

CS6208 : Advanced Topics in Artificial Intelligence

Graph Machine Learning

Google GPU

Semester 2 2022/23

Xavier Bresson

<https://twitter.com/xbresson>

Department of Computer Science
National University of Singapore (NUS)



Outline

- Google Colab
- Google Cloud

Outline

- Google Colab
- Google Cloud

Google Colab

- I personally use it for GPU-based prototypes.
 - It is a combination of Google Drive, Google Colab (free GPU), and code editor.

Google Colab

- Step 1 : Install Google Drive App
 - <https://support.google.com/drive/answer/7329379#zippy=%2Cdownload-install-google-drive-for-desktop> (for Mac and Windows)
 - Local folder “/Users/xbresson/Google Drive” contains all files on the Google cloud <https://drive.google.com/drive/u/0/my-drive>. You can edit files directly on your local machine and it will automatically sync on the cloud.

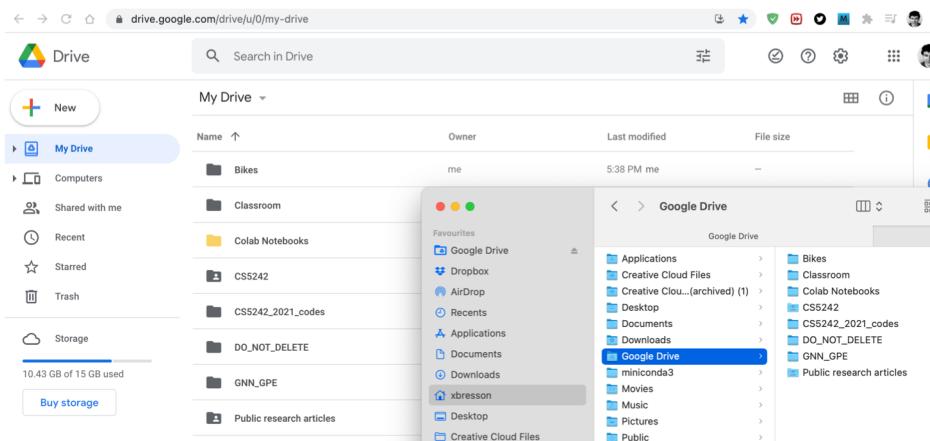
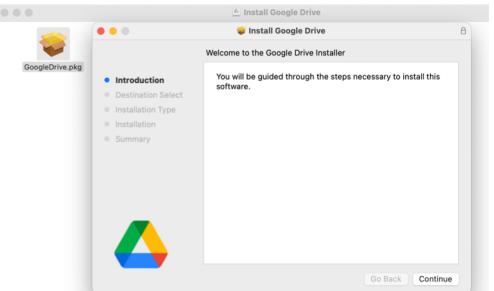
Download & install Google Drive for desktop

You might not be able to use Google Drive for desktop, or your organization might install it for you. If you have questions, [ask your administrator](#).

To download Google Drive for desktop:

[DOWNLOAD FOR WINDOWS](#) [DOWNLOAD FOR MAC](#)

1. On your computer, open:
 - GoogleDriveSetup.exe on Windows
 - GoogleDrive.dmg on Mac
2. Follow the on-screen instructions.

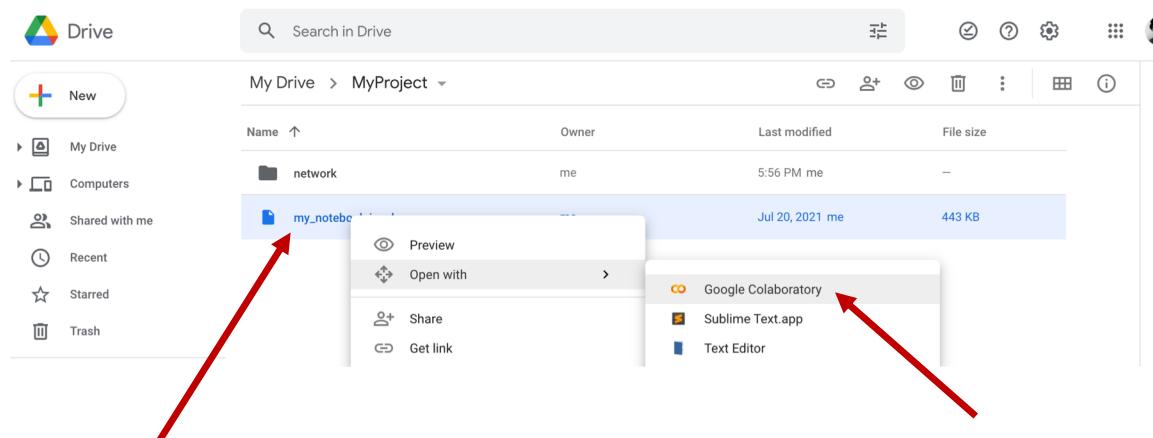
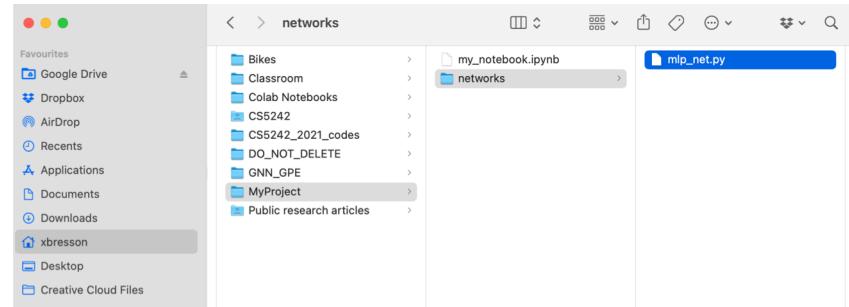


Google Colab

- Step 2 : Create a project folder “MyProject”.

<https://www.dropbox.com/s/bwx7buz5pws0eq0/MyProject.zip>

- Open the notebook with Colab from
<https://drive.google.com/drive/u/0/my-drive>



Google Colab

The image shows the Google Colab interface with several key features highlighted:

- Code Editor:** On the left, the code editor displays a notebook named "my_notebook.ipynb". The code includes setup for GPU usage, mounting Google Drive, and saving checkpoints. A red arrow points to the "Tools" menu at the top.
- Runtime Menu:** A red arrow points to the "Runtime" tab in the top navigation bar. A dropdown menu is open, showing options like "Run all", "Run before", "Run the focused cell", etc. The "Change runtime type" option is highlighted.
- Notebook Settings Dialog:** A red arrow points to the "Notebook settings" dialog, which is overlaid on the bottom right. It allows selecting the hardware accelerator (GPU selected), runtime shape (Standard), and other options like omitting code cell output.

```
[1] import torch
print(torch.__version__)
print('cuda available with GPU:',torch.cuda.get_device_name(0))
!nvcc --version

[2] from google.colab import drive
drive.mount('/content/gdrive')
import os
os.chdir('/content/gdrive/MyDrive/MyProject')
!pwd

[3] # Import user functions
%load_ext autoreload
%autoreload 2
from networks.mlp_net import MLP

[4] # GPU Setup
if torch.cuda.is_available():
    print('cuda available with GPU:',torch.cuda.get_device_name(0))
    device = torch.device('cuda')
else:
    print('cuda not available')
    device = torch.device('cpu')

[5] # YOUR CODE

# Saving checkpoint
import time
MODEL_NAME = 'MLP'
DATASET_NAME = 'MNIST'
out_dir = 'out/classification/'
root_ckpt_dir = out_dir + 'checkpoints/' + MODEL_NAME + "_" + DATASET_NAME + "_" + time.strftime('%H%M%S_on_%b_%d_%Y')
ckpt_dir = os.path.join(root_ckpt_dir, "RUN_")
print(ckpt_dir)

model = MLP(784,10)
epoch = 100

if not os.path.exists(ckpt_dir):
    os.makedirs(ckpt_dir)
torch.save(model.state_dict(), '{}.pkl'.format(ckpt_dir + "/epoch_" + str(epoch)))
```

Google Colab

The screenshot shows the Google Colab interface with several windows open:

- Left Window (Code Editor):** Displays a Jupyter Notebook titled "my_notebook.ipynb". The code in cell [3] imports the "mlp_net" module from the "networks" directory.
- Middle Window (File Browser):** Shows the "networks" directory structure. A red arrow points from the "mlp_net.py" file in the browser to the import statement in the code editor.
- Bottom Window (Code Editor):** Displays the contents of the "mlp_net.py" file, which defines an MLP class with forward and __init__ methods.

```
[1] import torch
print(torch.__version__)
print('cuda available with GPU:',torch.cuda.get_device_name(0))
nvcc --version
1.9.0+cu102
cuda available with GPU: Tesla P100-PCIE-16GB
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2020 NVIDIA Corporation
Built on Wed Jul 22 19:09:09 PDT 2020
Cuda compilation tools, release 11.0, V11.0.221
Build cuda_11_0_bu_rcc45_37.28845127_0

[2] from google.colab import drive
drive.mount('/content/gdrive')
import os
os.chdir('/content/gdrive/MyDrive/MyProject')
!pwd

Drive already mounted at /content/gdrive; to attempt to forcibly remount, call drive.mount("/content/gdrive", force_remount=True).
/content/gdrive/MyDrive/MyProject

[3] # Import user functions
%load_ext autoreload
#autoreload 2
from networks.mlp_net import MLP

[4] # GPU Setup
if torch.cuda.is_available():
    print('cuda available with GPU:',torch.cuda.get_device_name(0))
    device = torch.device('cuda')
else:
    print('cuda not available')
    device = torch.device('cpu')

cuda available with GPU: Tesla P100-PCIE-16GB

[5] # YOUR CODE

[18] # Saving checkpoint
import time
MODEL_NAME = 'MLP'
DATASET_NAME = 'MNIST'
out_dir = 'out/classification/'
root_ckpt_dir = out_dir + 'checkpoints/' + MODEL_NAME + "_" + DATASET_NAME + "_" + time.strftime('%H%M%S_on_%b_%d_%Y')
ckpt_dir = os.path.join(root_ckpt_dir, "RUN_")
print(ckpt_dir)

model = MLP(784,10)
epoch = 100

if not os.path.exists(ckpt_dir):
    os.makedirs(ckpt_dir)
torch.save(model.state_dict(), '{}.pkl'.format(ckpt_dir + "/epoch_" + str(epoch)))

out/classification/checkpoints/MLP_MNIST_10h58m37s_on_Aug_16_2021/RUN_
```

```
import torch.nn as nn
"""
MLP network
"""
class MLP(nn.Module):
    def __init__(self, input_dim, output_dim, L=2): # L=nb_hidden_layers
        super().__init__()
        list_FC_layers = [nn.Linear(input_dim, input_dim, bias=True) for l in range(L-1)]
        list_FC_layers.append(nn.Linear(input_dim, output_dim, bias=True))
        self.FC_layers = nn.ModuleList(list_FC_layers)
        self.L = L

    def forward(self, x):
        y = x
        for l in range(self.L):
            y = self.FC_layers[l](y)
            y = torch.relu(y)
        y = self.FC_layers[self.L](y)
        return y
```

Google Colab

- Install packages in Colab :

```
✓ [6] !pip install tensorboardX
3s
Collecting tensorboardX
  Downloading tensorboardX-2.4-py2.py3-none-any.whl (124 kB)
    ██████████ | 124 kB 8.0 MB/s
Requirement already satisfied: protobuf>=3.8.0 in /usr/local/lib/python3.7/dist-packages (from tensorboardX) (3.17.3)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from tensorboardX) (1.19.5)
Requirement already satisfied: six>=1.9 in /usr/local/lib/python3.7/dist-packages (from protobuf>=3.8.0->tensorboardX) (1.15.0)
Installing collected packages: tensorboardX
Successfully installed tensorboardX-2.4
```

- How to prevent Colab from disconnecting?
 - 1. Colab disconnects after 30 mins automatically if there is no activity (e.g. no mouse click).
 - 2. When you connect to a GPU, there is given a maximum of 12 hours. Then you need to wait a few hours before connecting to a GPU.
- Solution to 1 : Simulate mouse clicks, <https://www.youtube.com/watch?v=wqVNSqaAIAC>
- Solution to 1&2 : Colab Pro

Colab Pro

- <https://colab.research.google.com/signup>
- US\$9.99/month (unsubscribe anytime)

Choose the Colab plan that's right for you

Whether you're a student, a hobbyist, or a ML researcher, Colab has you covered

[Restrictions apply, learn more here](#)

Plan	Cost	Features
Colab	Free	No subscription required.
Colab Pro	\$9.99 / month	Current plan <ul style="list-style-type: none">Faster GPUsMore memoryLonger runtimes
Colab Pro+	\$49.99 / month	<ul style="list-style-type: none">Background executionFaster GPUsEven more memoryEven longer runtimes

Outline

- Google Colab
- Google Cloud

Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - Monitor your \$\$
 - Setup firewall
 - ssh the VM machine
 - Setup Python on the VM machine
 - Run the notebooks
 - Run Python without notebooks

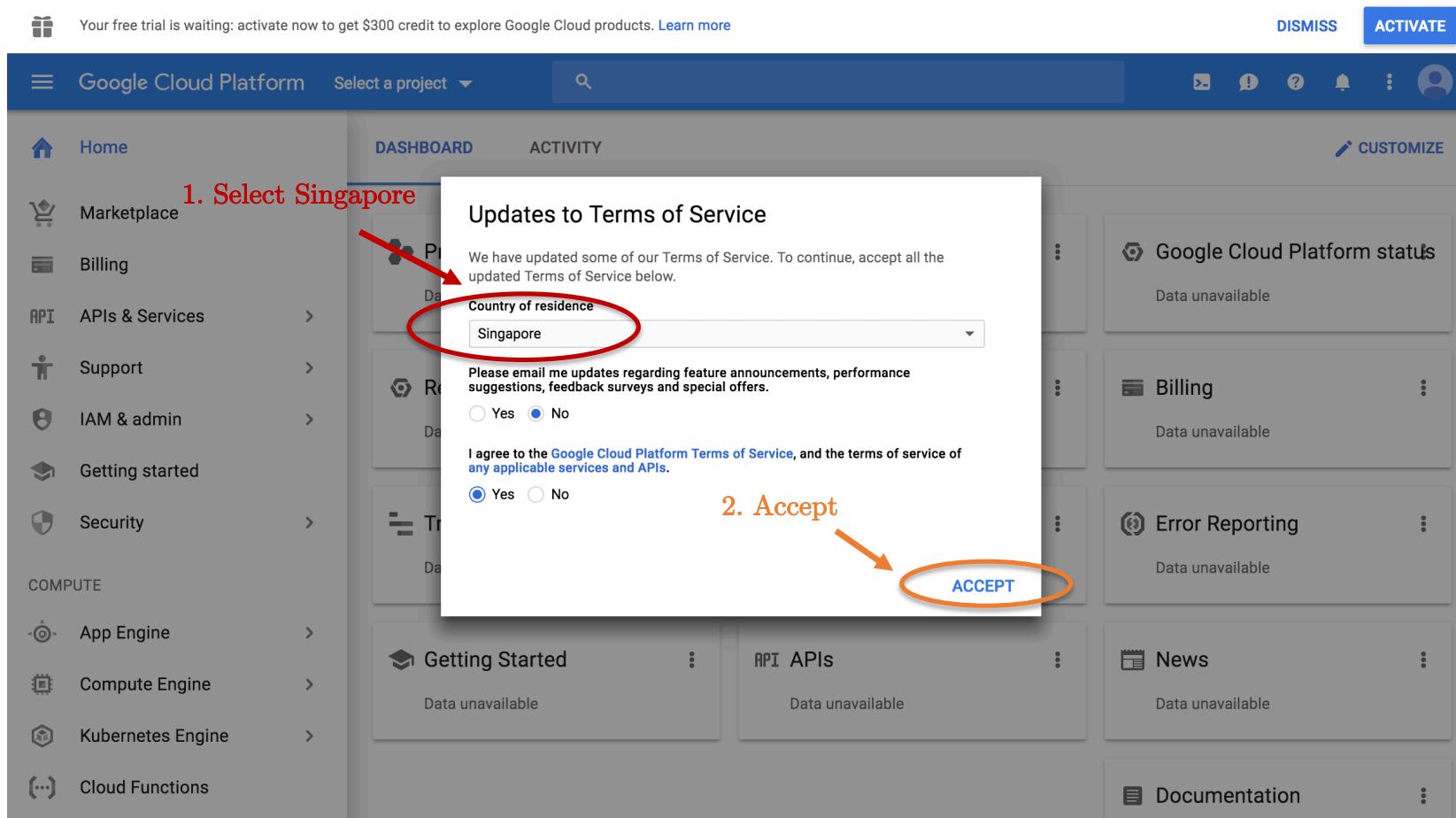
Activate the US\$ 300 credit

- Go to Google Cloud:
 - <https://console.cloud.google.com>
- Google Cloud offers US\$ 300 credit
 - 1 hour of GPU NVIDIA Tesla K80 is US\$ 0.5 ⇒ 600 hours of free GPU !

Google Cloud
Platform
Computer application



Activate the US\$ 300 credit



Activate the US\$ 300 credit

Click here

Your free trial is waiting: activate now to get \$300 credit to explore Google Cloud products. [Learn more](#)

DISMISS ACTIVATE

Google Cloud Platform Select a project

Home Marketplace Billing APIs & Services Support IAM & admin Getting started Security COMPUTE App Engine Compute Engine Kubernetes Engine Cloud Functions STORAGE

DASHBOARD ACTIVITY CUSTOMIZE

Project info Data unavailable

App Engine Data unavailable

Google Cloud Platform status Data unavailable

Resources Data unavailable

Compute Engine Data unavailable

Billing Data unavailable

Trace Data unavailable

SQL Data unavailable

Error Reporting Data unavailable

Getting Started Data unavailable

API APIs Data unavailable

News Data unavailable

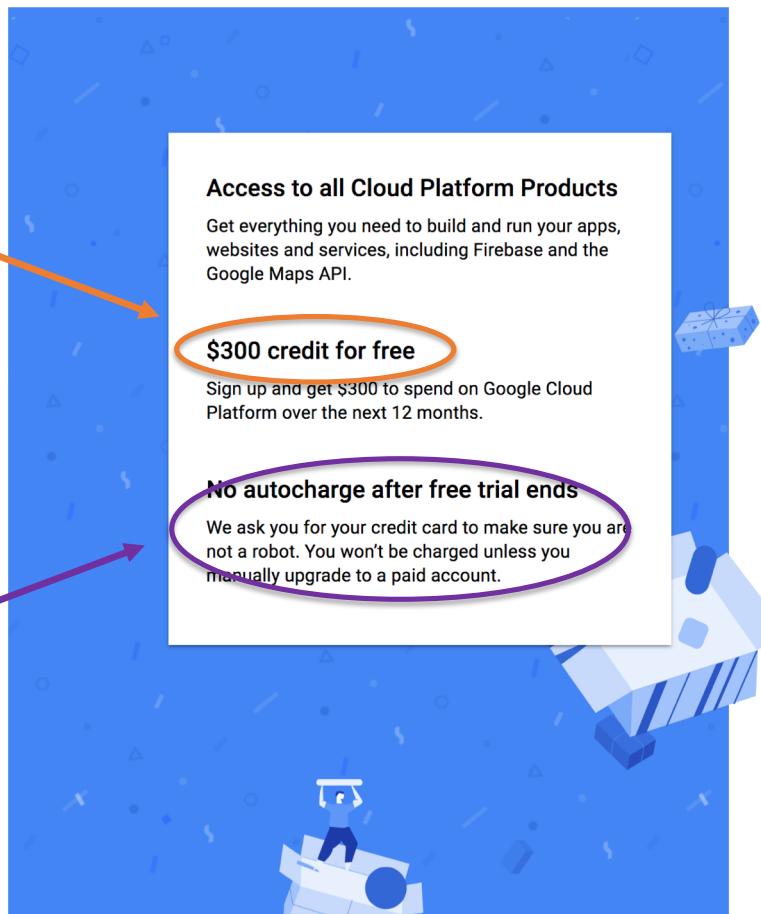
Documentation Learn about Compute Engine

Activate the US\$ 300 credit

1. US\$ 300 free credit for 12 months



2. Credit card needed but will NOT be charged after the US\$ 300 free credit.



Try Cloud Platform for free

Country

Singapore

Acceptances

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

- Yes
 No

I have read and agree to the [Google Cloud Platform Free Trial Terms of Service](#).

Required to continue

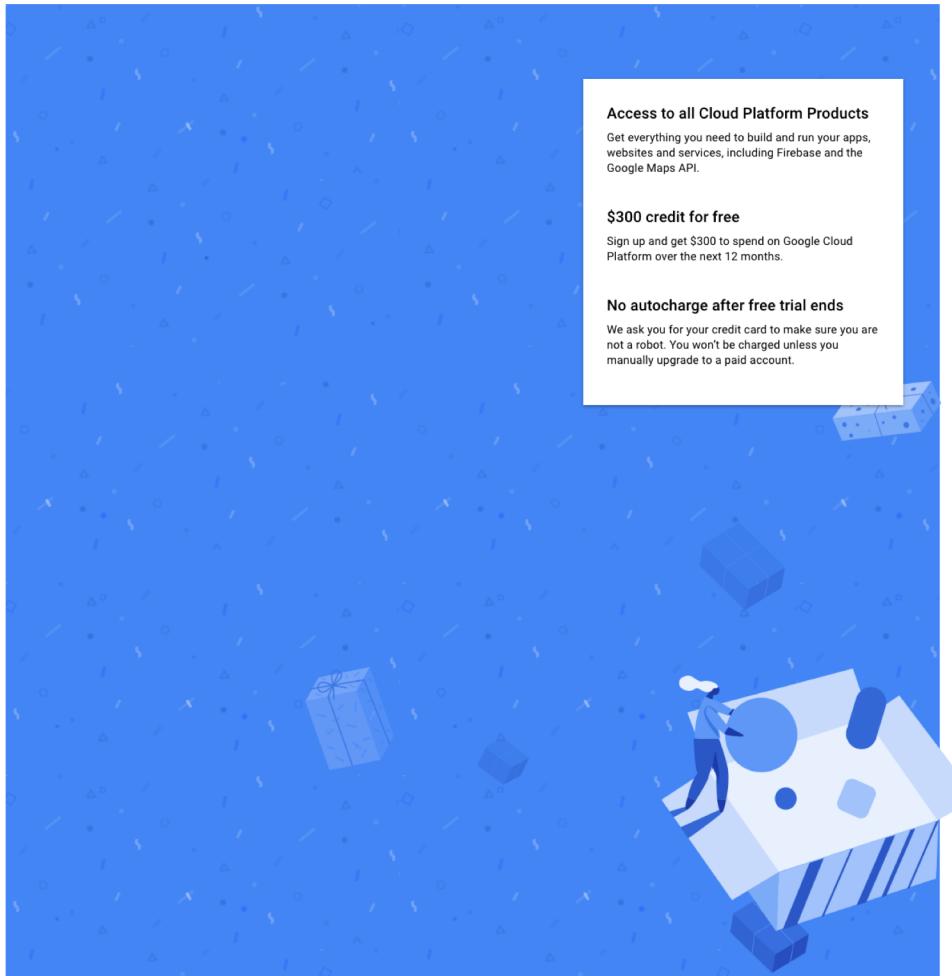
- Yes
 No

AGREE AND CONTINUE

3. Click here

[Privacy policy | FAQs](#)

Activate the US\$ 300 credit



Try Cloud Platform for free

Customer info

Individual

Name and address

Name Xavier Bresson

Address line 1 *(Required)*

Address line 2

Post code *(Required)*

Phone number

How you pay

Automatic payments
You pay for this service only after you accrue costs, via an automatic charge when you reach your billing threshold or 30 days after your last automatic payment, whichever comes first.

Payment method *(Required)*

Card number *(Required)*

MM *(Required)*

/ YY *(Required)*

CVC

Cardholder name Xavier Bresson

Credit or debit card address is same as above

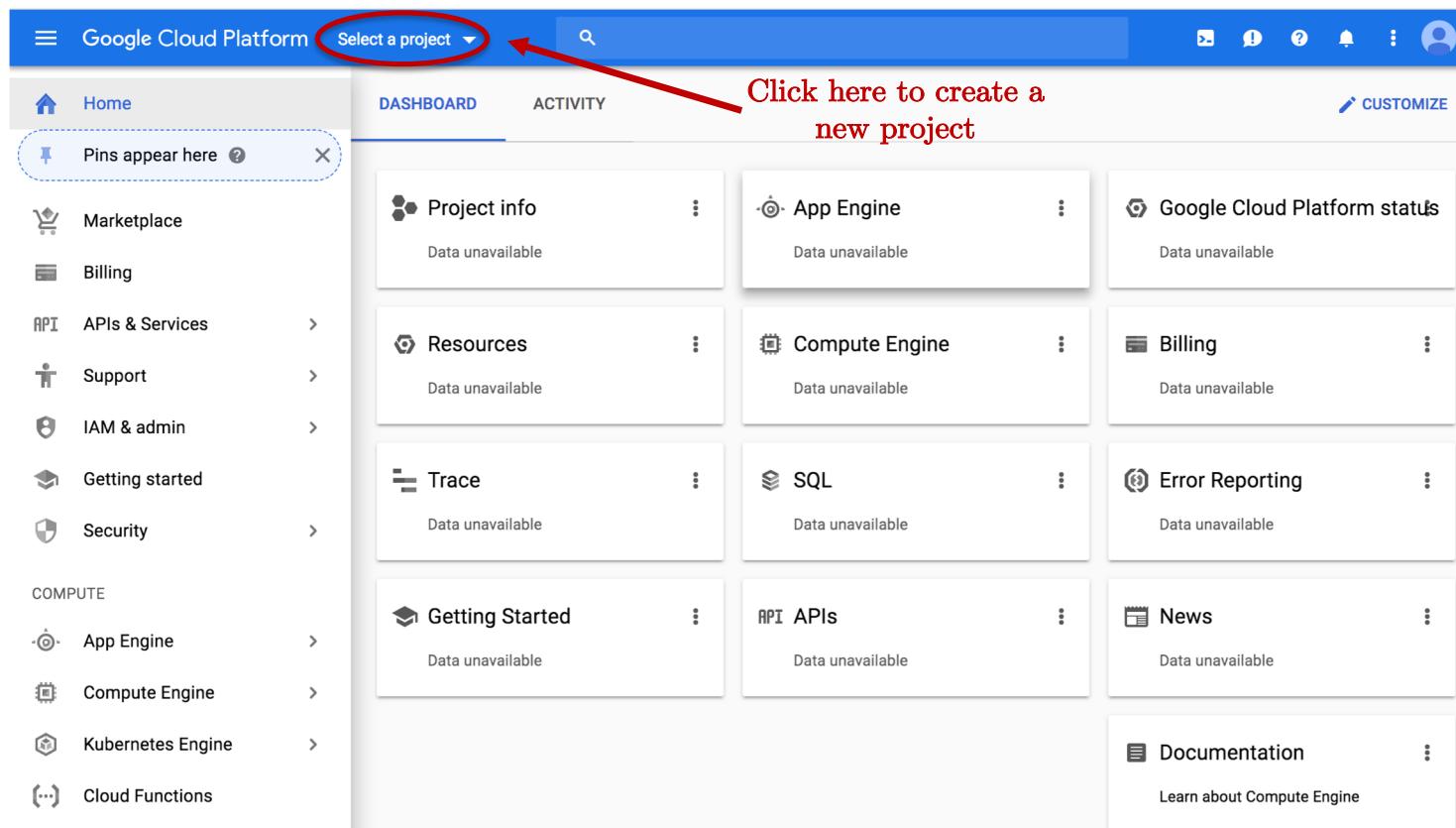
START MY FREE TRIAL!

Fill all lines

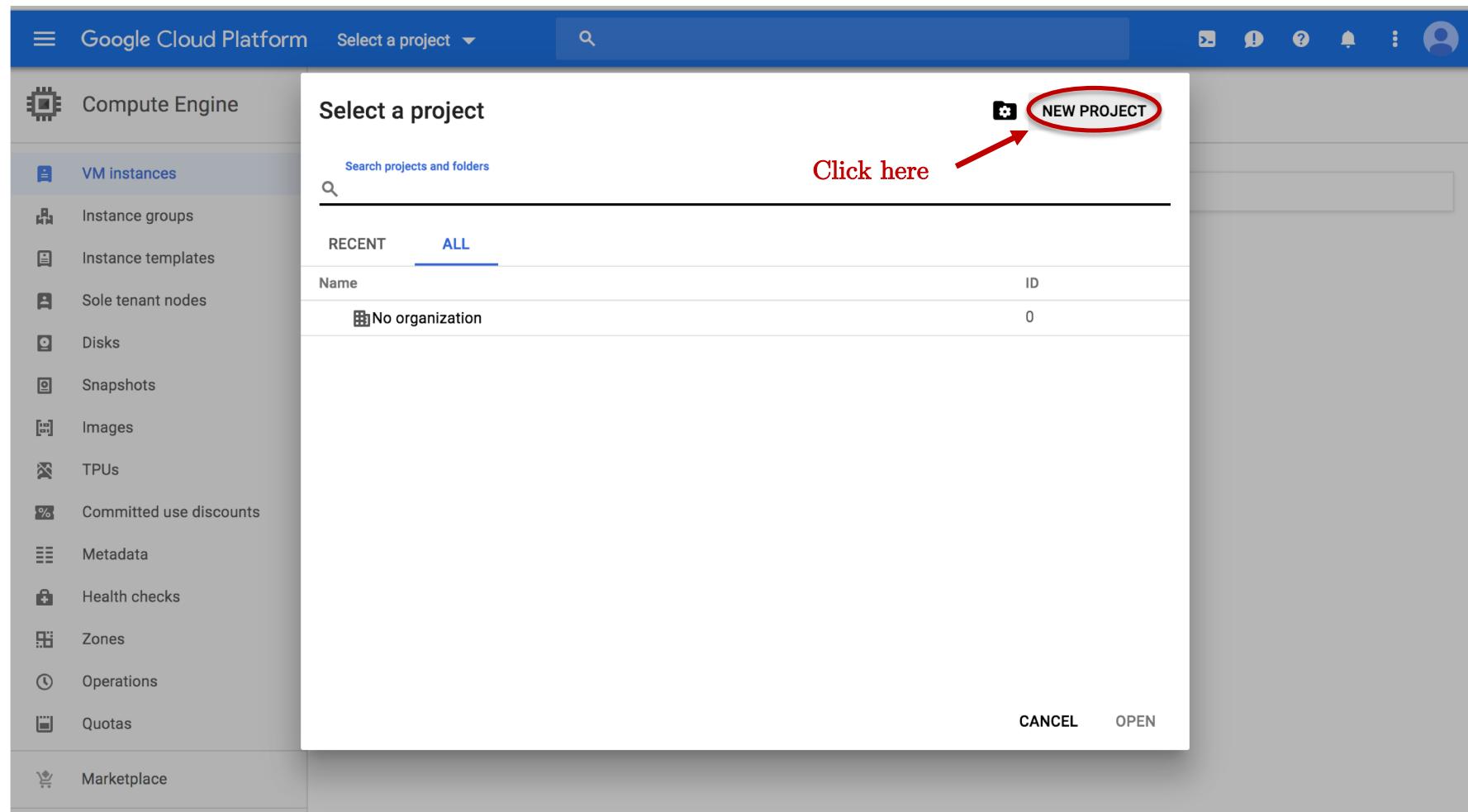
Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - **Create a VM machine**
 - Monitor your \$\$
 - Setup firewall
 - ssh the VM machine
 - Setup Python on the VM machine
 - Run the notebooks
 - Run Python without notebooks

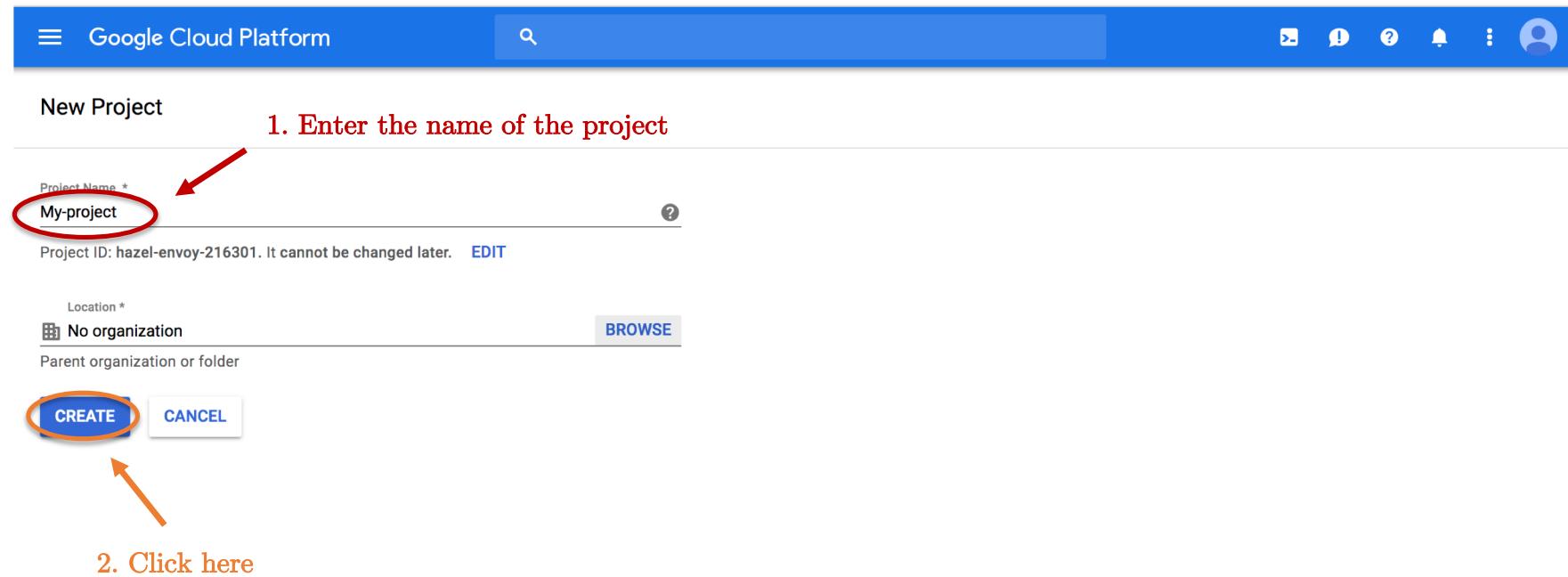
Create a VM instance



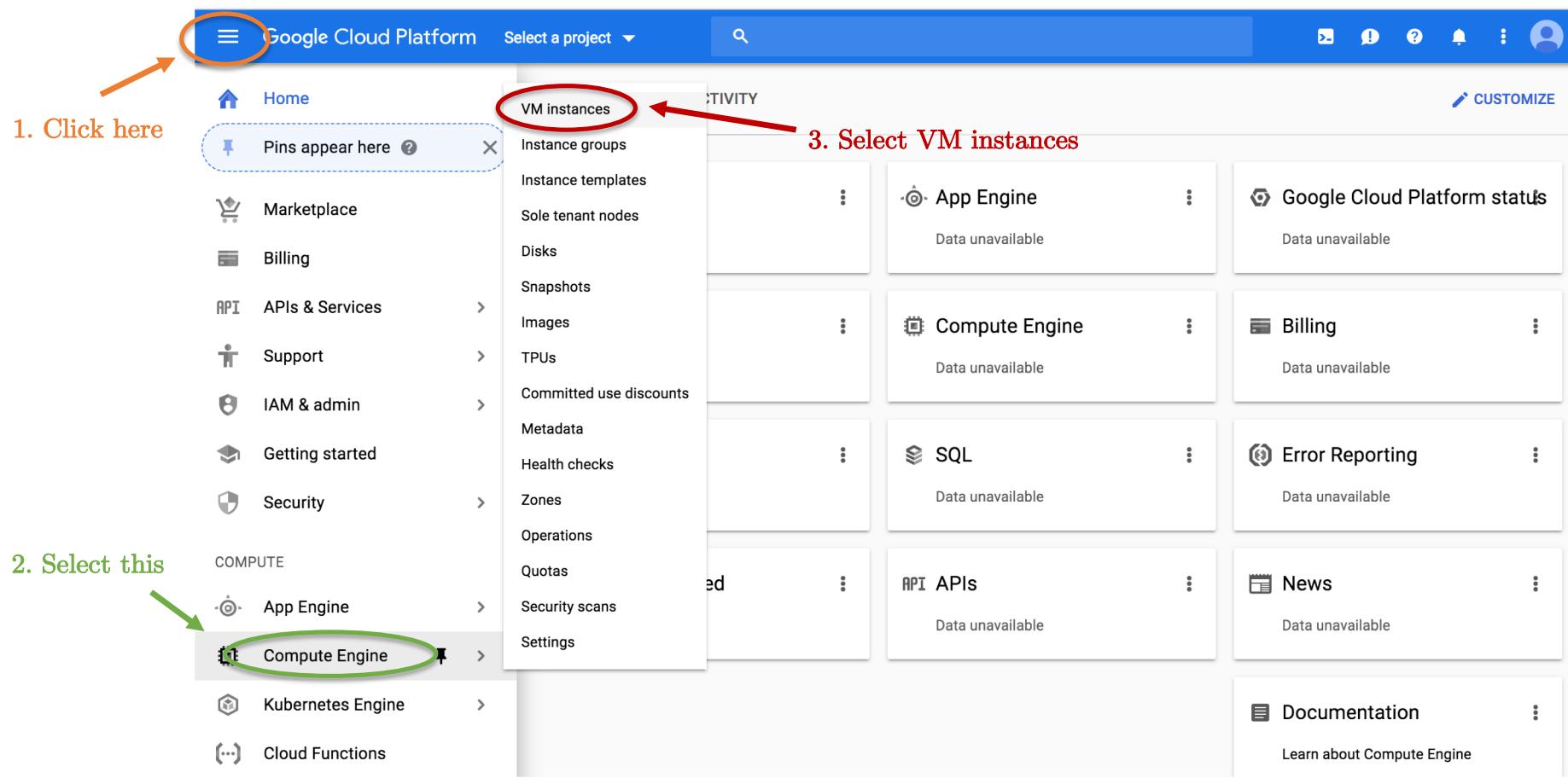
Create a VM instance



Create a VM instance



Create a VM instance



Create a VM instance

The screenshot shows the Google Cloud Platform interface for Compute Engine VM instances. The left sidebar lists various Compute Engine services: VM instances (selected), Instance groups, Instance templates, Sole tenant nodes, Disks, Snapshots, Images, TPUs, Committed use discounts, Metadata, Health checks, Zones, Operations, Quotas, Security scans, and Settings. The main content area is titled "Compute Engine VM instances" and contains a brief description of what VM instances are and how to create them. At the bottom of this section, there are three buttons: "Create", "Import", and "Take the quickstart". A red circle highlights the "Create" button, and a red arrow points from the text "Create a new VM instance" below it towards the same button.

Compute Engine VM instances

Compute Engine lets you use virtual machines that run on Google's infrastructure. Create micro-VMs or larger instances running Debian, Windows, or other standard images. Create your first VM instance, import it using a migration service, or try the quickstart to build a sample app.

Create or Import or Take the quickstart

Create a new VM instance

Create a VM instance

The screenshot shows the 'Create an instance' wizard in the Google Cloud Platform interface. The steps are numbered and annotated with arrows pointing to specific fields or sections:

- 1. Give a name**: An arrow points to the 'Name' input field where 'my-vm-gpu' is entered.
- 2. Select Taiwan (close to SG with GPUs)**: An arrow points to the 'Region' dropdown set to 'asia-east1 (Taiwan)'.
- 3. Select 4 vCPUs (instead of 1 vCPU)**: An orange arrow points to the 'Cores' section where '4 vCPU' is selected.
- 4. Select a K80 GPU**: A blue arrow points to the 'GPU' section where 'NVIDIA Tesla K80' is selected.
- 5. Select Ubuntu 16.04 LTS**: A purple arrow points to the 'Boot disk' section where 'Ubuntu 16.04 LTS' is selected.
- 6. Select Size with 30GB**: A green arrow points to the 'Size (GB)' input field where '30' is entered.
- 7. Check "Allow HTPP traffic" and "Allow HTTPS traffic"**: A yellow arrow points to the 'Firewall' section where both checkboxes are checked.
- 8. Click on Create**: A blue arrow points to the 'Create' button at the bottom of the page.

The VM instance will be created !

Create a VM instance

The screenshot shows the Google Cloud Platform Compute Engine VM instances page. The left sidebar is titled 'Compute Engine' and contains a list of options: VM instances (selected), Instance groups, Instance templates, Sole tenant nodes, Disks, Snapshots, Images, TPUs, Committed use discounts, Metadata, Health checks, Zones, Operations, Quotas, and Security scans. The main area is titled 'VM instances' and has a 'CREATE INSTANCE' button. Below it is a table with one row, which is highlighted with a red circle around the 'my-vm-gpu' name and an arrow pointing to the text 'The VM is active.' The table columns are Name, Zone, Recommendation, Internal IP, External IP, and Connect.

Name	Zone	Recommendation	Internal IP	External IP	Connect
my-vm-gpu	asia-east1-b		10.140.0.2 (nic0)	35.221.198.112	SSH

The VM is active.

Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - **Monitor your \$\$**
 - Setup firewall
 - ssh the VM machine
 - Setup Python on the VM machine
 - Run the notebooks
 - Run Python without notebooks

Monitor your \$\$

1. Check out the price of the VM per hour or per month when creating the VM.

The screenshot shows the 'Create an instance' form. A red arrow points from the text 'S\$364.01 per month estimated' to a circled area. The circled area includes the text 'S\$364.01 per month estimated' and 'Effective hourly rate \$0.499 (730 hours per month)'. The rest of the form includes fields for Name (my-vm-gpu), Region (asia-east1 (Taiwan)), Zone (asia-east1-b), Machine type (4 vCPU, 15 GB memory, 1 NVIDIA Tesla K80 GPU), and other configuration options like CPU platform (Automatic).

The screenshot shows the 'VM instances' list. A purple circle highlights the row for 'my-vm'. A context menu is open over this row, with 'Stop' highlighted by an orange circle. The menu also includes options like Start, Recycle, Delete, New instance group, View network details, and View logs.

3. If you are NOT using the VM
Stop it !

2. If the VM is active then

You are paying \$\$!

Monitor your \$\$

The screenshot shows the Google Cloud Platform Compute Engine VM instances page. On the left, there's a sidebar with various options like VM instances, Instance groups, Instance templates, etc. The main area shows a table of VM instances. One instance, named "my-vm" in the "Name" column, is selected. A context menu is open over this instance, with the "Start" option highlighted and circled in red. An orange arrow points from the text below towards this "Start" button. The table columns include Name, Zone, Recommendation, Internal IP, External IP, and Connect.

Name	Zone	Recommendation	Internal IP	External IP	Connect
my-vm	asia-southeast1-a		10.148.0.2 (nic0)	None	SSH

1. If you want to use the VM then start it but remember that
You are paying \$\$!

Monitor your \$\$

1. Click on Menu

2. Click on Billing

3. Click on Overview

Google Cloud Platform

Home

VPC network

Products

Marketplace

Billing

APIs & Services

Support

IAM & admin

Getting started

Security

Compute

App Engine

Compute Engine

Kubernetes Engine

Cloud Functions

Overview

Billing account overview

Billing account ID: 01AD61-A1780C-E53D06

Credits

Promotion ID	Expires	Promotion value	Amount remaining
Free Trial	Mar 6, 2019	\$300.00	\$295.30

Budgets & alerts

Transactions

Billing export

Payment settings

Payment method

Reports

Billing

Overview

Billing account overview

Billing account ID: 01AD61-A1780C-E53D06

Credits

Promotion ID	Expires	Promotion value	Amount remaining
Free Trial	Mar 6, 2019	\$300.00	\$295.30

Projects linked to this billing account

Project name	Project ID
My First Project	useful-airlock-197304

DON'T FORGET TO TURN OFF YOUR VM !

Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - Monitor your \$\$
 - **Setup firewall**
 - ssh the VM machine
 - Setup Python on the VM machine
 - Run the notebooks
 - Run Python without notebooks

Setup firewall

1. Click on Menu

2. Click on Firewall rules

3. Click on Create Firewall Rule

Google Cloud Platform My First Project Firewall rules + CREATE FIREWALL RULE REFRESH DELETE

Firewall rules control incoming or outgoing traffic to an instance. By default, incoming traffic from outside your network is blocked. [Learn more](#)

Note: App Engine firewalls are managed [here](#).

Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network
default-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80	Allow	1000	default
default-allow-https	Ingress	https-server	IP ranges: 0.0.0.0/0	tcp:443	Allow	1000	default
default-allow-icmp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	icmp	Allow	65534	default
default-allow-internal	Ingress	Apply to all	IP ranges: 10.128.0.0/9	tcp:0-65535 udp:0-65535 icmp	Allow	65534	default
default-allow-rdp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:3389	Allow	65534	default
default-allow-ssh	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:22	Allow	65534	default

Setup firewall

1. Enter any name.

2. Select “All instances in the network” for Targets.

3. Enter 0.0.0.0/0 for Source IP ranges

4. Check tcp and enter 8888 for Specified protocols and ports

5. Click Create.

Google Cloud Platform My First Project

VPC network

Firewall rules

Routes

VPC network peering

Shared VPC

Create a firewall rule

Name: my-firewall-rule

Description (Optional)

Network: default

Priority: 1000

Direction of traffic: Ingress

Action on match: Allow

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: Specified protocols and ports

tcp: 8888

Disable rule

Create Cancel

Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - Monitor your \$\$
 - Setup firewall
 - **ssh the VM machine**
 - Setup Python on the VM machine
 - Run the notebooks
 - Run Python without notebooks

ssh the VM machine

The screenshot shows the Google Cloud Platform Compute Engine VM instances page. On the left, there's a sidebar with various options like VM instances, Instance groups, Instance templates, etc. The main area shows a table of VM instances. One instance named "my-vm" is listed with its details: Zone (asia-southeast1-a), Internal IP (10.148.0.2 (nic0)), External IP (35.240.216.2), and a "Connect" button. The "SSH" part of the "Connect" button is circled in red, and a red arrow points from the text "Click on SSH and get access to a terminal" to this circled area. Another red arrow points from the same text to a terminal window on the right.

Click on SSH and get access to a terminal

xavier_bresson@my-vm:~

```
Secure https://ssh.cloud.google.com/projects/useful-airlock-197304/regions/asia-southeast1-a/instances/my-vm?authuser=0&hl=en-US
Connected, host fingerprint: ssh-rsa 2048 83:BD:21:32:FF:CB:25:36:07:0E:3E:C8:B5:D1:B8:BA:2B:C4:71:00:D6:1A:EF
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.15.0-1018-gcp x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/Advantage

 Get cloud support with Ubuntu Advantage Cloud Guest:
 http://www.ubuntu.com/business/services/cloud

0 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.

xavier_bresson@my-vm:~$
```

Outline (Google Cloud)

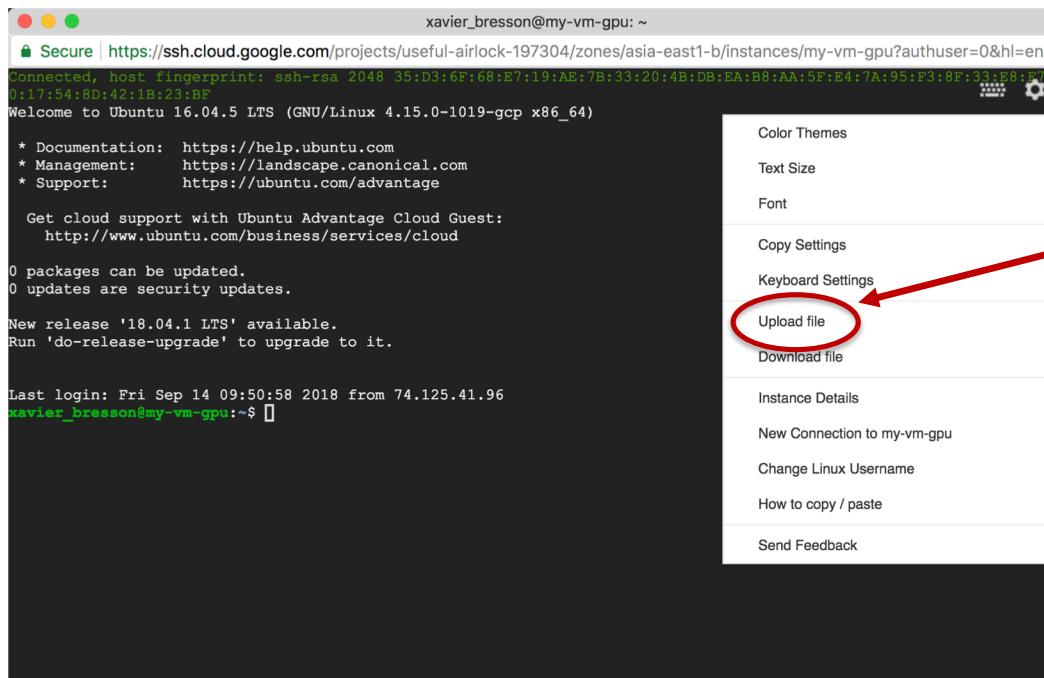
- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - Monitor your \$\$
 - Setup firewall
 - ssh the VM machine
 - **Setup Python on the VM machine**
 - Run the notebooks
 - Run Python without notebooks

Setup Python on the VM machine

1. Go to this link :

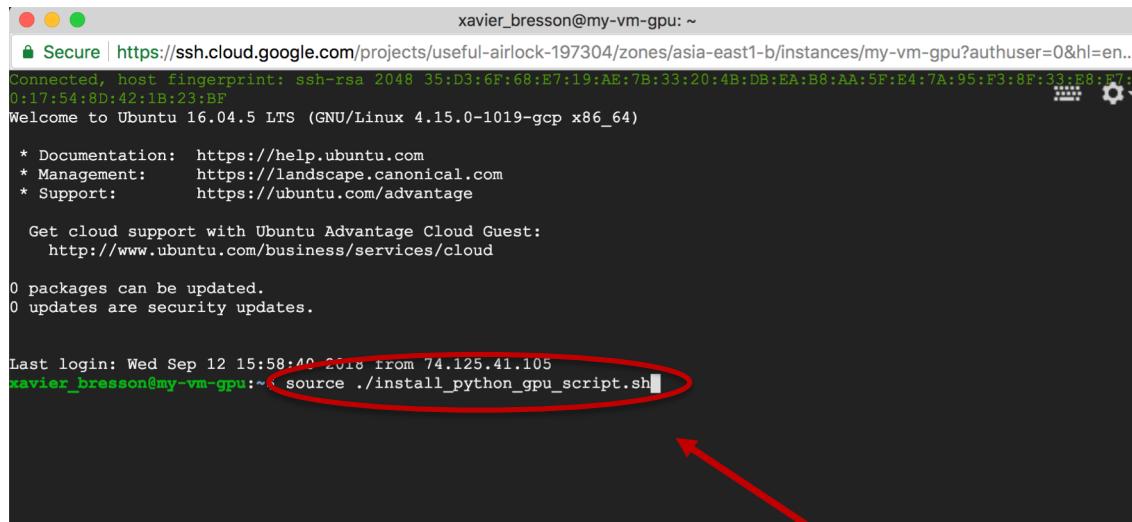
https://www.dropbox.com/s/ek0phqdlsjfmupg/install_python_gpu_script.sh?dl=0

2. Download the script file `install_python_gpu_script.sh` to configure Python on the VM machine.



3. Upload the script file to configure Python on the VM machine.

Setup Python on the VM machine



```
xavier_bresson@my-vm-gpu: ~
Secure | https://ssh.cloud.google.com/projects/useful-airlock-197304/zones/asia-east1-b/instances/my-vm-gpu?authuser=0&hl=en...
Connected, host fingerprint: ssh-rsa 2048 35:D3:6F:68:E7:19:AE:7B:33:20:4B:DB:EA:B8:AA:5F:E4:7A:95:F3:8F:33:E8:F7:D
0:17:54:8D:42:1B:23:BF
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.15.0-1019-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 Get cloud support with Ubuntu Advantage Cloud Guest:
   http://www.ubuntu.com/business/services/cloud

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

Last login: Wed Sep 12 15:58:40 2018 from 74.125.41.105
xavier_bresson@my-vm-gpu:~$ source ./install_python_gpu_script.sh
```

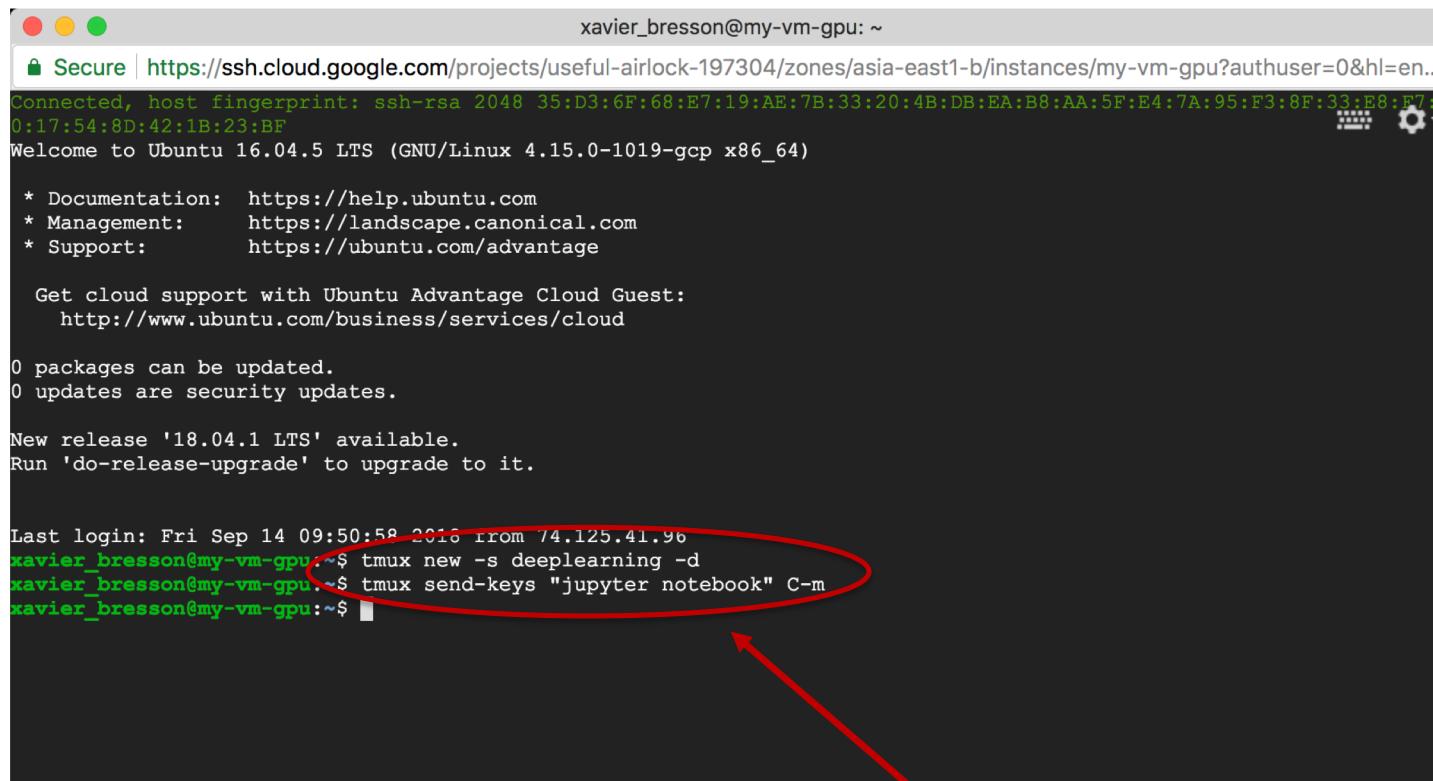
Run the script with the command:

`source ./install_python_gpu_script.sh`

Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - Monitor your \$\$
 - Setup firewall
 - ssh the VM machine
 - Setup Python on the VM machine
 - **Run the notebooks**
 - Run Python without notebooks

Run the notebooks



xavier_bresson@my-vm-gpu: ~

Secure | https://ssh.cloud.google.com/projects/useful-airlock-197304/zones/asia-east1-b/instances/my-vm-gpu?authuser=0&hl=en...

```
Connected, host fingerprint: ssh-rsa 2048 35:D3:6F:68:E7:19:AE:7B:33:20:4B:DB:EA:B8:AA:5F:E4:7A:95:F3:8F:33:E8:F7:D  
0:17:54:8D:42:1B:23:BF  
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.15.0-1019-gcp x86_64)  
  
* Documentation: https://help.ubuntu.com  
* Management: https://landscape.canonical.com  
* Support: https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
0 packages can be updated.  
0 updates are security updates.  
  
New release '18.04.1 LTS' available.  
Run 'do-release-upgrade' to upgrade to it.  
  
Last login: Fri Sep 14 09:50:58 2018 from 74.125.41.96  
xavier_bresson@my-vm-gpu:~$ tmux new -s deeplearning -d  
xavier_bresson@my-vm-gpu:~$ tmux send-keys "jupyter notebook" C-m  
xavier_bresson@my-vm-gpu:~$
```

Start the notebooks remotely with the commands:

tmux new -s deeplearning -d
tmux send-keys "jupyter notebook" C-m

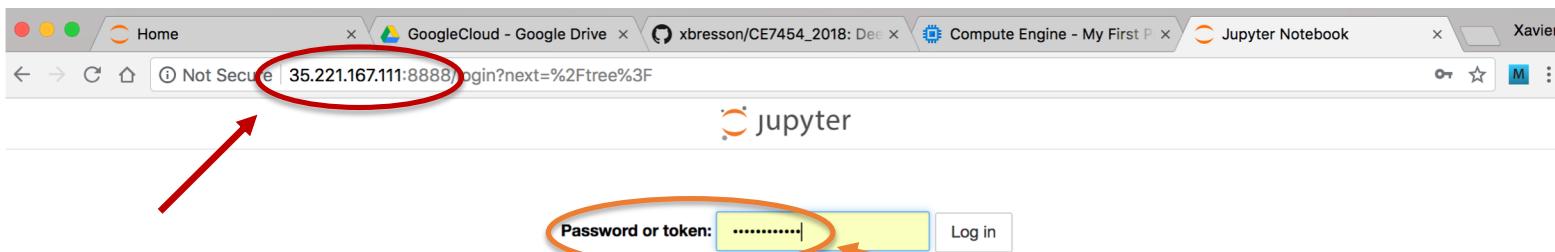
Run the notebooks

The screenshot shows the Google Cloud Platform Compute Engine VM instances page. On the left, there's a sidebar with various options like VM instances, Instance groups, Instance templates, etc. The main area shows a table of VM instances. One instance, named "my-vm-gpu", is selected. A red circle highlights its "External IP" field, which contains "35.221.167.111". A red arrow points from the text "Use the IP address on the Cloud machine" down to this highlighted IP address.

Name	Zone	Recommendation	Internal IP	External IP	Connect
my-vm-gpu	asia-east1-b		10.140.0.2 (nic0)	35.221.167.111	SSH

Use the IP address on the Cloud machine

Run the notebooks



1. Type the address of the Cloud machine with :8888 in any web browser :

`http://35.221.167.111:8888`

2. Type the password: deeplearning

Token authentication is enabled

If no password has been configured, you need to open the notebook server with its login token in the URL, or paste it above. This requirement will be lifted if you [enable a password](#).

The command:

```
jupyter notebook list
```

will show you the URLs of running servers with their tokens, which you can copy and paste into your browser. For example:

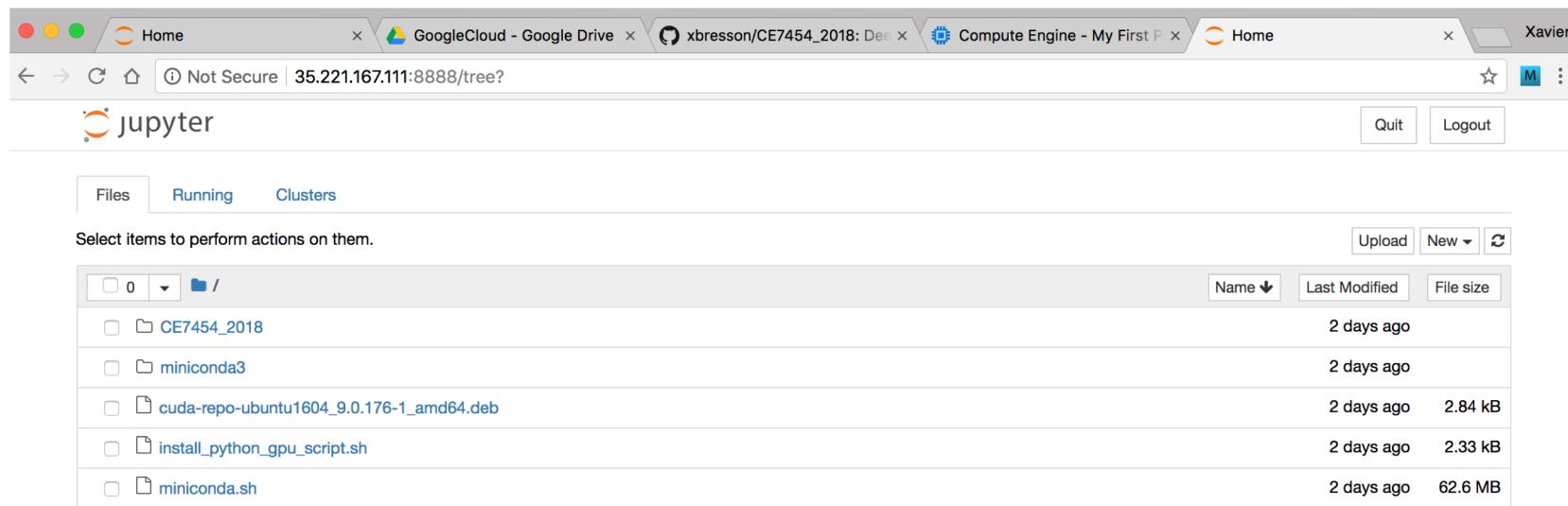
```
Currently running servers:  
http://localhost:8888/?token=c8de56fa... :: /Users/you/notebooks
```

or you can paste just the token value into the password field on this page.

See [the documentation on how to enable a password](#) in place of token authentication, if you would like to avoid dealing with random tokens.

Cookies are required for authenticated access to notebooks.

Run the notebooks



Files Running Clusters

Select items to perform actions on them.

Upload New

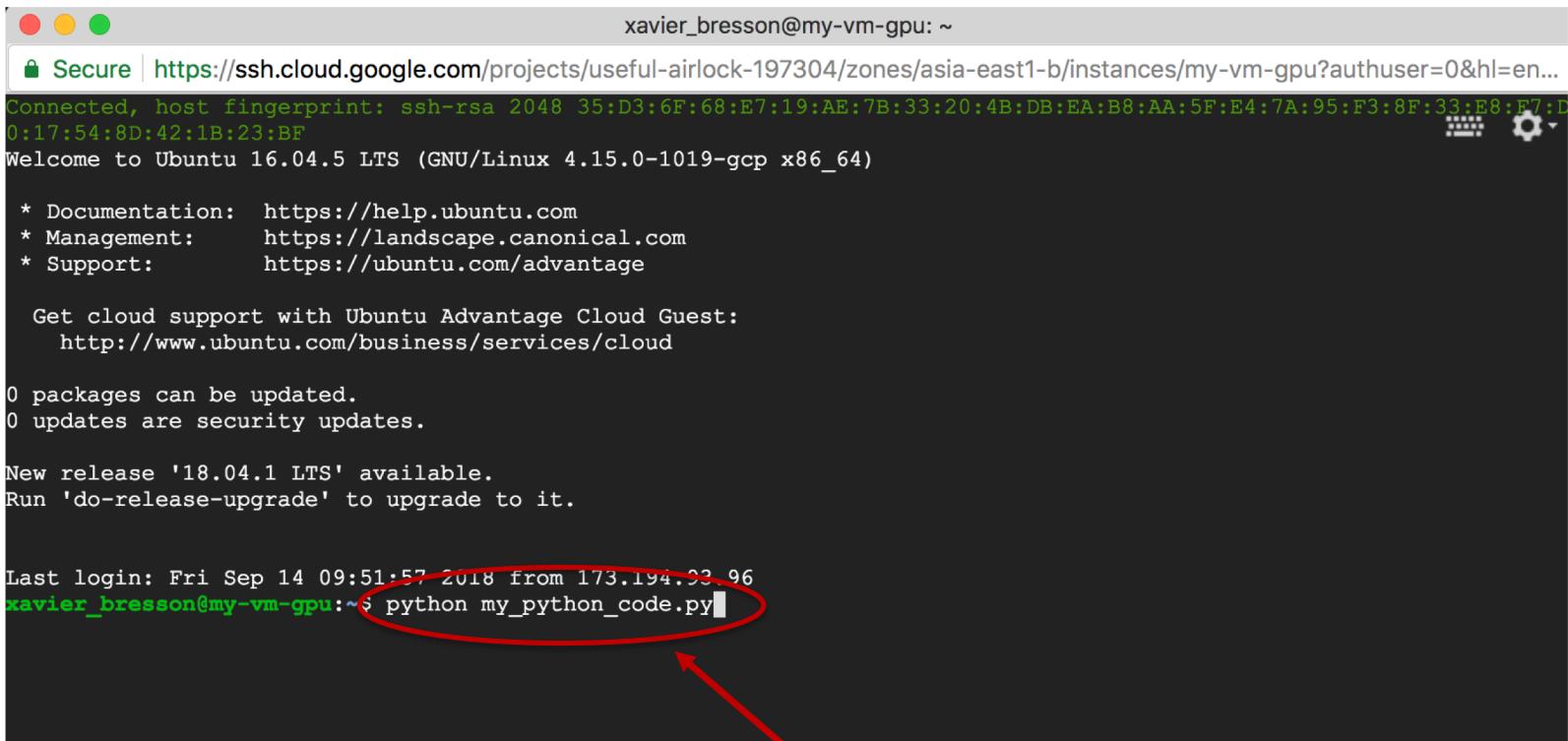
	Name	Last Modified	File size
<input type="checkbox"/>	0	2 days ago	
<input type="checkbox"/>	CE7454_2018	2 days ago	
<input type="checkbox"/>	miniconda3	2 days ago	
<input type="checkbox"/>	cuda-repo-ubuntu1604_9.0.176-1_amd64.deb	2 days ago	2.84 kB
<input type="checkbox"/>	install_python_gpu_script.sh	2 days ago	2.33 kB
<input type="checkbox"/>	miniconda.sh	2 days ago	62.6 MB

The notebooks are ready to run with GPU acceleration !

Outline (Google Cloud)

- Google Cloud
 - Activate the US\$ 300 credit
 - Create a VM machine
 - Monitor your \$\$
 - Setup firewall
 - ssh the VM machine
 - Setup Python on the VM machine
 - Run the notebooks
 - **Run Python without notebooks**

Run Python without notebooks



```
xavier_bresson@my-vm-gpu: ~
Secure | https://ssh.cloud.google.com/projects/useful-airlock-197304/zones/asia-east1-b/instances/my-vm-gpu?authuser=0&hl=en...
Connected, host fingerprint: ssh-rsa 2048 35:D3:6F:68:E7:19:AE:7B:33:20:4B:DB:EA:B8:AA:5F:E4:7A:95:F3:8F:33:E8:F7:D0:17:54:8D:42:1B:23:BF
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.15.0-1019-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

 Get cloud support with Ubuntu Advantage Cloud Guest:
   http://www.ubuntu.com/business/services/cloud

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

New release '18.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Fri Sep 14 09:51:57 2018 from 173.194.23.96
xavier_bresson@my-vm-gpu:~$ python my_python_code.py
```

Run your python code with GPU acceleration.

DON'T FORGET TO TURN OFF YOUR VM !



Questions?