



INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
TOULOUSE

GOOGLE CLOUD

IA FRAMEWORKS

CODE DEVELOPMENT FOR DATA SCIENTIST

OBJECTIVE:

- Go further than data exploration and training model.
- Run code on real dataset with more computation power.
- Discover tool that you will need to know if you need to deploy model.

A THREE PARTS LAB.

- Write **python script**.
- Run code on **Google's Virtual Machine**.
- Run code on **Google's Virtual Machine** within **Docker container**.

CODE DEVELOPMENT FOR DATA SCIENTIST

OBJECTIVE:

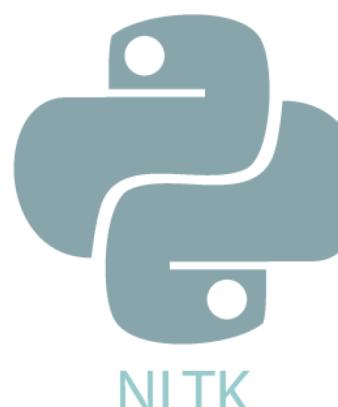
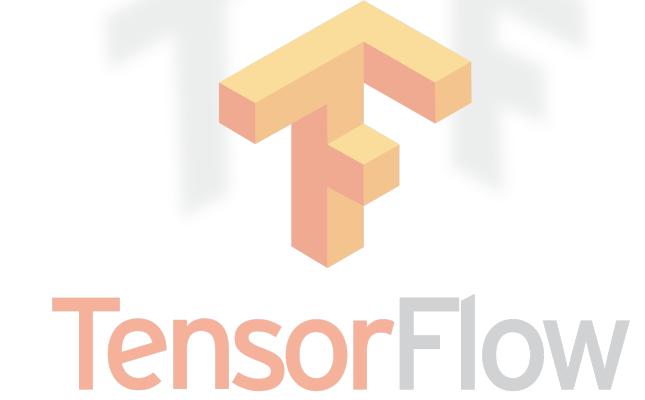
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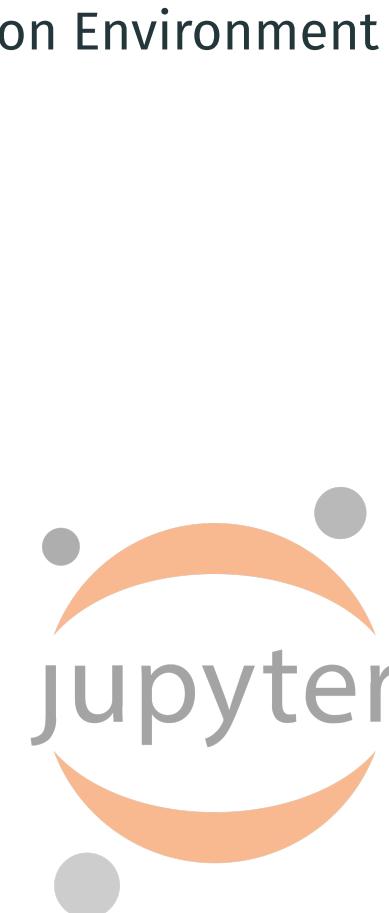
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GOOGLE CLOUD PLATFORM

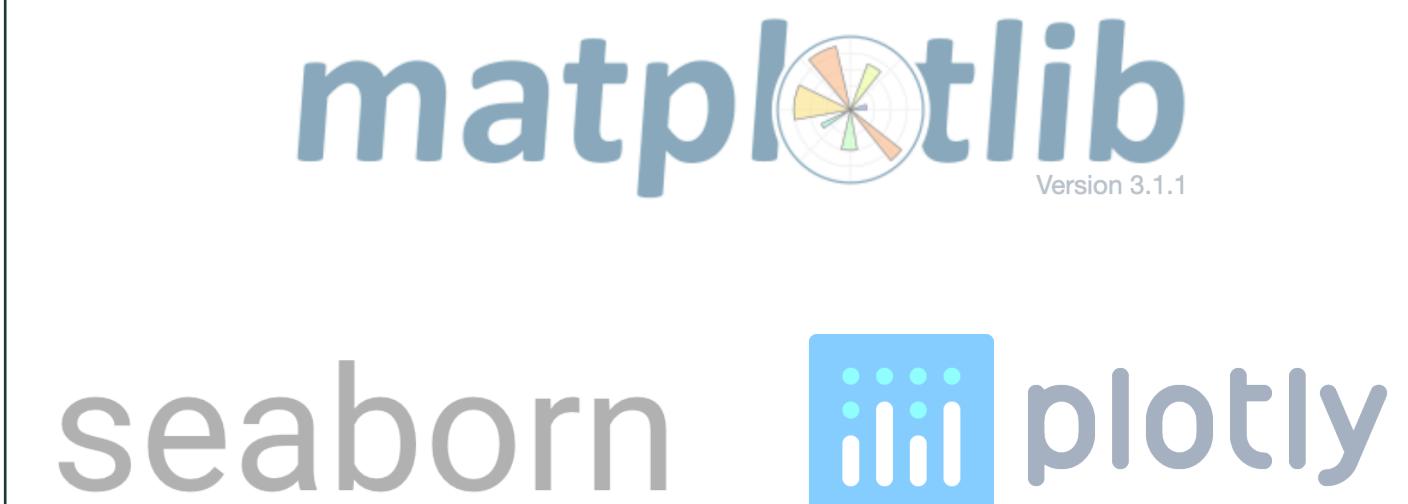
ML Python Libraries



Python Environment



Viz' Python Libraries



Framework & Tool

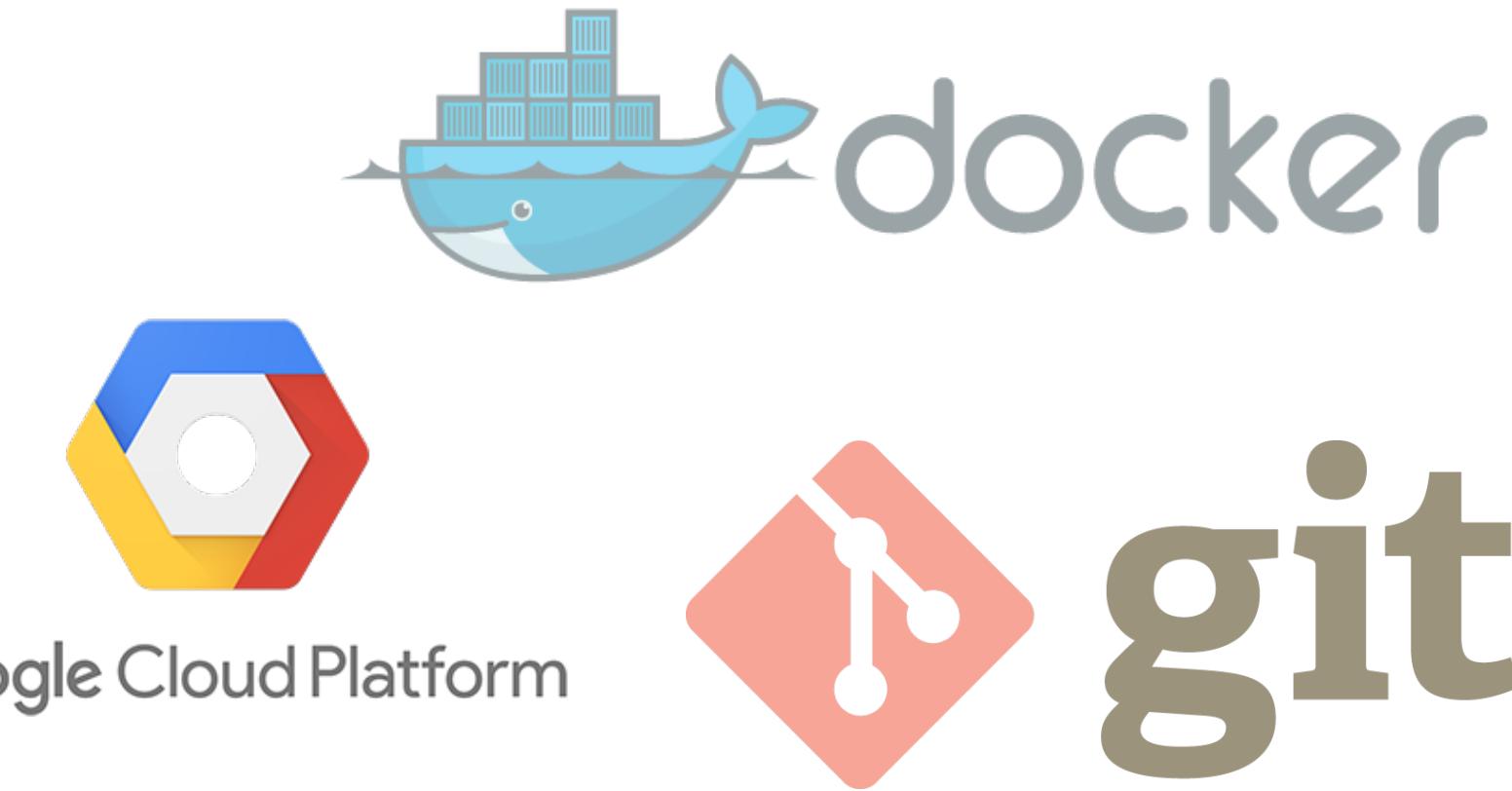


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INTRODUCTION

GOOGLE CLOUD

Suite of cloud computing services with more than 90 products: -> [Link](#).

- **Power computation.** *Compute Engine.*
 - *Instances. Tensorflow instances. Kubernetes, etc..*
- **Storage.**
 - *sql, datastore, bucket etc...*
- **Big Data.**
 - *Big Query, Dataflow.*
- **Artificial Intelligence.**
 - *Data Labeling, ML auto, Notebook etc..*
- **Network, operation, scheduler, monitoring etc...**

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COMPUTE ENGINE

For the TP: **Power computation.**

- *Instances with Tensorflow already installed* → [Link](#)

Why not IA Tools ?

- *Solution for non expert.*
- *Can't do whatever you want.*
- *Not for educational purpose.*

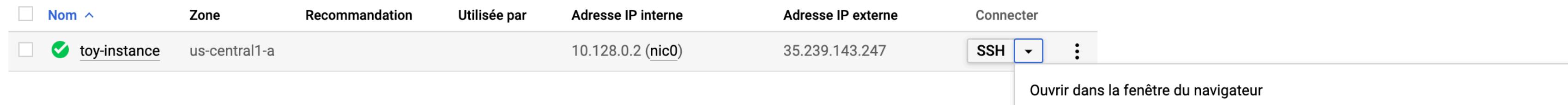
What do I need to use it?

- *Basic knowledge of the google cloud interface.*
- *Basic use of terminal command (No graphic interface)*
- *gcloud SDK*

VIRTUAL MACHINE INSTANCES

How to access the **instance** one it has been launched?

- **ssh** *Google cloud* online interface.



- Classic **ssh** connection.
- **cloud sdk**

CLOUD SDK - COMMAND

Command line tool which allow to manage VM instance.

- ***gcloud init.*** To be used at first utilisation.
- ***gcloud compute instances start/stop/delete instance_name.*** To start/stop/removes the instance.
- ***gcloud compute scp –recurse CopyFrom CopyTo.*** To send file on the instance.
 - *–recurse (optionnal):* to be used if directory is copied
 - *CopyFrom:* location of the file or directory to be copied
 - *CopyTo:* Location of the directory where the file or directory will be copied.
- ***gcloud compute ssh –ssh-key-file pathToSshKey –zone Zone*** To set ssh connection to the instance.
 - *–ssh-key-file:* path to your ssh key.
 - *–zone:* where the instance is.
- ***gcloud compute ssh .. –command*** To execute command on the instance.
 - *gcloud compute ssh –command ‘mkdir data’*
 - *gcloud compute ssh –command ‘python learning.py’*

EXECUTION'S PIPELINE

PIPELINE

1. Write script in your local machine.
2. Turn your instance on.
3. Build environment (at first used).
4. Send latest version of your code to the instance.
5. Send data to the instance.
6. Run script on the instance.
7. Get the result locally to analyse the results.
8. Turn your instance off.

PIPELINE - COMMAND

1. Write script in your local machine.
2. *gcloud compute instances start InstanceName*
3. *gcloud compute ssh –command ‘mkdir data ..’*
4. *gcloud compute scp script.py ‘bguillou@instance-gpu:/home/’*
5. *gcloud compute scp –recurse data ‘bguillou@instance-gpu:/home/’*
6. *gcloud compute ssh –command ‘python script.py -a 3’*
7. *gcloud compute scp –recurse ‘bguillou@instance-gpu:/home/results’ ‘/home’*
8. *gcloud compute instances stop InstanceName.*

Too many possibility to make mistake. -> [Write the all pipeline with python script.](#)

PIPELINE - TP

3 python script

- **instances.py.** An **InstanceManager**'s python class. Allows to apply **generic** gcloud command through python code with pre-setting VM arguments.
- **project.py.** An **ProjectManager**'s python class. Allows to apply **project specific** gcloud command through python code.
- **main.py.** It contains the script you will run in order to apply the all pipeline.

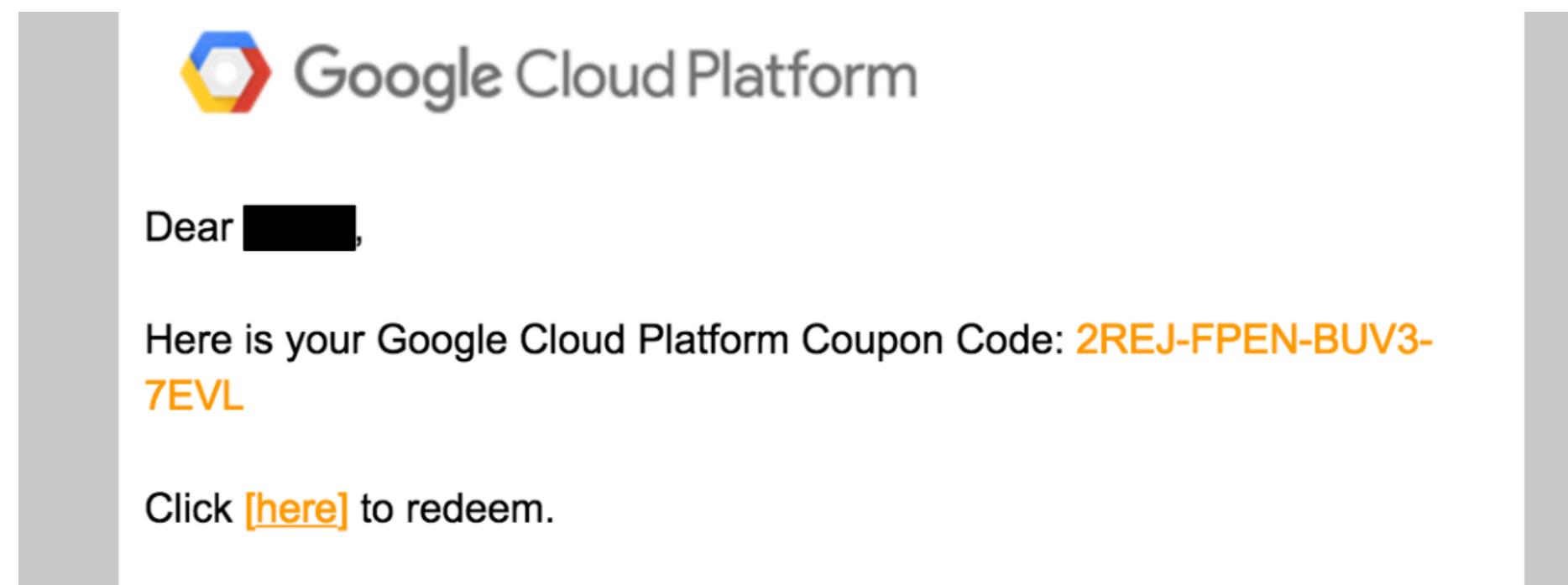
ANNEXE A - INITIALISATION PROCEDURE

BEFORE TO START

- If you're connected to a gmail account when starting this procedure. It will automatically connect your google cloud account to your gmail address, even if you're using a insa email. Disconnect yourself from your gmail account before starting if you don't want this connection to append.
- **AT NO MOMENT** you have to give your credit card. Google cloud website can be confusing. Google has a 300\$ welcome credit offer if you register with your credit card. **THIS IS NOT THE OFFER** INSA has subscribed to. So if you are asked to give your credit information you are in the wrong road.

STEP1 - GET STUDENT CREDIT

- 1.Click on the following [link](#) : Fill the form with name / first name (or fake one if you don't want to give your data to google) and your INSA's email (you have to do that).
- 2.You will received a confirmation email. Click on the confirmation link.
- 3.Finally you will received your confirmation code:



Click on the [here] link. Give the code and valid your subscription

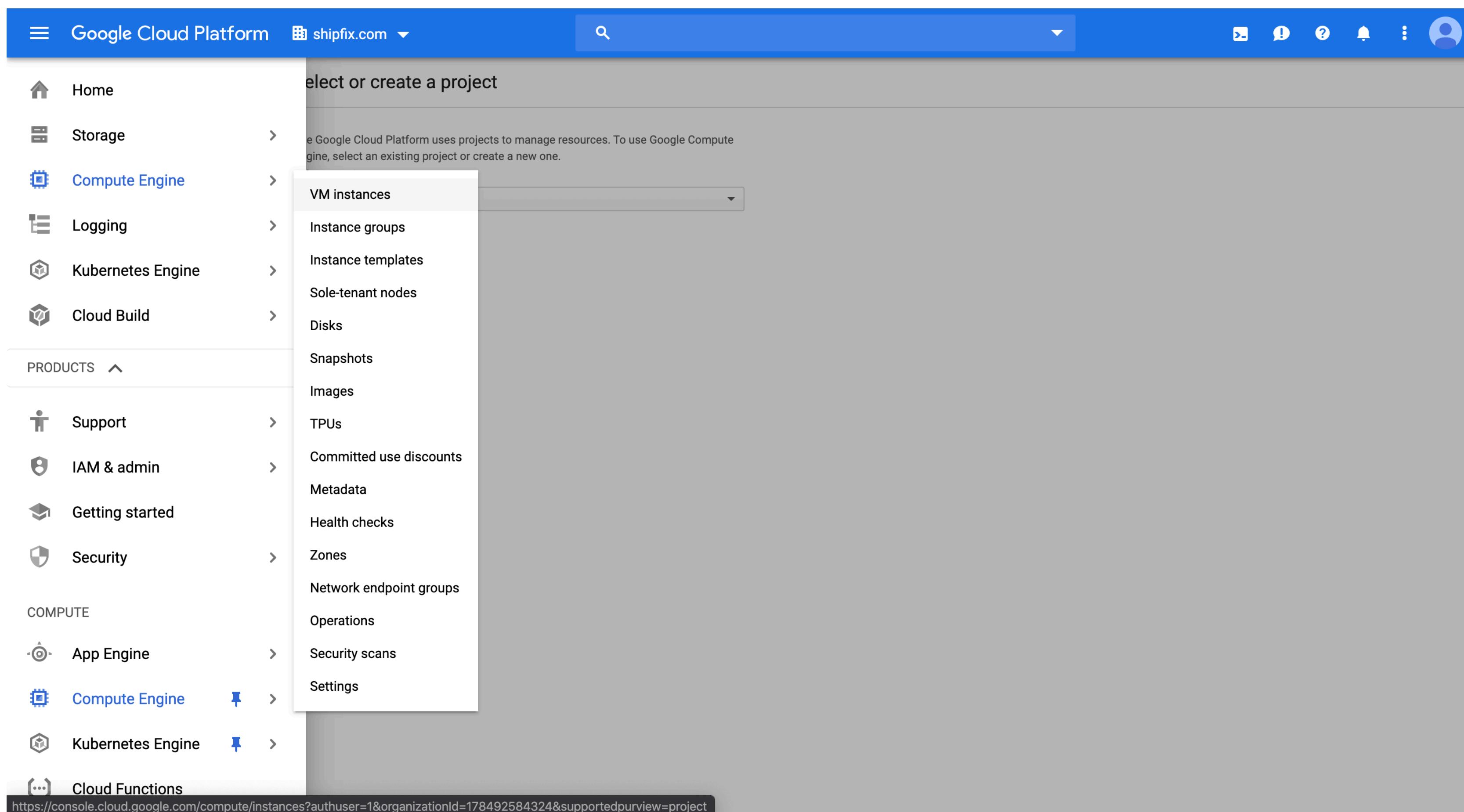
Congrats! You have a google cloud account.

But you do not have GPU credits, go to step 2.

STEP2 - ACTIVATE COMPUTE ENGINE

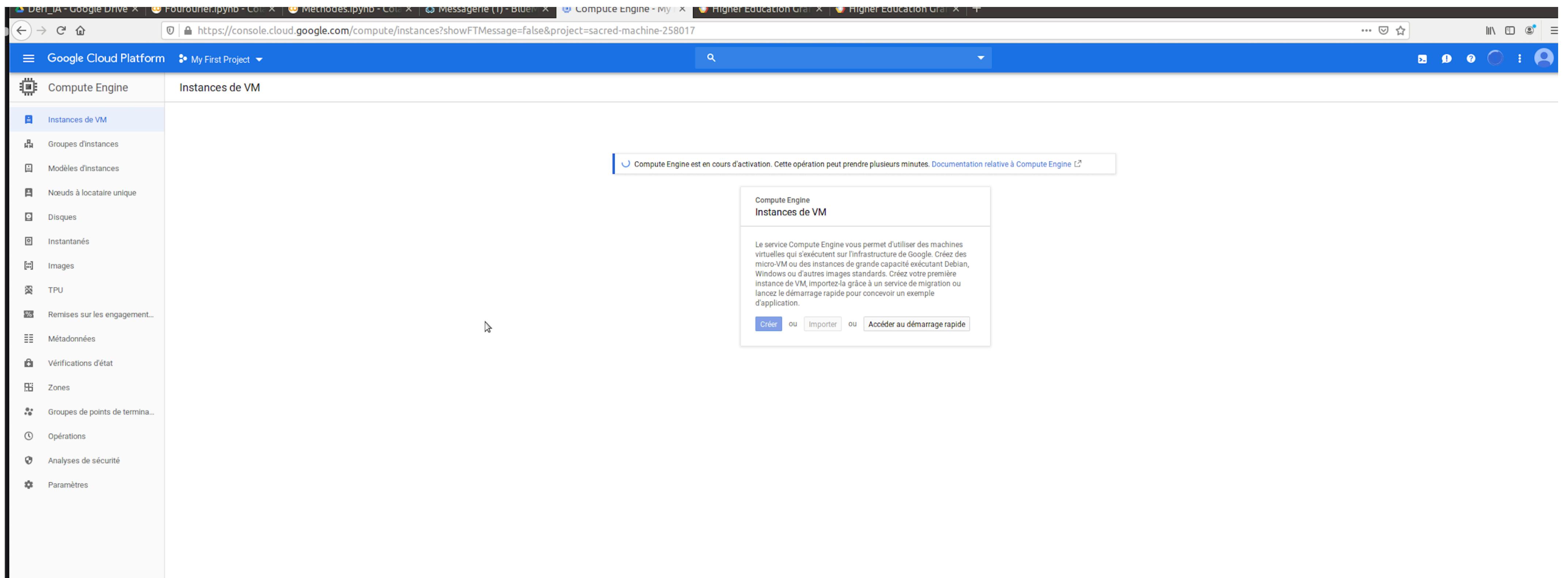
Go on gcloud [homepage](#)

Open the Compute Engine - VM instances page, to activate it.



STEP2 - ACTIVATE COMPUTE ENGINE

Wait for compute engine to be activated.
When it activated, the button create is accessible but **do not click** on it.



STEP3 - REQUEST GPU CREDITS

Compute Engine is now activated. But you are not allowed to used gpu so far.

Go on the **Quotas** page under **IAM et admin** menu.

The screenshot shows the Google Cloud Platform interface. The left sidebar is titled "Google Cloud Platform" and includes links for Accueil, Marketplace, Facturation, API et services, Assistance, IAM et admin (which is currently selected), Premiers pas, Sécurité, Anthos, CALCUL (with App Engine, Compute Engine, Kubernetes Engine, Cloud Functions, Cloud Run, and VMware Engine listed), STOCKAGE (with Bigtable and Datastore listed), and a link to https://console.cloud.google.com/iam-admin/quotas?hl=fr&organizationId=0&project=aif2021&supportedpurview=project.

The main content area is titled "Quotas" and shows the configuration for a Compute Engine instance named "instance-1". It specifies the region as "us-central1 (Iowa)" and the zone as "us-central1-a". The "Estimation mensuelle : 24,86 \$" is noted, along with the fact that it's a pay-as-you-go model. A "Détails" button is present.

A modal window is open, showing the "Quotas" section of the Compute Engine settings. It lists "Comptes de service", "Libellés", "Paramètres", and "Rôles". Under "Paramètres", it shows a "Processeur virtuel" (Virtual CPU) set to "Un cœur partagé" (Shared core), "Mémoire" (Memory) set to "4 Go", and "GPU" set to "-". Below this, there's a note about VM confidentialité.

At the bottom of the main content area, there's a "Disque de démarrage" (Boot disk) section showing a "Nouveau disque persistant standard de 10 Go" (New standard persistent disk of 10 GB) with an "Image" (Image) of "Debian GNU/Linux 10 (buster)". A "Modifier" (Edit) button is available for this disk.

STEP3 - REQUEST GPU CREDITS

Find the GPUs(all regions) metric -> Click on TOUS LES QUOTAS

IAM et admin		Quotas	MODIFIER LES QUOTAS	MASQUER LE PANNEAU DES QUOTAS
+•	IAM	Compute Engine API	Instance GetSerialPortOutput requests per 100 seconds per user	TOUS LES QUOTAS
	Identité et organisation	Google Cloud Storage JSON API	Queries per 100 seconds per user	TOUS LES QUOTAS
	Policy Troubleshooter	BigQuery API	Google internal requests per day	TOUS LES QUOTAS
	Règles de l'organisation	BigQuery API	Streaming insert rows per second (default quota)	TOUS LES QUOTAS
	Quotas	Cloud Storage API	Turned down per day	TOUS LES QUOTAS
	Comptes de service	Cloud Storage API	Google internal requests per day	TOUS LES QUOTAS
	Libellés	Compute Engine API	Affinity Groups	TOUS LES QUOTAS
	Paramètres	Compute Engine API	Commitments	TOUS LES QUOTAS
	Confidentialité et sécurité	Compute Engine API	Committed CPUs	TOUS LES QUOTAS
	Identity-Aware Proxy (IAP)	Compute Engine API	Committed local SSD disk reserved (GB)	TOUS LES QUOTAS
	Rôles	Compute Engine API	Committed NVIDIA K80 GPUs	TOUS LES QUOTAS
	Journaux d'audit	Compute Engine API	Committed NVIDIA P100 GPUs	TOUS LES QUOTAS
	Groupes	Compute Engine API	Committed NVIDIA P4 GPUs	TOUS LES QUOTAS
		Compute Engine API	Committed NVIDIA V100 GPUs	TOUS LES QUOTAS
		Compute Engine API	Committed NVIDIA T4 GPUs	TOUS LES QUOTAS
		Compute Engine API	Committed NVIDIA A100 GPUs	TOUS LES QUOTAS
		Compute Engine API	Committed A2 CPUs	TOUS LES QUOTAS
		Compute Engine API	Preemptible Local SSD (GB)	TOUS LES QUOTAS
		Compute Engine API	Preemptible CPUs	TOUS LES QUOTAS
		Compute Engine API	GPUs (all regions)	TOUS LES QUOTAS
		Compute Engine API	NVIDIA A100 GPUs	TOUS LES QUOTAS
		Compute Engine API	Preemptible NVIDIA A100 GPUs	TOUS LES QUOTAS
		Compute Engine API	A2 CPUs	TOUS LES QUOTAS
		Compute Engine API	Committed N2 CPUs	TOUS LES QUOTAS
		Compute Engine API	Committed C2 CPUs	TOUS LES QUOTAS
		Compute Engine API	Committed N2D CPUs	TOUS LES QUOTAS
		Compute Engine API	Committed licenses	TOUS LES QUOTAS

STEP3 - REQUEST GPU CREDITS

On the new page, select the only line and click on **MODIFIER LES QUOTAS**.

The screenshot shows the Google Cloud Platform interface. The left sidebar is the navigation menu with 'Quotas' selected. The main content area shows the 'Détails des métriques de quota' for the 'Compute Engine API' service, specifically for 'GPUs (all regions)'. A single row is listed with 'Zone' as 'Mondial', 'Utilisation actuelle' as '0', and 'Pic d'utilisation sur 7 jours' also as '0'. To the right, a modal window titled 'Compute Engine API' is open, asking for a new quota limit. It displays the current limit as '0' and a text input field labeled 'Nouvelle limite *'. Below it is a larger text area for 'Description de la requête' with placeholder text about sending the request to the provider for approval. At the bottom of the modal is an 'OK' button.

On the window which open on the right side.

- Check the register email is your INSA email (it might be your gmail email if you valid your coupon while connecting to your gmail adress).
- Fill the phone number field (it can be a fake one).
- Set new quota limit to 1.
- Write your request:

I am attending AI frameworks courses at INSA Toulouse, and I would need to use gpu card to complete the exercises. Can you increase the limit to one?

Now YOU'RE DONE!

ANNEXE B - REMINDER

GCE : HOME PAGE

The screenshot shows the Google Cloud Platform Home Page. At the top, there is a blue header bar with the following elements from left to right:

- Google Cloud Platform Hamburger (highlighted with a yellow circle)
- Project dropdown: TestTPGCE (highlighted with a red circle)
- Project status: Projet en cours
- Search icon
- Notification icons: mail, warning, help, bell
- User profile icon

Below the header, there are two navigation tabs: TABLEAU DE BORD (selected) and ACTIVITÉ. On the right, there is a PERSONNALISER button.

The main content area contains several cards:

- Informations sur le projet**:
 - Nom du projet: TestTPGCE
 - ID du projet: testtpgce
 - Numéro du projet: 341748641608

[Accéder aux paramètres du projet](#)
- Ressources**:
 - Compute Engine: 1 instance
- Trace**:
 - Aucune donnée Trace des sept derniers jours

[Premiers pas avec Stackdriver Trace](#)
- Compute Engine**:
 - Processeur (%): Aucune donnée disponible pour la période sélectionnée.

[Accéder au tableau de bord Compute Engine](#)

- API API**:
- Requêtes (requêtes/s): 0,0175, 0,017
- État de Google Cloud Platform**:
- Fonctionnement normal de tous les services
- [Accéder à Cloud Status Dashboard](#)
- Facturation**:
- Frais estimés: 0,00 USD \$ Pour la période de facturation 1–5 nov. 2018
- [Afficher les frais détaillés](#)
- Error Reporting**:
- Aucun signe d'erreur. Avez-vous configuré Error Reporting ?
- [Découvrir comment configurer Error Reporting](#)
- Actualités**:
- Serverless from the ground up: Connecting Cloud Functions with a

At the bottom left, there is a file preview for "onglet_creer_pr....png". At the bottom right, there is a "Tout afficher" button.

GCE : SELECT A PROJECT

The screenshot shows the Google Cloud Platform (GCP) dashboard. On the left, there's a sidebar with sections like 'Informations sur le projet', 'Ressources', and 'Trace'. The main area displays a 'Selectionner un projet' (Select a project) dialog box. This dialog has a search bar at the top and two tabs: 'PROJETS RÉCENTS' (Recent projects) and 'TOUS' (All projects). Under 'PROJETS RÉCENTS', there's a list with one item: 'TestTPGCE' (with a checkmark), 'Nom' (Name), and 'Identifiant' (Identifier). At the bottom of the dialog are 'ANNULER' (Cancel) and 'OUVRIR' (Open) buttons. The background of the dashboard shows a summary of the project 'TestTPGCE', including its status, billing information (0,00 USD \$), and error reporting details.

Sélectionner un projet

Rechercher des projets et des dossiers

PROJETS RÉCENTS TOUS

Nom	Identifiant
TestTPGCE	testtpgce

ANNULER OUVRIR

Informations sur le projet

Nom du projet
TestTPGCE

ID du projet
testtpgce

Numéro du projet
341748641608

→ Accéder aux paramètres du projet

Ressources

Compute Engine
1 instance

Trace

Aucune donnée Trace des sept derniers jours

→ Premiers pas avec Stackdriver Trace

Google Cloud Platform

t normal de tous les services

Status Dashboard

0,00 USD \$

de facturation 1–5 nov. 2018

détaillés

ting

erreur. Avez-vous configuré Error Reporting ?

ment configurer Error Reporting

Actualités

Serverless from the ground up: Connecting Cloud Functions with a

GCE : A NEW PROJECT

≡ Google Cloud Platform 🔍

Nouveau projet

⚠ Il vous reste 22 projects dans votre quota. Demandez une augmentation ou supprimez des projets.
[En savoir plus](#)

[MANAGE QUOTAS](#)

Nom du projet * ?

ID du projet : atomic-griffin-221614. Vous ne pourrez pas le modifier par la suite.

[MODIFIER](#)

Compte de facturation * ▼

Tous les frais relatifs à ce projet seront facturés sur le compte que vous sélectionnez ici.

Zone * [PARCOURIR](#)

Organisation ou dossier parent

[CRÉER](#) [ANNULER](#)

GCE : MAIN MENU (HAMBURGER)

The screenshot shows the Google Cloud Platform main menu (Hamburger menu) on the left. The 'Compute Engine' section is highlighted with a red circle. A dropdown menu for 'Instances de VM' is open, listing options like 'Groupes d'instances', 'Modèles d'instances', 'Nœuds à locataire unique', 'Disques', 'Instantanés', 'Images', 'TPU', 'Remises sur les engagements d'utilisation', 'Métadonnées', 'Vérifications d'état', 'Zones', 'Groupes de points de terminaison du réseau', 'Opérations', and 'Quotas'. The URL at the bottom of the page is <https://console.cloud.google.com/compute/instances?project=testtpgce&supportedpurview=project>.

Google Cloud Platform

- Accueil
- Marketplace
- Facturation
- API et services
- Assistance
- IAM et administration
- Premiers pas
- Sécurité
- CALCUL
 - App Engine
 - Compute Engine
 - Kubernetes Engine
 - Cloud Functions
- STOCKAGE

Instances de VM

- Groupes d'instances
- Modèles d'instances
- Nœuds à locataire unique
- Disques
- Instantanés
- Images
- TPU
- Remises sur les engagements d'utilisation
- Métadonnées
- Vérifications d'état
- Zones
- Groupes de points de terminaison du réseau
- Opérations
- Quotas

Compute Engine

Etat de Google Cloud Platform

Fonctionnement normal de tous les services

→ Accéder à Cloud Status Dashboard

Facturation

Frais estimés 0,00 USD \$
Pour la période de facturation 1–5 nov. 2018

→ Afficher les frais détaillés

Error Reporting

Aucun signe d'erreur. Avez-vous configuré Error Reporting ?

→ Découvrir comment configurer Error Reporting

Actualités

Serverless from the ground up: Connecting Cloud Functions with a

GCE : VM INSTANCE

The screenshot shows the Google Cloud Platform Compute Engine Instances page. On the left, there's a sidebar with various options like Instances de VM, Groupes d'instances, Modèles d'instances, etc. The main area shows a table of existing VM instances, with one named 'instance-2' listed. A prominent red circle highlights the 'CRÉER UNE INSTANCE' button at the top center of the page. To the right of the table, there's a panel titled 'Sélectionner une instance' with tabs for AUTORISATIONS, SURVEILLANCE, and LIBELLÉS, and a message saying 'Veuillez sélectionner au moins une ressource.'

Google Cloud Platform TestTPGCE

Instances de VM

CRÉER UNE INSTANCE

IMPORTER LA VM

MASQUER LE PANNEAU D'INFORMATIONS

Colonnes

Nom	Zone	Recommandation	Adresse IP interne	Adresse IP externe	Se connecter
instance-2	europe-west1-b		10.132.0.2 (nic0)	Aucune	SSH

Sélectionner une instance

AUTORISATIONS

SURVEILLANCE

LIBELLÉS

Veuillez sélectionner au moins une ressource.

GCE : CREATE A VM INSTANCE

← Créer une instance

Pour créer une instance de VM, sélectionnez l'une de ces options :

Nouvelle instance de VM Créez entièrement une instance de VM unique

Nouvelle instance de VM à partir d'un modèle Créez une instance de VM unique à partir d'un modèle existant

Marketplace Déployez une solution prête à l'emploi sur une instance de VM

Nom ? **instance-3**

Région ? **us-east1 (Caroline du Sud)** **Zone** ? **us-east1-b**

Type de machine
Cliquez sur "Personnaliser" pour sélectionner des coeurs, la mémoire et des GPU.

1 vCPU **3,75 Go de mémoire** **Personnaliser**

Conteneur ?
 Déployer une image de conteneur dans cette instance de VM. [En savoir plus](#)

Disque de démarrage ?
Nouveau disque persistant standard de 10 Go
Image: **Debian GNU/Linux 9 (stretch)** **Modifier**

Identité et accès à l'API ?
Compte de service ? Compute Engine default service account

Champs d'application de l'accès ?
 Autoriser l'accès par défaut
 Autoriser l'accès complet à l'ensemble des API Cloud
 Définir l'accès pour chaque API

Pare-feu ?
Ajouter des tags et des règles de pare-feu pour autoriser un trafic réseau spécifique provenant d'internet

Autoriser le trafic HTTP
 Autoriser le trafic HTTPS

▼ Gestion, sécurité, disques, mise en réseau et location unique

Estimation mensuelle : 24,67 \$
Soit un coût horaire d'environ 0,034 \$
Vous payez ce que vous consommez : facturation à la seconde, sans frais initiaux à supporter

▼ Détails

GCE : VM CONFIGURATION

← Créer une instance

Pour créer une instance de VM, sélectionnez l'une de ces options :

- Nouvelle instance de VM**
Créer entièrement une instance de VM unique >
- Nouvelle instance de VM à partir d'un modèle**
Créer une instance de VM unique à partir d'un modèle existant
- Marketplace**
Déployer une solution prête à l'emploi sur une instance de VM ←

Région ? europe-west1 (Belgique) Zone ? europe-west1-b

Type de machine
Cliquez sur "Personnaliser" pour sélectionner des coeurs, la mémoire et des GPU.

Cœurs Affichage standard
1 vCPU 1 - 96

Mémoire
3,75 Go 1 - 6,5

Plus de mémoire ?

Plate-forme du processeur ?
Automatique

GPU
Le nombre de GPU est lié au nombre de coeurs de processeur et de mémoires sélectionnés pour cette instance. Pour ce type de machine, vous devez sélectionner au moins 1 GPU. [En savoir plus](#)

Nombre de GPU Type de GPU
1 NVIDIA Tesla K80

Vous ne pouvez pas transférer les machines dotées de GPU pendant la maintenance de l'hôte

[Choisir un type de machine](#)

GCE : START DISK

The screenshot shows the Google Cloud Platform interface for creating a new instance. The main title is "Créer une instance". On the left, there's a sidebar with three options: "Nouvelle instance de VM" (Create new VM instance), "Nouvelle instance de VM à partir d'un modèle" (Create VM instance from a template), and "Marketplace" (Deploy a ready-to-use solution). The "Marketplace" option is currently selected.

The main content area is titled "Disque de démarrage" (Boot disk). It asks to select a boot image or snapshot. Below this, there are tabs for "Images d'OS" (OS Images), "Images d'application" (Application Images), "Images personnalisées" (Custom Images), "Instantanés" (Snapshots), and "Disques existants" (Existing Disks). The "Images d'OS" tab is selected.

A prominent message at the top says: "Les VM protégées sont en phase bêta. En savoir plus" (Protected VMs are in beta. Learn more) with a "Dismiss" button.

The list of OS images includes:

- Afficher les images disposant des fonctionnalités des VM protégées ?
- Debian GNU/Linux 9 (stretch)
amd64 built on 20181011
- CentOS 6
x86_64 built on 20181011
- CentOS 7
x86_64 built on 20181011
- CoreOS alpha 1939.0.0
amd64-usr published on 2018-10-24
- CoreOS beta 1911.2.0
amd64-usr published on 2018-10-24
- CoreOS stable 1855.5.0
amd64-usr published on 2018-10-24
- Ubuntu 14.04 LTS
amd64 trusty image built on 2018-10-22
- Ubuntu 16.04 LTS
amd64 xenial image built on 2018-10-30
- Ubuntu 18.04 LTS
amd64 bionic image built on 2018-10-29
- Ubuntu 18.10
amd64 cosmic image built on 2018-10-18
- Ubuntu 16.04 LTS Minimal
amd64 xenial minimal image built on 2018-10-29
- Ubuntu 18.04 LTS Minimal
amd64 bionic minimal image built on 2018-10-30
- Ubuntu 18.10 Minimal
amd64 cosmic minimal image built on 2018-10-18
- Container-Optimized OS 69-10895.91.0 stable
Kernel: ChromiumOS-4.14.65 Kubernetes: 1.11.1 Docker: 17.03.2 Family: cos-69-lts
- Container-Optimized OS 71-11151.16.0 beta
Kernel: ChromiumOS-4.14.74 Kubernetes: 1.11.2 Docker: 18.06.1 Family: cos-beta

At the bottom, there are buttons for "Sélectionner" (Select) and "Annuler" (Cancel).

GCE : QUOTAS

The screenshot shows the Google Cloud Platform interface. The top navigation bar is blue, displaying 'Google Cloud Platform' and a dropdown menu for the project 'TestTPGCE'. A search bar is located at the top right. On the left, a sidebar menu lists various services: Accueil, Marketplace, Facturation, API et services (with a dropdown for Assistance, IAM et administration, Premiers pas, and Sécurité), CALCUL (with a dropdown for App Engine, Compute Engine, Kubernetes Engine, and Cloud Functions), STOCKAGE (with a dropdown for Bigtable, Datastore, Firestore, Stockage, and SQL), and Scanner. The 'Compute Engine' service is currently selected, as indicated by its blue icon and the open dropdown menu below it. The dropdown for 'Compute Engine' includes options: Tableau de bord, Services, Versions, Instances, Files d'attente de tâches, Tâches Cron, Analyses de sécurité, Règles de pare-feu, Quotas (which is highlighted in light blue), Blobstore, Memcache, Recherche, and Paramètres. The main content area has a light gray background and contains a box titled 'Quotas' with the text: 'Consultez et demandez vos quotas Compute Engine sur la page "Quotas" de "IAM et administration"'.

GCE : QUOTAS

Google Cloud Platform TestTPGCE ▾

Quotas [MODIFIER LES QUOTAS](#)

Type de quota	Service	Métrique	Zone	
Tous les quotas	Compute Engine API	GPUs (all regions)	Toutes les zones	Effacer
Service	Zone	Utilisation actuelle	Pic d'utilisation sur 7 jours	Limite
Compute Engine API GPUs (all regions)	Mondial	<div style="width: 100%;">1</div>	—	1

IAM et administration

- IAM
- Identité et organisation
- Règles de l'organisation
- Quotas**
- Comptes de service
- Libellés
- Confidentialité et sécurité
- Paramètres
- Clés de chiffrement
- Proxy sensible à l'identité (IA...)
- Rôles
- Journaux d'audit

GCE : BILLING

The screenshot shows the Google Cloud Platform interface for managing Virtual Machines (VMs). The left sidebar contains navigation links for Accueil, Marketplace, Facturation, API et services, Assistance, IAM et administration, Premiers pas, and Sécurité. The main content area is titled "Instances de VM" and includes buttons for "CRÉER UNE INSTANCE", "IMPORTER LA VM", "ACTUALISER", "DÉMARRER", "ARRÊTER", "RÉINITIALISER", and "SUPPRIMER". A search bar and a "Colonnes" dropdown are also present. The table lists one instance:

Nom	Zone	Recommandation	Adresse IP interne	Adresse IP externe	Se connecter
instance-2	europe-west1-b		10.132.0.2 (nic0)	35.233.12.224	SSH

GCE : BILLING

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