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Reinforcement Learning: Qwik Start | Google Cloud Skills Boost

Qwiklabs : 8-10 minutes

GSP691

Overview

Like many other areas of machine learning research, reinforcement learning (RL) is evolving at breakneck speed. Just as they have done in other research areas, researchers are leveraging deep learning to achieve state-of-the-art results.

In this lab, you will learn the basics of reinforcement learning by building a simple game, which has been modelled on a sample provided by OpenAI Gym.

What you'll learn

In this lab, you will:

- Understand the fundamental concepts of reinforcement learning.
- Create an AI Platform Tensorflow 2.1 Notebook.
- Clone the sample repository from the training data analyst repo found on Github.
- Read, understand, and run the steps found in the notebook.

Setup and requirements

Before you click the Start Lab button

Read these instructions. Labs are timed and you cannot pause them. The timer, which starts when you click **Start Lab**, shows how long Google Cloud resources will be made available to you.

This hands-on lab lets you do the lab activities yourself in a real cloud environment, not in a simulation or demo environment. It does so by giving you new, temporary credentials that you use to sign in and access Google Cloud for the duration of the lab.

To complete this lab, you need:

- Access to a standard internet browser (Chrome browser recommended).

Note: Use an Incognito or private browser window to run this lab. This prevents any conflicts between your personal account and the Student account, which may cause extra charges incurred to your personal account.

- Time to complete the lab---remember, once you start, you cannot pause a lab.

Note: If you already have your own personal Google Cloud account or project, do not use it for this lab to avoid extra charges to your account.

How to start your lab and sign in to the Google Cloud Console

1. Click the **Start Lab** button. If you need to pay for the lab, a pop-up opens for you to select your payment method. On the left is the **Lab Details** panel with the following:
    - The **Open Google Console** button
    - Time remaining
    - The temporary credentials that you must use for this lab
    - Other information, if needed, to step through this lab
2. Click **Open Google Console**. The lab spins up resources, and then opens another tab that shows the **Sign in** page.

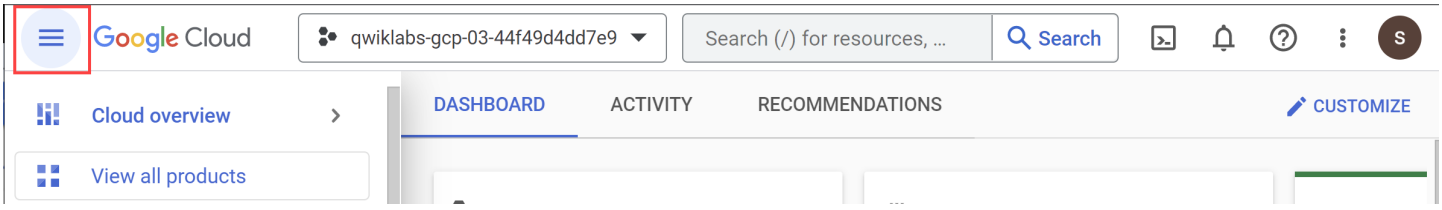
    Tip: Arrange the tabs in separate windows, side-by-side.

    Note: If you see the **Choose an account** dialog, click **Use Another Account**.
3. If necessary, copy the **Username** from the **Lab Details** panel and paste it into the **Sign in** dialog. Click **Next**.
4. Copy the **Password** from the **Lab Details** panel and paste it into the **Welcome** dialog. Click **Next**.

    Important: You must use the credentials from the left panel. Do not use your Google Cloud Skills Boost credentials. **Note:** Using your own Google Cloud account for this lab may incur extra charges.
5. Click through the subsequent pages:
    - Accept the terms and conditions.
    - Do not add recovery options or two-factor authentication (because this is a temporary account).
    - Do not sign up for free trials.

After a few moments, the Cloud Console opens in this tab.

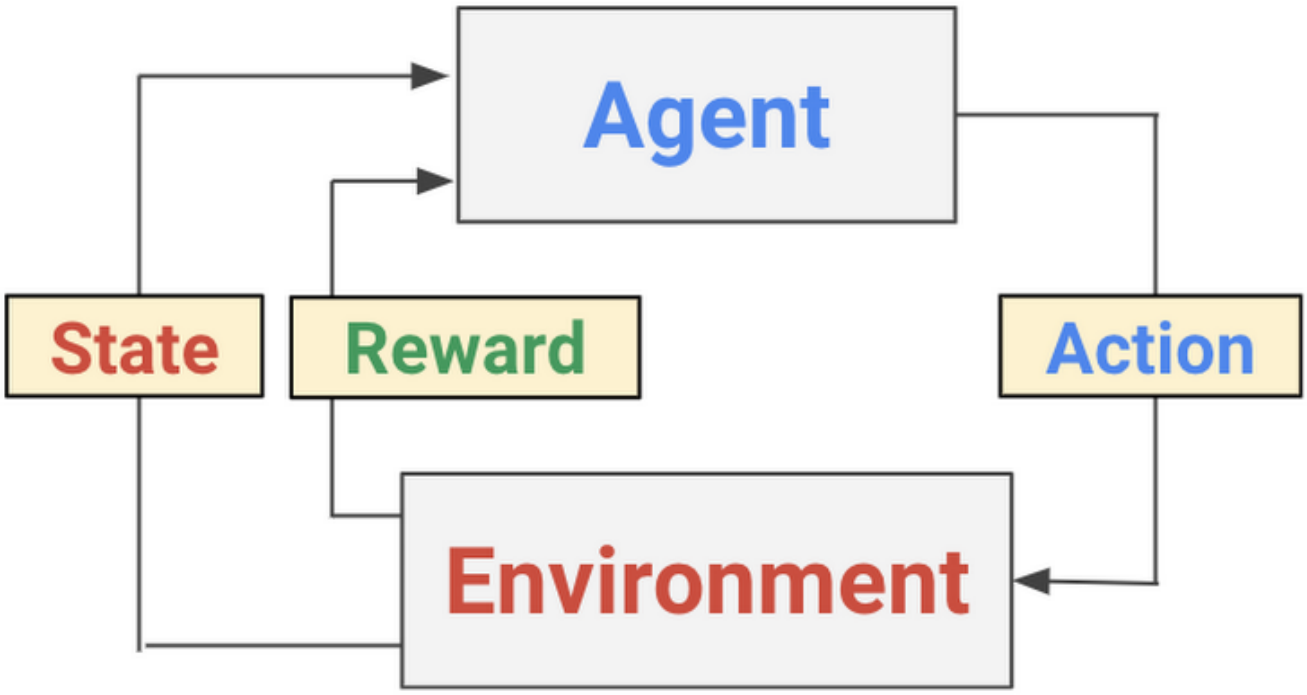
Note: You can view the menu with a list of Google Cloud Products and Services by clicking the **Navigation menu** at the top-left.



Task 1. Reinforcement learning 101

Reinforcement learning (RL) is a form of machine learning whereby an agent takes actions in an environment to maximize a given objective (a reward) over this sequence of steps. Unlike more traditional supervised learning techniques, every data point is not labelled and the agent only has access to "sparse" rewards.

While the history of RL can be dated back to the 1950s and there are a lot of RL algorithms out there, 2 easy to implement yet powerful deep RL algorithms have a lot of attractions recently: deep Q-network (DQN) and deep deterministic policy gradient (DDPG). We briefly introduce the algorithms and variants based on them in this section.

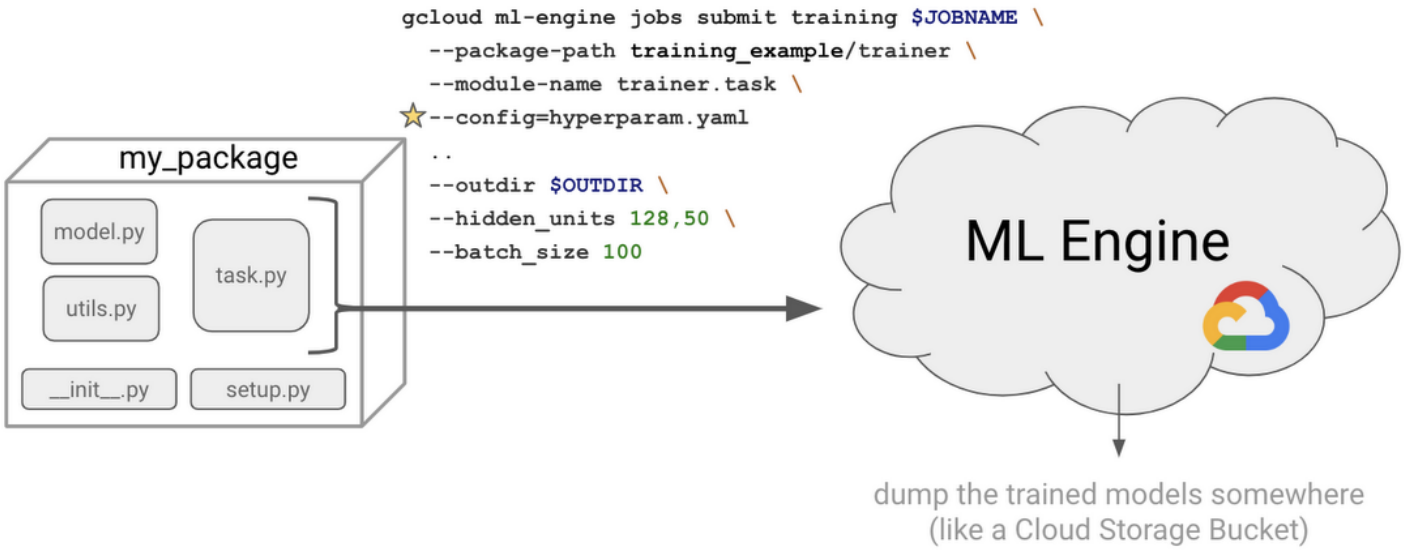


A conceptual process diagram of the Reinforcement Learning problem

The Deep Q-network (DQN) was introduced by Google Deepmind's group in this Nature paper in 2015. Encouraged by the success of deep learning in the field of image recognition, the authors incorporated deep neural networks into Q-Learning and tested their algorithm in the Atari Game Engine Simulator, in which the dimension of the observation space is very large.

The deep neural network acts as a function approximator that predicts the output Q-values, or the desirability of taking an action, given a certain input state. Accordingly, DQN is a value-based method: in the training algorithm DQN updates Q-values according to Bellman's equation, and to avoid the difficulty of fitting a moving target, it employs a second deep neural network that serves as an estimation of target values.

On a more practical level, the following model highlights the source files, the shell command, and the endpoint to get an RL job running on Google Cloud:



Task 2. Set up your environment

1. In the Google Cloud console, in the **Navigation menu** (☰), click **Vertex AI > Dashboard**.
2. Click **Enable All Recommended APIs**.

Task 3. Launch Vertex AI Notebooks

To create and launch a Vertex AI Workbench notebook:

1. In the **Navigation Menu** ☰, click **Vertex AI** > **Workbench**.
2. On the **Workbench** page, click **Enable Notebooks API** (if it isn't enabled yet), then click **New Notebook**.
3. In the **Customize instance** menu, select **TensorFlow Enterprise** and choose the latest version of **TensorFlow Enterprise 2.x (with LTS)** > **Without GPUs**.
4. Name the notebook.
5. Set **Region** to and **Zone** to any zone within the designated region.
6. In the **Notebook properties**, click the pencil icon to edit the instance properties.
7. Click **Machine type** and then select **e2-standard-2** for Machine type.
8. Leave the remaining fields at their default and click **Create**.

After a few minutes, the **Workbench** page lists your instance, followed by **Open JupyterLab**.

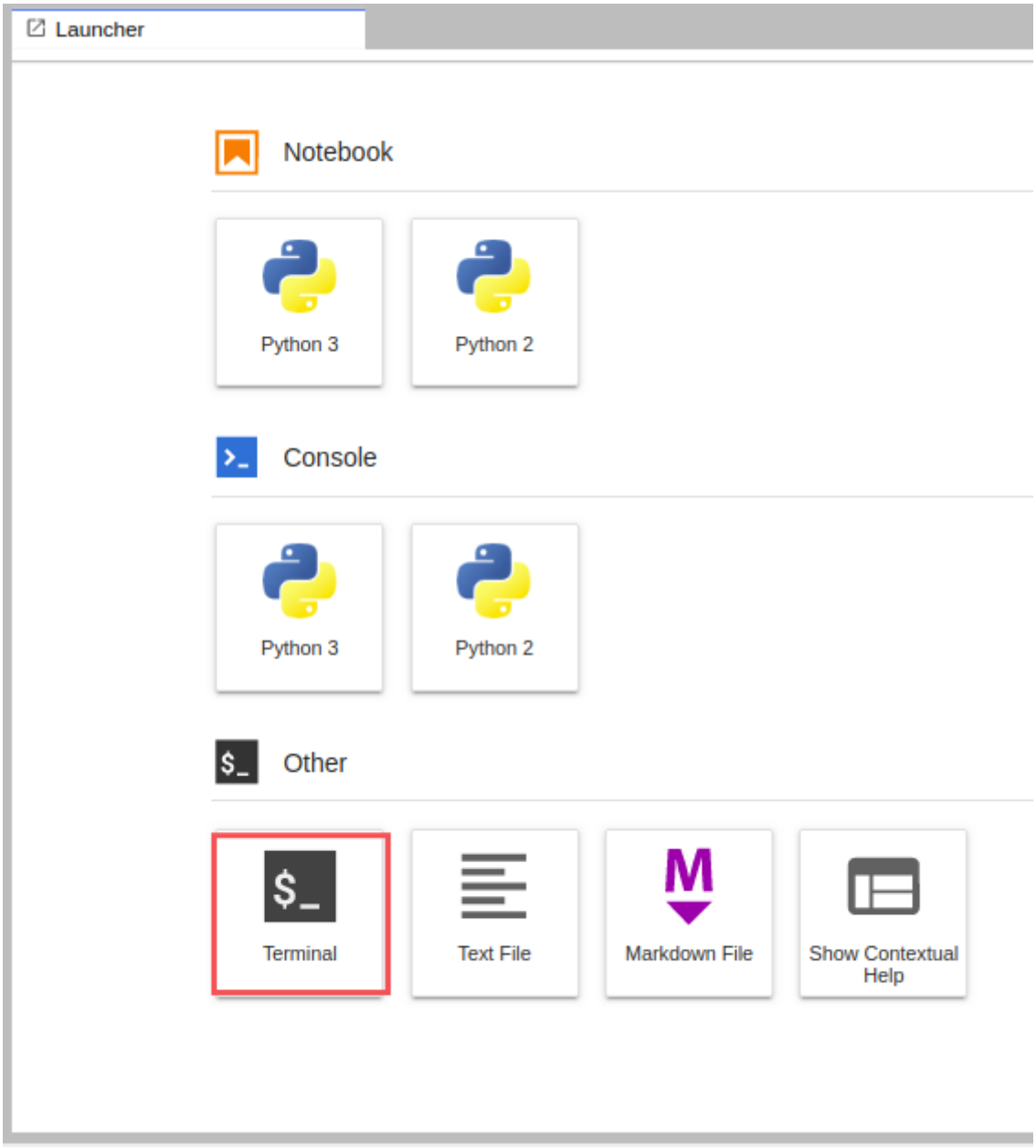
9. Click **Open JupyterLab** to open JupyterLab in a new tab. If you get a message saying beatrix jupyterlab needs to be included in the build, just ignore it.

Click *Check my progress* to verify the objective. Create a Vertex AI Platform Notebook

Task 4. Clone the sample code

To clone the `training-data-analyst` repository in your JupyterLab instance:

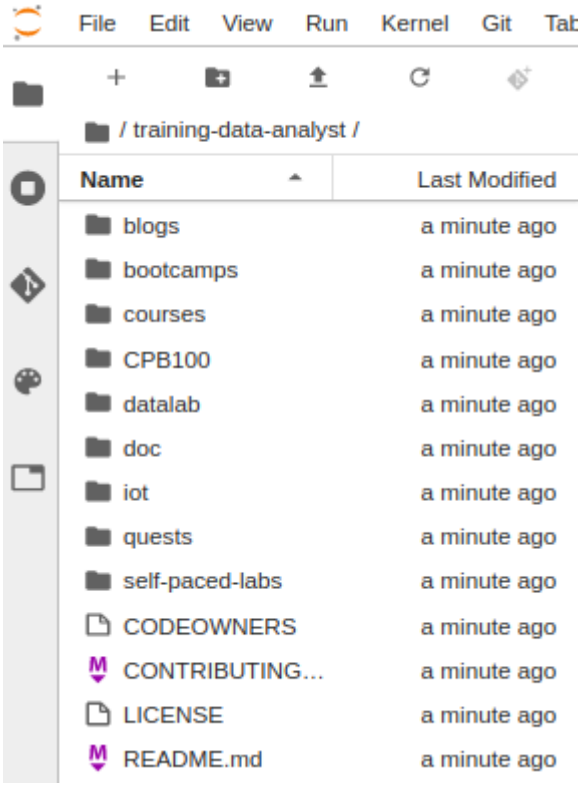
1. In JupyterLab, click the **Terminal** icon to open a new terminal.



2. At the command-line prompt, type the following command and press **ENTER**:

```
git clone https://github.com/GoogleCloudPlatform/training-data-analyst
```

3. To confirm that you have cloned the repository, in the left panel, double click the `training-data-analyst` folder to see its contents.

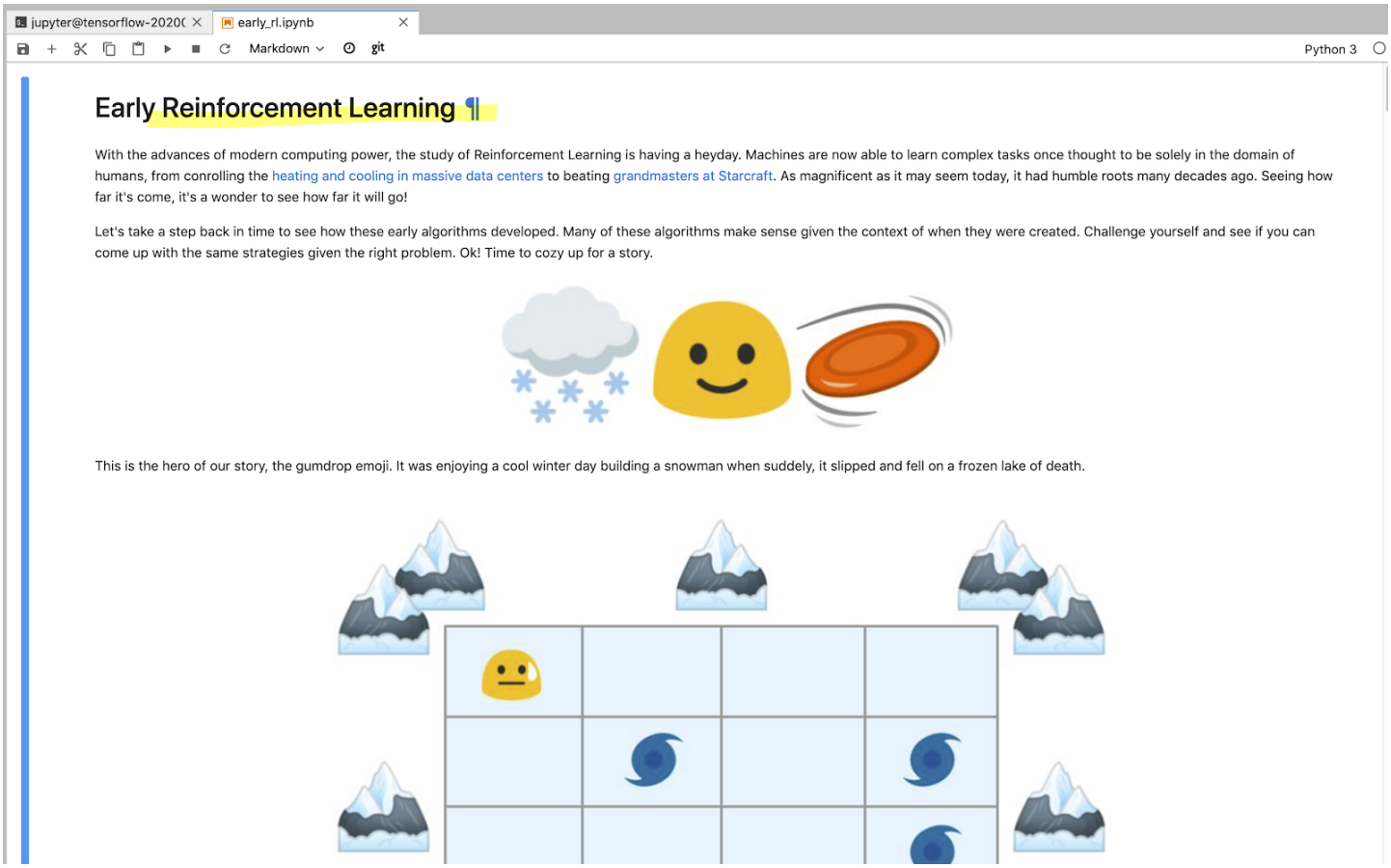


4. From the left-hand menu, select **training-data-analyst> quests> rl > early_rl > early_rl.ipynb**. This will open a new tab.

Click *Check my progress* to verify the objective. Clone the sample code

Task 5. Run through the notebook

Your new tab should look similar to the following:



1. Read through the following notebook and run all code blocks with **Shift + Enter**.
2. Return here after you have completed the instructions in the notebook.

Congratulations!

In this lab you learned the basic principles of reinforcement learning (RL). After creating a Jupyterlab instance, you cloned a sample repository and ran through a notebook where you received hands-on practice with the fundamentals of reinforcement learning. You are now ready to take more labs in this series.

Finish your quest

This self-paced lab is part of the Qwiklabs Quest Baseline: Data, ML, AI. A Quest is a series of related labs that form a learning path. Enroll in this Quest and get immediate completion credit if you've taken this lab.

Google Cloud training and certification

...helps you make the most of Google Cloud technologies. Our classes include technical skills and best practices to help you get up to speed quickly and continue your learning journey. We offer fundamental to advanced level training, with on-demand, live, and virtual options to suit your busy schedule. Certifications help you validate and prove your skill and expertise in Google Cloud technologies.

Manual Last Updated January 13, 2023

Lab Last Tested January 13, 2023

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