB `/mnt` directory that you can use to put your data, model checkpoints, models etc.
- Remember that the `/mnt` directory won't be persistent across reboots/terminations.
- Stop your instances when are done for the day to avoid incurring charges. GPU instances are costly. Use your funds wisely. Terminate them when you are sure you are done with your instance (disk storage also costs something, and can be significant if you have a large disk footprint).
- Look into creating custom alarms to automatically stop your instances when they are not doing anything.
- If you need access to a large dataset and don't want to download it every time you spin up an instance, the best way to go would be to create an AMI for that and attach that AMI to your machine when configuring your instance (before launching but after you have selected the AMI).

---

 [cs231n](#)

 [cs231n](#)

[karpathy@cs.stanford.edu](mailto:karpathy@cs.stanford.edu)