

Azure Guide for CS224n

This guide will help you setup and use Azure Virtual Machines for your final project. Before we start, it cannot be stressed enough: **do not leave your machine running when you are not using it**. The expected time to complete the setup guide is **15 min** to **1 hour**, depending on which configuration you opt to take.

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Your Azure subscription for this class

Microsoft has generously agreed to sponsor CS224n, and has provided us with Azure credit to distribute to CS224n students. We expect that there will be enough credit for teams to run as many experiments as they need for their projects. **However, it's very important for students to manage their credit carefully, so that they can get the most out of it (see next section).**

You should receive an email on Tuesday or Wednesday (Feb 13/14) with an invitation to claim your initial Azure credit of **\$150**. Credit has been assigned per team (according to the teams you gave us in your project proposal), with the same amount allocated regardless of team size. The \$150 corresponds to about **130 hours**, or slightly over **5 days** on a NV6 machine.

The \$150 is an initial allocation. If you use it up running *genuine* experiments, that's **perfectly OK and completely expected** – we expect that most teams will need more credit, and we have plenty more to give you. However, please don't use up your credit by leaving your machine running when you're not using it! Nor should you use up many hours of credit using your VM to write your code (see next section).

When you run out of credit (or before you run out), you can ask us for more on Piazza using the "azure" tag.

Best practices for managing your Azure credit

Azure virtual machines are charged at a flat rate, for each minute that they are turned on. This is irrespective of:

- whether you are ssh'd to the machine at that time
- whether you are running any processes on the machine at that time
- the computational intensity of the the processes you're running
- whether you're using GPUs

Therefore, the most important thing you need to do to, to manage your Azure credit, is to **carefully turn your VM on and off just when you need it**. If you are using a NV6 VM, it is charged at **\$1.14/hour** while it is turned on.

We advise you to **develop your code on your local machine** (for example your laptop with the CPU version of TensorFlow installed) for debugging (i.e., work on your new code until you are able to complete several training iterations without errors), then run your code on your Azure VM when it's time to train on a GPU.

*Note: we have provided you with a [Practical Tips for Final Projects](#) document which gives tips on how to sync your code between your laptop and your VM, how to use *tmux* to manage your sessions in your VM, and how to monitor your memory/CPU/GPU usage.*

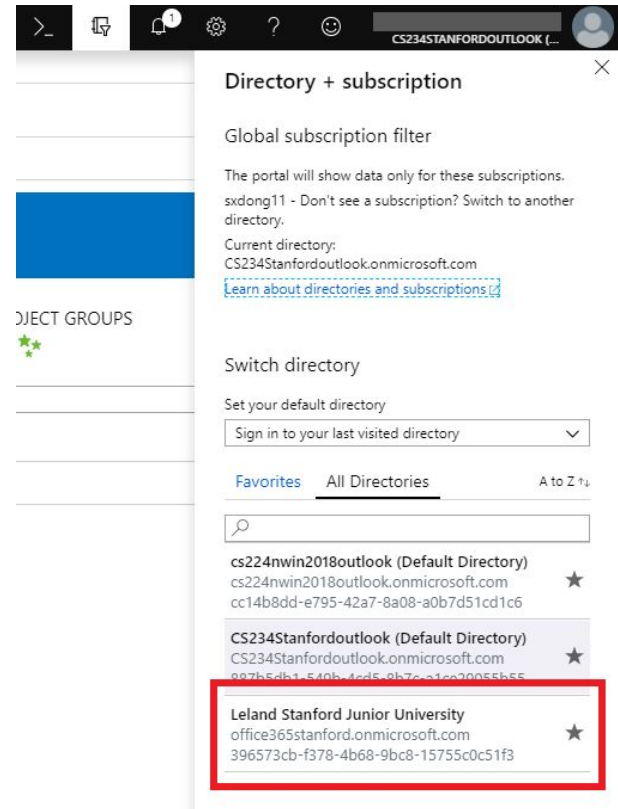
Azure also has an [auto-shutdown feature](#) that allows you to specify a time when you want your VM to turn off - this allows you to turn off the machine at a time when you are unable to do it manually. For example, if you start an experiment at 9 p.m., and you want to stop it after 5 hours, you can set auto-shutdown to turn your VM off at 2 a.m. This will prevent you spending credit that you would have otherwise spent until you woke up many hours later to turn off the VM.

See FAQs of this document to learn how to check your balance.

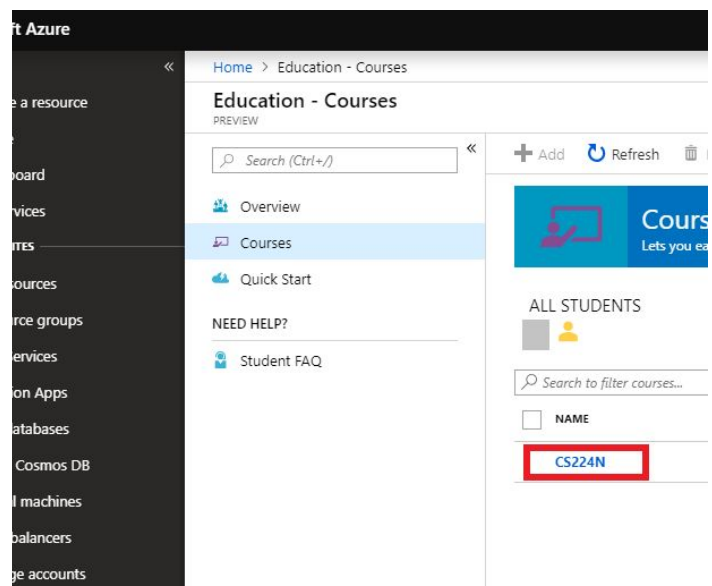
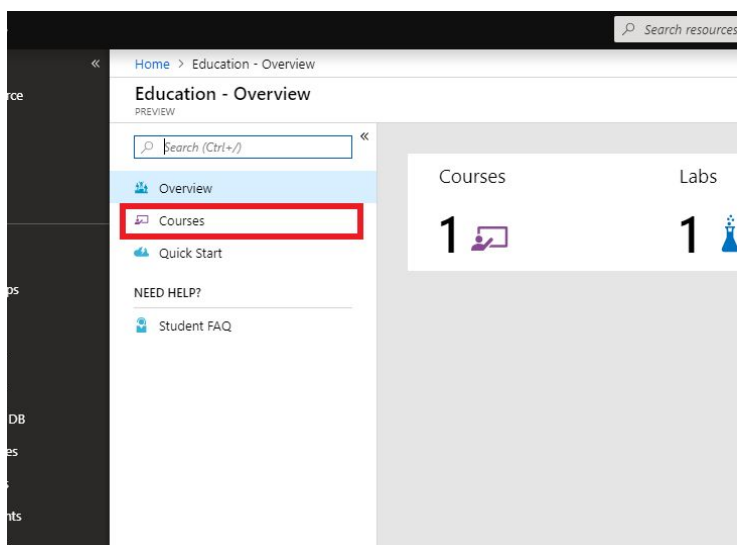
Configuring your Azure VM

Creating an Azure account (5 min)

Login to your account at portal.azure.com using your stanford.edu email address and make sure your **Active Directory** (shown under your email address in the top right corner) is **Leland Stanford Junior University**. If you have multiple subscriptions (e.g. you're sharing the same email account for CS 224N with another course using Azure like CS 234 or CS 273B), click on the **Account Menu** in the top-right corner, select **Switch directory**, and choose **Leland Stanford Junior University**.



Go to portal.azure.com/#blade/Microsoft_Azure_Education/EducationMenuBlade/overview. Click on **Courses**. You should see **CS224N**(if you are working on assignments) or **CS224N Project** (if you are working on the project) in your list of courses. If you don't see the course(s) for CS224N, see Piazza for detailed instructions.

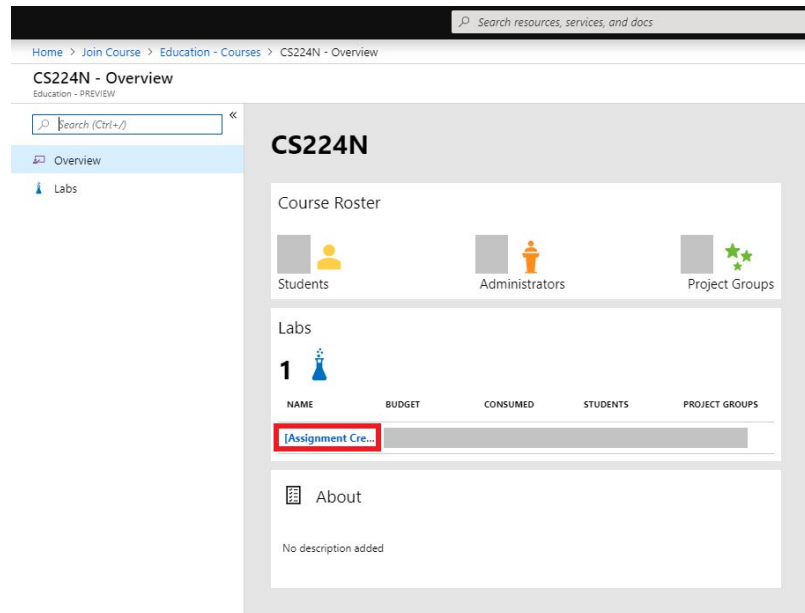


Activating your subscription (5 min)

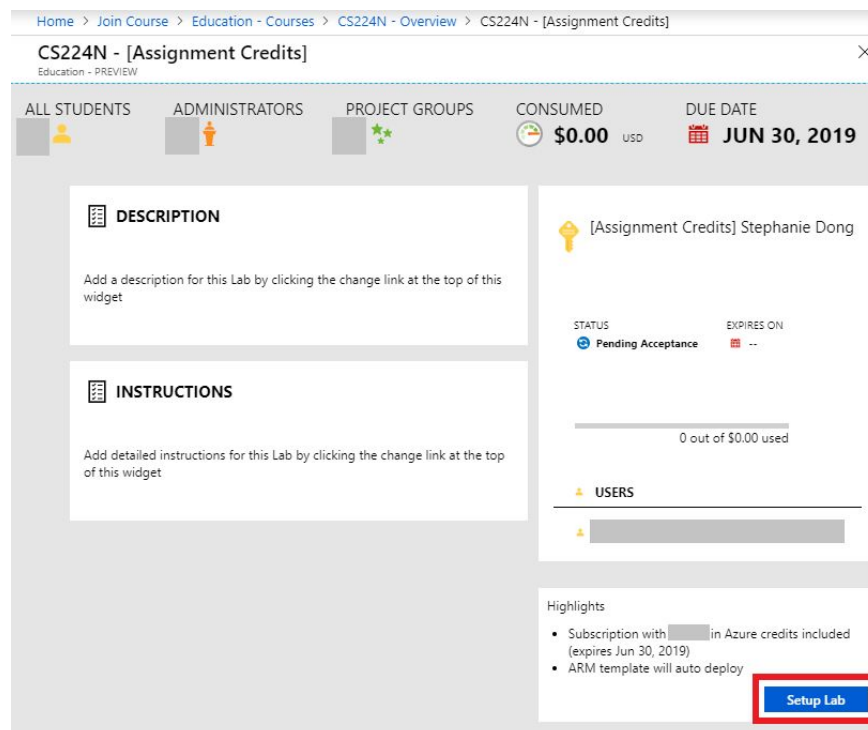
Click on **CS224N** or **C224N Project** as applicable. Under **Labs**, is where you will see your Azure credit subscriptions. You will be receiving credits for assignments and project separately.

If you are following this guide for assignments that require Azure, you should see **[Assignment Credits]**. Click on **[Assignment Credits]**.

If you are following this guide for the final project, you should see **[Project Credits]**. Click on **[Project Credits]**.



You should be brought to an overview page for your Azure subscription for either the assignments or the project. Click on **Setup Lab** to activate your subscription. If you don't see the option for **Setup Lab**, and your **STATUS** says **Accepted**, then you have already done this step.



If this is your first time activating a subscription under Azure, you may be brought to the agreement page. **Fill in your information** and click **Next** and **Sign up**. It may take a few minutes for the next page to load after you click **Sign up**.

privacy statement and [subscription agreement](#)'. At the bottom of this section is a blue button labeled 'Next', which is highlighted with a red rectangle. The footer contains links for 'Feedback', 'Privacy & Cookies', 'Trademarks', 'Legal', 'Support', and 'Give us feedback', along with a copyright notice '© 2019 Microsoft'."/>

Microsoft Azure Sign out

Microsoft Azure Sponsorship 2

This offer provides customers sponsored access to Microsoft Azure for a set monetary limit and time duration, whichever is reached first.

1 About you

Country/Region ?

First name

Last name

Email address for important notifications ?

Phone

Example: (425) 555-0100

By proceeding you acknowledge the [privacy statement](#) and [subscription agreement](#)

Next

2 Agreement

subscription agreement, [offer details](#), and [privacy statement](#)'. Below this is a paragraph: 'I will receive information, tips, and offers from Microsoft or selected partners about Azure, including Azure Newsletter, Pricing updates, and other Microsoft products and services.' At the bottom of this section is a blue button labeled 'Sign up', which is highlighted with a red rectangle. The footer contains links for 'English', 'Privacy & Cookies', 'Trademarks', 'Legal', 'Support', and 'Give us feedback', along with a copyright notice '© 2019 Microsoft'."/>

Microsoft Azure Sign out

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2 Agreement

☐ I agree to the [subscription agreement](#), [offer details](#), and [privacy statement](#)

I will receive information, tips, and offers from Microsoft or selected partners about Azure, including Azure Newsletter, Pricing updates, and other Microsoft products and services.

Sign up

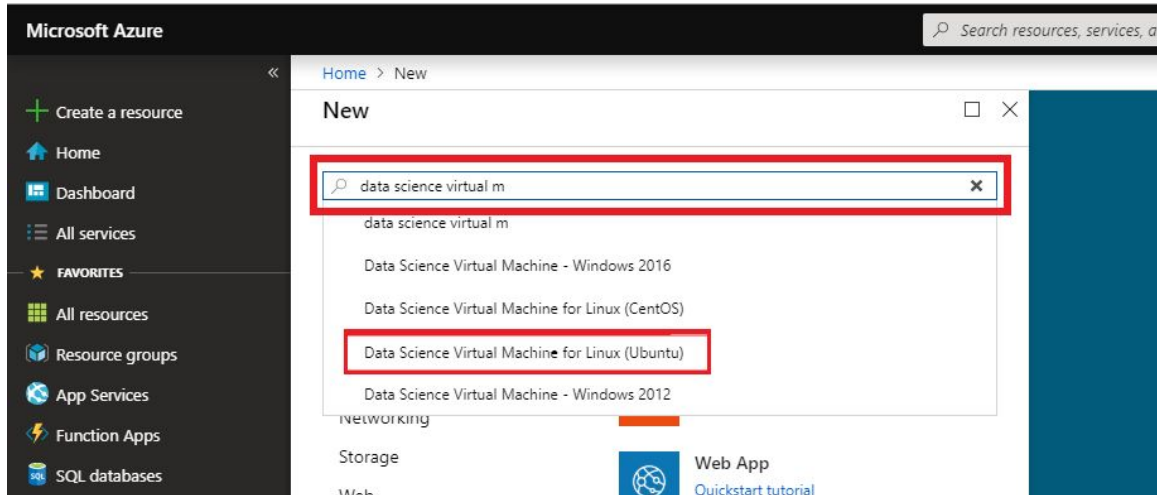
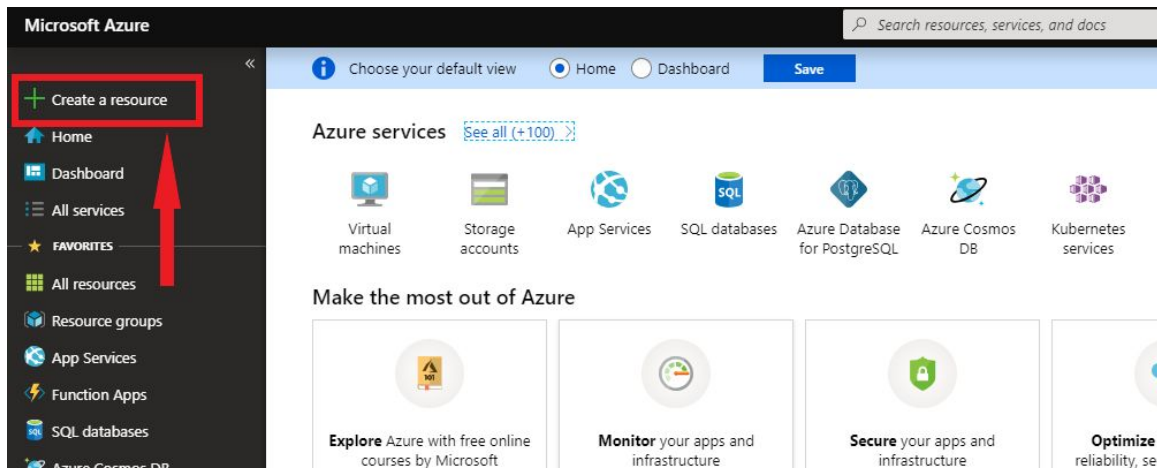
English Privacy & Cookies Trademarks Legal Support Give us feedback © 2019 Microsoft

Creating a VM (15-45 min)

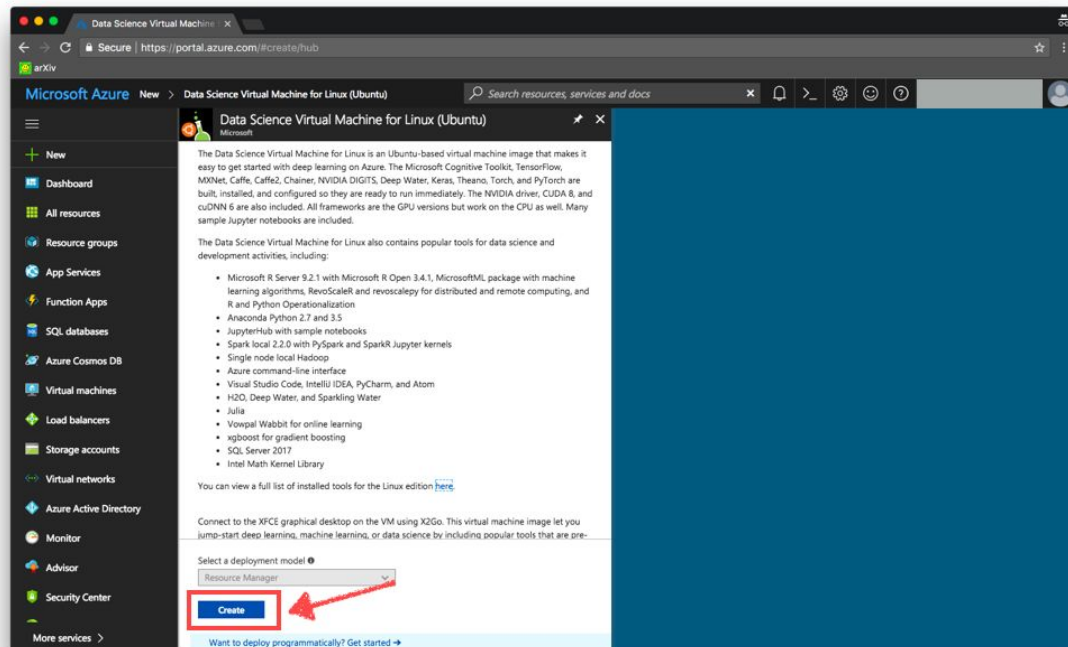
Using a predefined image (15 min)

If you use a predefined image, we recommend using the **Data Science Virtual Machine for Linux (Ubuntu)** image, which comes installed with Python 3.5, pytorch-gpu, tensorflow-gpu, CUDA, and cuDNN.

1. Click the **+ Create a Resource** in the left sidebar menu and type in **Data Science Virtual Machine for Linux (Ubuntu)**. It's essential that you select the Ubuntu and **not** CentOS distribution.



2. Click **Create**.



3. Fill in the following fields:

- **Subscription.**
 - i. If this is your first time using Azure or Azure for CS224N on this account, you should only see **Microsoft Azure Sponsorship 2**. Choose this option
 - ii. Otherwise, if you are working on assignments and you see the subscription starting with **[Assignment Credits]**, choose this one.
 - iii. If you are working on projects, you should see an option starting with **[Project Credits]**. Choose this one.
 - iv. The VM that you create will use Azure credits from the subscription chosen, and sometimes may not be transferable to a different subscription. If you don't see the subscription that you are looking for, make sure you follow the section above on *Activating your subscription* carefully. If that still does not resolve your issue, post on Piazza for assistance.
- **Resource group.** If you create multiple VMs, those within the same resource group will share resources. Unless you create multiple VMs, this configuration does not matter, so click **Create New** and type **cs224n-gpu**.
 - i. **IMPORTANT**. If you are switching to a new subscription (for example from **[Assignment Credits]** to **[Project Credits]**, you need to create a new resource group.
- **Virtual Machine Name.** This will be the name of your VM. You can name it whatever you want. I named mine **cs224-dev-VM1**
- **Region.** Choose **East US**
- **Image.** **IMPORTANT** Choose **Data Science Virtual Machine for Linux (Ubuntu)**

- **Size.** Click on **Change size** and search for **NV6**. Select **NV6**. You may need to **clear all filters**. See screenshots below.
- **User name.** This will be the username used on the VM. You can name yourself whatever you want. I named myself **steph**. Since it's most convenient for all of the people in your group to share one user account, it might make more sense to use the name **group** or **team** or **<team-name>** like **purple-elephants**. (I bet your favorite language model didn't expect to see purple elephants in an Azure walkthrough...)
- **Authentication type.** If you are not familiar with SSH keys, authenticate using password; otherwise, choose whichever you prefer. I chose a secret password.

Microsoft Azure

Home > New > Data Science Virtual Machine for Linux (Ubuntu) > Create a virtual machine

Create a virtual machine

Basics Disks Networking Management Guest config Tags Review + create

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own custom image. Complete the Basics tab then Review + create to provision a virtual machine with default parameters or customize. Looking for classic VMs? [Create VM from Azure Marketplace](#)

PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize resources.

* Subscription: Microsoft Azure Sponsorship 2

* Resource group: (New) cs224n-gpu [Create new](#)

INSTANCE DETAILS

* Virtual machine name: cs224n-dev-VM1

* Region: East US

Availability options: No infrastructure redundancy required

* Image: Data Science Virtual Machine for Linux (Ubuntu) [Browse all images and disks](#)

* Size: Standard DS3 v2 [Change size](#)

ADMINISTRATOR ACCOUNT

[Authentication home](#)

Select a VM size

Browse available virtual machine sizes and their features

Search by VM size... [Clear all filters](#)

Size: Small (0-4) Generation: Current Family: General purpose

Showing 12 of 197 VM sizes | Subscription: Microsoft Azure Sponsorship 2 | Region: East US

VM SIZE	OFFERING	FAMILY	VCPUS	RAM (GB)	DATA DISKS
B1ms	Standard	General purpose	1	2	2
B1s	Standard	General purpose	1	1	2
B2ms	Standard	General purpose	2	8	4
B2s	Standard	General purpose	2	4	4
B4ms	Standard	General purpose	4	16	8
D2s_v3	Standard	General purpose	2	8	4
D4s_v3	Standard	General purpose	4	16	8
DS1_v2	Standard	General purpose	1	3.5	4
DS2_v2	Standard	General purpose	2	7	8
DS3_v2	Standard	General purpose	4	14	16
DS2_v2 @	Promo	General purpose	2	7	8
DS3_v2 @	Promo	General purpose	4	14	16

Search resources, services, and docs

Search by VM size... [Restore default filters](#)

[Add filter](#)

Showing 1 of 197 VM sizes | Subscription: Microsoft Azure Sponsorship 2 | Region: East US | Current size: Standard_DS3_v2

VM SIZE	OFFERING	FAMILY	VCPUS	RAM (GB)	DATA DISKS	MAX IOPS	TEMPORARY STORAGE	PREMIUM DISK SUPPORT	COST/MONTH (EST.)
NV6	Standard	GPU	6	56	24	20000	380 GB	No	\$848.16

[Select](#)

Prices presented are estimates in your local currency that include Azure infrastructure applicable software costs, as well as any discounts for the subscription and location. Final charges will appear in your local currency in cost analysis and billing views. [View Azure pricing calculator](#).

4. Double check the fields outlined in red below are filled in according to the spec above. Click **Review + create**.

Search resources, services, and docs

Home > New > Data Science Virtual Machine for Linux (Ubuntu) > Create a virtual machine

Create a virtual machine

Warning: Changing Basic options may reset selections you have made. Review all options prior to creating the virtual machine.

PROJECT DETAILS
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

* Subscription Microsoft Azure Sponsorship 2

* Resource group cs224n-gpu
[Create new](#)

INSTANCE DETAILS

* Virtual machine name cs224n-dev-VM1

* Region East US

Availability options No infrastructure redundancy required

* Image Data Science Virtual Machine for Linux (Ubuntu)
[browse all images and disks](#)

* Size **Standard NV6**
6 vcpus, 56 GB memory
[Change size](#)

ADMINISTRATOR ACCOUNT

Authentication type ☒ Password ☐ SSH public key

* Username steph

* Password

* Confirm password

Review + create Previous Next: Disks >

5. Wait for the configuration to validate. Click **Create**. Sometimes, the validation errors. If you don't see **Validation passed**, click on **Basics**, confirm the fields you filled in from the previous step are still there and click **Review + create** to try again.

Microsoft Azure

Search resources, services, and docs

Home > New > Data Science Virtual Machine for Linux (Ubuntu) > Create a virtual machine

Create a virtual machine

✓ Validation passed

Basics Disks Networking Management Guest config Tags Review + create

PRODUCT DETAILS

Data Science Virtual Machine for Linux (Ubuntu) Not covered by credits
by Microsoft
[Terms of use](#) | [Privacy policy](#)
0.0000 USD/hr

Standard NV6 Subscription credits apply
by Microsoft
[Terms of use](#) | [Privacy policy](#)
1.1400 USD/hr
[Pricing for other VM sizes](#)

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the [Azure Marketplace Terms](#) for additional details.

BASICS

Subscription	Microsoft Azure Sponsorship 2
Resource group	cs224n-gpu
Virtual machine name	cs224n-dev-VM1
Region	East US
Availability options	No infrastructure redundancy required
Authentication type	Password
Username	steph

DISKS

OS disk type	Standard SSD
Use managed disks	Yes

Create Previous Next Download a template for automation

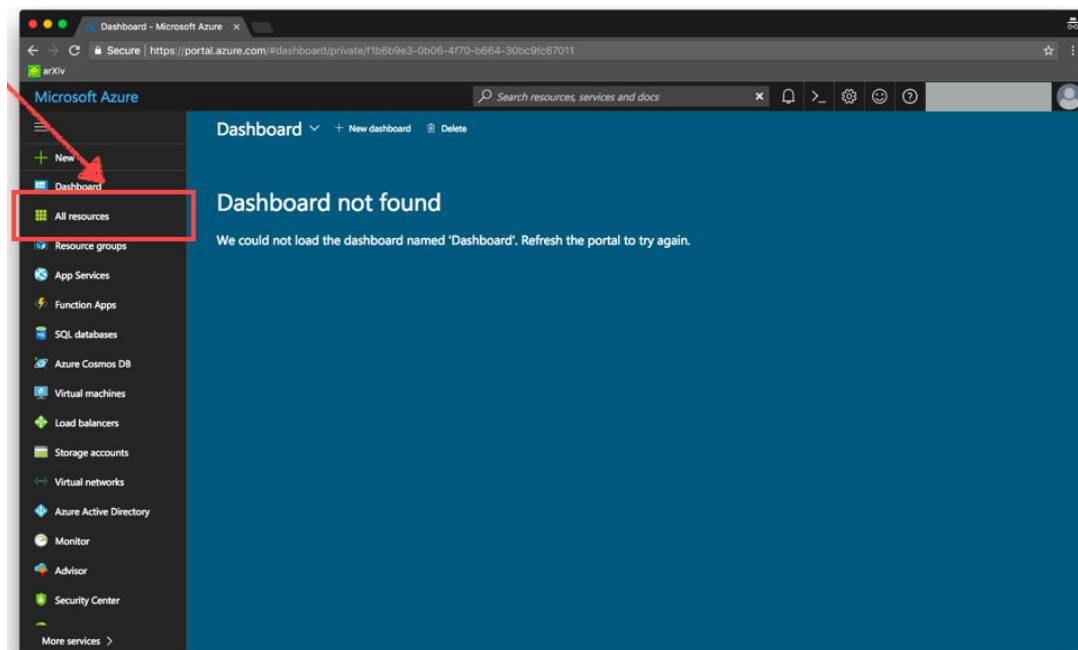
6. You've created a VM! Continue to [Using Azure](#).

NOTE: If you do not plan on using your VM right now, stop the instance **right now**. The VM is automatically started up when it is created. Follow the instructions below to stop your VM.

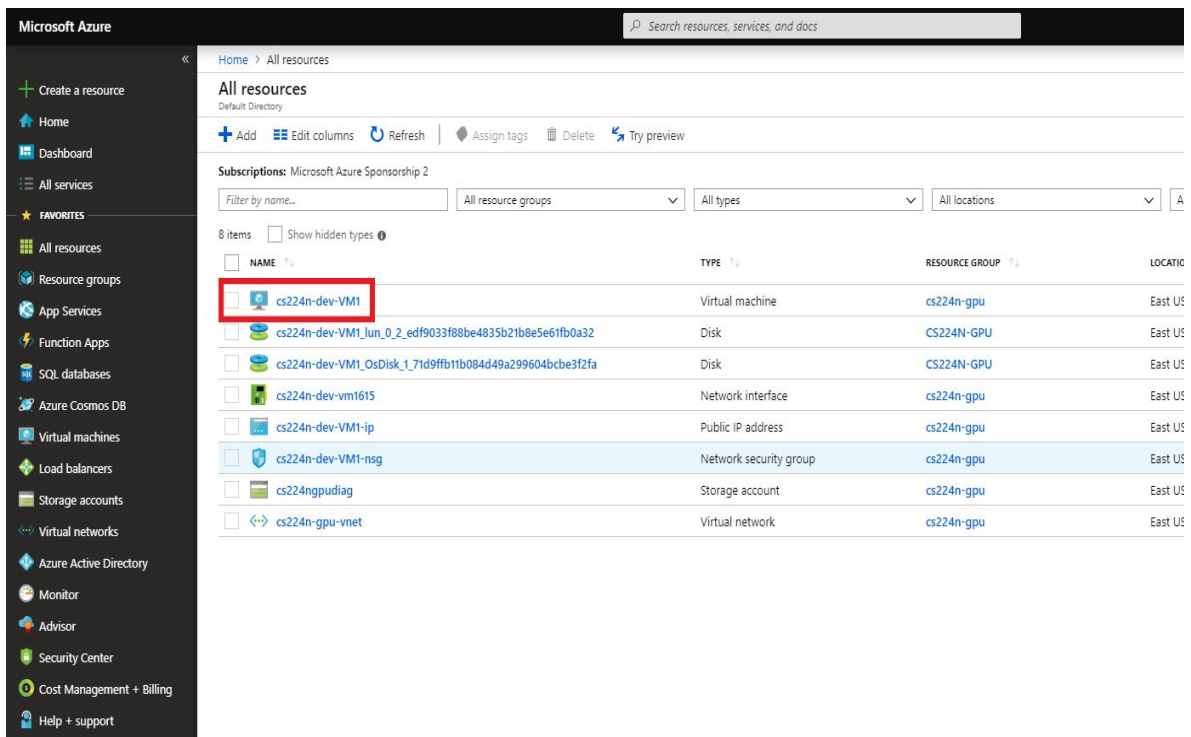
Using Azure

Managing a VM

1. Click the **All resources** in the left sidebar menu. If it is not on the left sidebar, click on **All services** in the sidebar, and **All resources** from there.



2. Click the name of your VM. You might need to **wait up to 10 minutes** after creating the VM for it to appear on this menu.



- There are a few important options. Click **Connect** for an ssh command to connect to your instance. Click **Start/Stop** to start or stop the instance. If you want to delete the instance, click **Delete**.

*Note that if your instance is stopped but not deleted, it will still accrue charge for storage. (This cost is minimal). Again, **do not leave your machine running when you are not using it**.*

The screenshot shows the Azure portal interface for a virtual machine named 'cs224n-dev-VM1'. The left sidebar contains navigation links for various Azure services. The main content area is divided into several sections:

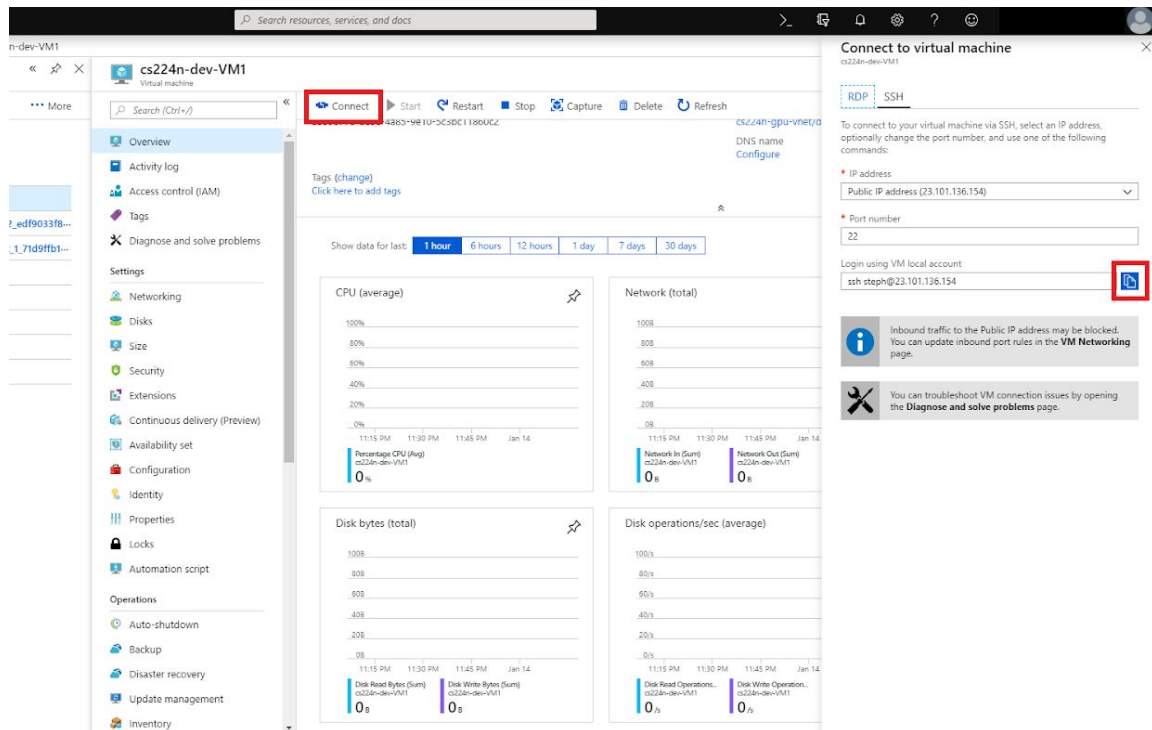
- Overview:** Displays basic information about the VM, including its resource group, status (Running), location (East US), subscription, and tags.
- Activity log:** Shows a list of recent activities related to the VM.
- Access control (IAM):** Provides options to manage access to the VM.
- Tags:** Allows for adding or editing tags for the VM.
- Settings:** Includes sections for Networking, Disks, Size, Security, Extensions, Continuous delivery (Preview), Availability set, Configuration, Identity, Properties, Locks, and Automation script.
- Operations:** Includes options for Auto-shutdown, Backup, Disaster recovery, Update management, and Inventory.

At the top of the VM details page, there are several action buttons: **Connect**, **Start**, **Restart**, **Stop**, **Capture**, **Delete**, and **Refresh**. The **Connect**, **Stop**, and **Delete** buttons are highlighted with red boxes in the image.

Below the settings, there are performance metrics for the VM, including CPU (average), Network (total), Disk bytes (total), and Disk operations/sec (average). The CPU and Network metrics show a graph of usage over time, while the Disk metrics show a bar chart of usage.

Connecting to a VM

1. Click **Connect** from the previous menu. In the right side panel that pops up, click on the copy icon, and paste the ssh command into your terminal



```
steph ~ /workspace
steph ~ /workspace ssh steph@40.117.81.218
The authenticity of host '40.117.81.218 (40.117.81.218)' can't be established.
ECDSA key fingerprint is SHA256:PH+XtvxN8rP3CJYRmx+3ckdWVFZw/d9amDm5ooGNDjs.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '40.117.81.218' (ECDSA) to the list of known hosts.
steph@40.117.81.218's password:
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.15.0-1035-azure x86_64)

4 packages can be updated.
0 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

*****
* Welcome to the Linux Data Science Virtual Machine on Azure! *
* *
* For more information on available tools and features, *
* visit http://aka.ms/dsvm/discover. *
*****

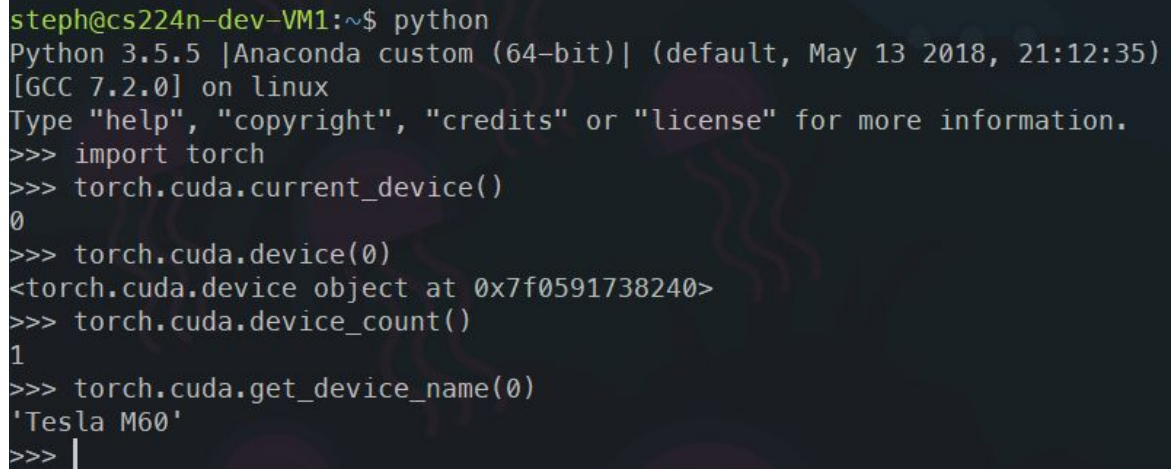
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

steph@cs224n-dev-VM1:~$
```

2. Check that Pytorch can access the GPUs by opening Python and typing the following:

```
import torch
torch.cuda.current_device()
torch.cuda.device(0)
torch.cuda.device_count()
```

You should see something like this:

A terminal window screenshot showing the execution of Python code to check PyTorch's access to GPUs. The prompt is 'steph@cs224n-dev-VM1:~\$'. The user runs 'python', which starts a Python 3.5.5 shell. The user then enters a series of commands: 'import torch', 'torch.cuda.current_device()' (returns 0), 'torch.cuda.device(0)' (returns a device object), 'torch.cuda.device_count()' (returns 1), and 'torch.cuda.get_device_name(0)' (returns 'Tesla M60').

```
steph@cs224n-dev-VM1:~$ python
Python 3.5.5 |Anaconda custom (64-bit)| (default, May 13 2018, 21:12:35)
[GCC 7.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import torch
>>> torch.cuda.current_device()
0
>>> torch.cuda.device(0)
<torch.cuda.device object at 0x7f0591738240>
>>> torch.cuda.device_count()
1
>>> torch.cuda.get_device_name(0)
'Tesla M60'
>>> |
```

If you see an error message about CUDA, post to Piazza for assistance.

FAQs

How do I check my remaining balance?

Go to the Labs under the CS224N Azure page from

https://portal.azure.com/#blade/Microsoft_Azure_Education/EducationMenuBlade/overview

Note that Azure bills at midnight every business day, so this figure usually reflects your credit as of the last billing time. Also, note that you will only see your subscription after it is activated. Instructions for activating your subscription(s) is in section *Activate your subscription* above.

How do I share my instances with other students in my group?

For shared subscriptions only, once an instance and user account on that instance has been created using a subscription, all accounts linked to that subscription can see that instance on their dashboard and follow the directions in Using Azure to manage and connect to their VM. Only the subscription created for the final project is shared.

How do I create new user accounts?

If your group feels strongly about using separate user accounts instead of a shared one on your instance, please post privately on Piazza.

What happens when I exceed my credit?

Azure bills at midnight every business day. So if, at midnight on a business day, you have exceeded your credit, Azure will turn off your VM. Note that at this point, your account may be in debt. If/when this happens to you, let us know on Piazza and tag your post with the "azure" tag.

Can I add a personal credit card to the account?

Sure, though we do not recommend it. If you exhaust the funds from your CS 224N subscription, your personal credit card will be charged without warning.

Can I select more powerful instances?

Though we recommend the NV6, you are free to use any of the instances. Just keep in mind that you have a budget!