

[End Lab](#)

02:13:22

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked.

[Learn more.](#)[Open Google Console](#)

Username

student-02-5a7887f0834dd



Password

6ho9kG8jtn9z



GCP Project ID

qwiklabs-gcp-02-b27ff28e



Classifying Images of Clouds in the Cloud with AutoML Vision

2 hours 30 minutes

Free

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Overview

In this lab, you upload images to Cloud Storage and use them to train a custom model to recognize different types of clouds (cumulus, cumulonimbus, etc.).

What you learn

In this lab, you learn how to perform the following tasks:

- Upload a labeled dataset to Cloud Storage and connect it to AutoML Vision with a CSV label file
- Train a model with AutoML Vision and evaluate its accuracy
- Generate predictions on your trained model

Set up your environments

Qwiklabs setup

For each lab, you get a new GCP project and set of resources for a fixed time at no cost.

- Make sure you signed into Qwiklabs using an **incognito window**.
- Note the lab's access time (for example, **02:00:00**) and make sure you can finish in that time block.

There is no pause feature. You can restart if needed, but you have to start at the beginning.

- When ready, click **START LAB**.
- Note your lab credentials. You will use them to sign in to Cloud Platform Console.

Caution: When you are in the console, do not deviate from the lab instructions. Doing so

may cause your account to be blocked.
[Learn more.](#)

[Open Google Console](#)

Username

Password

GCP Project ID

5. Click **Open Google Console**.

6. Click **Use another account** and copy/paste credentials for **this** lab into the prompts.

If you use other credentials, you'll get errors or **incur charges**.

7. Accept the terms and skip the recovery resource page.

Do not click **End Lab** unless you are finished with the lab or want to restart it. This clears your work and removes the project.

Task 1. Set up AutoML Vision

AutoML Vision provides an interface for all the steps in training an image classification model and generating predictions on it. Start by enabling the AutoML API.

Open the navigation menu and select **APIs & Services > Library**. In the search bar type in "Cloud AutoML API". Click on the **Cloud AutoML API** result and then click **Enable**.

This may take a minute. You should now be on the following page (ensure that the **Activation Status** is **Enabled**):

APIs & Services Cloud AutoML API	Overview	<input type="button" value="DISABLE API"/>
<ul style="list-style-type: none"> <input checked="" type="radio"/> Overview <input type="radio"/> Metrics <input type="radio"/> Quotas <input type="radio"/> Credentials 	<p>Details</p> <p>Name Cloud AutoML API</p> <p>By Google</p> <p>Service name automl.googleapis.com</p> <p>Overview Train high-quality custom machine learning models with minimum effort and machine learning expertise.</p> <p>Activation status Enabled</p>	

Create a Cloud Storage bucket for your training data

1. On the GCP Console title bar, click **Activate Cloud Shell** ().

2. When prompted, click **Continue**.

In Cloud Shell, paste the below command to make a new bucket to hold your training. We use the magic variable `$DEVSHELL_PROJECT_ID`, which knows your current project, and

simply add `-vcm` to the end.

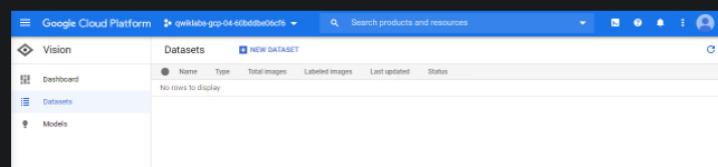
Run the below command in Cloud Shell:

```
gsutil mb -p $DEVSHELL_PROJECT_ID \
    -c regional \
    -l us-central1 \
    gs://$DEVSHELL_PROJECT_ID-vcm/
```

Leave your Cloud Shell window open for additional steps to follow.

Open a new browser tab and navigate to the [AutoML UI](#).

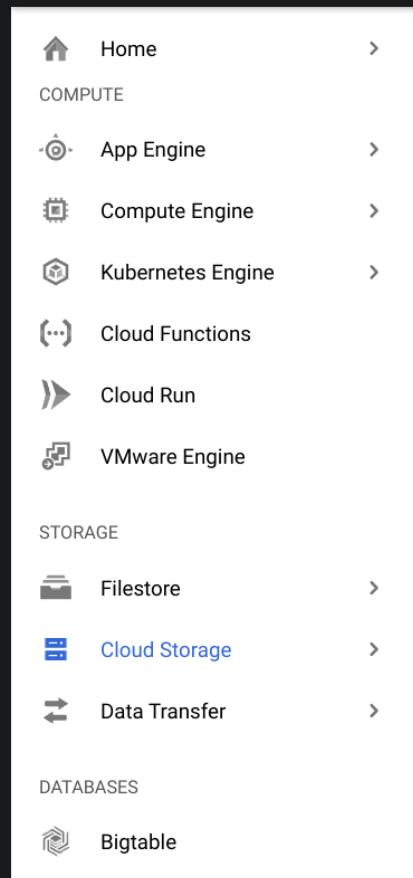
You will be taken to the AutoML Vision datasets page once the APIs are verified.

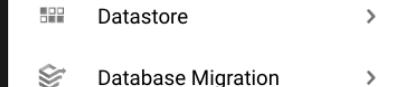


Task 2. Upload training images to Cloud Storage

In order to train a model to classify images of clouds, you need to provide labeled training data so the model can develop an understanding of the image features associated with different types of clouds. In this example, your model will learn to classify three different types of clouds: cirrus, cumulus, and cumulonimbus. To use AutoML Vision you need to put your training images in Cloud Storage.

In the Cloud Console, open the **Navigation menu** and select **Cloud Storage > Browser**:





Once there, you should see the bucket from the last step.

The training images are publicly available in a Cloud Storage bucket. Use the `gsutil` command-line utility for Cloud Storage to copy the training images into your bucket:

```
gsutil -m cp -r gs://cloud-training/automl-lab-clouds/*  
gs://$DEVSHELL_PROJECT_ID-vcm/
```

Once copying is complete you can view the CSV file and three types of clouds you have images for:

```
gsutil ls gs://$DEVSHELL_PROJECT_ID-vcm/
```

Which types of clouds do you have training data (images) for?

- Cirrus
- Stratus
- Cumulus
- Cumulonimbus

Submit

Optional: View the images using the Cloud Storage Console UI

When the images finish copying, click the **Refresh** button at the top of the Cloud Storage browser. Then click on your bucket name. You should see a `data.csv` file and 3 folders of photos for each of the 3 different cloud types to be classified:

Name	Storage class	Public access	Protection
qwiklabs-gcp-00-4c252559a70-vcm	Regional	Subject to object ACLs	None

NAME	SIZE	TYPE	CREATED	STORAGE CLASS	LAST MODIFIED	PUBLIC ACCESS	VERSION HISTORY	ENCRYPTED
data.csv	2.5 KB	text/csv	Oct 7, 2022	Regional	Oct 7, 2022	Not public	—	Google-managed

If you click on the individual image files in each folder, and then click once more when you see the URL, you can see the photos you'll be using to train your model for each type of cloud.

Task 3. Create an AutoML Vision training dataset

Now that your training data is in Cloud Storage, you need a way for AutoML Vision to access it. You'll create a CSV file where each row contains a URL to a training image and the associated label for that image. This CSV file has been created for you; you just need to update it with your bucket name.

Run the following commands which:

- Copy the template file to your Cloud Shell instance
- Update the CSV with the files in your project
- Upload this updated CSV file to your Cloud Storage bucket
- Show the bucket to confirm the data.csv file is present

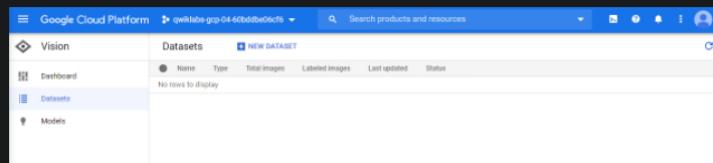
```
gsutil cp gs://cloud-training/automl-lab-clouds/data.csv .
head --lines=10 data.csv
sed -i -e "s/placeholder/$DEVSHELL_PROJECT_ID-vcm/g" ./data.csv
head --lines=10 data.csv
gsutil cp ./data.csv gs://$DEVSHELL_PROJECT_ID-vcm/
gsutil ls gs://$DEVSHELL_PROJECT_ID-vcm/
```

View all the folders and files in your bucket you can add a wildcard to `gsutil ls` like so:

```
gsutil ls gs://$DEVSHELL_PROJECT_ID-vcm/*
```

Highlight and copy the location of your data file to your clipboard which will look similar to:
`gs://qwiklabs-gcp-your-project-id-will-be-here-vcm/data.csv`

Navigate back to the [AutoML Vision datasets page](#).

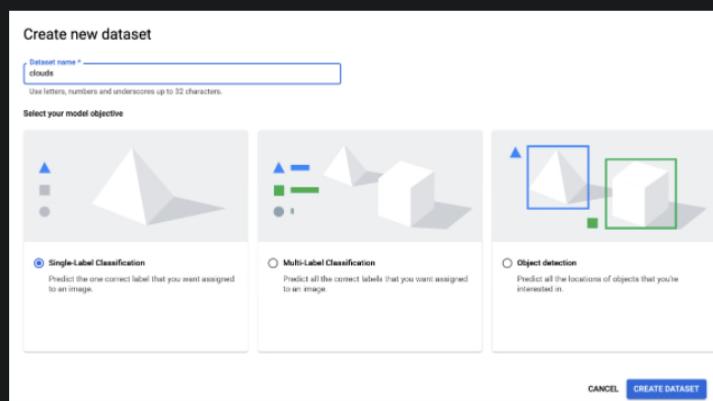


At the top of the Cloud Console, click **+ New dataset**.

Type **clouds** for the dataset name.

Leave **Single-label Classification** checked.

Click **Create dataset** to continue.



On the next screen you will choose the location of your training images (the ones you uploaded in the previous step).

Choose **Select a CSV file on Cloud Storage** and add the file name to the URL for the file that is in your clipboard from the previous step. You may also use the browse function to find the csv file. Once you see the white in green checkbox you may select **Continue** to proceed.

Select files to import

To build a custom model, you first need to import a set of images to train it. Each image should be categorized with a label. (Labels are essential for telling the model how to identify an image.)

- Each label should have at least 100 images for best results.

Upload Images from your computer
 Select a CSV file on Cloud Storage

Select a CSV file on Cloud Storage

If you haven't already, upload your files to [Cloud storage](#). The CSV file should be a list of GCS paths to your images. Images can be in JPG, PNG, GIF, BMP or ICO formats. Optionally, you can specify the TRAIN, VALIDATION, or TEST split.

Sample CSV format

```
[<label>, <image_path>]
TRAIN, gs://My_Bucket/sample1.jpg,cat
TEST, gs://My_Bucket/sample2.jpg,dog
```

gs://* qwiklabs-gcp-04-40bddbe06cf6-vcn/data.csv

Once the import has completed click the **Images** tab to see the images in your dataset.

It will take 8 to 12 minutes while the image metadata is processed ("Running: Importing Images" will appear on the screen). Once complete, the images will appear by category.

Task 4. Inspect the images

Next, proceed with a brief examination of the images.

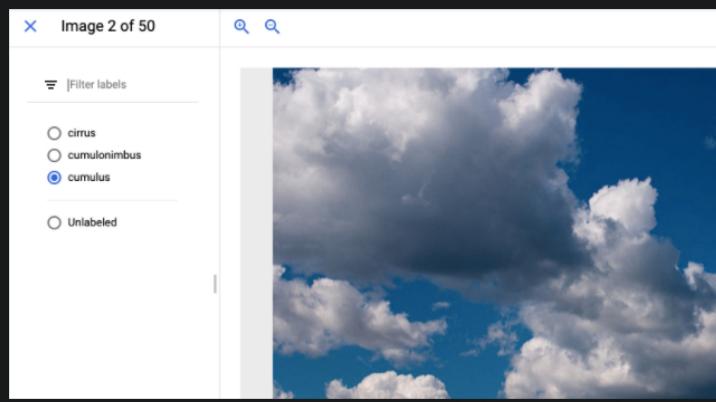
Label	Count
cirrus	20
cumulonimbus	20
cumulus	20

Try filtering by different labels in the left menu (i.e. click cumulus) to review the training images:

Type to filter...	
cirrus	20
cumulonimbus	20
cumulus	20
Add label	

Note: If you were building a production model, you'd want *at least* 100 images per label to ensure high accuracy. This is just a demo so only 20 images of each type were used so the model could train quickly.

If any images are labeled incorrectly you can click on them to switch the label or delete the image from your training set:



To see a summary of how many images you have for each label, click on **Label stats**. You should see the following pop-out box show up on the right side of your browser. Press **Done** after reviewing the list.

Label Stats

Unlabeled images aren't used. Your dataset will be automatically split into [Train, Validation and Test sets](#).

Ideally, each label should have at least 10 images. Fewer images often result in inaccurate precision and recall. You must also have at least 8, 1, 1 images each assigned to your Train, Validation and Test sets.

Labels	Images	Train	Validation	Test
cirrus	20	16	2	2
cumulonimbus	20	16	2	2
cumulus	20	16	2	2

[DONE](#)

Note: If you are working with a dataset that isn't already labeled, AutoML Vision provides an in-house human labeling service.

Task 5. Train your model

You're ready to start training your model! AutoML Vision handles this for you automatically, without requiring you to write any of the model code.

To train your clouds model, go to the **Train** tab and click **Start training**.

The screenshot shows the 'Train' tab of the AutoML Vision interface. It displays the following information:

- Try labeling more images before training**
- Unlabeled images aren't used. Your dataset will be automatically split into Train, Validation, and Test sets.**
- Labels** (cirrus, cumulonimbus, cumulus) and **Images** (20 each) with corresponding **Train**, **Validation**, and **Test** counts (16, 2, 2 respectively).
- START TRAINING** button.

Enter a name for your model, or use the default auto-generated name.

Leave **Cloud hosted** selected and click **Continue**.

Train new model

1 Define your model

Model name *
clouds_20191017015319

Cloud hosted
Host your model on Google Cloud for online predictions

Edge
Download your model for offline/mobile use

CONTINUE

2 Set a node hour budget

START TRAINING **CANCEL**

For the next step, type the value "8" into the **Set your budget *** box and check **Deploy model to 1 node after training**. This process (auto-deploy) will make your model immediately available for predictions after testing is complete.

Click **Start training**.

Train new model

Define your model

2 Set a node hour budget

Enter the maximum number of node hours you want to spend training your model.

We recommend using [16 node hours](#) for your dataset. However, you can train for as little as 8 node hours. You may also eligible to train with free node hours.
[Pricing guide](#)

Note to beta users: AutoML Vision has updated its pricing for node hours.

Set your budget *
8 node hours

Estimated completion date: Aug 14, 2020 12 PM
GMT+1

Deploy model to 1 node after training

Make your model available for REST API requests immediately after training.
Deployment pricing applies.

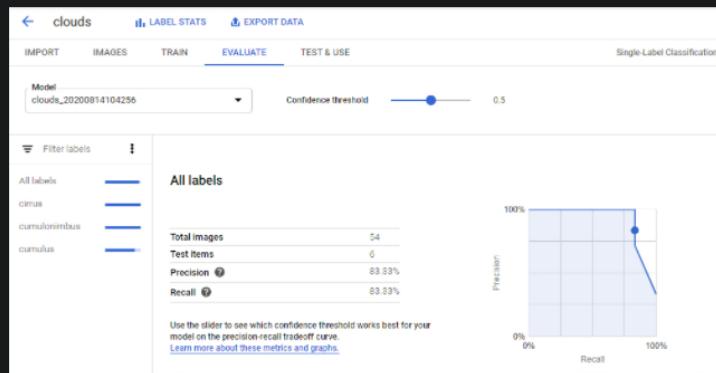
START TRAINING **CANCEL**

Note: Training this custom model can be expected to take over an hour to complete (**55 to 90 minutes** on average). The total training time includes node training time as well as infrastructure set up and tear down. To get full credit for the lab you do not need to wait for training to complete and can simply review at the below screenshots from Evaluation and Prediction.

Task 6. Evaluate your model

After training is complete, select the **Evaluate** tab. Here you'll see information about

Precision and Recall of the model. It should resemble the following:



You can also adjust the **Confidence threshold** slider to see its impact.

Finally, scroll down to take a look at the **Confusion matrix**.

Confusion matrix

True Label	Predicted Label		
	cumulus	cumulonimbus	cirrus
cumulus	50%	50%	-
cumulonimbus	-	100%	-
cirrus	-	-	100%

This tab provides some common machine learning metrics to evaluate your model accuracy and see where you can improve your training data. Since the focus for this lab was not on accuracy, move on to the next section about predictions section. Feel free to browse the accuracy metrics on your own.

Task 7. Generate predictions

Now it's time for the most important part: generating predictions on your trained model using data it hasn't seen before.

There are a few ways to generate predictions. In this lab you use the UI to upload images. You'll see how your model does classifying these two images (the first is a cirrus cloud, the second is a cumulonimbus).

First, download these images to your local machine by right-clicking on each of them (**Note:** You may want to assign a simple name like 'Image1' and 'Image2' to assist with uploading later):





Navigate to the **Test & Use** tab in the AutoML UI:

On this page you will see that the model you just trained and deployed is listed in the **Model** pick list.

Click **Upload images** and upload the cloud sample images you just saved to your local disk (you can select both images at the same time).

The screenshot shows the 'TEST & USE' tab selected in the top navigation bar. A dropdown menu labeled 'Model' is open, showing the option 'clouds_20200914104256'. Below the dropdown, a message indicates the model is deployed and available for online prediction requests. A notice for beta users about the v1beta1 API endpoint is also present. At the bottom, there is a section titled 'Test your model' with a prominent 'UPLOAD IMAGES' button, which is highlighted with a red box.

When the prediction request completes you should see something like the following:

The screenshot shows the 'Predictions' results for a single object. The image uploaded is a photograph of wispy cirrus clouds. The prediction results show one object labeled 'CIRRUS' with a confidence score of 1.00.

Prediction	Score
CIRRUS	1.00



Excellent - the model classified each type of cloud correctly!

Congratulations!

You've learned how to train your own custom machine learning model and generate predictions on it through the web UI. Now you've got what it takes to train a model on your own image dataset.

What was covered

- Uploading training images to Cloud Storage and creating a CSV for AutoML Vision to find these images.
- Reviewing labels and training a model in the AutoML Vision UI.
- Generating predictions on new cloud images.

End your lab

When you have completed your lab, click **End Lab**. Qwiklabs removes the resources you've used and cleans the account for you.

You will be given an opportunity to rate the lab experience. Select the applicable number of stars, type a comment, and then click **Submit**.

The number of stars indicates the following:

- 1 star = Very dissatisfied
- 2 stars = Dissatisfied
- 3 stars = Neutral
- 4 stars = Satisfied
- 5 stars = Very satisfied

You can close the dialog box if you don't want to provide feedback.

For feedback, suggestions, or corrections, please use the **Support** tab.

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