Laboratorio 1:

Setup and requirements

Qwiklabs setup

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.

What you need

To complete this lab, you need:

- Access to a standard internet browser (Chrome browser recommended).
- Time to complete the lab.

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

Note: If you are using a Chrome OS device, open an Incognito window to run this lab.

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 a panel populated with the temporary credentials that you must use for this lab.

Open Google 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.

Username
google2727032_student@qwiklabs.n

Password
k68CZXsxMZ

GCP Project ID
qwiklabs-gcp-4fbfecac8667e457

New to labs? View our introductory video!

2. Copy the username, and then click **Open Google Console**. The lab spins up resources, and then opens another tab that shows the **Sign in** page.
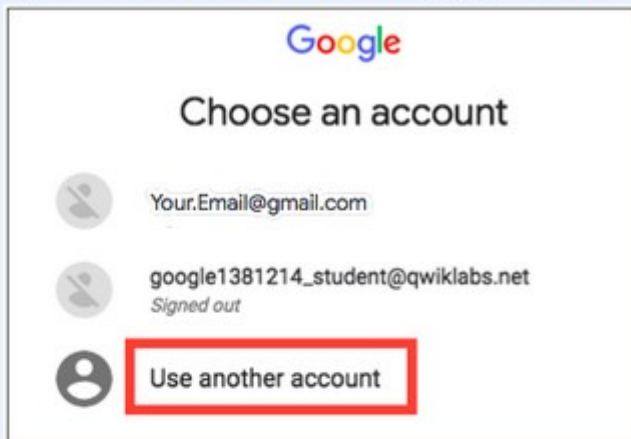

Google

Sign in

Use your Google Account

Email or phone

Forgot email?

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

If you see the **Choose an account** page, click **Use Another Account**.

Google

Choose an account

Your.Email@gmail.com

google1381214_student@qwiklabs.net
Signed out

Use another account

3. In the **Sign in** page, paste the username that you copied from the left panel. Then copy and paste the password.

   Important: You must use the credentials from the left panel. Do not use your Google Cloud Training credentials. If you have your own Google Cloud account, do not use it for this lab (avoids incurring charges).

4. 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.
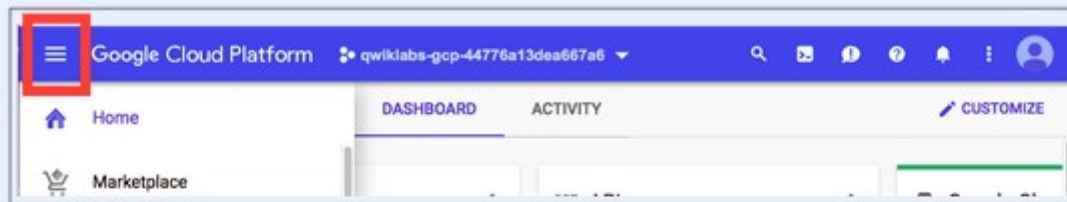
Set up AutoML Vision

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

From the **Navigation menu**, select **APIs & Services** > **Library**.

In the search bar type in "Cloud AutoML". Click on the **Cloud AutoML API** result and then click **Enable**.

This will take a minute to set up.

Now open this AutoML UI link in a new browser.

Click **Check my progress** to verify the objective.

Click **Check my progress** to verify the objective.

Enable the AutoML API

Check my progress

Assessment Completed!

Activate Cloud Shell

Cloud Shell is a virtual machine that is loaded with development tools. It offers a persistent 5GB home directory and runs on the Google Cloud. Cloud Shell provides command-line access to your Google Cloud resources.

In the Cloud Console, in the top right toolbar, click the **Activate Cloud Shell** button.
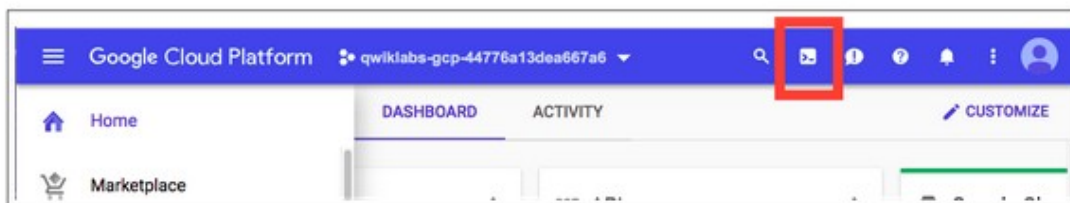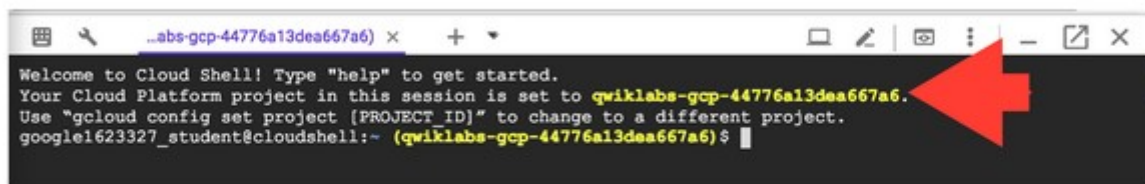

Click **Continue**.

Cloud Shell

Google Cloud Shell provides you with command-line access to your cloud resources directly from your browser. You can easily manage your projects and resources without having to install the Google Cloud SDK or other tools on your system. Learn more.

Continue

It takes a few moments to provision and connect to the environment. When you are connected, you are already authenticated, and the project is set to your *PROJECT_ID*. For example:

`gcloud` is the command-line tool for Google Cloud. It comes pre-installed on Cloud Shell and supports tab-completion.

You can list the active account name with this command:

```
gcloud auth list
```

(Output)

```
ACTIVE: *
ACCOUNT: student-01-xxxxxxxxxxxx@qwiklabs.net
To set the active account, run:
    $ gcloud config set account `ACCOUNT`
```

You can list the project ID with this command:

```
gcloud config list project
```

(Output)

```
[core]
project = <project_ID>
```

(Example output)

```
[core]
project = qwiklabs-gcp-44776a13dea667a6
```

> For full documentation of `gcloud` see the [gcloud command-line tool overview](#).

In Cloud Shell, use the following commands to create environment variables for your Project ID and Username, replacing `<USERNAME>` with the User Name you logged into the lab with:

```
export PROJECT_ID=$DEVSHELL_PROJECT_ID
```

```
export QWIKLABS_USERNAME=<USERNAME>
```

Run the following command to give AutoML permissions:

```
gcloud projects add-iam-policy-binding $PROJECT_ID \
    --member="user:$QWIKLABS_USERNAME" \
    --role="roles/automl.admin"
```

Now create a storage bucket by running the following:

```
gsutil mb -p $PROJECT_ID \
    -c standard     \
    -l us-central1 \
    gs://$PROJECT_ID-vcm/
```

In the Google Cloud console, open the **Navigation menu** and click on **Cloud Storage** to see it.

Google Cloud Platform

≡

Home ›

◈ Kubernetes Engine ›

⦂·⦂ Cloud Functions

❱❱ Cloud Run

VMware Engine

STORAGE

Filestore ›

Cloud Storage 📌 ›

⇄ Data Transfer ›

DATABASES

Bigtable

▦ Datastore ›

≋ Database Migration ›
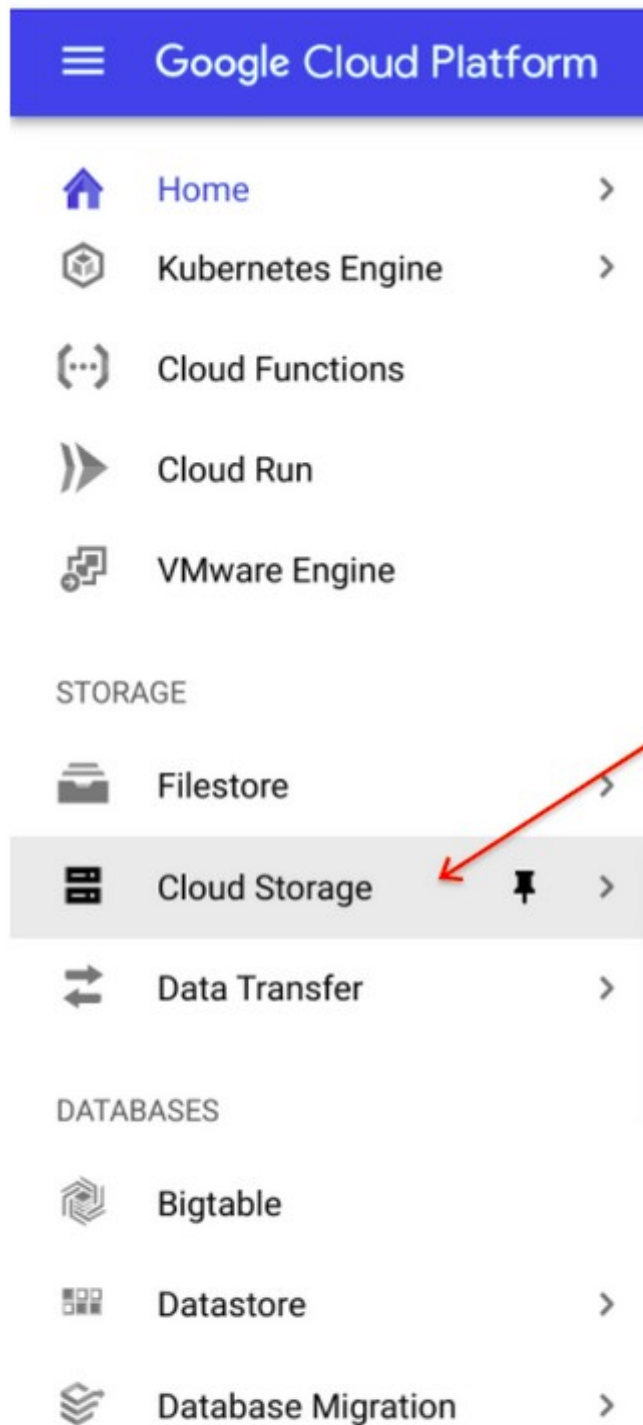
Click **Check my progress** to verify the objective.

Create a Cloud Storage Bucket

✓ Check my progress

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.

Before adding the cloud images, create an environment variable with the name of your bucket.

Run the following command in Cloud Shell:

```
export BUCKET=$PROJECT_ID-vcm
```

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://spls/gsp223/images/* gs://${BUCKET}
```

When the images finish copying, click the **Refresh** button at the top of the Storage browser, then click on your bucket name. You should see 3 folders of photos for each of the 3 different cloud types to be classified:

If you click on the individual image files in each folder you can see the photos you'll be using to train your model for each type of cloud.

Create a 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 command to copy the file to your Cloud Shell instance:

```
gsutil cp gs://spls/gsp223/data.csv .
```

Then update the CSV with the files in your project:

```
sed -i -e "s/placeholder/${BUCKET}/g" ./data.csv
```

Now upload this file to your Cloud Storage bucket:

```
gsutil cp ./data.csv gs://${BUCKET}
```

Once that command completes, click the **Refresh** button at the top of the Storage browser. Confirm that you see the `data.csv` file in your bucket.

Navigate back to the [AutoML Vision](#) tab. Your page should now resemble the following:
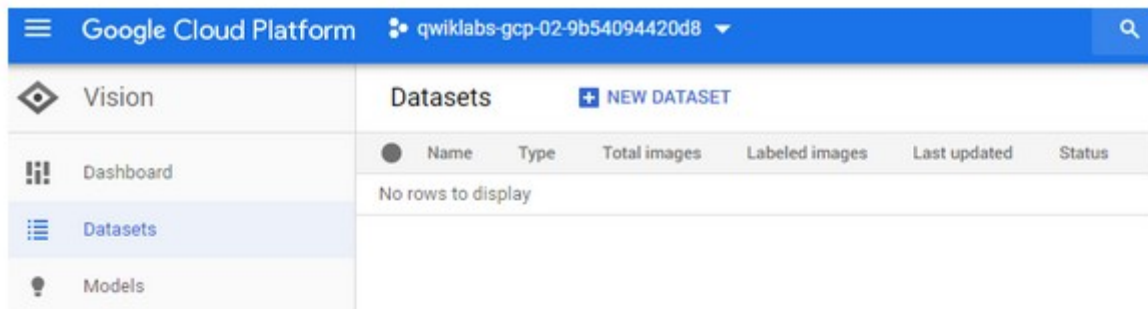
At the top of the console, click **+ NEW DATASET**.

Type "clouds" for the Dataset name.

Select "Single-Label Classification".

In your own projects, you may want to use multi-class classification.

Click **CREATE DATASET**.

Choose **Select a CSV file on Cloud Storage** and add the file name to the URL for the file you just uploaded - `gs://your-bucket-name/data.csv`

An easy way to get this link is to go back to the Cloud Console, click on the `data.csv` file. Click on the **copy** icon in the URI field.

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, VALIDATE, or TEST split.

Sample CSV format

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

    ┌ gs:// * ───┐
    │ ☑ qwiklabs-gcp-f6f486de5b62bbe3-vcm/data.csv   BROWSE │
    └──┘

[**CONTINUE**]

Click **CONTINUE**.

It will take 2 - 5 minutes for your images to import. Once the import has completed, you'll be brought to a page with all the images in your dataset.

Click **Check my progress** to verify the objective.

Create a Dataset

Check my progress
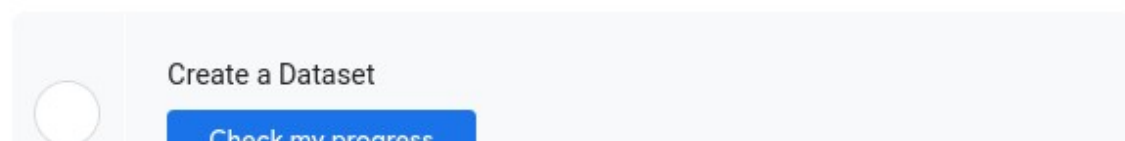
Inspect images

After the import completes, click on the **Images** tab to see the images you uploaded.
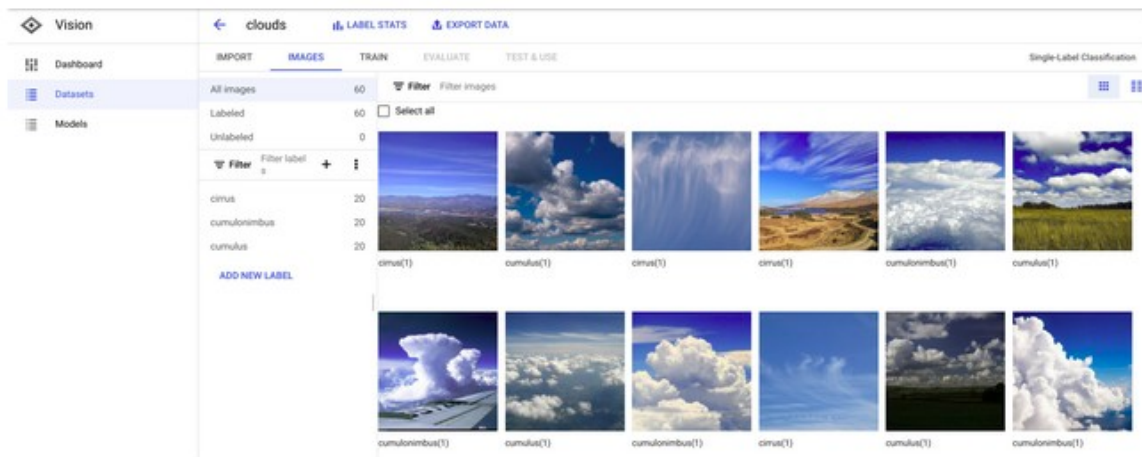
Try filtering by different labels in the left menu (i.e. click cumulus) to review the training images:

> **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 were used so the model could train quickly.

If any images are labeled incorrectly you can click on the image to switch the label:

If any images are labeled incorrectly you can click on the image to switch the label:

Filter labels

○ cirrus

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**.

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

Leave **Cloud-hosted** selected, then click **Continue**.

Set the node hours to **8**.

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

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

Set your budget *

8   node hours

Estimated completion date: Dec 23, 2020 9 PM GMT+5

☐ **Deploy model to 1 node after training**

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

START TRAINING   CANCEL

Click **Start Training**.

Evaluate your model

In the **Evaluate** tab, you'll see information about Precision and Recall of the model.
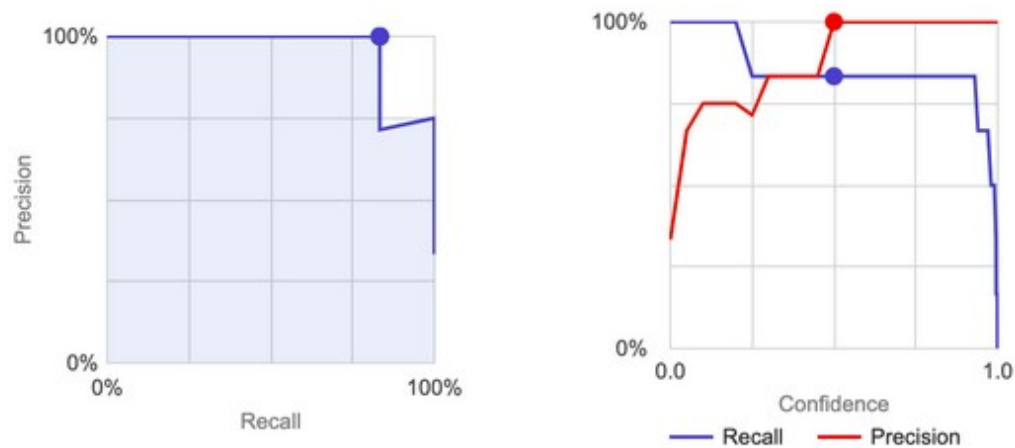
You can also play around with **Confidence threshold**.

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

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

Confusion matrix

This table shows how often the model classified each label correctly (in blue),
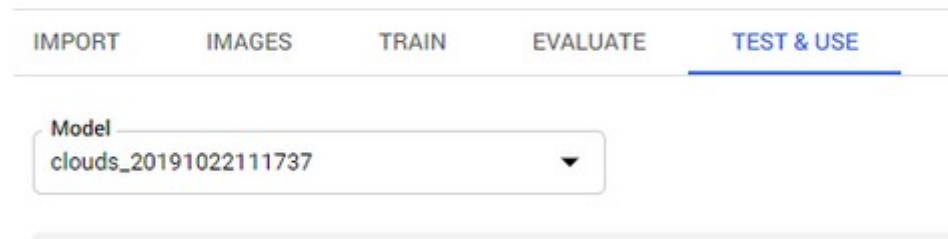**confused labels**. You can download the entire confusion matrix as a CSV file.

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

All of this 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.

Deploy your model

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

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

IMPORT	IMAGES	TRAIN	EVALUATE	TEST & USE

Model
clouds_20191022111737 ▼

Click **Deploy model** and then click **Deploy**.

This will take around **20 minutes** to deploy.

Generate predictions

There are a few ways to generate predictions. In this lab you'll 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).

Download these images to your local machine by right-clicking on each of them:

Return to the AutoML Vision UI, click **Upload Images** and upload the clouds to the online prediction UI. When the prediction request completes you should see something like the following:

Predictions
1 object

cumulonimbus   0.958722295 0.96

Click **Check my progress** to verify the objective.

Click **Check my progress** to verify the objective.

Run the predictions

Check my progress

Pretty cool - 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.

Finish your Quest

This self-paced lab is part of the Qwiklabs Machine Learning APIs and Intro to ML: Image Processing Quests. A Quest is a series of related labs that form a learning path. Completing a Quest

earns you a badge to recognize your achievement. You can make your badge (or badges) public and link to them in your online resume or social media account. Enroll in these Quests and get immediate completion credit if you've taken this lab. See other available Qwiklabs Quests.

Take your next lab

Continue your Quest with Detect Labels, Faces, and Landmarks in Images with the Cloud Vision API, or check out these suggestions:

- Awwvision: Cloud Vision API from a Kubernetes Cluster

- Entity and Sentiment Analysis with the Natural Language API

Next steps / learn more

- Watch the intro video
- Learn more about how AutoML Vision works by listening to the Google Cloud Podcast episode
- Read the announcement blog post
- Learn how to perform each step with the API

Google Cloud Training & 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.

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