

Azure Step-by-Step Setup

Key-Points

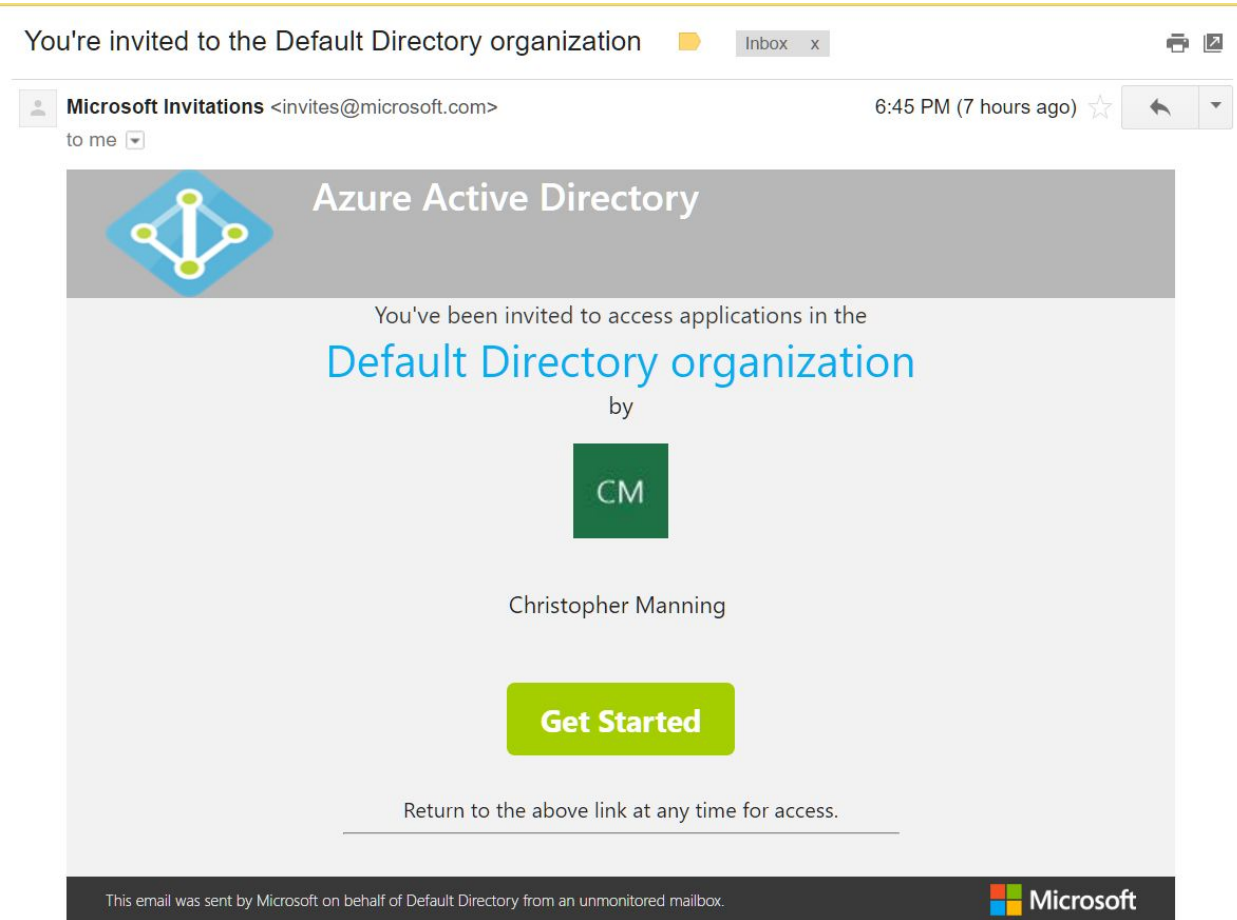
- This guide will walk you through running your code on GPUs in Azure.
- Every team regardless of size has one guaranteed GPU in the datacenter to which you have been assigned. You can check this in the cs224n Grade Viewer or by examining info the default VM that we have provided (keep reading).
- Before we start, it cannot be stressed enough: **do not leave the VM running when you are not using it.**
- If you signed up as a team of 2-3 people, you should see \$60 in credits. If you signed up alone, the total will be \$30. These are for assignment 3, and the quota will be increased later.
- **The expected time from start to finish is 1-2 hours. The most time consuming part will be downloading and installing NVIDIA drivers, CUDA and Tensorflow.**

FAQ

- If your teams have changed and you need to grant/remove access for an individual, follow the directions here:
<https://docs.microsoft.com/en-us/azure/billing/billing-add-change-azure-subscription-administrator>
- Do not install updates using: `sudo apt-get install --upgrade`
 - This might break the CUDA driver installation if the kernel is updated.
- Out of disk space error when unzipping or downloading your dataset.
 - Attach a larger disk to your VM.
<https://docs.microsoft.com/en-us/azure/virtual-machines/virtual-machines-linux-classic-attach-disk>
 - Run `df -h` to see which disks have free space.
 - Store your data to the attached disk. There may be a temporary disk as well; do not store persistent data to it!
- Problems connecting (e.g., using SSH) to the VM
 - Try `ping <vm's ip address>`
 - Try ssh to myth/corn first and then try ssh'ing to the VM from there
 - Try restarting the VM and/or your local machine
 - If all of the previous steps fail, file an Azure support ticket
- Checking Azure credits
 - <https://www.microsoftazuresponsorships.com/>

Creating a Microsoft account

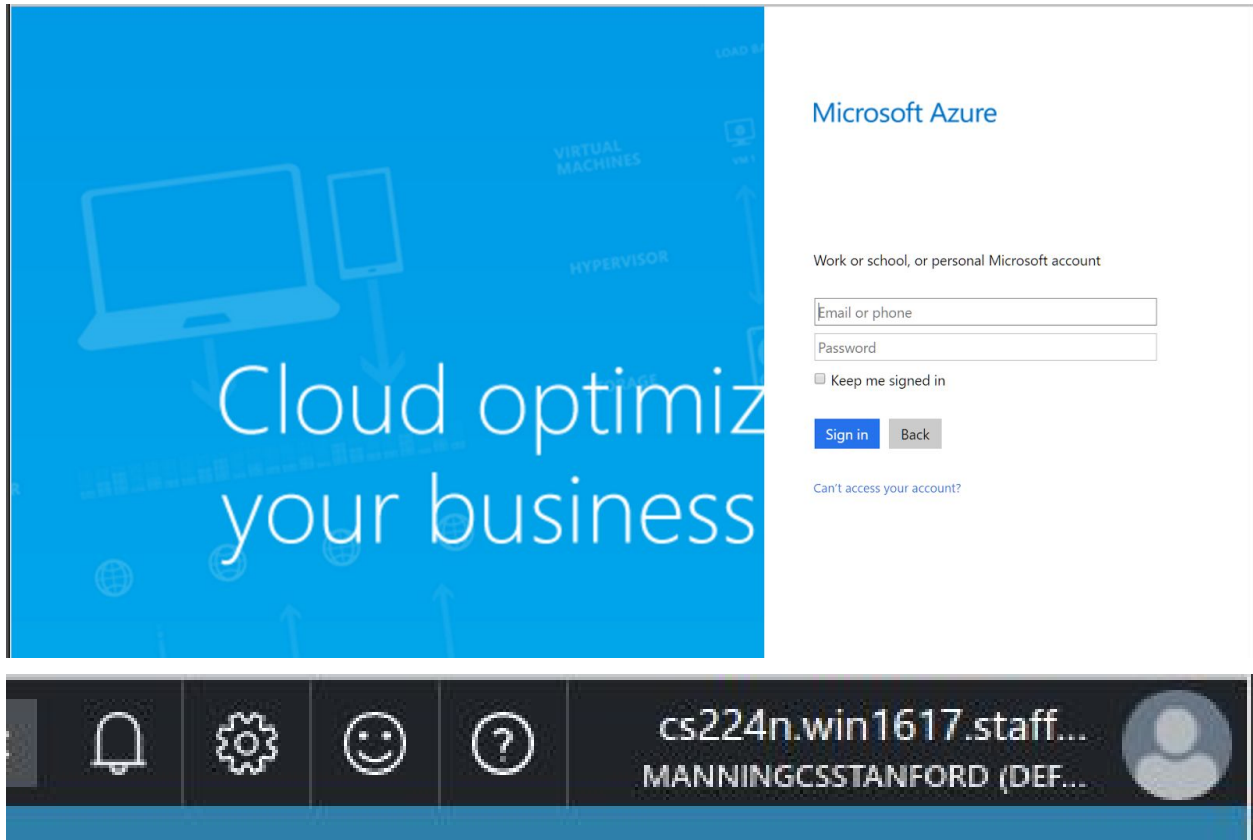
- You should have received an email to your inbox with an invitation to join the Azure subscription with credits.
- Please **follow the instructions** using the email address that received this invitation.



Getting started

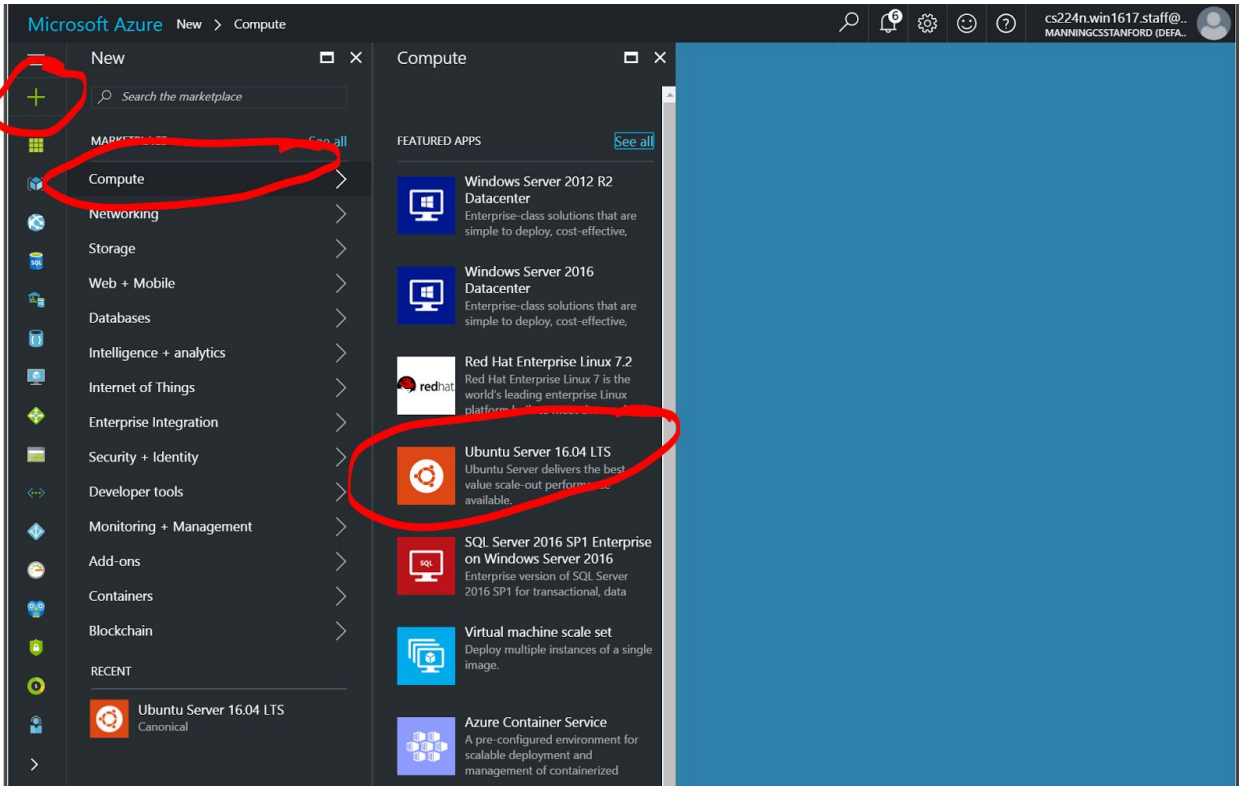
Logging into Azure portal

- Once you have created your account, log in to Azure at: portal.azure.com
- After logging in, you should reach the dashboard page.
- If you have multiple subscriptions (e.g., you previously signed up for a free one), then you must select MANNINGCSSTANFORD etc. by clicking in the top right quarter. If no such option appears see Piazza and the Azure subscriptions issues post (@1830).

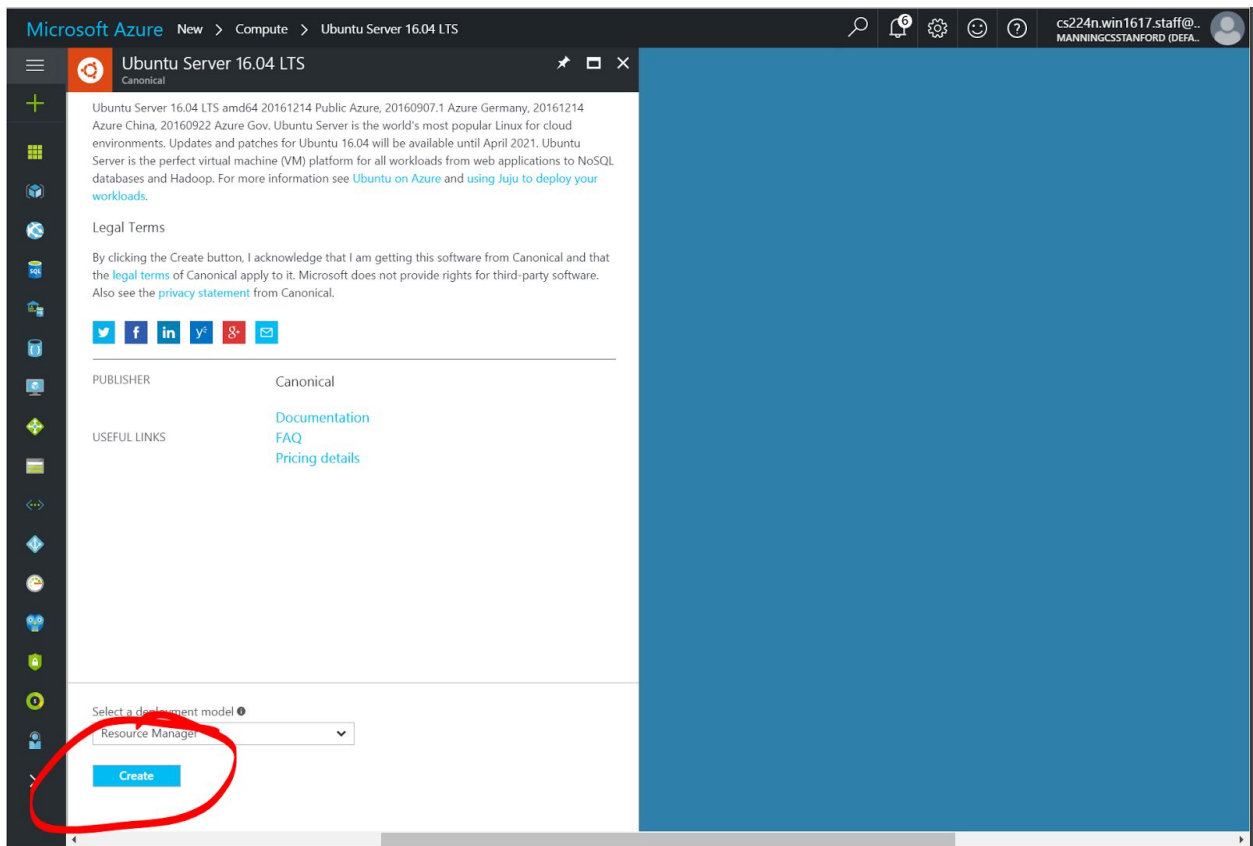


Create a VM

Once you are logged in, click on the + on the left. Select **Ubuntu Server 16.04 LTS**.



The following screen will appear. **Click Create.**



Fill in the name, user, etc for your VM. You must change the storage type from SSD to HDD. Also, you must use the region that you have been allotted.

Check the CS224n grade viewer for which region you have been assigned to.

<https://web.stanford.edu/class/cs224n/cgi-bin/protected/scores.php>

The screenshot shows the 'Create virtual machine' wizard in the Microsoft Azure portal, specifically the 'Basics' tab. The left sidebar shows the progression: 1 Basics (selected), 2 Size, 3 Settings, and 4 Summary. The main form contains the following fields:

- Name:** cs224n-gpu
- VM disk type:** HDD (highlighted with a red circle)
- User name:** cs224n
- Authentication type:** SSH public key (with a 'Password' button)
- Password:** (masked with dots)
- Confirm password:** (masked with dots)
- Subscription:** cs224ntas
- Resource group:** Create new (selected), cs224n-gpu
- Location:** South Central US (highlighted with a red circle)

An 'OK' button is at the bottom of the form.

View all (click the button) of the options and **select NV6** by scrolling through the list. **If NV6 does not show up, then you probably chose the wrong region or chose SSD in the previous page.** Also, if you do not select NV6 (or any of the NV/NC options), then you are not using a GPU instance and the setup scripts later will fail.

Microsoft Azure New > Compute > Ubuntu Server 16.04 LTS > Create virtual machine > Choose a size

Create virtual machine

Choose a size

Browse the available sizes and their features

1 Basics Done

2 Size Choose virtual machine size

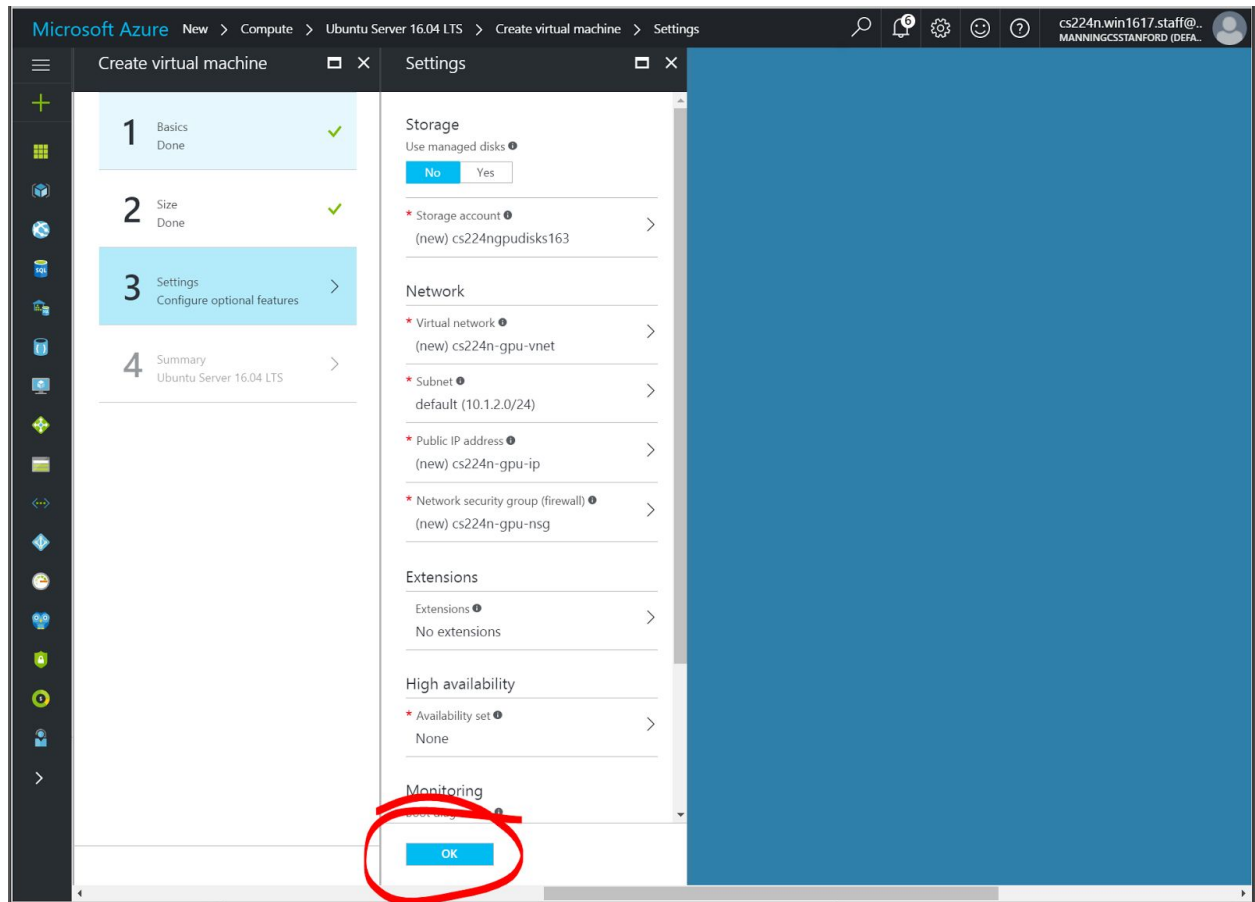
3 Settings Configure optional features

4 Summary Ubuntu Server 16.04 LTS

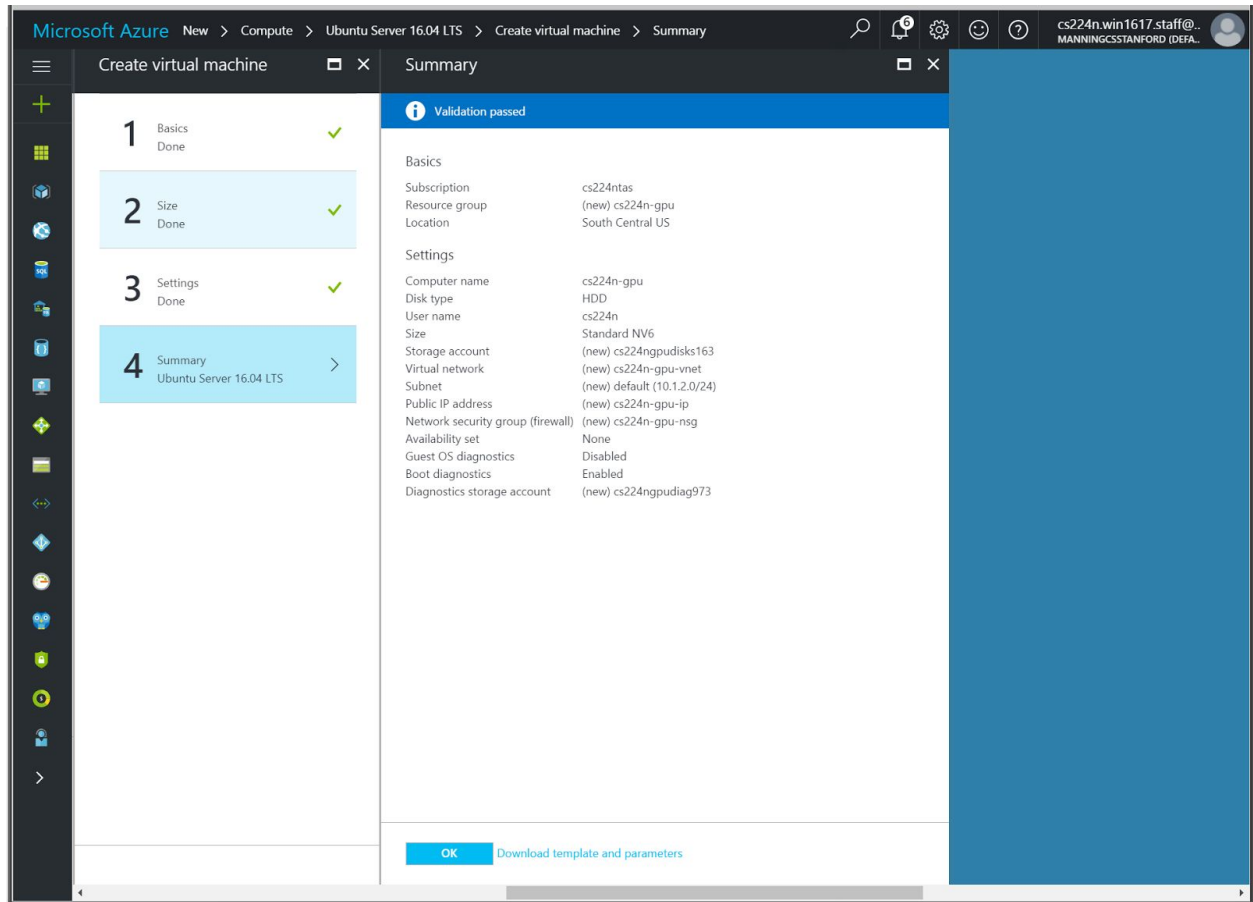
1,743.19 USD/MONTH (ESTIMATED)		1,431.46 USD/MONTH (ESTIMATED)		1,917.29 USD/MONTH (ESTIMATED)	
NV6 Standard		NV12 Standard		NV24 Standard	
6 Cores	12 Cores	12 Cores	24 Cores	24 Cores	
56 GB	112 GB	112 GB	224 GB	224 GB	
8 Data disks	16 Data disks	16 Data disks	32 Data disks	32 Data disks	
8x500 Max IOPS	16x500 Max IOPS	16x500 Max IOPS	32x500 Max IOPS	32x500 Max IOPS	
380 GB Local SSD	680 GB Local SSD	680 GB Local SSD	1440 GB Local SSD	1440 GB Local SSD	
Load balancing	Load balancing	Load balancing	Load balancing	Load balancing	
1x M60 Graphics	2x M60 Graphics	2x M60 Graphics	4x M60 Graphics	4x M60 Graphics	
855.60 USD/MONTH (ESTIMATED)		1,711.20 USD/MONTH (ESTIMATED)		3,422.40 USD/MONTH (ESTIMATED)	
NC6 Standard		NC12 Standard		NC24 Standard	
6 Cores	12 Cores	12 Cores	24 Cores	24 Cores	
56 GB	112 GB	112 GB	224 GB	224 GB	
8 Data disks	16 Data disks	16 Data disks	32 Data disks	32 Data disks	
8x500 Max IOPS	16x500 Max IOPS	16x500 Max IOPS	32x500 Max IOPS	32x500 Max IOPS	
380 GB Local SSD	680 GB Local SSD	680 GB Local SSD	1440 GB Local SSD	1440 GB Local SSD	
Load balancing	Load balancing	Load balancing	Load balancing	Load balancing	
1x K80 Graphics	2x K80 Graphics	2x K80 Graphics	4x K80 Graphics	4x K80 Graphics	
803.52 USD/MONTH (ESTIMATED)		1,607.04 USD/MONTH (ESTIMATED)		3,214.08 USD/MONTH (ESTIMATED)	
F15 Standard		F25 Standard		F45 Standard	

Select

Click OK.



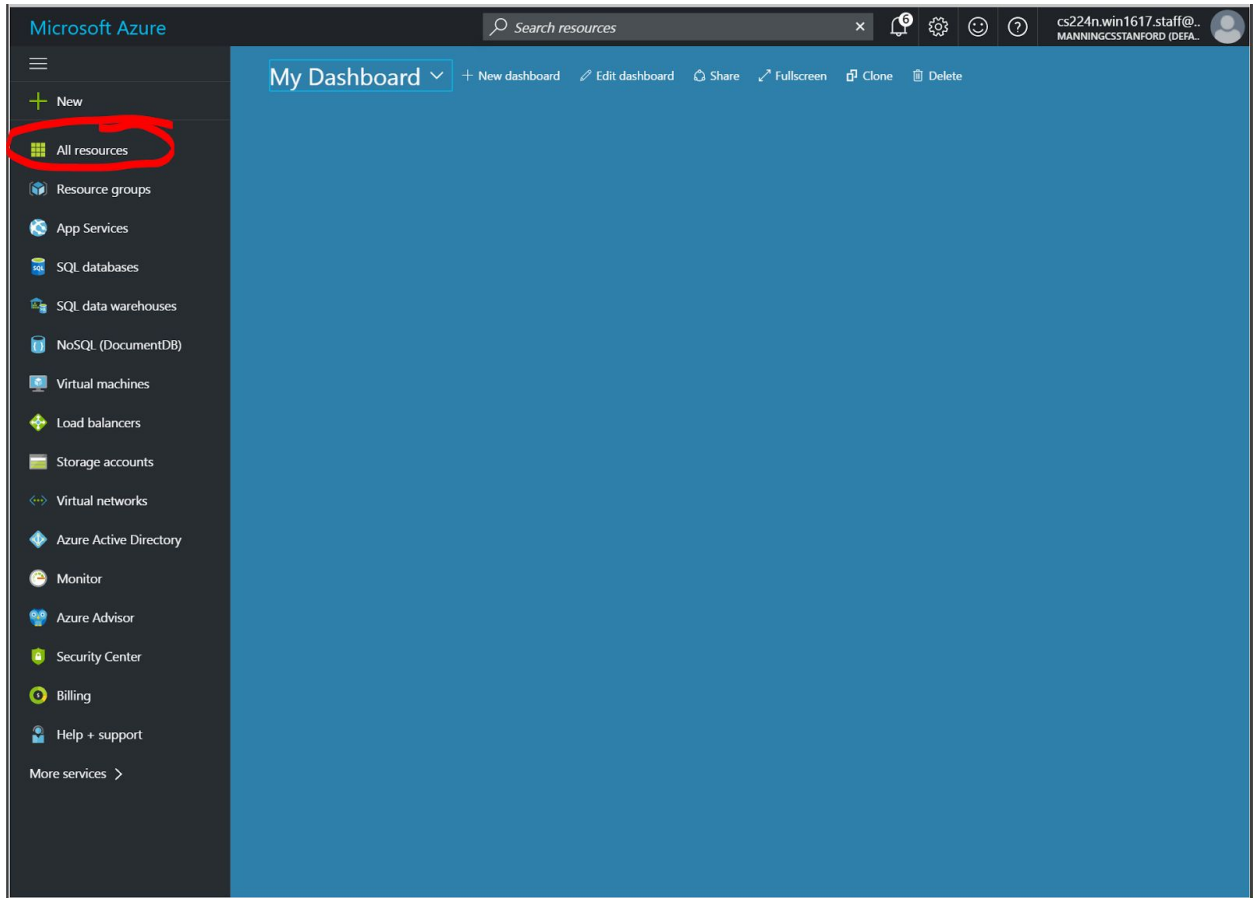
Wait for the configuration to validate and then click OK.



Using the VM

Finding your VM

Click **all resources** and select your VM. Our subscription has many, but yours will only have one if you just followed the setup instructions.



The screenshot displays the Microsoft Azure portal interface. On the left, the 'All resources' list shows various VMs and network components, with 'cs224n-gpu3' selected and highlighted by a red circle. The main pane shows the details for 'cs224n-gpu3', a Virtual machine. The 'Essentials' section indicates the VM is 'Running' in the 'South Central US' location. The 'Monitoring' section shows a graph for 'CPU percentage' with a current value of 1.3%.

Spinning up your VM

If you just completed the previous part and the VM has finished deploying, then your VM should be running already.

Microsoft Azure All resources > cs224n-gpu

cs224n-gpu Virtual machine

Essential

Resource group [change](#)
cs224ngpus

Status
Stopped (deallocated)

Location
South Central US

Subscription name [change](#)
Microsoft Azure Sponsorship 2

Subscription ID
8736134f-1004-49e9-b479-679b3692432a

Computer name
-

Operating system
Linux

Size
Standard NV6 (6 cores, 56 GB memory)

Public IP address/DNS name label
[cs224ngpus-pip/<none>](#)

Virtual network/subnet
[cs224ngpus-vnet/Subnet](#)

Monitoring

CPU percentage

100%
80%
60%
40%
20%
0%

1:15 AM 1:30 AM 1:45 AM 2 AM

PERCENTAGE CPU
10 %

Connecting (SSH) to your VM

Once your VM is started (it may take a few minutes). Click connect and follow the instructions.

Microsoft Azure cs224n-gpu3

cs224n-gpu3
Virtual machine

Search (Ctrl+/)

Connect Start Restart Stop Delete

To connect to your Linux virtual machine using SSH, use the following command: `ssh cs224n@13.65.215.150`

OK

Subscription name (change)
cs224ntas

Subscription ID
8736134f-1004-49e9-b479-679b3692432a

Public IP address/DNS name label
13.65.215.150/<none>

Virtual network/subnet
cs224n-gpu3-vnet/default

Monitoring

CPU percentage

100%
80%
60%
40%
20%
0%

3:30 PM 3:45 PM 4 PM 4:15 PM

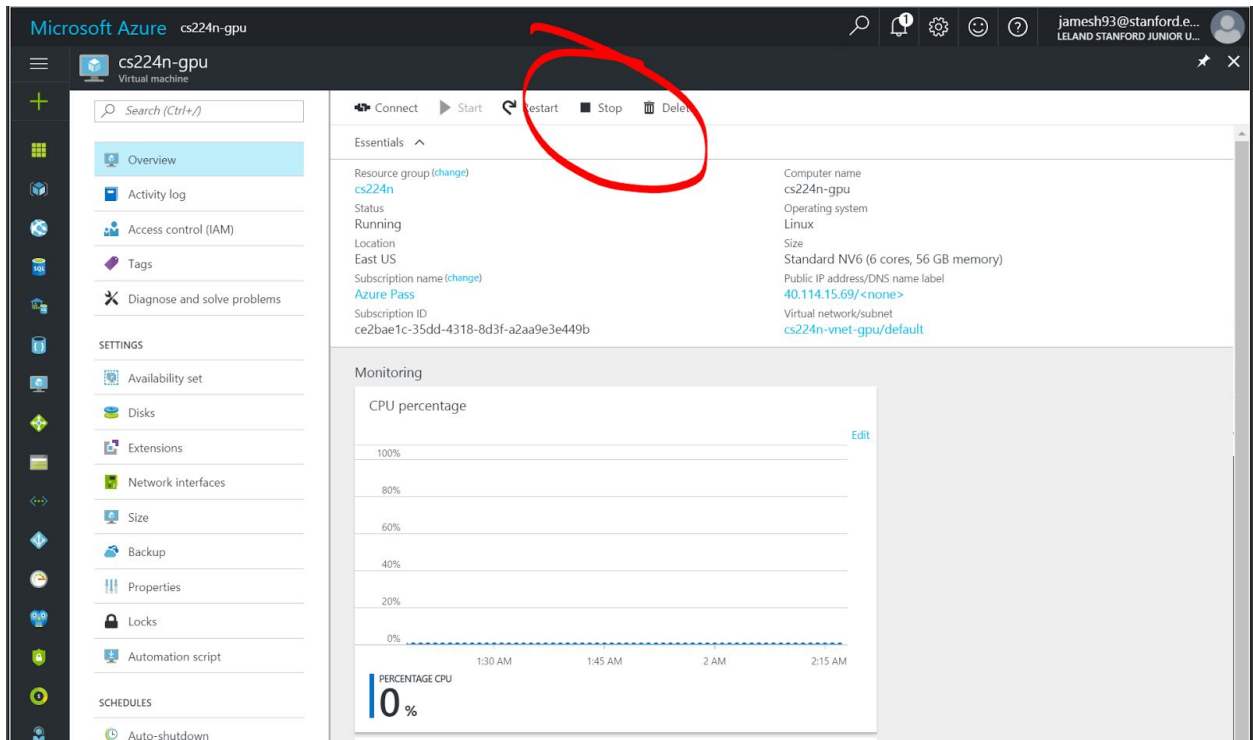
PERCENTAGE CPU
0.35%

Disk read and write

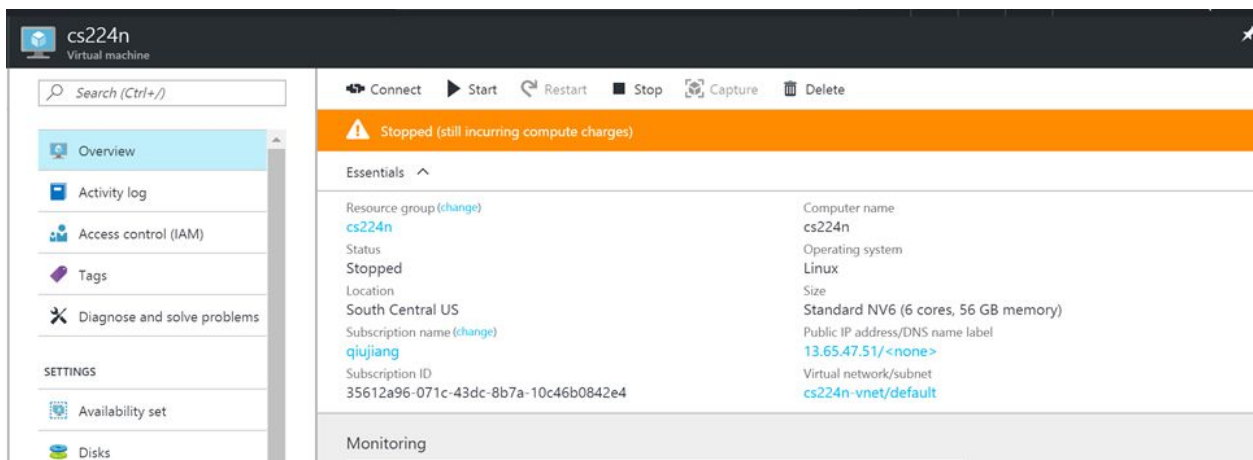
600MB
500MB
400MB

Stopping your VM

Once you are done working, stop your VM. You must do this or your credits will disappear at a rate of \$1+ every hour the VM is on.



Make sure your VM is fully stopped. **If you see “stopped still incurring compute charges”, you must hit stop again.**



Completing CUDA/Tensorflow setup

You will need to SSH into your VM.

Now we will finish installing CUDA and Tensorflow dependencies. There are two scripts that you will need to run and your VM will need to reboot in the between running them.

First, in your VM do:

```
git clone https://jhong1@bitbucket.org/jhong1/azure-gpu-setup.git
cd azure-gpu-setup
```

You should see the following if you use **ls -all**

```
cs224n@cs224n-gpu3:~/azure-gpu-setup$ ls -all
total 32
drwxrwxr-x 3 cs224n cs224n 4096 Feb 23 00:45 .
drwxr-xr-x 7 cs224n cs224n 4096 Feb 23 00:25 ..
drwxrwxr-x 8 cs224n cs224n 4096 Feb 23 00:45 .git
-rw-rw-r-- 1 cs224n cs224n    2 Feb 23 00:03 .gitignore
-rwxrwxr-x 1 cs224n cs224n  722 Feb 23 00:03 gpu-setup-part1.sh
-rwxrwxr-x 1 cs224n cs224n 1566 Feb 23 00:45 gpu-setup-part2.sh
-rw-rw-r-- 1 cs224n cs224n  311 Feb 23 00:45 gpu-test.py
-rw-rw-r-- 1 cs224n cs224n  132 Feb 23 00:03 README
cs224n@cs224n-gpu3:~/azure-gpu-setup$
```

Run `gpu-setup-part1.sh` using the following command:

```
./gpu-setup-part1.sh
```

This will install some libraries, fetch and install NVIDIA drivers, and trigger a reboot. (The command will take some time to run.)

Once your VM has finished restarting. SSH into the VM again. Navigate to the **azure-gpu-setup** directory again. Run the command:

```
./gpu-setup-part2.sh
```

This script installs the CUDA toolkit, CUDNN, and Tensorflow. It also sets the required environment variables. Once the script finishes, we must do:

```
source ~/.bashrc
```

This ensures that the shell will use the updated environment variables. Now, to test that Tensorflow and the GPU is properly configured, run the gpu test script by executing:

```
python gpu-test.py
```

You should see the following if all went well.

```

cs224n@cs224n-gpu3:~/azure-gpu-setup$ python gpu-test.py
...loaded python test [now attempting to list GPUs]
I tensorflow/stream_executor/dso_loader.cc:128] successfully opened CUDA library libcublas.so locally
I tensorflow/stream_executor/dso_loader.cc:128] successfully opened CUDA library libcudnn.so locally
I tensorflow/stream_executor/dso_loader.cc:128] successfully opened CUDA library libcufft.so locally
I tensorflow/stream_executor/dso_loader.cc:128] successfully opened CUDA library libcuda.so.1 locally
I tensorflow/stream_executor/dso_loader.cc:128] successfully opened CUDA library libcurand.so locally
I tensorflow/core/common_runtime/gpu/gpu_device.cc:885] Found device 0 with properties:
name: Tesla M60
major: 5 minor: 2 memoryClockRate (GHz) 1.1775
pciBusID b620:00:00.0
Total memory: 7.93GiB
Free memory: 7.86GiB
I tensorflow/core/common_runtime/gpu/gpu_device.cc:906] DMA: 0
I tensorflow/core/common_runtime/gpu/gpu_device.cc:916] 0: Y
I tensorflow/core/common_runtime/gpu/gpu_device.cc:975] Creating TensorFlow device (/gpu:0) -> (device: 0, name: Tesla M60,
pci bus id: b620:00:00.0)
cs224n@cs224n-gpu3:~/azure-gpu-setup$

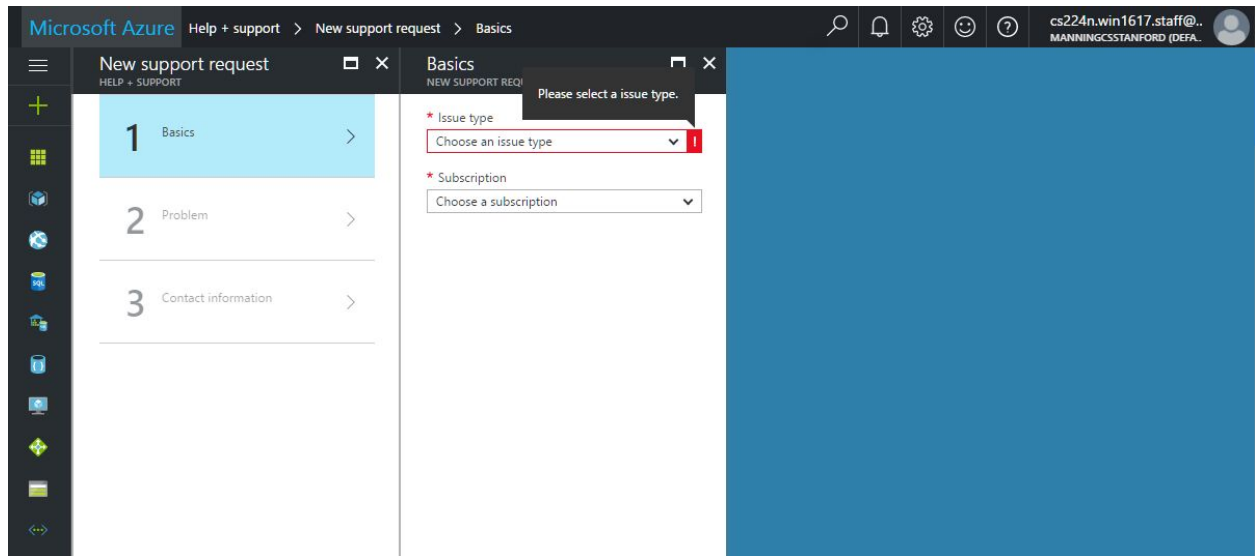
```

Filing a support ticket

Click on the help icon in the left sidebar and select new support request.

The screenshot shows the Microsoft Azure Help + support interface. In the left sidebar, the 'Help + support' menu is expanded, and the 'New support request' option is highlighted with a red circle. The main content area displays 'Have you tried one of these?' with three cards: 'Get started', 'Documentation', and 'Billing FAQ'. Below these is the 'Community' section with links to 'MSDN Forums', 'Stackoverflow', and '@AzureSupport'. At the bottom, there is a 'Recent support requests' section with a table header: SUPPORT REQUEST, ID, RESOURCE TYPE, UPDATED, and SUBSC. The table is currently loading.

Follow the on screen instructions.



General recommendations

We **highly suggest** the following for using the GPU instances:

- Develop and debug your code locally and use **scp** to copy your code to the VM to run for the long training steps.
- Save your work often and keep a local copy.
- Be mindful of when your instance is running and shut it off when you are not actively using it.