cs231n / **gcloud**

Google Cloud tutorial and setup

13 commits　**2** branches　**0** releases　**3** contributors

Branch: master ▾　New pull request　Create new file　Upload files　Find file　Clone or download ▾

LinxiFan Merge branch 'master' of https://github.com/cs231n/gcloud　Latest commit `775ebbc` on Apr 15

.img	add Jupyter section	7 months ago
README.md	Merge branch 'master' of https://github.com/cs231n/gcloud	6 months ago
jupyter_notebook_config.py	initial	7 months ago
setup.sh	Add tensorflow support	6 months ago
test_tf.py	Add tensorflow support	6 months ago
verify_gpu.py	update verify_gpu	7 months ago

README.md

Google Cloud Setup and Tutorial

BEFORE WE BEGIN

BIG REMINDER: Make sure you stop your instances!

(We know you won't read until the very bottom once your assignment is running, so we are printing this at the top too since it is ***super important***)

Don't forget to ***stop your instance*** when you are done (by clicking on the stop button at the top of the page showing your instances), otherwise you will ***run out of credits*** and that will be very sad. :(

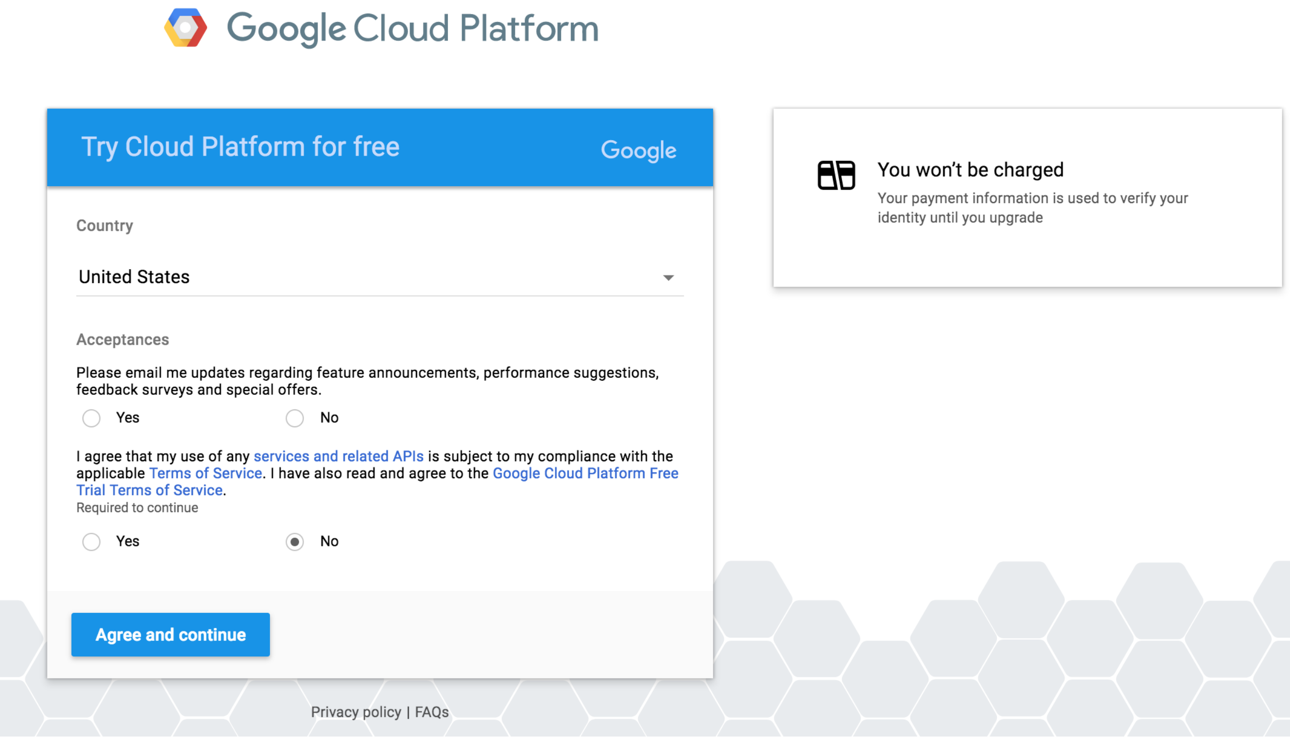
If you follow our instructions below correctly, you should be able to restart your instance and the downloaded software will still be available.

Create and Configure Your Account

For the class project and assignments, we offer an option to use Google Compute Engine for developing and testing your implementations. This tutorial lists the necessary steps of working on the assignments using Google Cloud. **We expect this tutorial to take about an hour. Don't get intimidated by the steps, we tried to make the tutorial detailed so that you are less likely to get stuck on a particular step. Please tag all questions related to Google Cloud with google_cloud on Piazza.**

This tutorial goes through how to set up your own Google Compute Engine (GCE) instance to work on the assignments. Each student will have $100 in credit throughout the quarter. When you sign up for the first time, you also receive $300 credits from Google by default. Please try to use the resources judiciously. But if $100 ends up not being enough, we will try to adjust this number as the quarter goes on.

First, if you don't have a Google Cloud account already, create one by going to the Google Cloud homepage and clicking on **Compute**. When you get to the next page, click on the blue **TRY IT FREE** button. If you are not logged into gmail, you will see a page that looks like the one below. Sign into your gmail account or create a new one if you do not already have an account.



Google Cloud Platform

Try Cloud Platform for free Google

Country

United States

Acceptances

Please email me updates regarding feature announcements, performance suggestions, feedback surveys and special offers.

○ Yes ○ No

I agree that my use of any services and related APIs is subject to my compliance with the applicable Terms of Service. I have also read and agree to the Google Cloud Platform Free Trial Terms of Service.
Required to continue

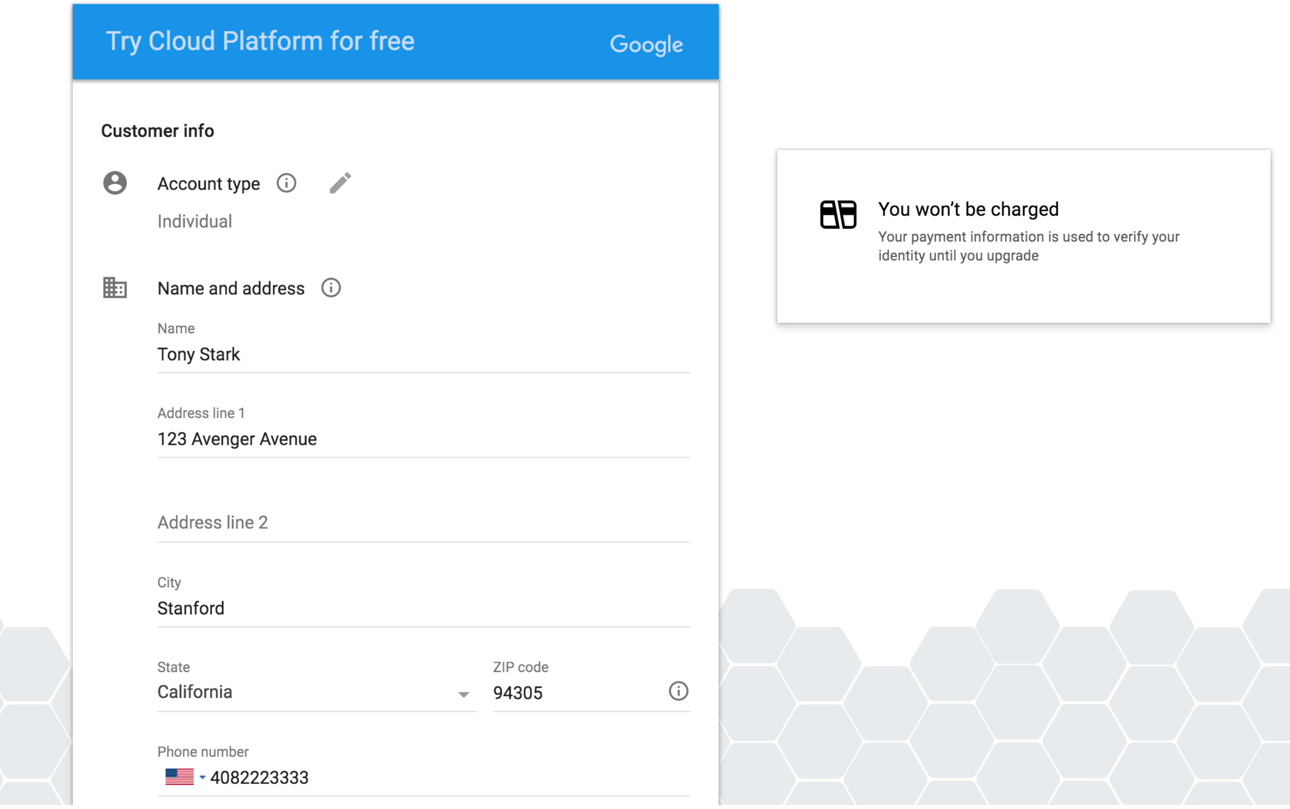
○ Yes ● No

Agree and continue

You won't be charged
Your payment information is used to verify your identity until you upgrade

Privacy policy | FAQs

Click the appropriate **yes** or **no** button for the first option, and check **yes** for the second option after you have read the required agreements. Press the blue **Agree and continue** button to continue to the next page to enter the requested information (your name, billing address and credit card information). Remember to select "**Individual**" as "Account Type":



Try Cloud Platform for free Google

Customer info

Account type
Individual

Name and address

Name: Tony Stark

Address line 1: 123 Avenger Avenue

Address line 2

City: Stanford

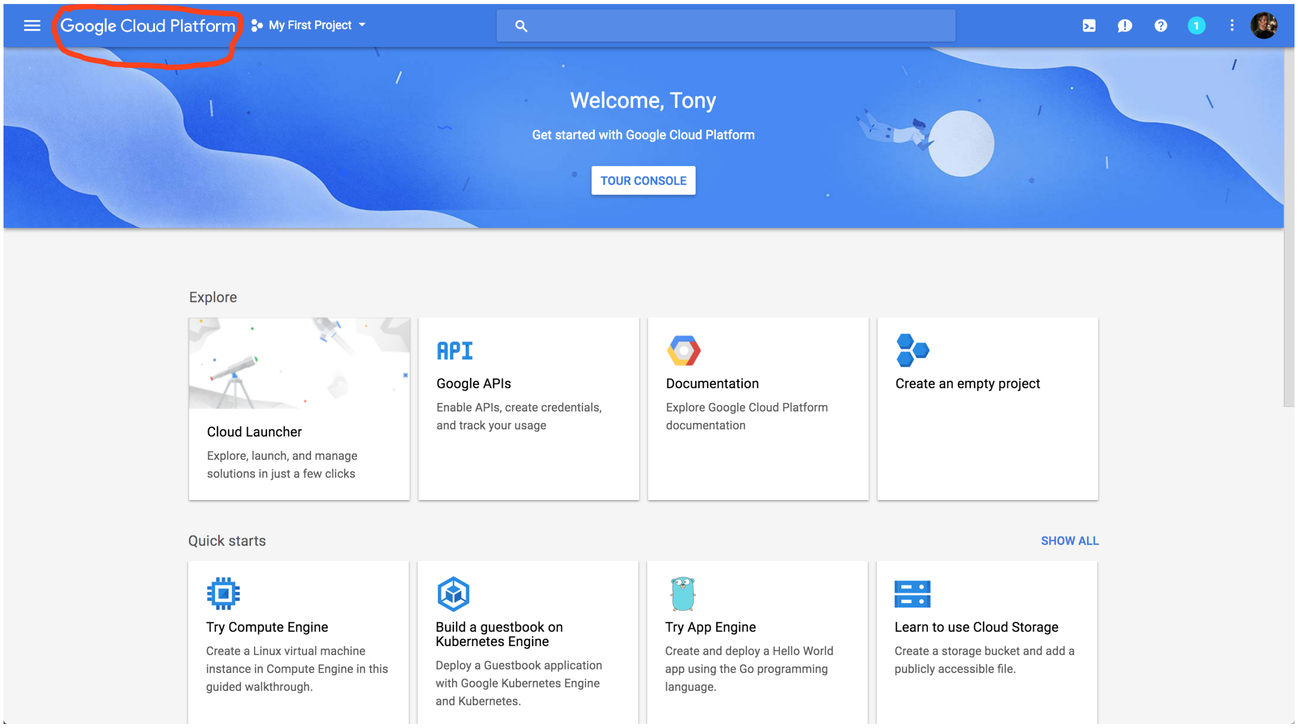
State: California

ZIP code: 94305

Phone number: 4082223333

You won't be charged
Your payment information is used to verify your identity until you upgrade

Once you have entered the required information, press the blue **Start my free trial** button. You will be greeted by a page like this:



Welcome, Tony

Get started with Google Cloud Platform

Cloud Launcher
Explore, launch, and manage solutions in just a few clicks

Google APIs
Enable APIs, create credentials, and track your usage

Documentation
Explore Google Cloud Platform documentation

Create an empty project

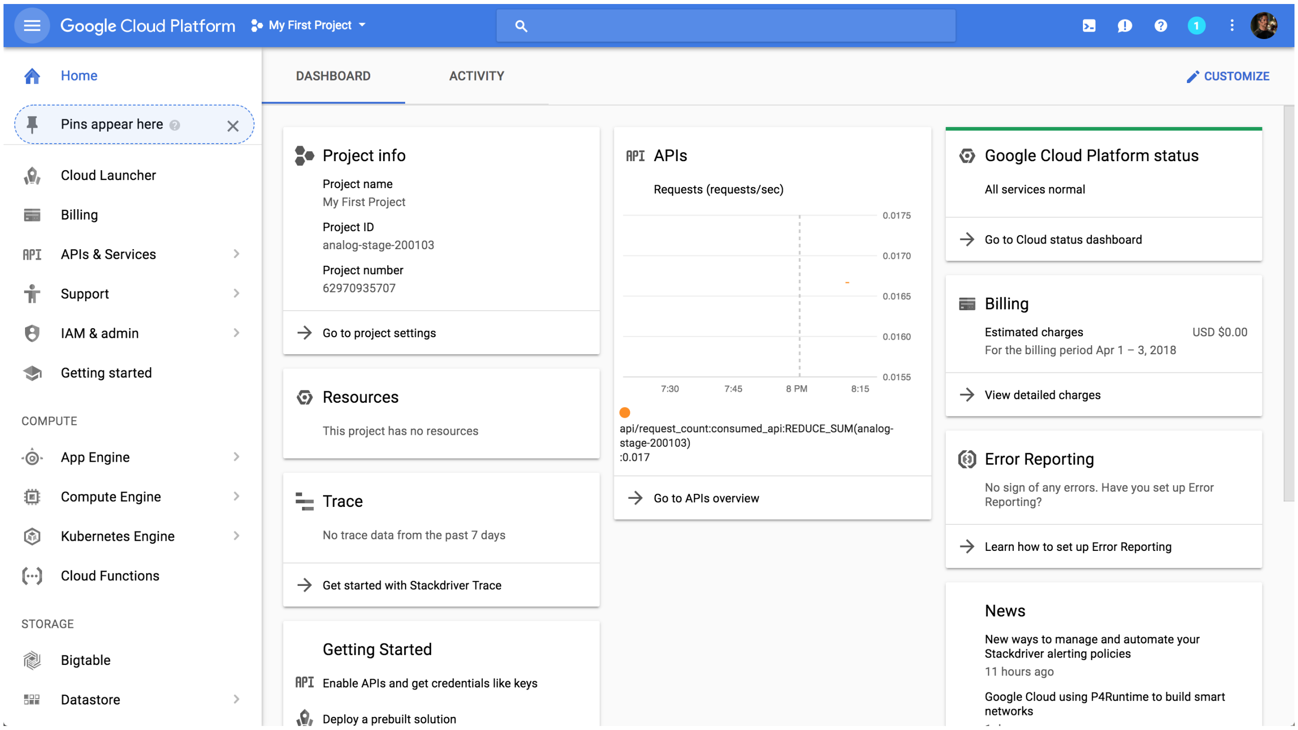
Try Compute Engine
Create a Linux virtual machine instance in Compute Engine in this guided walkthrough.

Build a guestbook on Kubernetes Engine
Deploy a Guestbook application with Google Kubernetes Engine and Kubernetes.

Try App Engine
Create and deploy a Hello World app using the Go programming language.

Learn to use Cloud Storage
Create a storage bucket and add a publicly accessible file.

Click the "Google Cloud Platform" (in red circle), and it will take you to the main dashboard:



Project info
Project name
My First Project
Project ID
analog-stage-200103
Project number
62970935707
Go to project settings

Resources
This project has no resources

Trace
No trace data from the past 7 days
Get started with Stackdriver Trace

Getting Started
Enable APIs and get credentials like keys
Deploy a prebuilt solution

APIs
Requests (requests/sec)
api/request_count:consumed_api:REDUCE_SUM(analog-stage-200103)
:0.017
Go to APIs overview

Google Cloud Platform status
All services normal
Go to Cloud status dashboard

Billing
Estimated charges USD $0.00
For the billing period Apr 1 – 3, 2018
View detailed charges

Error Reporting
No sign of any errors. Have you set up Error Reporting?
Learn how to set up Error Reporting

News
New ways to manage and automate your Stackdriver alerting policies
11 hours ago
Google Cloud using P4Runtime to build smart networks

To change the name of your project, click on Go to project settings under the **Project info** section.

Request an increase in GPU quota

Your account typically does not come with GPU quota. You have to explicitly request for it under **IAM Admin** > **Quotas**. Follow the instructions at:

- General quota instructions
- Step-by-step GPU-specific walk-through (all answers in the link are useful)

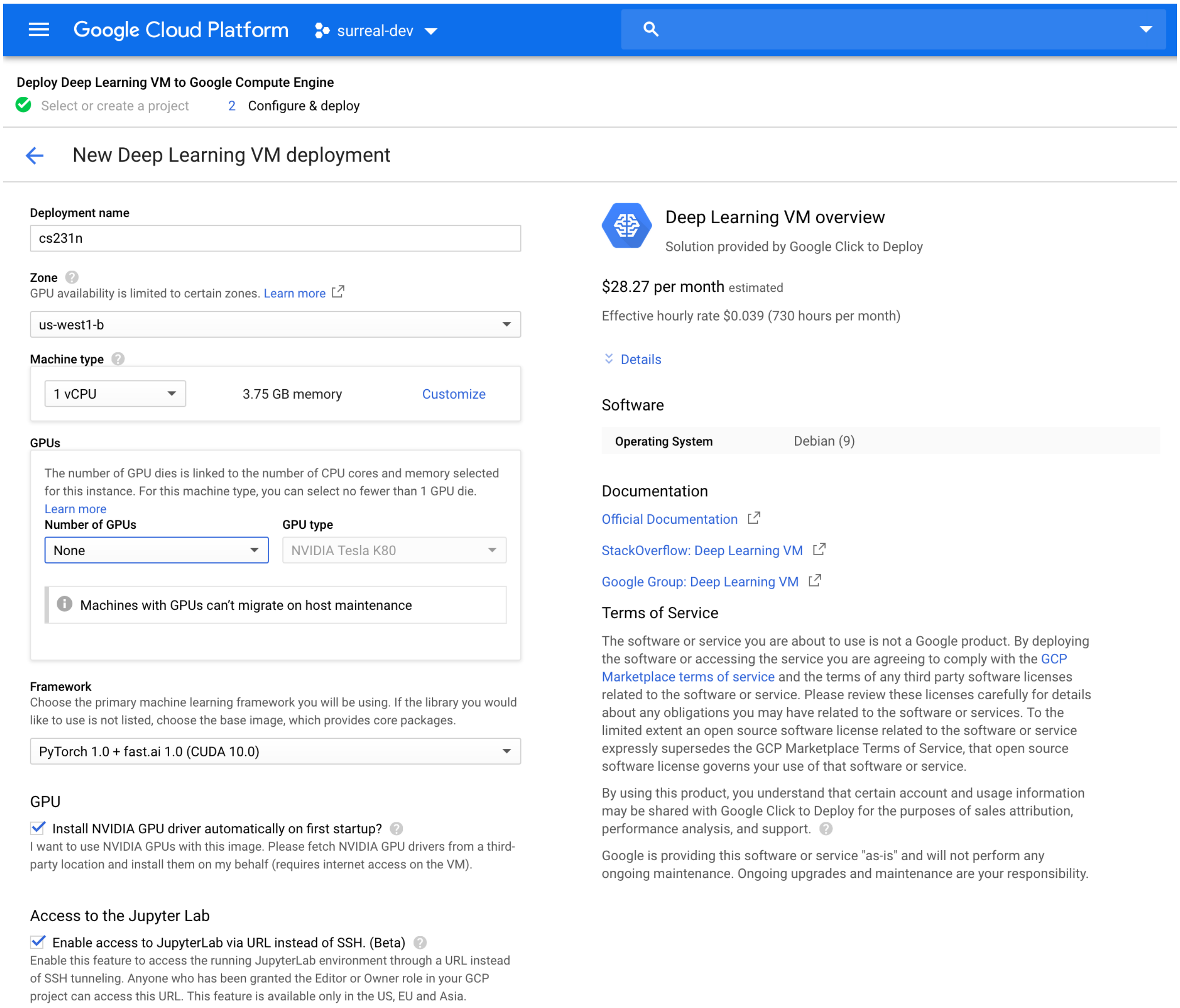
Please request the quota increase ASAP, because they will take up to a week to process! If you don't have GPU quota, you will have to create a CPU-only VM first and create another GPU VM later, explained in the next section.

FAQ: ***Why don't I see any GPU-related quotas when I follow the instructions to filter for them?***. Check that you have a default zone and region set under **Compute Engine** > **Settings** > **Region** / **Zone**. Please set these to be `us-west1` and `us-west1-b`, respectively, and then try again.

Google Cloud VM Image

1. Go to this gcloud marketplace. You may (or may not) be taken to a page where you have to click on "Launch in Compute Engine", and then you should see a configuration sheet with the title "New Deep Learning VM deployment".
2. Fill in `Deployment name` field with your preferred VM name.
3. In `Machine type` field, change `2 vCPUs` to `1 vCPU`. You can always add more CPUs later if necessary.
4. In `GPUs` field, you can follow one of the two paths:
    - (a) If you have successfully requested GPU quota, you should set `Number of GPUs` to `1`. **GPU drivers and CUDA will be automatically installed *only if* you select at least 1 GPU**. For our first assignment, you don't need GPUs. Since GPUs are very expensive, you can add them back when they become necessary later.
    - (b) If you don't have GPU quota yet, you must set `Number of GPUs` to `None`. WARNING: GPU drivers and CUDA will **NOT** be installed. All libraries will be CPU only. Once your GPU quota increase request is approved, you can follow path (a) to deploy a GPU-enabled image.
5. In `Frameworks` field, change `TensorFlow 1.13 (Intel optimized ...)` to `PyTorch 1.0 + fast.ai`. We will have instructions for you later if you want Tensorflow.
6. Check the box `Install NVIDIA GPU driver automatically on first startup?`.
7. Check the box `Enable access to JupyterLab via URL instead of SSH. (Beta)`.
8. Leave all other options as default.
9. Click the blue botton `Deploy` at the end of the page.

Your configuration sheet should look similar to below:



Google Cloud Platform surreal-dev

Deploy Deep Learning VM to Google Compute Engine

✓ Select or create a project 2 Configure & deploy

← New Deep Learning VM deployment

Deployment name

cs231n

Zone

GPU availability is limited to certain zones. Learn more

us-west1-b

Machine type

1 vCPU 3.75 GB memory Customize

GPUs

The number of GPU dies is linked to the number of CPU cores and memory selected for this instance. For this machine type, you can select no fewer than 1 GPU die. Learn more

Number of GPUs: None

GPU type: NVIDIA Tesla K80

Machines with GPUs can't migrate on host maintenance

Framework

Choose the primary machine learning framework you will be using. If the library you would like to use is not listed, choose the base image, which provides core packages.

PyTorch 1.0 + fast.ai 1.0 (CUDA 10.0)

GPU

☑ Install NVIDIA GPU driver automatically on first startup?

I want to use NVIDIA GPUs with this image. Please fetch NVIDIA GPU drivers from a third-party location and install them on my behalf (requires internet access on the VM).

Access to the Jupyter Lab

☑ Enable access to JupyterLab via URL instead of SSH. (Beta)

Enable this feature to access the running JupyterLab environment through a URL instead of SSH tunneling. Anyone who has been granted the Editor or Owner role in your GCP project can access this URL. This feature is available only in the US, EU and Asia.

Deep Learning VM overview

Solution provided by Google Click to Deploy

$28.27 per month estimated

Effective hourly rate $0.039 (730 hours per month)

Details

Software

Operating System	Debian (9)

Documentation

Official Documentation

StackOverflow: Deep Learning VM

Google Group: Deep Learning VM

Terms of Service

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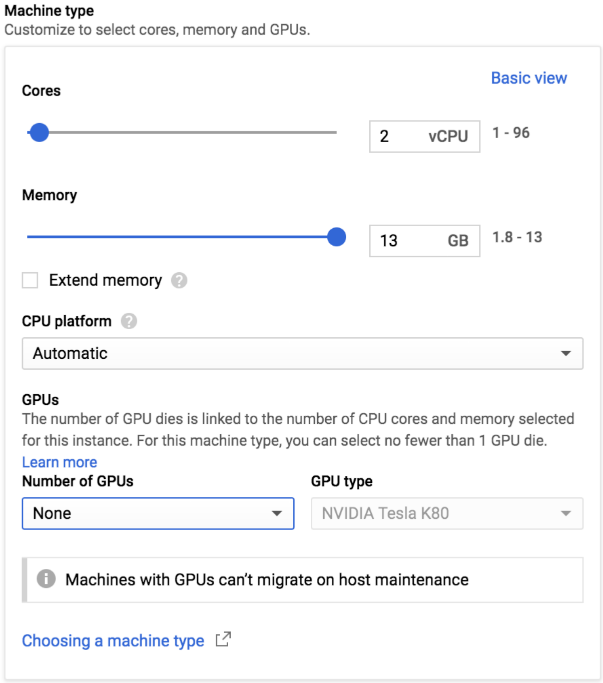
Google is providing this software or service "as-is" and will not perform any ongoing maintenance. Ongoing upgrades and maintenance are your responsibility.

Change VM hardware

You can always change number of CPUs, number of GPUs, CPU memory, and GPU type after your VM has been created.

1. You must stop the instance first.
2. Go to your VM instance's details at **Compute Engine** > **VM instances** > [click on instance name]. Click "edit" on your VM's page.
3. In `Machine type` box, click `Customize` .
4. Set `Number of GPUs` to `None` if you don't need GPUs.
5. For `GPU type` , `NVIDIA Tesla K80` is typically enough for most of our assignments. `P100` and `V100` are way more expensive, but also faster.
6. Scroll all the way down and click `Save` button.
7. Start your instance again.



Machine type

Customize to select cores, memory and GPUs.

Basic view

Cores

2 vCPU 1 - 96

Memory

13 GB 1.8 - 13

□ Extend memory

CPU platform

Automatic

GPUs

The number of GPU dies is linked to the number of CPU cores and memory selected for this instance. For this machine type, you can select no fewer than 1 GPU die.

Learn more

Number of GPUs: None

GPU type: NVIDIA Tesla K80

Machines with GPUs can't migrate on host maintenance

Choosing a machine type

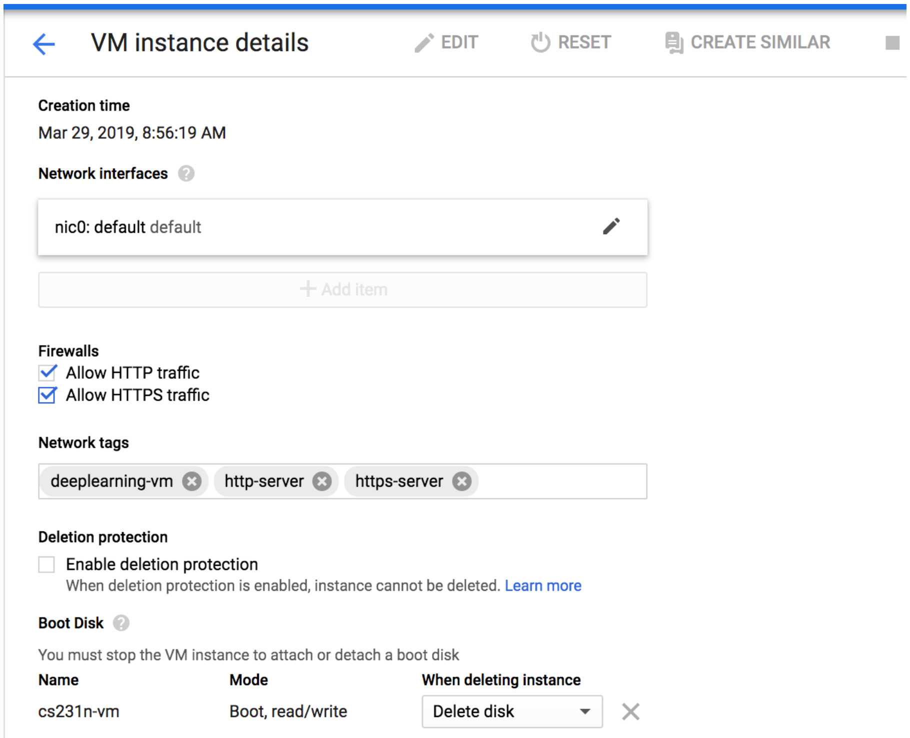
Configure networking

Wait until the deployment is finished. You should see a running VM with a green checkmark next to it on your Compute Engine page.

We need to tweak a few more settings to enable remote access to Jupyter notebooks.

1. You must stop the instance first.
2. Go to your VM instance's details at **Compute Engine** > **VM instances** > [click on instance name]. Click "edit" on your VM's page.
3. Select "Allow HTTP traffic" and "Allow HTTPS traffic".
4. Scroll all the way down and click the blue button "save".
5. Go to Firewall config page.
6. Click "CREATE FIREWALL RULE"
7. Give it an arbitrary name, such as `cs231n` .
8. In `Targets` field, select `All instances in the network` .
9. In `Source IP ranges` , enter `0.0.0.0/0` .
10. In `Protocols and ports` field, select "Specified protocols and ports". Then check `tcp` and enter `7000-9000` .
11. Click the blue button `Create` .
12. Restart your instance on the Compute Engine page.

Your configuration sheets should look similar to below:



Creation time
Mar 29, 2019, 8:56:19 AM

Network interfaces

nic0: default default

Firewalls
☑ Allow HTTP traffic
☑ Allow HTTPS traffic

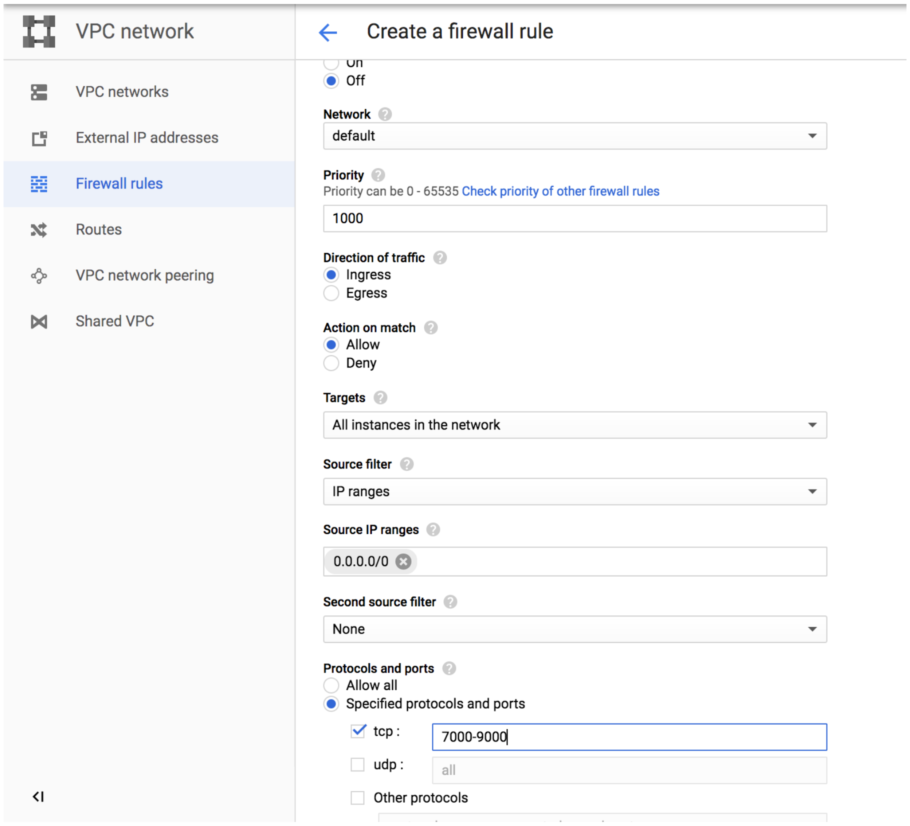
Network tags
deeplearning-vm, http-server, https-server

Deletion protection
□ Enable deletion protection
When deletion protection is enabled, instance cannot be deleted. Learn more

Boot Disk
You must stop the VM instance to attach or detach a boot disk

Name	Mode	When deleting instance
cs231n-vm	Boot, read/write	Delete disk

Firewall Rules:



○ On
● Off

Network
default

Priority
Priority can be 0 - 65535 Check priority of other firewall rules
1000

Direction of traffic
● Ingress
○ Egress

Action on match
● Allow
○ Deny

Targets
All instances in the network

Source filter
IP ranges

Source IP ranges
0.0.0.0/0

Second source filter
None

Protocols and ports
○ Allow all
● Specified protocols and ports
☑ tcp : 7000-9000
□ udp : all
□ Other protocols

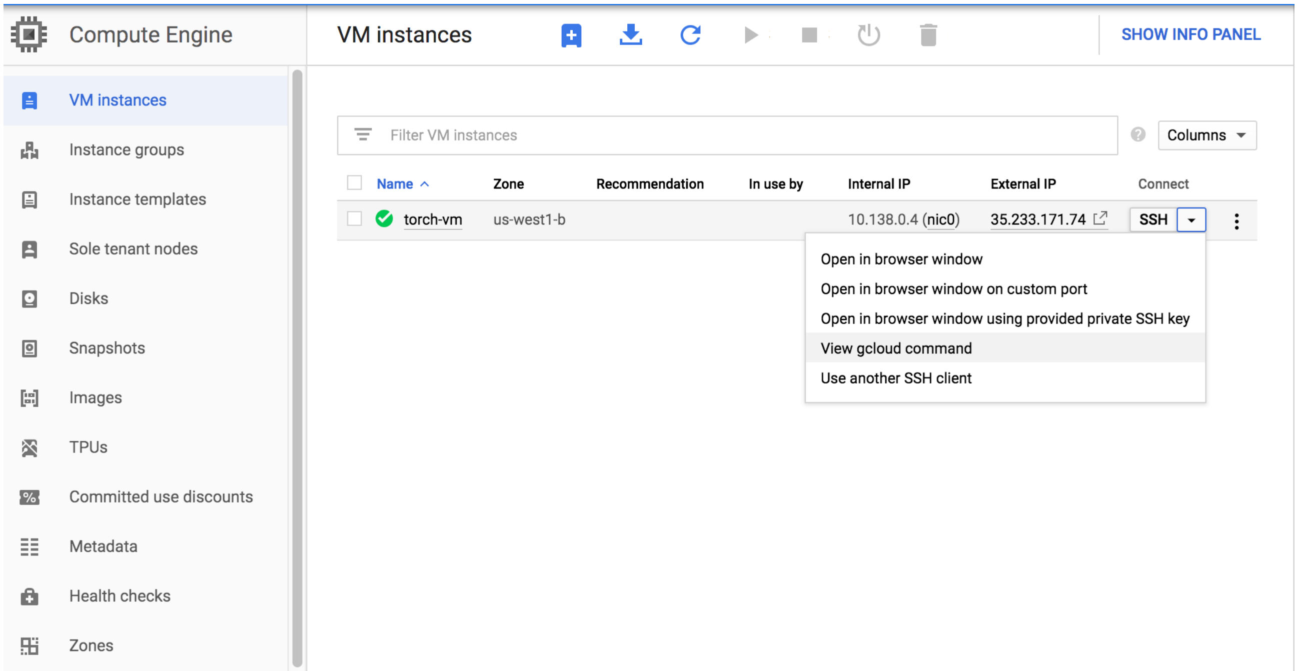
Access your newly created VM

Now that you have created your virtual GCE, you want to be able to connect to it from your computer. The rest of this tutorial goes over how to do that using the command line. First, download the Google Cloud SDK that is appropriate for your platform from here and follow their installation instructions. **NOTE: this tutorial assumes that you have performed step #4 on the website which they list as optional**. When prompted, make sure you select `us-west1-b` as the time zone.

If `gcloud` command is not in system path, you can also reference it by its full path `/<DIRECTORY-WHERE-GOOGLE-CLOUD-IS-INSTALLED>/bin/gcloud` . See this page for more detailed instructions.

To ssh into your VM, go to your VM instance details page by clicking on its name. Under **Remote access** at the top of the page, you may either click directly on `SSH` which will launch a new browser window with the SSH session, or click on the drop-down arrow and select `View gcloud command` instead to retrieve the terminal command. It should look like

```
gcloud compute --project "<YOUR_PROJECT_ID>" ssh --zone "us-west1-b" "<YOUR_VM_NAME>"
```



Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
torch-vm	us-west1-b			10.138.0.4 (nic0)	35.233.171.74	SSH

First-time Setup Script

After you SSH into the VM for the first time, you need to run a few commands in your home directory. You will be asked to set up a password for your Jupyter notebook.

```
git clone https://github.com/cs231n/gcloud.git
cd gcloud/
chmod +x ./setup.sh
./setup.sh
```

Verification

If you have GPU enabled, you should be able to:

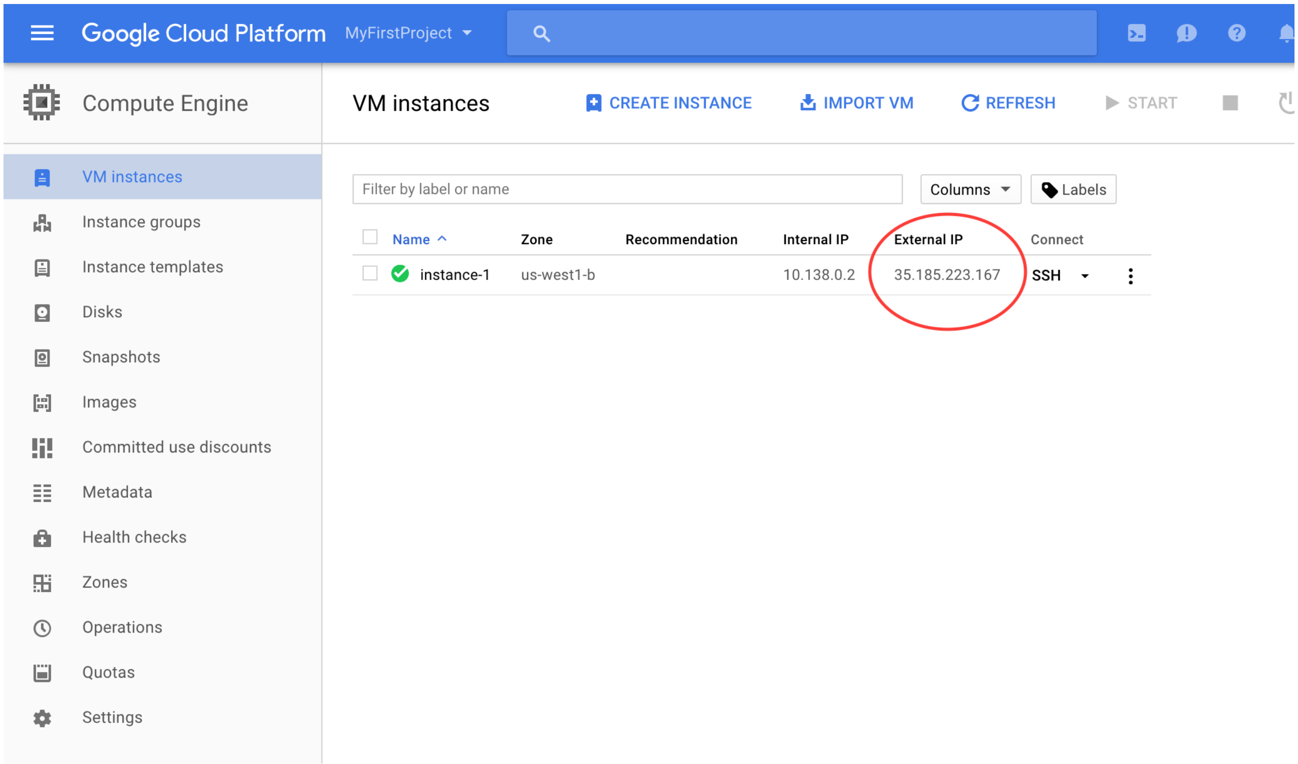
- run `nvidia-smi` and see the list of attached GPUs and their usage statistics. Run `watch nvidia-smi` to monitor your GPU usage in real time.
- inside the `gcloud/` folder, run `python verify_gpu.py` . If your GPU is attached and CUDA is correctly installed, you shouldn't see any error.
- If you want to use Tensorflow 2.0, run `python test_tf.py` . The script will show you the installed Tensorflow version (2.0.0-alpha) and then run a sample MNIST training. You should see around 97% accuracy at the end.

Using Jupyter Notebook with Google Compute Engine

Many of the assignments will involve using Jupyter Notebook. Below, we discuss how to run Jupyter Notebook from your GCE instance and connect to it with your local browser.

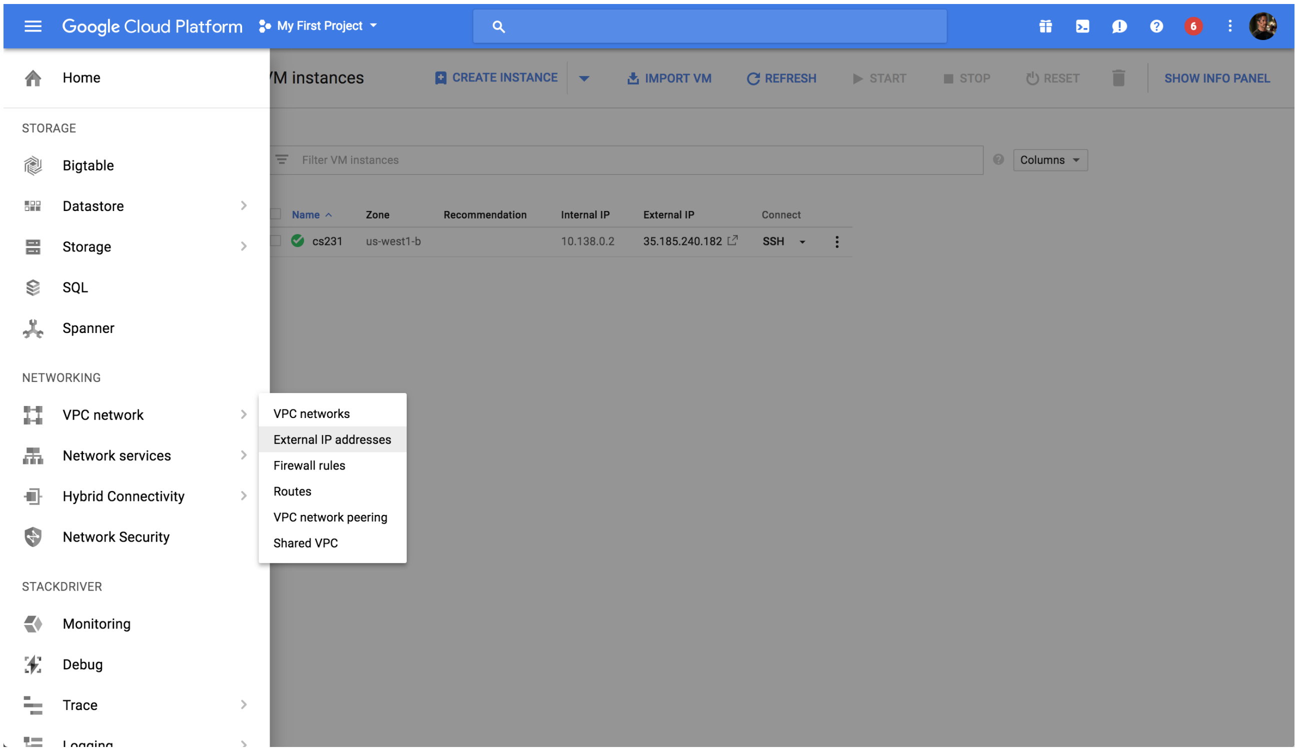
Getting a Static IP Address

Change the External IP address of your Google Cloud Engine instance to be static (see screenshot below).



Name	Zone	Recommendation	Internal IP	External IP	Connect
instance-1	us-west1-b		10.138.0.2	35.185.223.167	SSH

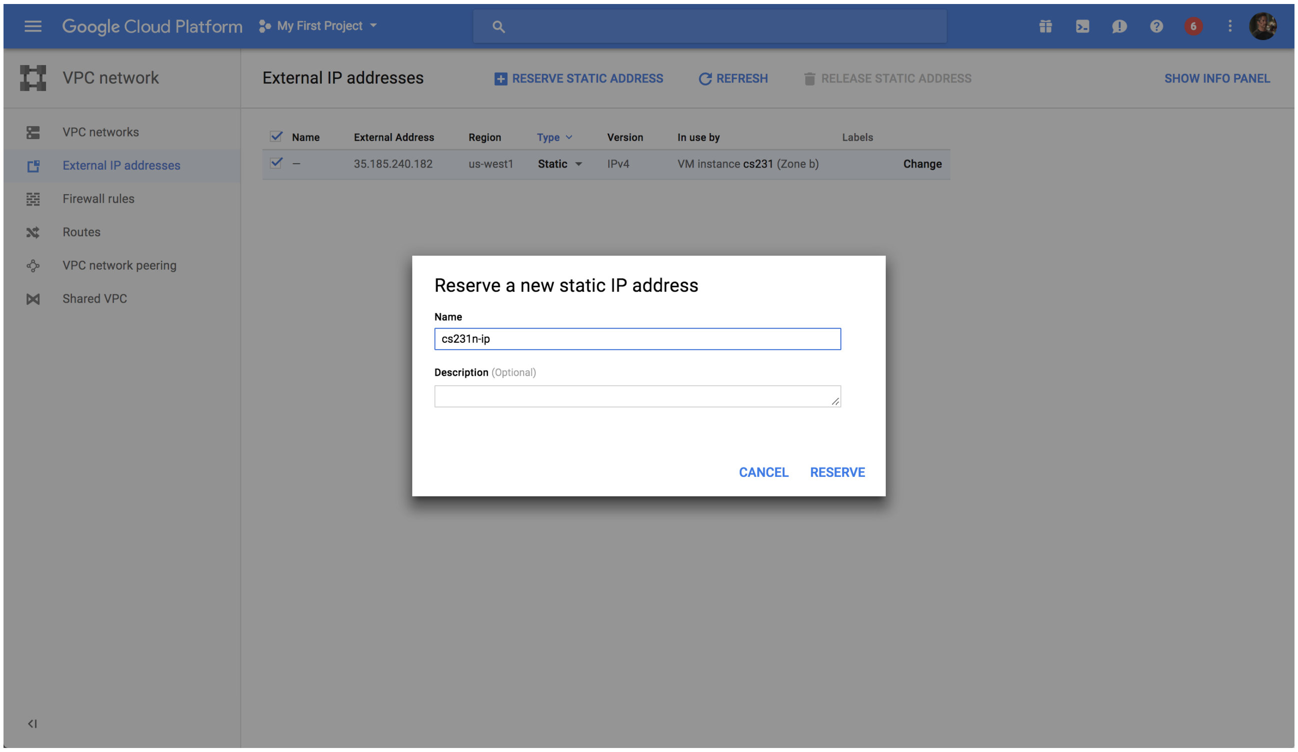
To Do this, click on the 3 line icon next to the **Google Cloud Platform** button on the top left corner of your screen, go to **VPC network** > **External IP addresses** (see screenshot below).



Name	Zone	Recommendation	Internal IP	External IP	Connect
cs231	us-west1-b		10.138.0.2	35.185.240.182	SSH

To have a static IP address, change **Type** from **Ephemeral** to **Static**. Enter your prefered name for your static IP, ours is `cs231n-ip` (see screenshot below). And click on Reserve.

NOTE: At the end of CS 231N when you don't need your instance anymore, release the static IP address because Google charges a small fee for unused static IPs (according to this page).



External IP addresses

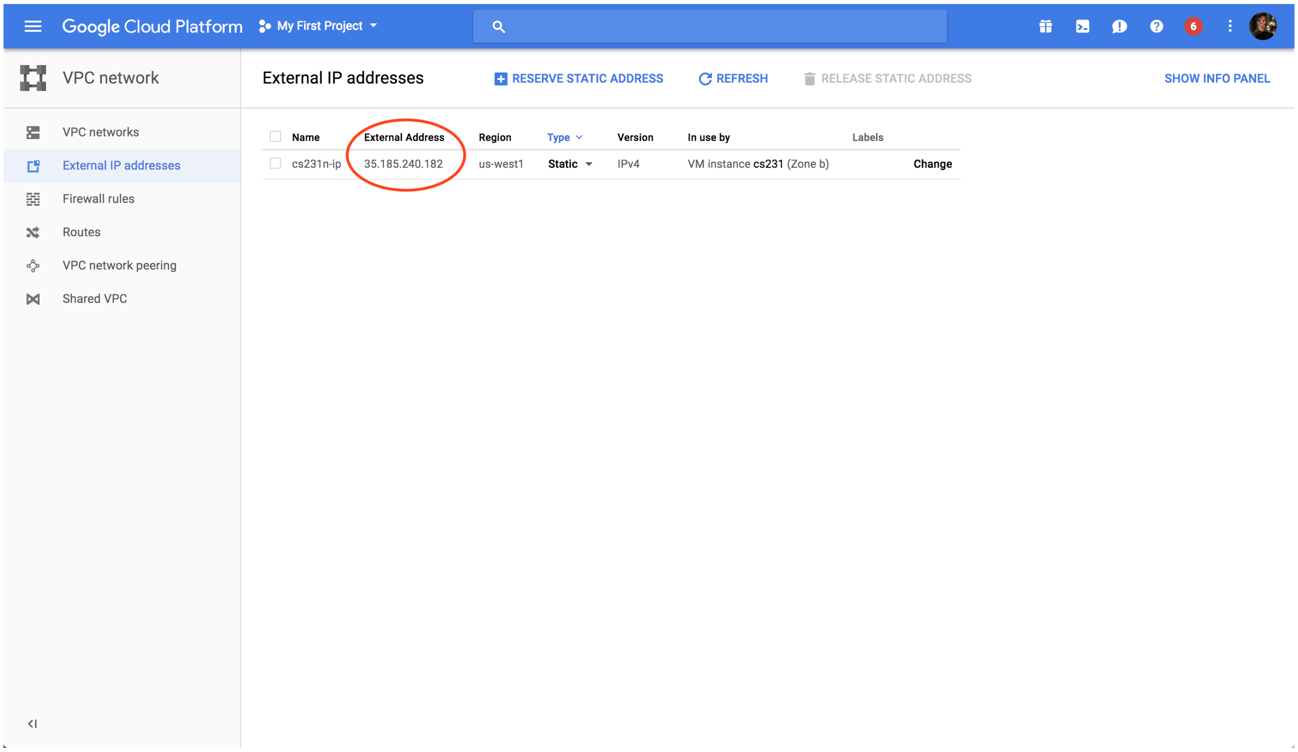
☑	Name	External Address	Region	Type	Version	In use by	Labels	
☑	–	35.185.240.182	us-west1	Static	IPv4	VM instance **cs231** (Zone b)		**Change**

Reserve a new static IP address

Name: cs231n-ip

Description (Optional):

Take note of your Static IP address (circled on the screenshot below). We use 35.185.240.182 for this tutorial.



External IP addresses

□	Name	External Address	Region	Type	Version	In use by	Labels	
□	cs231n-ip	35.185.240.182	us-west1	Static	IPv4	VM instance **cs231** (Zone b)		**Change**

Launching and connecting to Jupyter Notebook

After you ssh into your VM using the prior instructions, run Jupyter notebook from the folder with your assignment files.

```
jupyter notebook
```

The default port is `8888`, specified in `~/.jupyter/jupyter_notebook_config.py`.

You can connect to your Jupyter session from your personal laptop. Open any browser and visit `35.185.240.182:8888` . The login password is the one you set with the setup script above.

Submission: Transferring Files From Your Instance To Your Computer

When you are done with your assignments, run the submission script in your assignment folder to make a zip file. Please refer to specific instructions for each assignment.

Once you create the zip file, e.g. `assignment1.zip` , you will transfer the file from GCE instance to your local laptop. There is an easy command for this purpose:

```
gcloud compute scp <user>@<instance-name>:/path/to/assignment1.zip /local/path
```

For example, to download files from our instance to the current folder:

```
gcloud compute scp tonystark@cs231:/home/shared/assignment1.zip .
```

The transfer works in both directions. To upload a file to GCE:

```
gcloud compute scp /my/local/file tonystark@cs231:/home/shared/
```

Another (perhaps easier) option proposed by a student is to directly download the zip file from Jupyter. After running the submission script and creating assignment1.zip, you can download that file directly from Jupyter. To do this, go to Jupyter Notebook and click on the zip file, which will be downloaded to your local computer.

BIG REMINDER: Make sure you stop your instances!

Don't forget to stop your instance when you are done (by clicking on the stop button at the top of the page showing your instances). You can restart your instance and the downloaded software will still be available.

We have seen students who left their instances running for many days and ran out of credits. You will be charged per hour when your instance is running. This includes code development time. We encourage you to read up on Google Cloud, regularly keep track of your credits and not solely rely on our tutorials.