

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 need Azure credits for assignment 4, assignment 5, and final project. When assignment 4 is released, you will receive an email containing an invitation to claim your Azure credits.

For the specifics of how much credits you will be provided for each of the assignments, refer to the Azure posts we will make on Ed.

For the final project, a credit of \$150 will be 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 **150 hours**, or slightly over **6 days** on a NC6 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 Ed 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 NC6 VM, it is charged at **\$0.9/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 PyTorch 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 **Stanford - office365stanford.onmicrosoft.com**.

Directory + subscription ×

Default subscription filter

The portal will show data only for these selected subscriptions on portal launch.

Lab1 Alvin Hou



Current directory: office365stanford.onmicrosoft.com

[Learn about directories and subscriptions](#)

Switch directory

Set your default directory

Sign in to your last visited directory



Favorites

All Directories

A to Z ↑↓

Search

Microsoft

microsoft.onmicrosoft.com

47



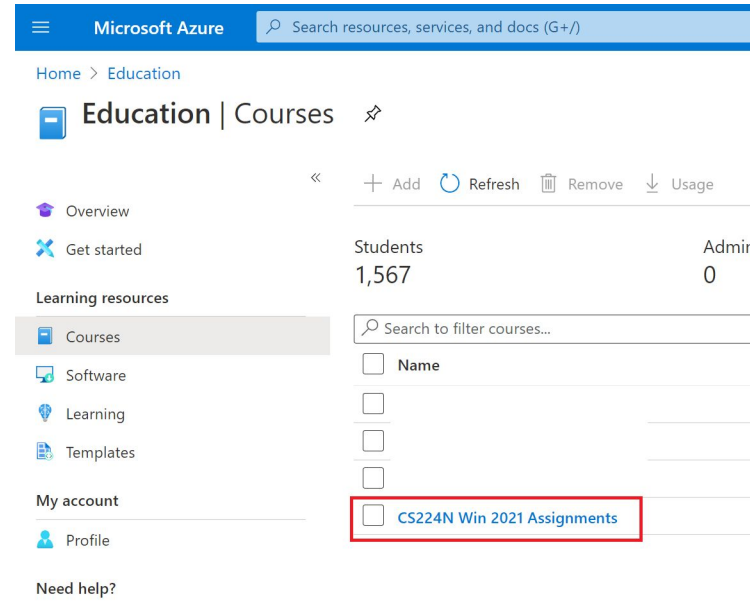
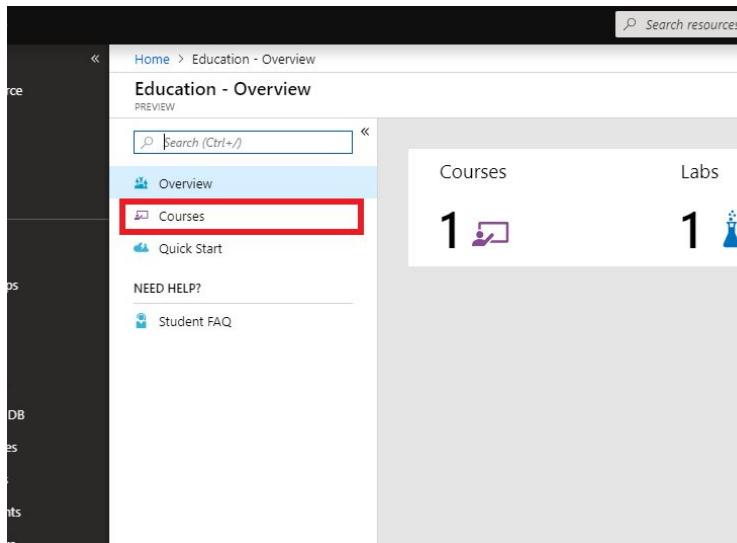
Stanford

office365stanford.onmicrosoft.com

f3



Go to portal.azure.com/#blade/Microsoft_Azure_Education/EducationMenuBlade/overview. Click on **Courses**. You should see **CS224N Win 2021 Assignments**(if you are working on assignments) or **CS224N Win 2021 Project** (if you are working on the project) in your list of courses. If you don't see the course(s) for CS224N, see Ed for detailed instructions.



Activating your subscription (5 min)

Click on **CS224N Win 2021 Assignments** or **CS224N Win 2021 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 **[Lab 1]**.

Click on **[Lab 1]**.

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

Home > Education >

CS224N Win 2021 Assignments | Overview

Course

«

Overview

Labs

CS224N Win 2021 Assignments

Course roster

Students	0	Administrators	0	Project groups
----------	---	----------------	---	----------------

1 Lab				
Name	Budget	Consumed	Students	Project groups
Lab 1	\$30.00	\$0.00	0	

[Home](#) > [CS224N Win 2021 Assignments](#) >

CS224N Win 2021 Assignments - Lab 1



Lab

Students	Administrators	Project groups	Consumed	Due date
1	0	0	\$0.00 USD	FEB 23, 2021

<p>Description</p> <p>Add a description for this lab by clicking the change link at the top of this widget</p>	<p>Resources ✓ Done</p> <p></p>
<p>Instructions</p> <p>Add detailed instructions for this Lab by clicking the change link at the top of this widget</p>	<p> Lab1 Alvin Hou df</p> <p>Status ✓ Active Expires on FEB 23, 2021</p>

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.

[Home](#) > [Join Course](#) > [Education - Courses](#) > [CS224N - Overview](#) > [CS224N - \[Assignment Credits\]](#)

CS224N - [Assignment Credits]

Education - PREVIEW

ALL STUDENTS	ADMINISTRATORS	PROJECT GROUPS	CONSUMED	DUE DATE
			\$0.00 USD	JUN 30, 2019

DESCRIPTION

Add a description for this Lab by clicking the change link at the top of this widget

INSTRUCTIONS

Add detailed instructions for this Lab by clicking the change link at the top of this widget

[Assignment Credits] Stephanie Dong

STATUS 🔄 Pending Acceptance EXPIRES ON 📅 --

0 out of \$0.00 used

USERS

Highlights

- Subscription with in Azure credits included (expires Jun 30, 2019)
- ARM template will auto deploy

Setup Lab

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**.

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

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

2 Agreement

☐ 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

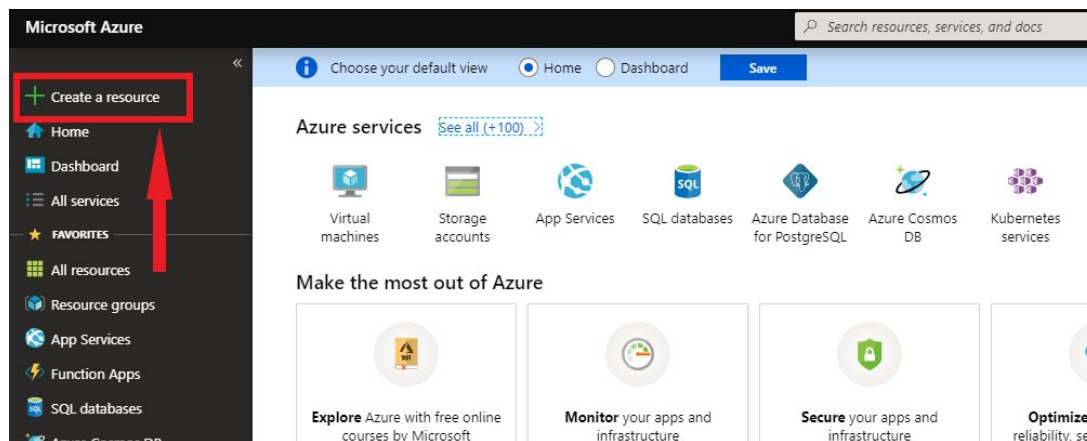
English Privacy & Cookies Trademarks Legal Support Give us feedback © 2019 Microsoft

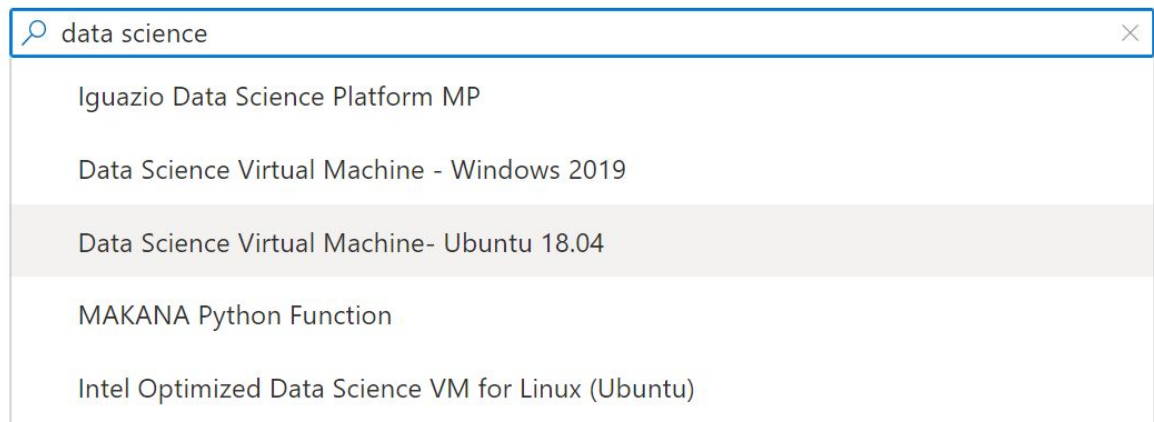
Creating a VM (15-45 min)

Using a predefined image (15 min)

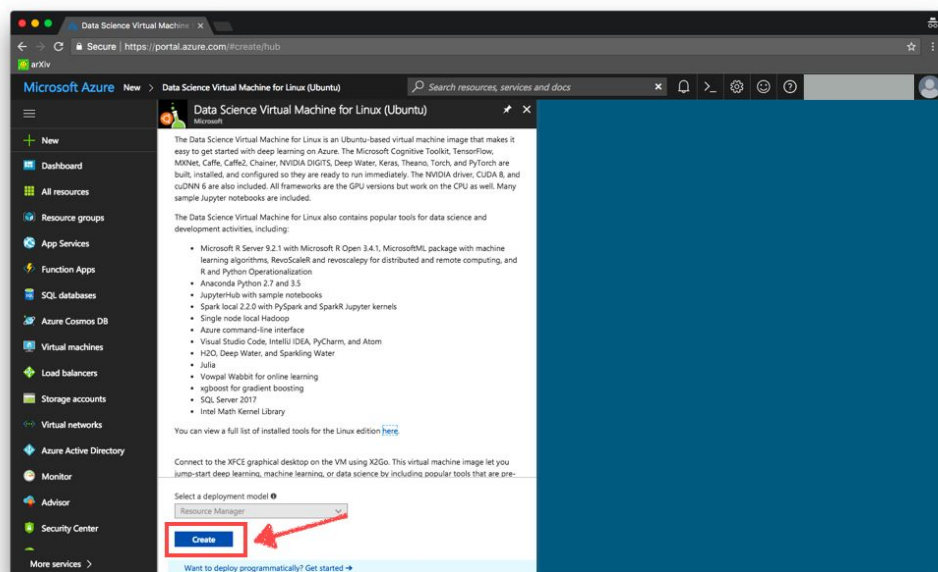
If you use a predefined image, we recommend using the **Data Science Virtual Machine- Ubuntu 18.04** image, which comes installed with Python 3.7, -gpu, tensorflow-gpu, CUDA, and cuDNN.

1. Click the **+ Create a Resource** in the left sidebar menu and type in **Data Science Virtual Machine- Ubuntu 18.04**. 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 might see **Microsoft Azure Sponsorship 2**. Choose this option
 - i. If you are working on assignments and you see the subscription starting with **[Lab 1]**, choose this one.
 - ii. If you are working on projects, you should see an option starting with **[Project Credits]**. Choose this one.
 - iii. 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 Ed 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 [Lab 1] 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.
- **Region.** Choose **East US**
- **Image.** **IMPORTANT** Choose **Data Science Virtual Machine- Ubuntu 18.04**
- **Size.** Click on **Change size** and search for **NC6**. Select **NC6_promo** if applicable. If not, pick **NC6**. 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.

Create a virtual machine

Subscription * ⓘ

Lab1 Alvin Hou

Resource group * ⓘ

(New) lab1_resource

Create new

Instance details

Virtual machine name * ⓘ

Region * ⓘ

(US) East US

Availability options ⓘ

No infrastructure redundancy required

Image * ⓘ

Data Science Virtual Machine - Ubuntu 18.04 - Gen1

See all images

Azure Spot instance ⓘ

☐

Size * ⓘ

Standard_DS3_v2 - 4 vcpus, 14 GiB memory (NT\$6,428.29/month)

See all sizes

Administrator account

Review + create

< Previous

Next : Disks >

Select a VM size

× Display cost : Monthly vCPUs : All RAM (GiB) : All + Add filter

Showing 5 of 407 VM sizes.

Subscription: TA Lab 1 Alvin Hou

Region: East US

Current size: Standard_NC6_Promo

Image: Data Science Virtual Machine - Ubuntu 18.04

[Learn more about VM sizes](#)

VM Size ↑↓	Family ↑↓	vCPUs ↑↓	RAM (GiB) ↑↓	Data disks ↑↓	Max IOPS ↑↓	Temp storage (GiB) ↑↓	Premium disk ↑↓
N-Series Designed for compute-intensive, graphics-intensive, and visualization workloads							
Non-premium storage VM sizes Premium storage is recommended for most workloads							
NC6	GPU	6	56	24	24x500	380	Not supported
NC6_Promo	GPU	6	56	24	24x500	380	Not supported
Other sizes							

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

Project details

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

Subscription * ⓘ

Resource group * ⓘ

Lab1 Alvin Hou

(New) lab1_resource

[Create new](#)

Instance details

Virtual machine name * ⓘ

Region * ⓘ

Availability options ⓘ

Image * ⓘ

Azure Spot instance ⓘ

Size * ⓘ

cs224n-gpu

(US) East US

No infrastructure redundancy required

Data Science Virtual Machine - Ubuntu 18.04 - Gen1

[See all images](#)

☐

Standard_NC6_Promo - 6 vcpus, 56 GiB memory (NT\$8,688.07/month)

[See all sizes](#)

Administrator account

Authentication type ⓘ

Username * ⓘ

Password * ⓘ

Confirm password * ⓘ

☐ SSH public key

☒ Password

azureuser

.....

.....

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.

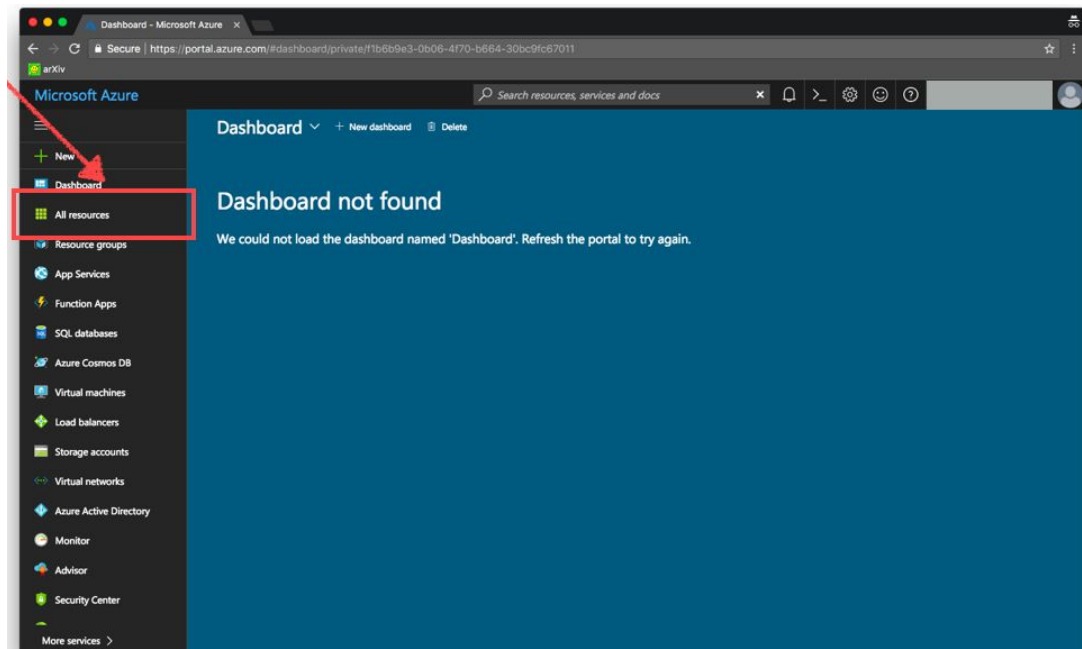
The screenshot shows the Microsoft Azure portal interface for creating a virtual machine. The left sidebar contains navigation links such as 'Create a resource', 'Home', 'Dashboard', 'All services', and 'FAVORITES'. The main content area is titled 'Create a virtual machine' and shows the 'Review + create' step. A green banner at the top of the main area indicates 'Validation passed'. Below this, there are tabs for 'Basics', 'Disks', 'Networking', 'Management', 'Guest config', 'Tags', and 'Review + create'. The 'Review + create' tab is active, showing product details for 'Data Science Virtual Machine for Linux (Ubuntu)' and 'Standard NV6'. The pricing is listed as '0.0000 USD/hr' for the VM and '1.1400 USD/hr' for the Standard NV6. The 'TERMS' section contains a legal disclaimer. The 'BASICS' section shows the subscription as 'Microsoft Azure Sponsorship 2', the resource group as 'cs224n-gpu', and the virtual machine name as 'cs224n-dev-VM1'. The 'DISKS' section shows the OS disk type as 'Standard SSD' and 'Use managed disks' as 'Yes'. At the bottom, there are buttons for 'Create', 'Previous', 'Next', and 'Download a template for automation'. The 'Create' button is highlighted with a red rectangle.

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.

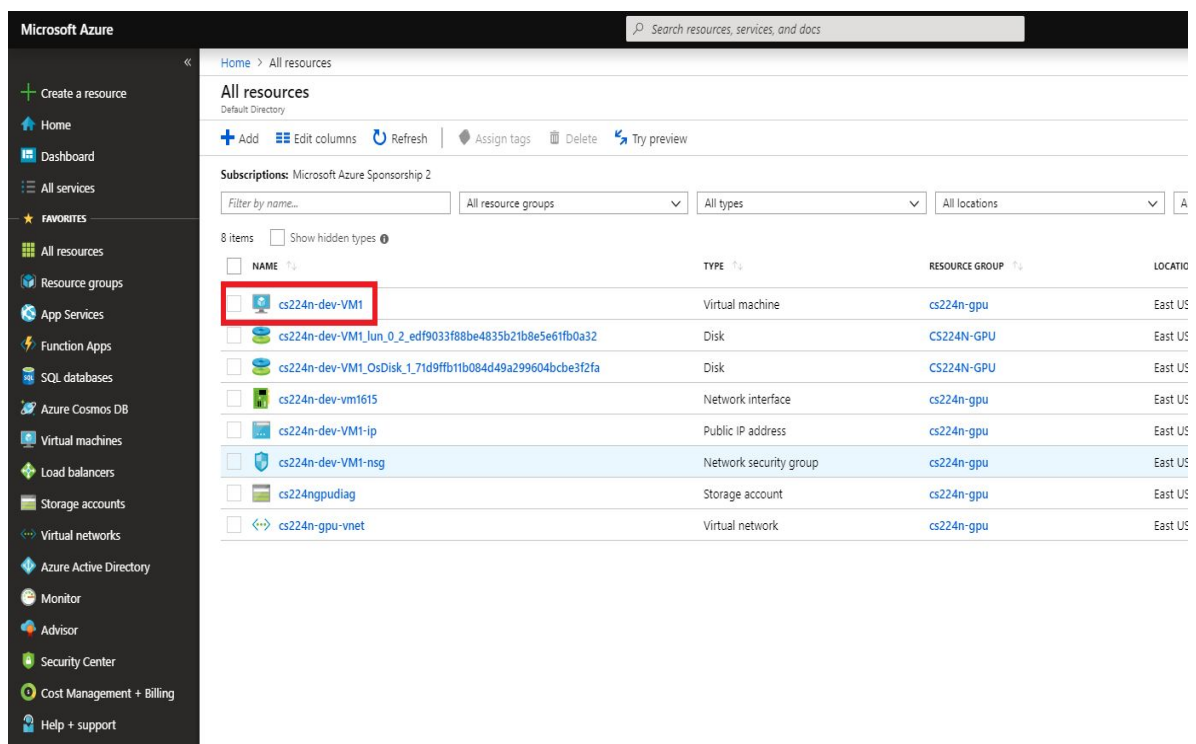
Using Azure

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.

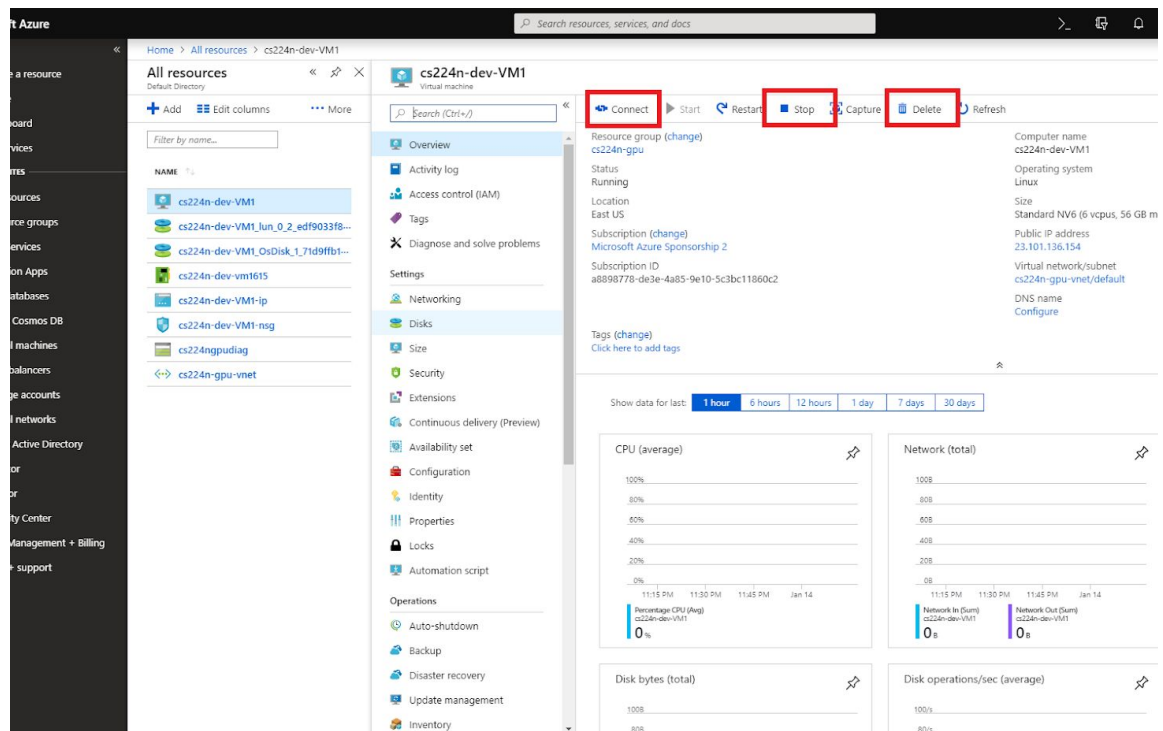


2. Click the name of your VM. You might need to **wait up to 10 minutes** after creating the VM for it to appear on this menu.



- 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.***



us

Connecting to a VM

Check out [CS224N: Practical Tips for Using Virtual Machines 2021](#) for more tips on using Azure.

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.

The screenshot displays the Azure portal interface for a virtual machine named 'cs224n-dev-VM1'. The left sidebar contains navigation options like Overview, Activity log, Access control (IAM), Tags, and Settings. The main area shows the VM's status as 'Running' and provides options to Start, Restart, Stop, Capture, Delete, or Refresh. A red box highlights the 'Connect' button. Below this, there are four performance charts: CPU (average), Network (total), Disk bytes (total), and Disk operations/sec (average). On the right, the 'Connect to virtual machine' panel is open, showing the 'SSH' tab. It displays the public IP address (23.101.136.154) and the port number (22). The login command is shown as 'ssh steph@23.101.136.154'. A red box highlights the copy icon next to the command. Below the command, there are two informational messages: one about inbound traffic being blocked and another about troubleshooting connection issues.

```

ssh alvin@137.117.89.16
alvin@137.117.89.16's password:
Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 5.4.0-1039-azure x86_64)

System information as of Tue Feb  2 06:19:35 UTC 2021

System load:  0.08               Processes:            172
Usage of /:   37.6% of 145.20GB   Users logged in:     0
Memory usage: 1%                 IP address for eth0:  10.0.0.4
Swap usage:   0%                 IP address for docker0: 172.17.0.1

* Introducing self-healing high availability clusters in MicroK8s.
  Simple, hardened, Kubernetes for production, from RaspberryPi to DC.

  https://microk8s.io/high-availability

16 packages can be updated.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

New release '20.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

*****
* Welcome to the Ubuntu 18.04 Data Science Virtual Machine! You          *
* can access this DSVM through SSH, view the graphical desktop with      *
* X2Go, or run Jupyter notebooks from a browser on your computer         *
* with JupyterHub. See the docs at https://aka.ms/dsvm/ubuntu/access     *
* for more information.                                                  *
*                                                                           *
* A full list of included tools is available at https://aka.ms/dsvm/tools *
*                                                                           *
* This DSVM includes these conda environments:                           *
* - py37_default                                                          *
* - py37_tensorflow                                                       *
* - py37_pytorch                                                          *
* - azureml_py36_tensorflow                                               *
* - azureml_py36_pytorch                                                 *
* - azureml_py36_automl                                                  *
*                                                                           *
* Activate any environment at a terminal with                             *
* "conda activate <environment>". Each conda environment is also         *
* available as a Jupyter kernel.                                         *
*****
Last login: Tue Feb  2 06:19:03 2021 from 128.12.122.226
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

```

2. Check that Pytorch can access the GPUs by activating the conda environment and opening Python. See the following example

```

$ conda activate py37_pytorch
$ python
>>> import torch
>>> torch.cuda.current_device()
>>> torch.cuda.device(0)
>>> torch.cuda.device_count()

```

You should see something like this:


```
alvin@cs224n-test:~$ conda activate py37_pytorch
(py37_pytorch) alvin@cs224n-test:~$ python
Python 3.7.9 (default, Aug 31 2020, 12:42:55)
[GCC 7.3.0] :: Anaconda, Inc. 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 0x7f83ebdf34d0>
>>> torch.cuda.device_count()
1
>>> torch.cuda.get_device_name(0)
'Tesla K80'
>>> █
```

If you see an error message about CUDA, post to Ed 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 Ed.

What happens when I exceed my credit?

Your subscription will be disabled. Please shut down your VM(s) and follow the instructions on Ed.

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 NC6, you are free to use any of the instances. Just keep in mind that you have a budget!

Appendix

How do I create an SSH key for VM connection?

On your local machine, create SSH key pairs:

- Run `ssh-keygen -m PEM -t rsa -b 4096` (Linux / MacOS)
- Or use the [PuTTYgen](#) tool (Windows)

When prompted for a passphrase, either enter a passphrase to secure your private key, or leave it empty.

The public key will be saved to `~/.ssh/id_rsa.pub` by default. The public key looks like:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAQCAQC1/KanayNr+Q7ogR5mKnGpKWRBQU7F3Jjhn7utdf7Z2i
UFYkaYx+MInSnT3XdNBR58KhC0IP8ptbngIaNOWd6zM8hB6UrcRT1Tpwk/SuGMw1Vb40x1EFph
BkVEUgBo10oANIEXriAMv1DMZsgvnMfiQ12tD/u14cxy1WNEMAftey/vX3Fgp2vEq4zHXEliY/
sFZLJUJzcRUI0M0fHXAuCjg/qyqqbIuTDFyfg8k0JTtyGFEMQhbXKcuP2yGx1uw0ice62LRzr8
w0mszftXyMik1PnshRXbmE2xgINyg5xo/ra3mq2imwtOKJpfdtFoMiKhJmSNHBSkK7vFTeYgg0
v2cQ2+vL381cIFX40h+QCzvNF/AXoDV1QtVtSqfQxRVG79Zqio5p12gHFkt1fV7reCBvVIhyxc
2L1YUkrq4DHZkxNY5c90GSHXSle9YsO3F1J5ip18f6gPq4xFmo6dVoJodZm9N0YMKCKZ4k1qJD
ESsJBk2uJDpmQQeMjJX3FnDXYYB182ZCGQzXfz1PDC29cWVgDZEXNHuYrOLmJTmYtLZ4WkdUHL
L1t5XsdoKwqlWpbegyYtGZgeZNRt00dN6ybOPJqmYFd2qRtb4sYPniGJD0Ghx4VodXAjT09omh
QJpE6w1ZbRWDvKC55R2d/CSPHJscEiuudb+1SG2uA/oik/WQ== username@domainname
```

Copy this public key, or run: `cat ~/.ssh/id_rsa.pub | pbcopy`

Now in VM creation, choose **SSH public key** instead of **Password** in **Authentication type**. Enter your preferred **Username**. In the **SSH public key** field, paste the public key you just generated and copied.

Size * ⓘ **Standard NV6_Promo**
6 vcpus, 56 GiB memory (\$508.90/month)
[Change size](#)

Administrator account

Authentication type ⓘ ☐ Password ☒ SSH public key

Username * ⓘ pyliao ✓

SSH public key * ⓘ

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAQCAQC1/KanayNr+Q7ogR5mKnGpKWRBQU7F3Jjhn7utdf7Z2i
UFYkaYx+MInSnT3XdNBR58KhC0IP8ptbngIaNOWd6zM8hB6UrcRT1Tpwk/SuGMw1Vb40x1EFph
BkVEUgBo10oANIEXriAMv1DMZsgvnMfiQ12tD/u14cxy1WNEMAftey/vX3Fgp2vEq4zHXEliY/
sFZLJUJzcRUI0M0fHXAuCjg/qyqqbIuTDFyfg8k0JTtyGFEMQhbXKcuP2yGx1uw0ice62LRzr8
w0mszftXyMik1PnshRXbmE2xgINyg5xo/ra3mq2imwtOKJpfdtFoMiKhJmSNHBSkK7vFTeYgg0
v2cQ2+vL381cIFX40h+QCzvNF/AXoDV1QtVtSqfQxRVG79Zqio5p12gHFkt1fV7reCBvVIhyxc
2L1YUkrq4DHZkxNY5c90GSHXSle9YsO3F1J5ip18f6gPq4xFmo6dVoJodZm9N0YMKCKZ4k1qJD
ESsJBk2uJDpmQQeMjJX3FnDXYYB182ZCGQzXfz1PDC29cWVgDZEXNHuYrOLmJTmYtLZ4WkdUHL
L1t5XsdoKwqlWpbegyYtGZgeZNRt00dN6ybOPJqmYFd2qRtb4sYPniGJD0Ghx4VodXAjT09omh
QJpE6w1ZbRWDvKC55R2d/CSPHJscEiuudb+1SG2uA/oik/WQ==
```

 ✓
[Learn more about creating and using SSH keys in Azure](#)

[Review + create](#) < Previous Next: Disks >

Proceed with the remaining process. Now when you login to the VM, you won't be prompted for a password!