ModelArts

Development Environment

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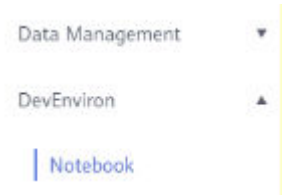
Contents

1 Introduction to DevEnviron

NOTE

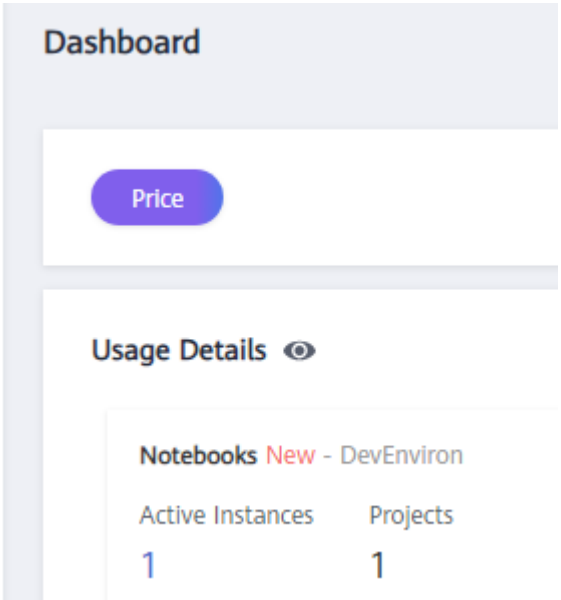
This document describes the functions of new-version DevEnviron notebook. Check the notebook version in the navigation pane on the left. If there is only one **Notebook** item under **DevEnviron**, the notebook is of the new version.

Figure 1-1 New-version notebook



After new-version notebook instances are created, **Notebooks New** will be displayed on the **Dashboard** page.

Figure 1-2 Notebooks New on the Dashboard page



Software development is a process of reducing developer costs and improving development experience. In AI development, ModelArts is dedicated to improving AI development experience and simplifying the development process. ModelArts DevEnviron uses cloud native resources and integrates the development tool chain to provide better in-cloud AI development experience for AI development, exploration, and teaching.

ModelArts notebook for seamless in-cloud and on-premises collaboration

- In-cloud JupyterLab, local IDE, and ModelArts plug-ins for remote development, tailored to your needs
- In-cloud development environment with AI compute resources, cloud storage, and built-in AI engines
- Custom runtime environment saved as an image for training and inference

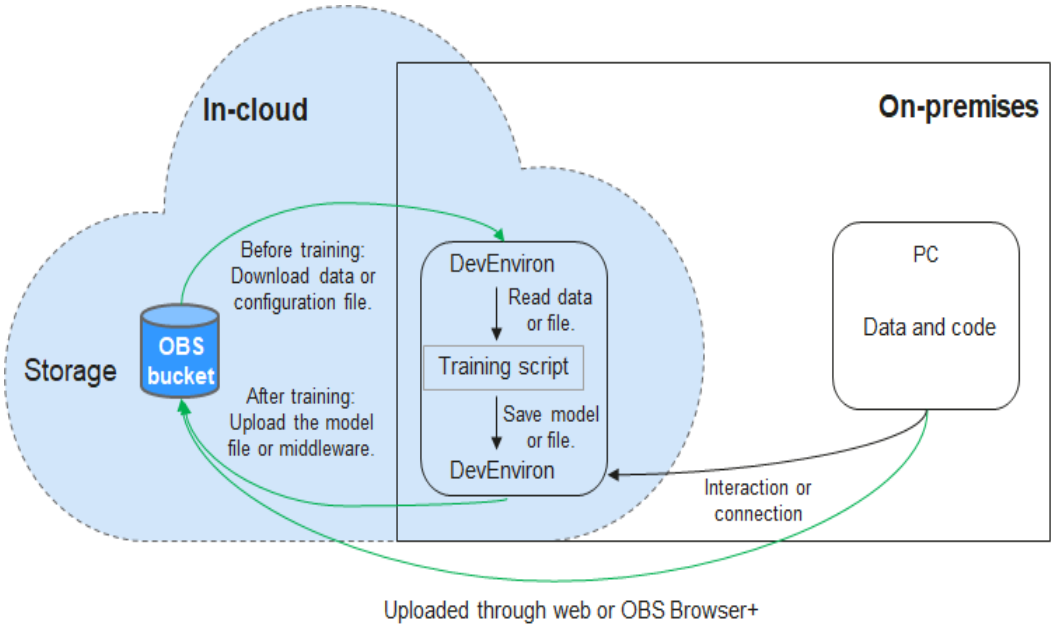
Feature 1: Remote development, allowing remote access to notebook from a local IDE

The notebook of the new version provides remote development. After enabling remote SSH, you can remotely access the ModelArts notebook development environment to debug and run code from a local IDE.

Due to limited local resources, developers using a local IDE run and debug code typically on a CPU or GPU server shared between team members. Building and maintaining the CPU or GPU server are costly.

ModelArts notebook instances are out of the box with various built-in engines and flavors for you to select. You can use a dedicated container environment. Only after simple configurations, you can remotely access the environment to run and debug code from your local IDE.

Figure 1-3 Remotely accessing notebook from a local IDE



ModelArts notebook can be regarded as an extension of a local development environment. The operations such as data reading, training, and file saving are the same as those performed in a local environment.

ModelArts notebook allows you to use in-cloud resources while with local coding habits unchanged.

A local IDE supports Visual Studio (VS) Code, PyCharm, and SSH. The PyCharm Toolkit and VS Code Toolkit plug-ins allow you to easily use cloud resources.

Feature 2: One-click image saving to save a development environment

ModelArts notebook of the new version allows you to save a running notebook instance as a custom image with one click.

When an image is saved, the installed pip dependency package is retained. In remote development through VS Code, the plug-ins installed on the server are retained.

Feature 3: Preset images that are out-of-the-box with optimized configurations and supporting mainstream AI engines

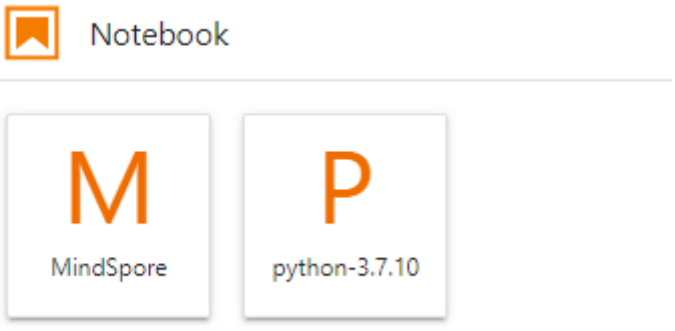
The AI engines and versions preset in each image are fixed. When creating a notebook instance, specify an AI engine and version, including the chip type.

ModelArts DevEnviron provides a group of preset images. You can use a preset image to start your notebook instance. After the development in the instance, submit a training job without any adaptation.

The image versions preset in ModelArts are determined based on user feedback and version stability. If your development can be carried out using the versions preset in ModelArts, for example, MindSpore 1.5, use preset images. These images have been fully verified and have many commonly-used installation packages built in. They are out-of-the-box, relieving you from configuring the environment.

The images preset in ModelArts DevEnviron include:

- Common preset packages: Common AI engines based on standard Conda, common data analysis software packages such as Pandas and Numpy, and common tool software such as CUDA and CUDNN, meet common AI development requirements.
- Preset Conda environments: A Conda environment and basic Conda Python (excluding any AI engine) are created for each preset image. The following figure shows the Conda environment for the preset MindSpore.



Select a Conda environment based on whether the AI engine is used for debugging.

- Notebook: a web application that enables you to code on the GUI and combine the code, mathematical equations, and visualized content into a document.
- JupyterLab plug-ins: enable flavor changing and instance stopping to improving user experience.
- Remote SSH: allows you to remotely debug a notebook instance from a local PC.

NOTE

- To simplify operations, ModelArts notebook of the new version does not support switchover between AI engines in a notebook instance.
- AI engines vary based on regions. For details about the AI engines available in a region, see the AI engines displayed on the management console.

Feature 4: JupyterLab, an online interactive development and debugging tool

ModelArts integrates open-source JupyterLab for online interactive development and debugging. You can use the notebook on the ModelArts management console to compile and debug code and train models based on the code, without concerning environment installation or configuration.

JupyterLab is an interactive development environment. It is the next-generation product of Jupyter Notebook. JupyterLab enables you to compile notebooks, operate terminals, edit Markdown text, enable interaction, and view CSV files and images.

2 Application Scenarios

ModelArts provides flexible, open development environments. Select a development environment based on site requirements.

- In-cloud notebook that is out of the box, relieving you from concerning environment installation or configuration. For details, see **JupyterLab Overview and Common Operations**.
- Local IDE for model development. After enabling remote SSH, you can remotely access the ModelArts notebook development environment to debug and run code from a local IDE. The local IDE allows you to use the in-cloud notebook development environment while with local coding habits unchanged.

  The local IDE supports VS Code, PyCharm, and SSH. Additionally, the PyCharm Toolkit and VS Code Toolkit are provided for convenient remote access. For details, see **Connecting to a Notebook Instance Through VS Code with One Click**.

3 Managing Notebook Instances

3.1 Creating a Notebook Instance

Before developing a model, create a notebook instance and access it for coding.

Context

- Only running notebook instances can be accessed or stopped.
- A maximum of 10 notebook instances can be created under an account.

Procedure

1. Log in to the ModelArts management console. In the navigation pane, choose **Settings** and check whether the access authorization has been configured. If not, configure access authorization. For details, see "Configuring Access Authorization".

   Figure 3-1 Configuring authorization

2. Log in to the ModelArts management console. In the left navigation pane, choose **DevEnviron > Notebook** to switch to the new-version **Notebook** page.
3. Click **Create**. On the **Create Notebook** page, configure parameters.
   a. Configure basic information of the notebook instance, including its name, description, and auto stop status. For details, see **Table 3-1**.

      Figure 3-2 Basic information of a notebook instance

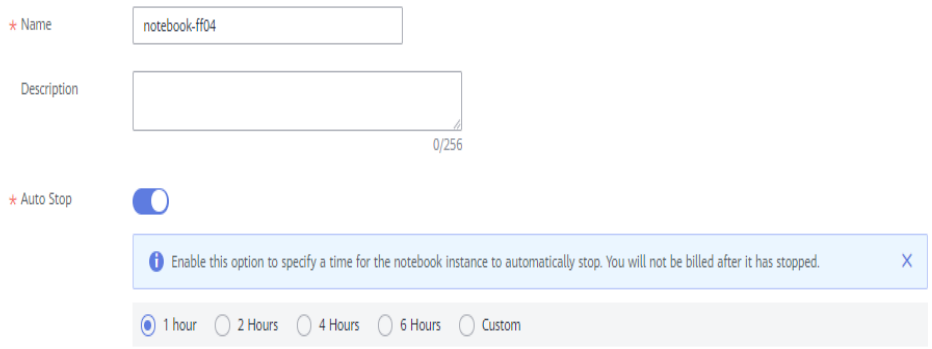
      

      Table 3-1 Basic parameters

Parameter	Description
Name	Name of the notebook instance. Enter 1 to 64 characters. Only letters, digits, hyphens (-), and underscores (_) are allowed.
Description	Brief description of the notebook instance
Auto Stop	Automatically stops the notebook instance at a specified time. This function is enabled by default. The default value is **1 hour**, indicating that the notebook instance automatically stops after running for 1 hour. The options are **1 hour**, **2 hours**, **4 hours**, **6 hours**, and **Custom**. You can select **Custom** to specify any integer from 1 to 24 hours.

   b. Configure notebook parameters, such as the image and instance flavor. For details, see **Table 3-2**.

Table 3-2 Notebook instance parameters

Parameter	Description
Image	Public and private images are supported. • Public images are the AI engines built in ModelArts. • Private images can be created using an instance that is created using a public image. Custom images have not been officially released. An image corresponds to an AI engine. When you select an image during instance creation, the AI engine is specified accordingly. Select an image as required. Enter a keyword of the image name in the search box on the right to quickly search for the image. You can change an image on a stopped notebook instance.
Resource Pool	Select a resource pool as required.
Type	Chip type, which can be CPU or GPU. The chips vary depending on the selected image.
Flavor	The flavor of your notebook instance.
Storage	**Default**, **EVS**, and **SFS** can be selected. • **Default** If you select this option, the system provides 50 GB of default free storage for each notebook instance. • **EVS** Set disk space, ranging from 5 GB to 4096 GB, based on actual usage. The default value is 5 GB. • **SFS**, which is supported by dedicated resource pools only All the storage paths of **Default**, **EVS**, and **SFS** are mounted to **/home/ma-user/work**. All read and write operations on files in the notebook instance are stored in this directory, not in OBS. The data is retained in **/home/ma-user/work**, even if the notebook instance is stopped or restarted. When the notebook instance is deleted, the data is deleted accordingly.

Parameter	Description
Remote SSH	• After you enable this function, you can remotely access the development environment of the notebook instance from your local development environment. • When a notebook instance is stopped, you can update the SSH configuration on the instance details page. **NOTE** The notebook instances with remote SSH enabled have VS Code plug-ins (such as Python and Jupyter) and the VS Code server package pre-installed, which occupy about 1 GB persistent storage space.
Key Pair	Set a key pair after remote SSH is enabled. Select an existing key pair. Alternatively, click **Create** on the right of the text box to create one on the DEW console. To do so, choose **Key Pair Service** > **Private Key Pairs** and click **Create Key Pair**. After a notebook instance is created, you can change the key pair on the instance details page. **CAUTION** Download the created key pair and properly keep it. When you use a local IDE to remotely access the notebook development environment, the key pair is required for authentication.
Whitelist	Set a whitelist after remote SSH is enabled. This parameter is optional. Add the IP addresses for remotely accessing the notebook instance to the whitelist, for example, the IP address of your local PC or the public IP address of the source device. A maximum of five IP addresses can be added and separated by commas (,). If the parameter is left blank, all IP addresses will be allowed for remote SSH access. If your source device and ModelArts are isolated from each other in network, obtain the public IP address of your source device using a mainstream search engine, for example, by entering "IP address lookup", but not by running **ipconfig** or **ifconfigip** locally. After a notebook instance is created, you can change the whitelist IP addresses on the instance details page.

4. Click **Next**.
5. After confirming the parameter settings, click **Submit**.

   Switch to the notebook instance list. The notebook instance is being created. It will take several minutes when its status changes to **Running**. Then, the notebook instance is created.
6. In the notebook instance list, click the instance name. On the instance details page that is displayed, view the instance configuration.

Figure 3-3 Details about a notebook instance

The SSH configuration of a stopped notebook instance can be modified. Both the key and whitelist can be modified.

To modify the whitelist, click the modification icon on the right.

3.2 Accessing a Notebook Instance

Access a notebook instance in the **Running** state for coding.

The methods of accessing notebook instances vary depending on the AI engine based on which the instance was created.

- Remotely accessed from a local IDE through PyCharm, VS Code, or SSH. For details, see **Connecting to a Notebook Instance Through VS Code Toolkit**.
- Accessed online using JupyterLab. For details, see **JupyterLab Overview and Common Operations**.

A ModelArts notebook instance is started as user **ma-user**. The default working directory of the instance is **/home/ma-user**.

```
sh-4.4$pwd
/home/ma-user
sh-4.4$
```

Create an instance and mount the persistent storage to **/home/ma-user/work**.

```
sh-4.4$pwd
/home/ma-user
sh-4.4$cd work/
sh-4.4$pwd
/home/ma-user/work
sh-4.4$
```

The data stored in the **work** directory only is retained after the instance is stopped or restarted. When you use a development environment, store the data for persistence in **/home/ma-user/work**.

3.3 Starting, Stopping, or Deleting a Notebook Instance

Starting or Stopping an Instance

Stop the notebook instances that are not needed. You can also restart a stopped instance.

1. Log in to the ModelArts management console. Choose **DevEnviron** > **Notebook** in the navigation pane on the left. The notebook list of the new version is displayed.
2. Start or stop the target notebook instance.
   - To start a notebook instance, click **Start** in the **Operation** column of the target notebook instance. Only stopped notebook instances can be started.
   - To stop a notebook instance, click **Stop** in the **Operation** column of the target notebook instance. Only running notebook instances can be stopped.

> **CAUTION**
>
> After a notebook instance is stopped:
>
> - The data stored only in **/home/ma-user/work** is retained. For example, the external dependency packages installed in other directories in the development environment will be deleted.

Deleting an Instance

Delete the notebook instances that are not needed.

1. Log in to the ModelArts management console. Choose **DevEnviron** > **Notebook** in the navigation pane on the left. The notebook list of the new version is displayed.
2. In the notebook list, click **Delete** in the **Operation** column of the target notebook instance. In the dialog box that is displayed, click **OK**.

> **CAUTION**
>
> Deleted notebook instances cannot be recovered.
>
> After a notebook instance is deleted, the data stored in the mounted directory will be deleted, regardless of whether the notebook instance uses the default storage or an EVS disk for storage.

3.4 Changing a Notebook Instance Image

ModelArts allows you to change images on a notebook instance to flexibly adjust its AI engine.

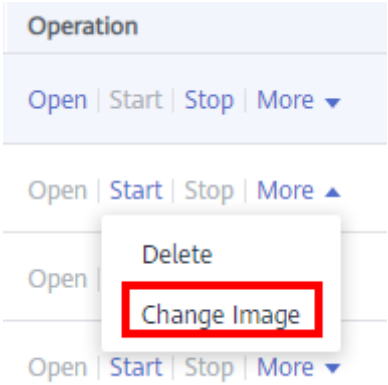
Constraints

The target notebook instance is stopped.

Procedure

1. Log in to the ModelArts management console and choose **DevEnviron** > **Notebook** in the navigation pane on the left to switch to the notebook page.
2. In the notebook list, click **More** in the **Operation** column of the target notebook instance and select **Change Image**.

   Figure 3-4 Change Image

3. In the **Change Image** dialog box, select a new image and click **OK**. After the modification, you can view the new image on the notebook list page.

3.5 Dynamically Expanding EVS Disk Capacity

Overview

If a notebook instance uses an EVS disk for storage, the disk is mounted to **/home/ma-user/work/** of the notebook container and the disk capacity can be expanded by up to 200 GB when the instance is running.

Application Scenarios

During notebook development, select a small EVS disk capacity, for example, 5 GB, when creating a notebook instance because the storage requirements are low at the initial stage. After the development, a large volume of data must be trained. Then, expand the disk capacity to cost-effectively meet your service needs.

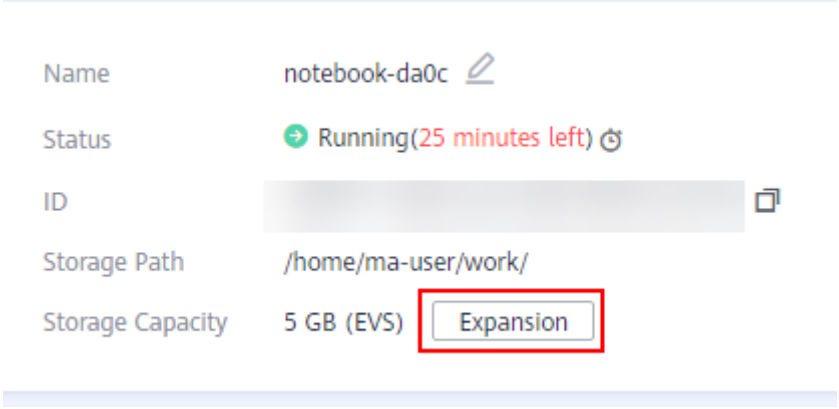
Restrictions

- The target notebook instance must use EVS for storage.
- Up to 100 GB can be expanded at a time. Additionally, the total capacity after expansion cannot exceed 4096 GB.
- If the original capacity of an EVS disk is 4096 GB, the disk capacity cannot be expanded.
- After the instance is stopped, the expanded capacity still takes effect.

Procedure

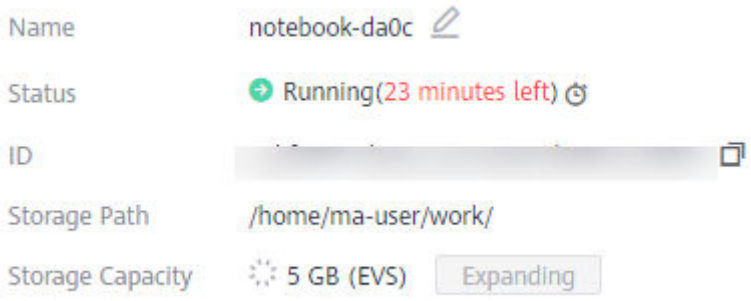
1. Log in to the ModelArts management console. In the left navigation pane, choose **DevEnviron > Notebook** to switch to the new-version **Notebook** page.
2. Click the name of a running notebook instance. On the instance details page, click **Expansion**.

   Figure 3-5 Instance details page

3. Set the capacity to be expanded and click **OK**. **Expanding** shows that the capacity expansion is in progress. After the expansion, the displayed storage capacity is the expanded capacity.

   Figure 3-6 Expanding

3.6 Changing the Flavor of a Notebook Instance

ModelArts allows you to flexibly change the node flavor for a notebook instance.

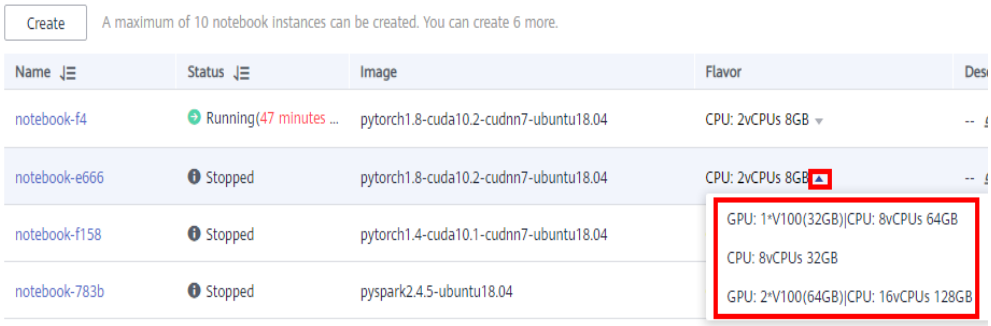
Constraints

The target notebook instance is stopped.

Procedure

1. Log in to the ModelArts management console and choose **DevEnviron** > **Notebook** in the navigation pane on the left to switch to the notebook page.
2. In the notebook list, click in the **Flavor** column of the target notebook instance and choose the target flavor from the drop-down list.

Figure 3-7 Changing flavor



3.7 Modifying the SSH Configuration for Notebook

ModelArts allows you to modify the SSH configuration for notebook instances.

If a notebook instance is created with remote SSH disabled, you can enable remote SSH on the notebook details page.

During the creation of a notebook instance, if you set a whitelist for remotely accessing it, you can change the IP addresses in the whitelist on the notebook instance details page. You can also change the key pair.

Constraints

The target notebook instance must be stopped.

Changing the Key Pair and the IP Addresses in the Whitelist

1. Log in to the ModelArts management console and choose **DevEnviron** > **Notebook** in the navigation pane on the left to switch to the notebook page.
2. Click the target notebook instance. Enable remote SSH and change the key pair and whitelist.

NOTE

For manually enabled remote SSH, see **Figure 1**. After the SSH configuration is updated, the remote SSH function cannot be disabled.

For remote SSH enabled by default in the selected image, see **Figure 2**.

Figure 3-8 Update SSH Configuration

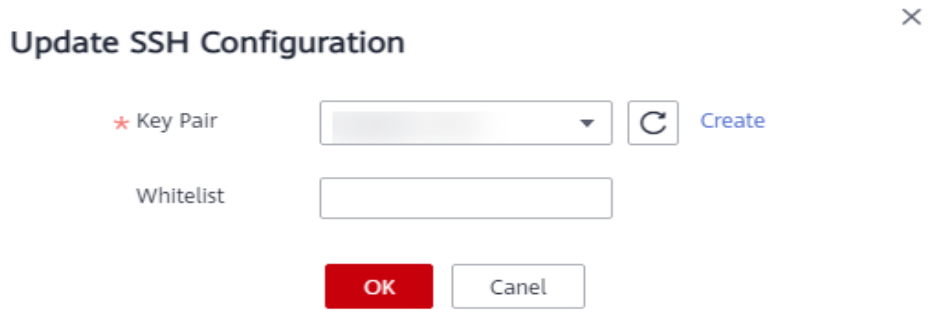


Figure 3-9 Changing the whitelist and key pair

- Click ▼ and choose an existing key pair, or click **Create** to create a new key pair.
- For details about how to configure a whitelist, see **Changing the Key Pair and the IP Addresses in the Whitelist**. After you change the IP addresses, the existing links are still valid. After the links are released, the new links only from the changed IP addresses can be set up.

3.8 Viewing All Notebook Instances of an IAM Project

Any IAM user granted with the **listAllNotebooks** and **listUsers** permissions can click **View all** on the notebook page to view the instances of all users in the current IAM project.

NOTE

Users granted with these permissions can also access OBS and SWR of all users in the current IAM project.

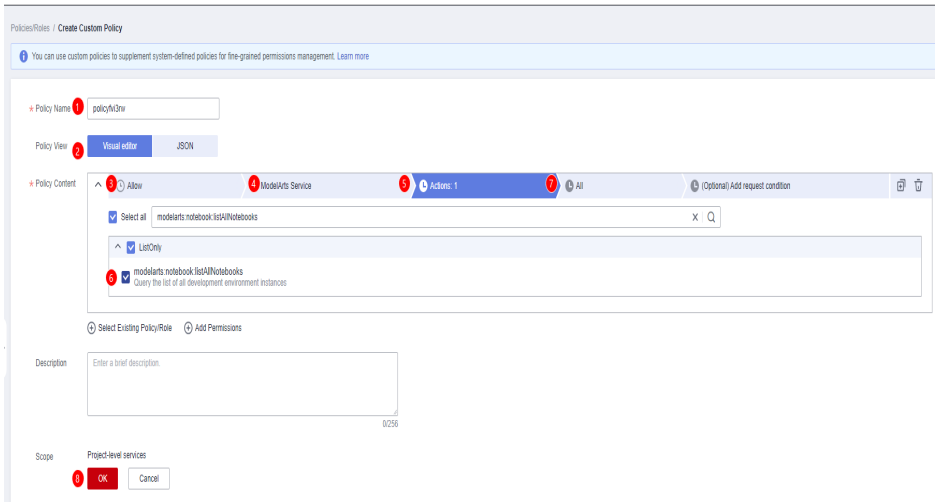
Assigning the listAllNotebooks Permission to an IAM User

1. Log in to the management console as a tenant user, hover the cursor over your username in the upper right corner, and choose **Identity and Access Management** from the drop-down list to switch to the IAM management console.
2. On the IAM console, choose **Permissions** > **Policies/Roles** from the navigation pane, click **Create Custom Policy** in the upper right corner, and create two policies.

   Policy 1: Create a policy that allows users to view all notebook instances of an IAM project, as shown in **Figure 1**.

- **Policy Name**: Enter a custom policy name, for example, **Viewing all notebook instances**.
- **Policy View**: Select **Visual editor**.
- **Policy Content**: Select **Allow**, **ModelArts Service**, **modelarts:notebook:listAllNotebooks**, and default resources.

Figure 3-10 Creating a custom policy



Policy 2: Create a policy that allows users to view all users of an IAM project.

- **Policy Name**: Enter a custom policy name, for example, **Viewing all users of the current IAM project**.
- **Policy View**: Select **Visual editor**.
- **Policy Content**: Select **Allow**, **Identity and Access Management**, **iam:users:listUsers**, and default resources.

3. In the navigation pane, choose **User Groups**. Then, click **Authorize** in the **Operation** column of the target user group. On the **Authorize User Group** page, select the custom policies created in **2**, and click **Next**. Then, select the scope and click **OK**.

   After the configuration, all users in the user group have the permission to view all notebook instances created by users in the user group.

   If no user group is available, create a user group, add users using the user group management function, and configure authorization. If the target user is not in a user group, you can add the user to a user group through the user group management function.

Enabling an IAM User to Start Other User's Notebook Instance

If an IAM user wants to access another IAM user's notebook instance through remote SSH, they need to update the SSH key pair to their own. Otherwise, error **ModelArts.6786** will be reported. For details about how to update a key pair, see **Modifying the SSH Configuration for Notebook**.

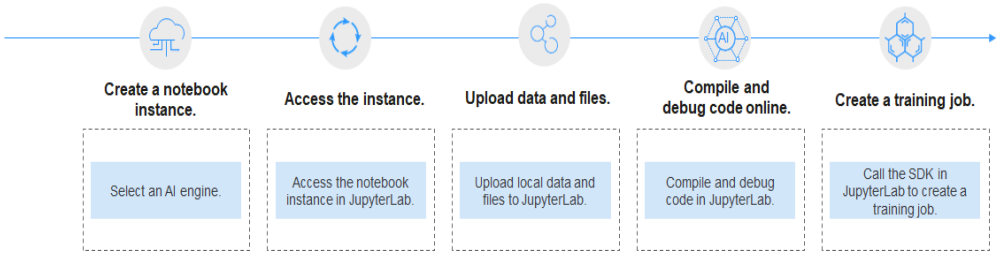
ModelArts.6789: Failed to find SSH key pair KeyPair-xxx on the ECS key pair page. Update the key pair and try again later.

4 JupyterLab

4.1 Operation Process in JupyterLab

ModelArts allows you to access notebook instances online using JupyterLab and develop AI models based on the PyTorch, TensorFlow, or MindSpore engines. The following figure shows the operation process.

Figure 4-1 Using JupyterLab to develop and debug code online



1. Create a notebook instance.

   On the ModelArts management console, create a notebook instance with a proper AI engine. For details, see **Creating a Notebook Instance**.

2. Use JupyterLab to access the notebook instance. For details, see **Accessing JupyterLab**.
3. Upload training data and code files to JupyterLab. For details, see **Uploading Files from a Local Path to JupyterLab**.
4. Compile and debug code in JupyterLab. For details, see **JupyterLab Overview and Common Operations**.

5. In JupyterLab, call the ModelArts SDK to create a training job for in-cloud training.

   For details, see .

4.2 JupyterLab Overview and Common Operations

JupyterLab is the next-generation web-based interactive development environment of Jupyter Notebook, enabling you to compile notebooks, operate terminals, edit Markdown text, enable interaction, and view CSV files and images.

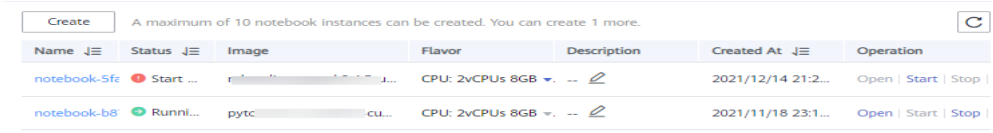
JupyterLab is the future mainstream development environment for developers. It has the same components as Jupyter Notebook, but offering more flexibility and powerful functions.

Accessing JupyterLab

To access JupyterLab from a running notebook instance, perform the following operations:

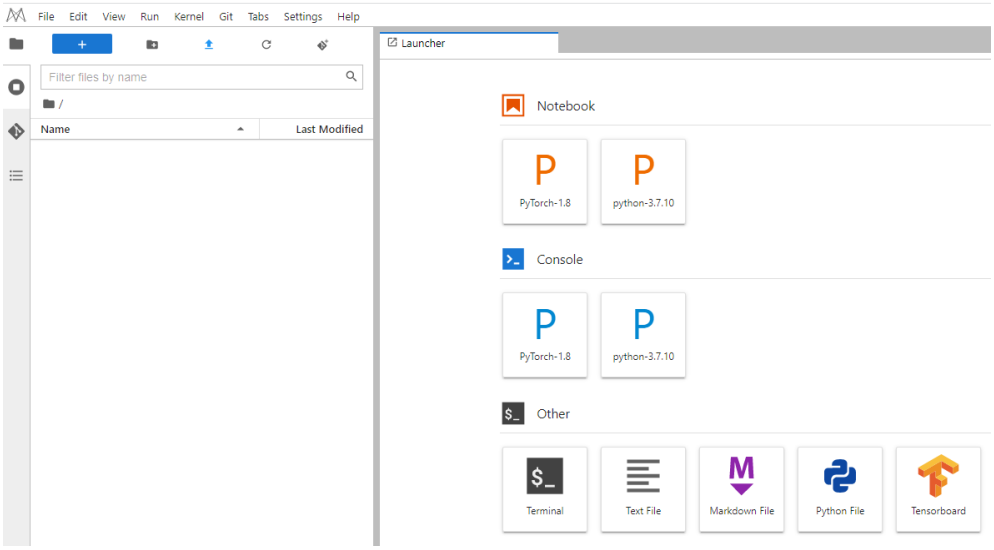
1. Log in to the ModelArts management console. Choose **DevEnviron** > **Notebook** in the navigation pane on the left. The notebook list of the new version is displayed.
2. Click **Open** in the **Operation** column of a running notebook instance to access JupyterLab.

   Figure 4-2 Accessing a notebook instance



3. The **Launcher** page is automatically displayed. Perform required operations. For details, see **JupyterLab Documentation**.

   Figure 4-3 JupyterLab homepage



NOTE

The notebook and console kernels and versions displayed on the **Launcher** page vary depending on the AI engine based on which a notebook instance is created. **Figure 2** shows an example only. Obtain the notebook and console kernels and versions on the management console.

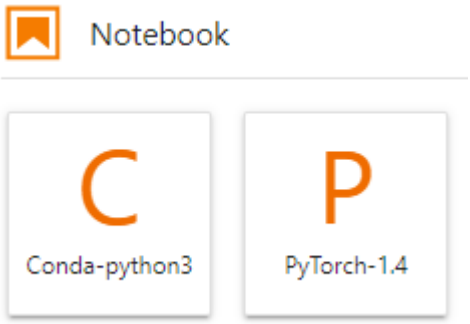
- **Notebook**: Select a kernel for running notebook, for example, TensorFlow or Python.
- **Console**: Call the terminal for command control.
- **Other**: Edit other files.

Creating an IPYNB File in JupyterLab

On the JupyterLab homepage, click a proper AI engine in the **Notebook** area to create an IPYNB file.

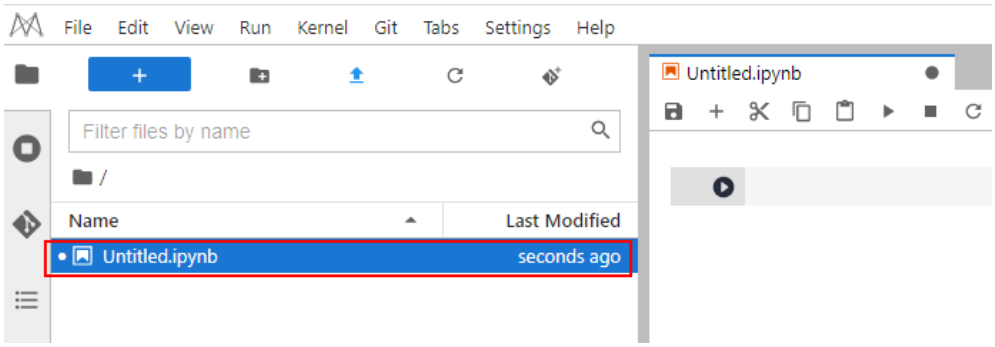
The AI engines supported by each notebook instance vary depending on the runtime environment. The following figure is only an example. Select an AI engine based on site requirements.

Figure 4-4 Selecting an AI engine and creating IPYNB file



The created IPYNB file is displayed in the navigation pane on the left.

Figure 4-5 Created IPYNB file



Creating a Notebook File and Accessing the Console

A console is a Python terminal, which is similar to the native IDE of Python, displaying the output after a statement is entered.

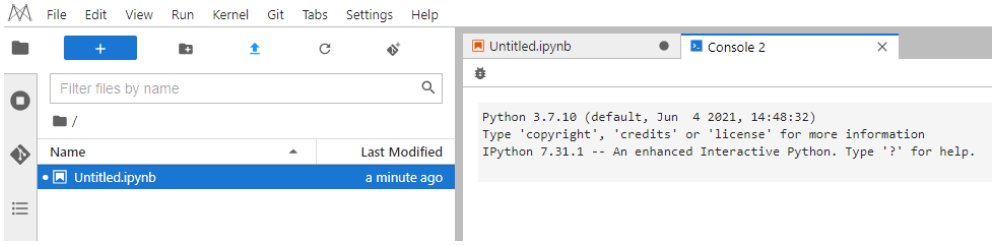
On the JupyterLab homepage, click a proper AI engine in the **Console** area to create a notebook file.

The AI engines supported by each notebook instance vary depending on the runtime environment. The following figure is only an example. Select an AI engine based on site requirements.

Figure 4-6 Selecting an AI engine and creating a console

After the file is created, the console page is displayed.

Figure 4-7 Creating a notebook file (console)

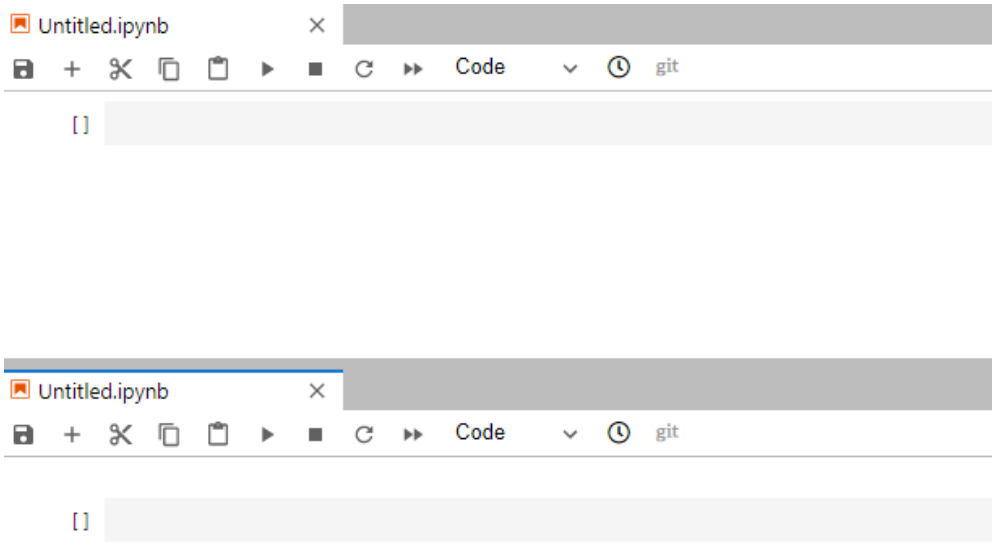


Editing a File in JupyterLab

JupyterLab allows you to open multiple notebook instances or files (such as HTML, TXT, and Markdown files) in one window and displays them on different tab pages.

In JupyterLab, you can customize the display of multiple files. In the file display area on the right, you can drag a file to adjust its position. Multiple files can be concurrently displayed.

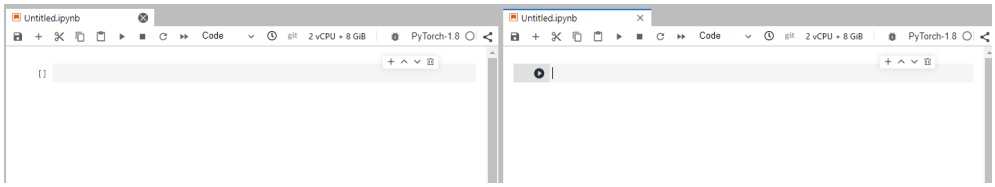
Figure 4-8 Customized display of multiple files



When writing code in a notebook instance, you can create multiple views of a file to synchronously edit the file and view execution results in real time.

To open multiple views, open an IPYNB file and choose **File** > **New View for Notebook**.

Figure 4-9 Multiple views of a file



Before coding in the code area of an IPYNB file in JupyterLab, add an exclamation mark (!) before the code.

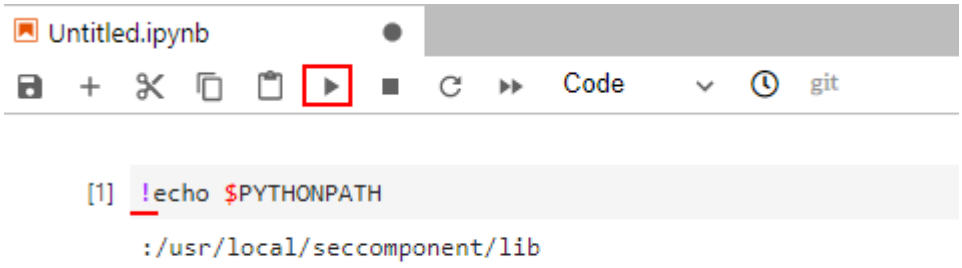
For example, install an external library Shapely.

```
!pip install Shapely
```

For example, obtain PythonPath.

```
!echo $PYTHONPATH
```


Figure 4-10 Running code

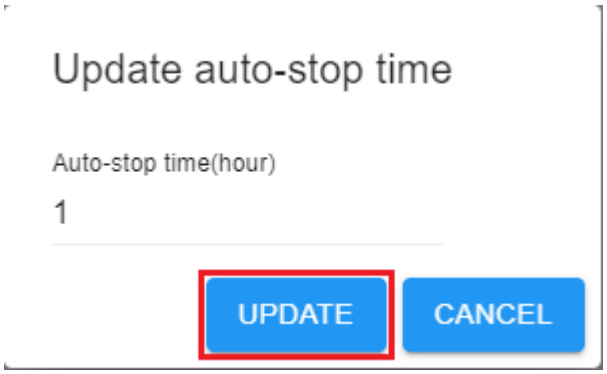


Renewing or Automatically Stopping a Notebook Instance

If you enable auto stop when you created or started a notebook instance, the remaining duration for stopping the instance is displayed in the upper right corner of JupyterLab. You can click the time for renewal.

Figure 4-11 Remaining duration

Figure 4-12 Renewing an instance



Common JupyterLab Buttons and Plug-ins

Figure 4-13 Common JupyterLab buttons and plug-ins

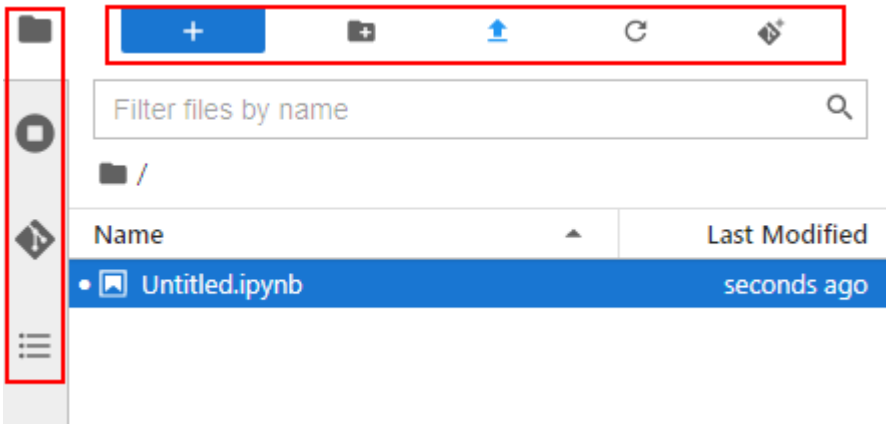


Table 4-1 JupyterLab buttons

Button	Description
+	Open the **Launcher** page, on which you can quickly create notebook instances, consoles, or other files.
	Create a folder.
	Upload files.
	Refresh the file directory.
	Git plug-in, which can be used to access the GitHub code library associated with the notebook instance.

Table 4-2 JupyterLab plug-ins

Plug-in	Description
	List files. Click this button to show all files in the notebook instance.
	Display the terminals and kernels that are running in the current instance.
	Git plug-in, which can be used to quickly access the GitHub code library.
	Property inspector.

Plug-in	Description
	Show the document organization.

Figure 4-14 Buttons in the navigation bar

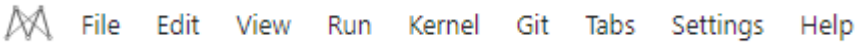


Table 4-3 Buttons in the navigation bar

Button	Description
File	Actions related to files and directories, such as creating, closing, or saving notebooks.
Edit	Actions related to editing documents and other activities in the IPYNB file, such as undoing, redoing, or cutting cells.
View	Actions that alter the appearance of JupyterLab, such as showing the bar or expanding code.
Run	Actions for running code in different activities such as notebooks and code consoles.
Kernel	Actions for managing kernels, such as interrupting, restarting, or shutting down a kernel.
Git	Actions on the Git plug-in, which can be used to quickly access the GitHub code library.
Tabs	A list of the open documents and activities in the dock panel.
Settings	Common settings and an advanced settings editor.
Help	A list of JupyterLab and kernel help links.

Figure 4-15 Buttons in the menu bar of an IPYNB file

Table 4-4 Buttons in the menu bar of an IPYNB file

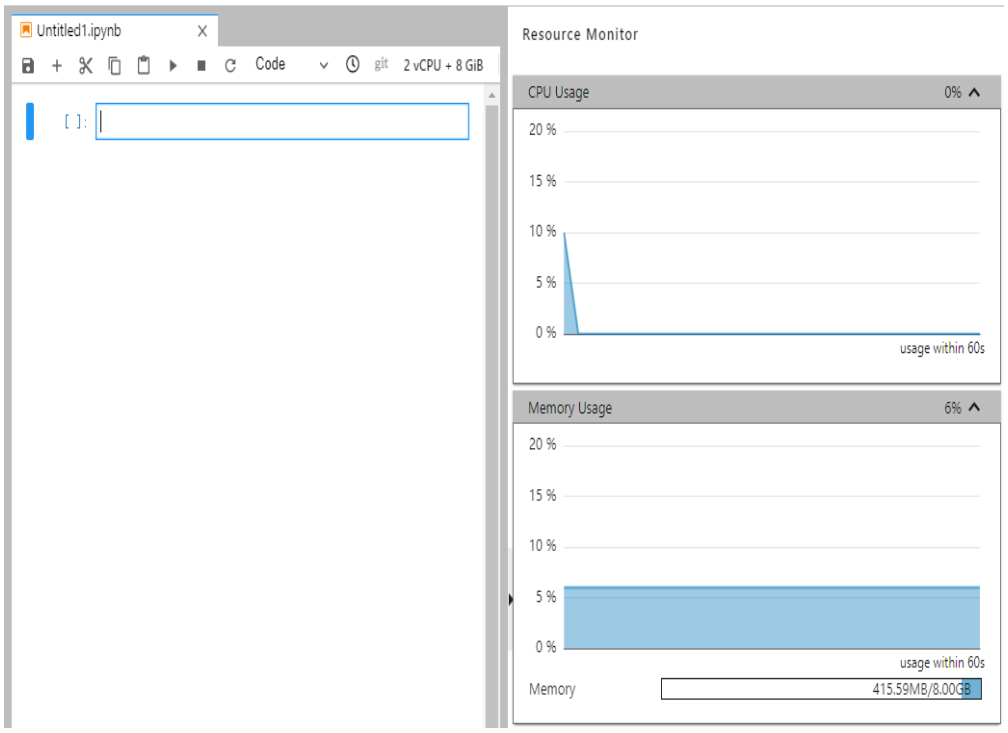
Button	Description
	Save a file.

Button	Description
+	Add a new cell.
	Cut the selected cell.
	Copy the selected cell.
	Paste the selected cell.
	Execute the selected cell.
	Terminate a kernel.
	Restart a kernel.
	Restart a kernel and run all code of the current notebook again.
Code	There are four options in the drop-down list: **Code** (Python code), **Markdown** (Markdown code, typically used for comments), **Raw** (a conversion tool), and **-** (not modified)
	View historical code versions.
git	Git plug-in. The gray button indicates that the plug-in is unavailable in the current region.
2 vCPU + 4 GiB	Instance flavor.
PyTorch-1.4	Kernel for you to select.
	Code running status. indicates the code is being executed.

Monitoring Resources

To obtain resource usage, select **Resource Monitor** in the right pane. The CPU usage and memory usage can be viewed.

Figure 4-16 Resource usage



4.3 JupyterLab Plug-ins

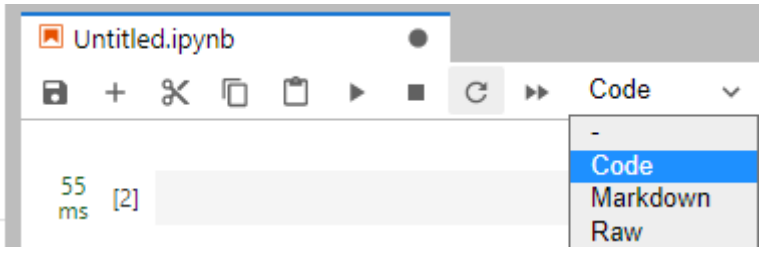
4.3.1 Code Parametrization Plug-in

The code parametrization plug-in simplifies notebook cases. You can quickly adjust parameters and train models based on notebook cases without complex code. This plug-in can be used to customize notebook cases for competitions and learning.

Use Guide

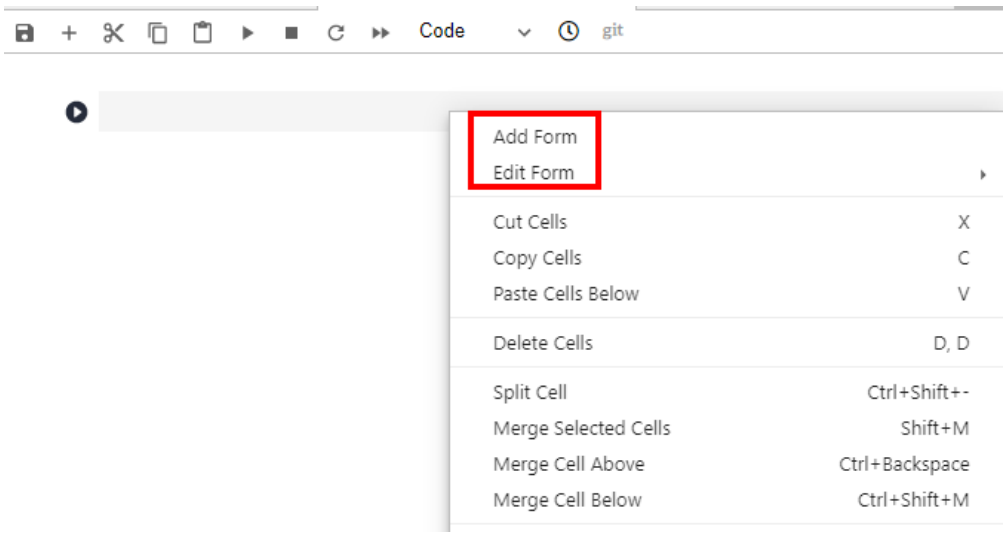
- The **Add Form** and **Edit Form** buttons are available only to the shortcut menu of code cells.

  Figure 4-17 Viewing a code cell

- After opening new code, add a form before editing it.

Figure 4-18 Shortcut menu of code cells



Add Form

If you click **Add Form**, a code cell will be split into the code and form edit area. Click **Edit** on the right of the form to change the default title.

Figure 4-19 Two edit areas

Edit Form

If you click **Edit Form**, four sub-options will be displayed: **Add new form field**, **Hide code**, **Hide form**, and **Show All**.

- You can set the form field type to **dropdown**, **input**, and **slider**. See **Figure 4**. Each time a field is added, the corresponding variable is added to the code and form areas. If a value in the form area is changed, the corresponding variable in the code area is also changed.

  NOTE

  When creating a dropdown form, click **ADD Item** and add at least two items. See **Figure 5**.

Figure 4-20 Form style of dropdown, input, and slider

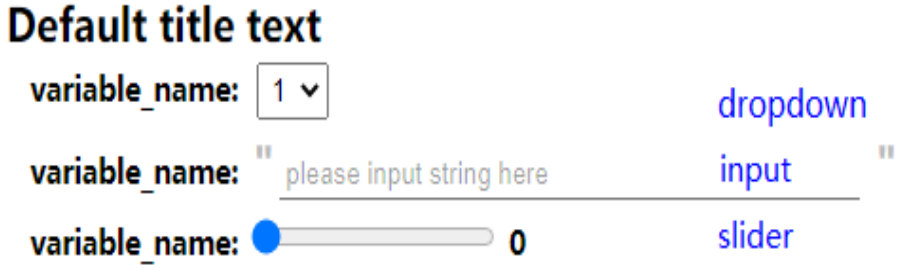


Figure 4-21 Creating a dropdown form

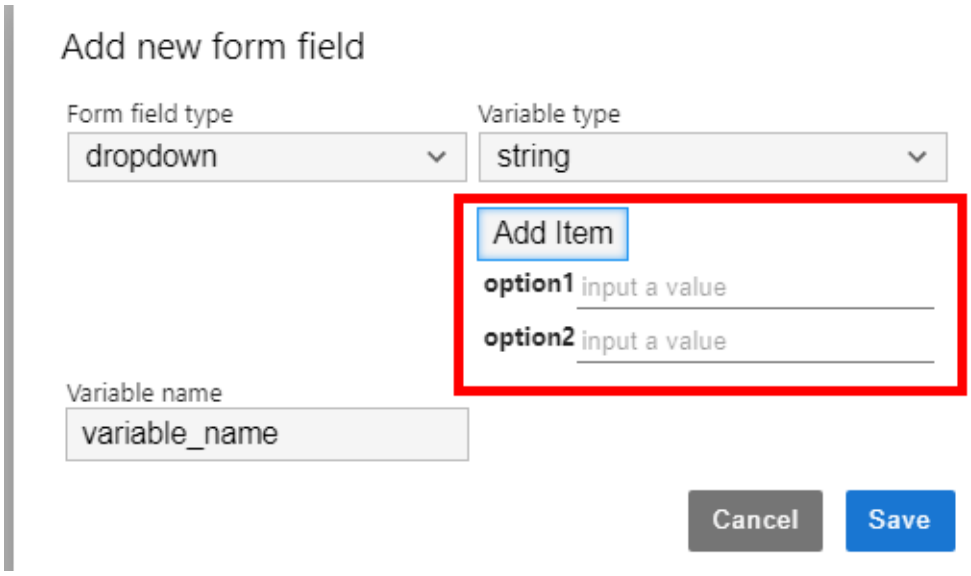
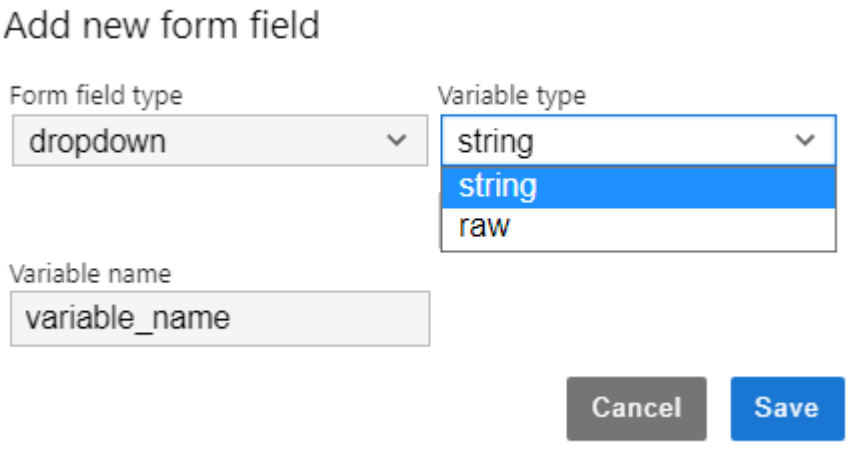


Figure 4-22 Deleting a form

- If the form field type is set to **dropdown**, the supported variable types are **raw** and **string**.



- If the form field type is set to **input**, the supported variable types are **boolean**, **date**, **integer**, **number**, **raw**, and **string**.
- If the form field type is set to **slider**, the minimum value, maximum value, and step can be set.

- If you click **Hide code**, the code area will be hidden.

- If you click **Hide form**, the form area will be hidden.
- If you click **Show All**, both the code and form areas will be displayed.

4.4 Using ModelArts SDK

Notebook instances allow you to use ModelArts SDK to manage OBS, training jobs, models, and real-time services.

Your notebook instances have automatically obtained your AK/SK for authentication and the region. Therefore, SDK sessions are automatically authenticated.

Example Code

- Create a training job.

```
from modelarts.session import Session
from modelarts.estimator import Estimator
session = Session()
estimator = Estimator(
                    modelarts_session=session,
                    framework_type='PyTorch',                                   # AI engine name
                    framework_version='PyTorch-1.0.0-python3.6',                # AI engine version
                    code_dir='/obs-bucket-name/src/',                           # Training script directory
                    boot_file='/obs-bucket-name/src/pytorch_sentiment.py',      # Training boot script
directory
                    log_url='/obs-bucket-name/log/',                            # Training log directory
                    hyperparameters=[
                                {"label":"classes",
                                 "value": "10"},
                                {"label":"lr",
                                 "value": "0.001"}
                                ],
                    output_path='/obs-bucket-name/output/',                     # Training output directory
                    train_instance_type='modelarts.vm.gpu.p100',                # Training environment
specifications
                    train_instance_count=1,                                     # Number of training nodes
                    job_description='pytorch-sentiment with ModelArts SDK')     # Training job description
job_instance = estimator.fit(inputs='/obs-bucket-name/data/train/', wait=False,
job_name='my_training_job')
```

- Obtain a model list.

```
from modelarts.session import Session
from modelarts.model import Model
session = Session()
model_list_resp = Model.get_model_list(session, model_status="published", model_name="digit",
order="desc")
```

- Obtain service details.

```
from modelarts.session import Session
from modelarts.model import Predictor
session = Session()
predictor_instance = Predictor(session, service_id="input your service_id")
predictor_info_resp = predictor_instance.get_service_info()
```

4.5 Using the Git Plug-in

In JupyterLab, you can use the Git plug-in to clone the GitHub open-source code repository, quickly view and edit data, and submit the modified data.

Prerequisites

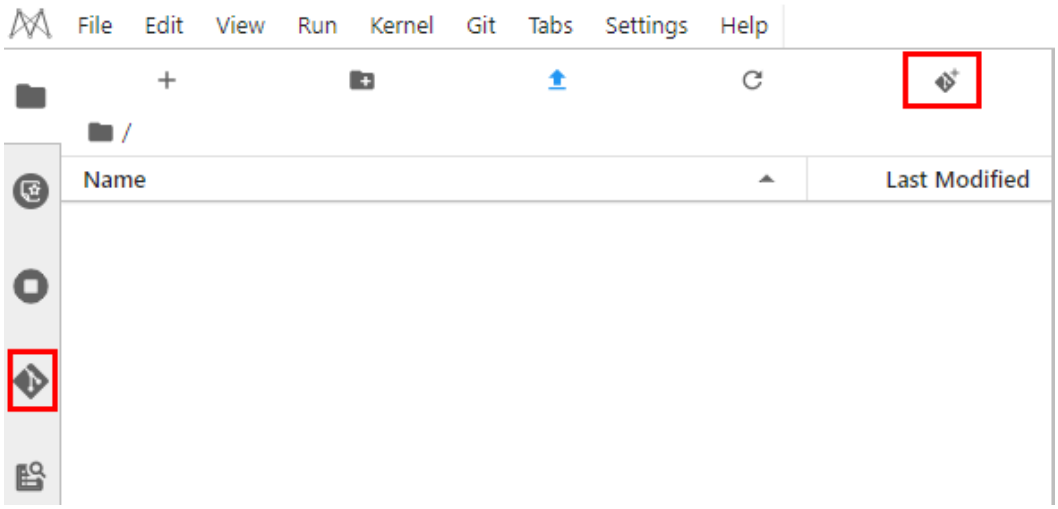
The notebook instance is running.

Starting the Git Plug-in of JupyterLab

In the notebook instance list, locate the target instance and click **Open** in the **Operation** column to go to the JupyterLab page.

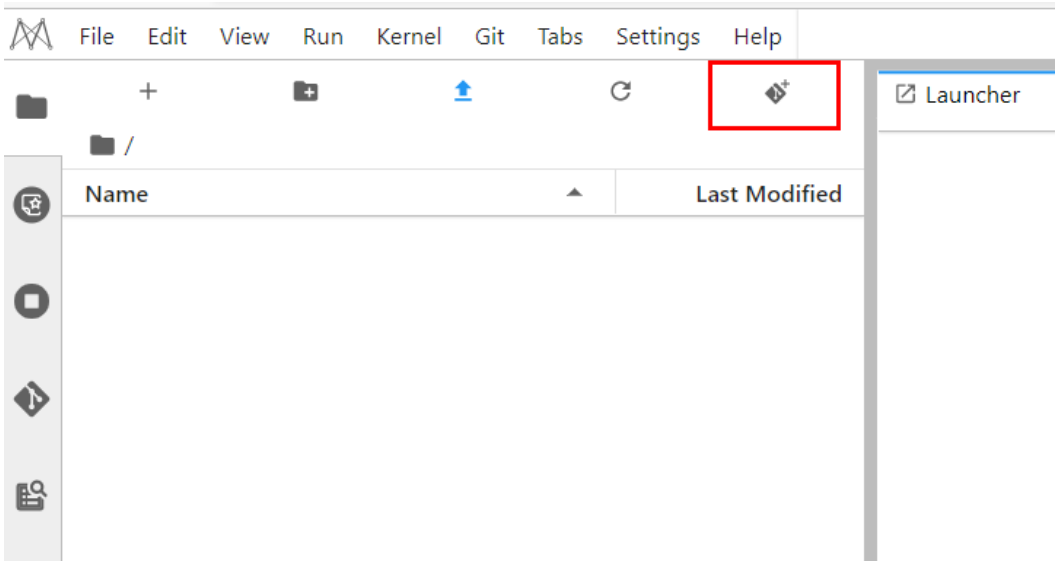
Figure 1 shows the Git plug-in of JupyterLab.

Figure 4-23 Git plug-in



Cloning a GitHub Open-Source Code Repository

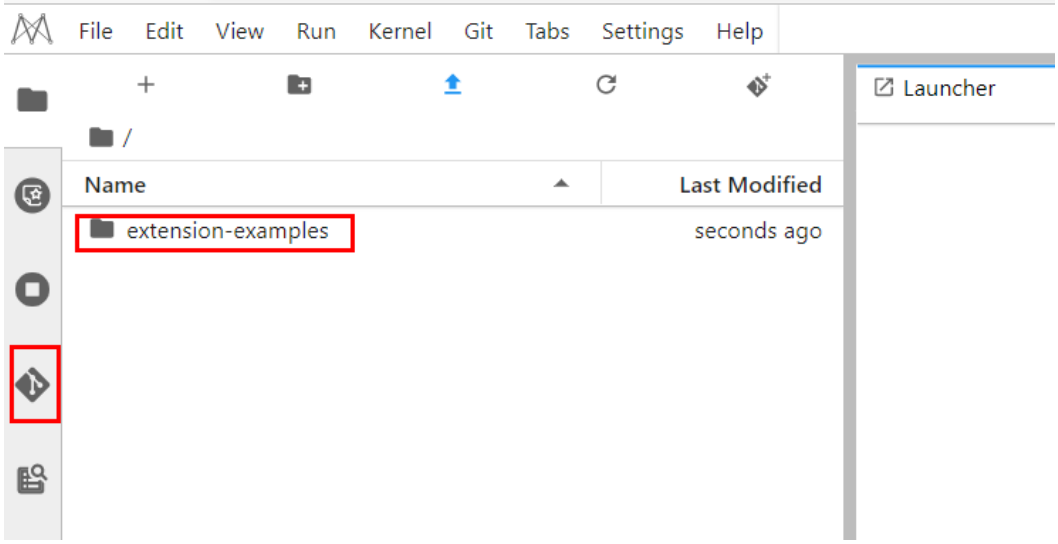
Alternatively, click the icon shown in the following figure to clone the GitHub open-source code repository.



Viewing a Code Repository

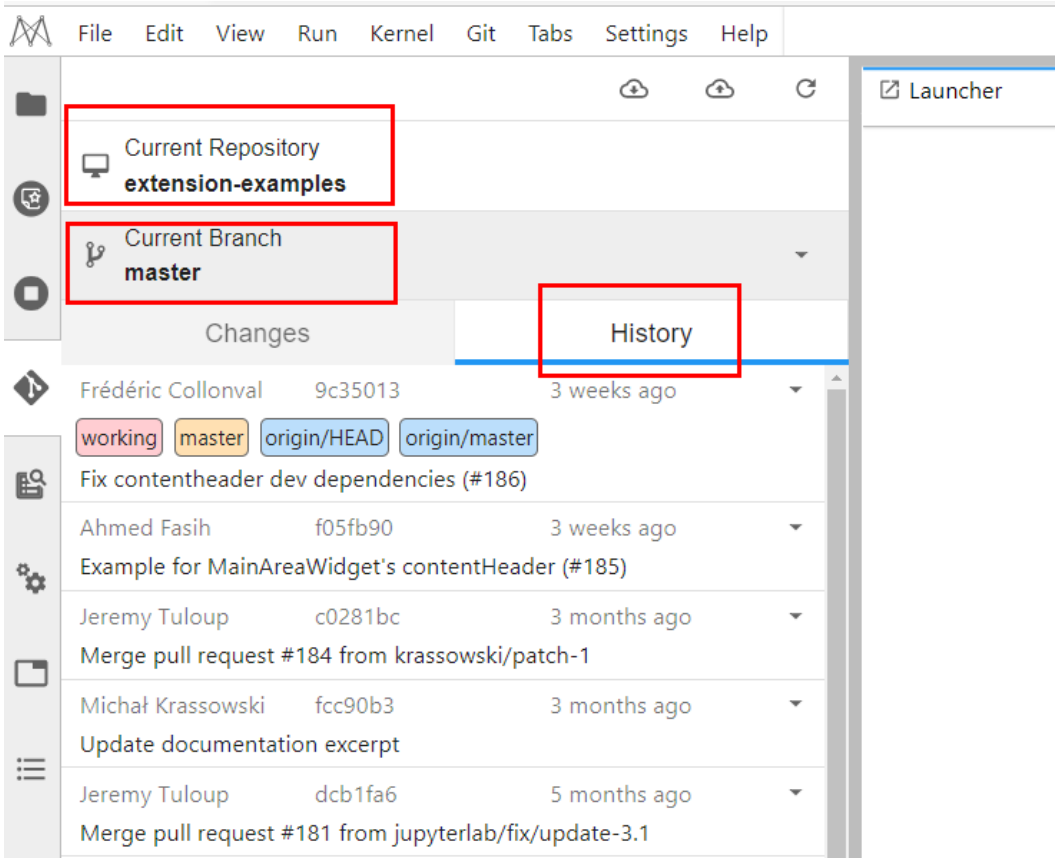
In the list under **Name**, double-click the folder you want to use and click the Git plug-in icon on the left to access the code repository corresponding to the folder.

Figure 4-24 Opening the folder and starting the Git plug-in



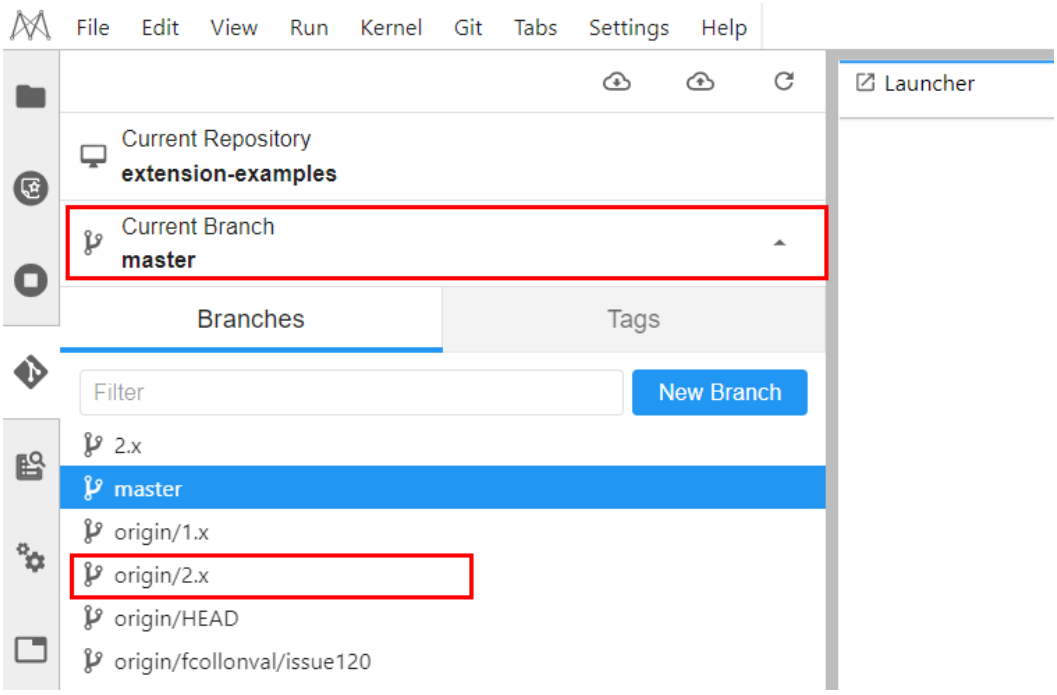
You can view the information current code repository, such as the repository name, branch, and historical submission records.

Figure 4-25 Viewing a code repository



NOTE

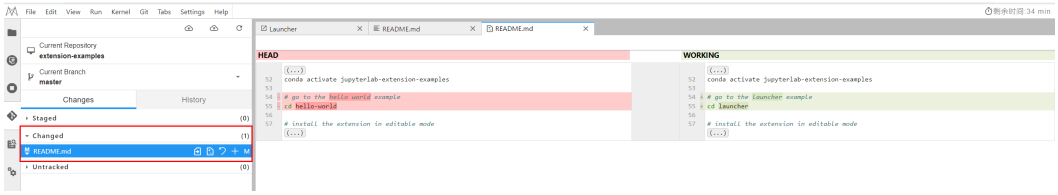
By default, the Git plug-in clones the master branch. To switch another branch, click **Current Branch** to expand all branches and click the target branch name.



Viewing Modifications

If a file in the code repository has been modified, you can view the modified file under **Changed** on the **Changes** tab page. Click **Diff this file** on the right of the file name to view the modifications.

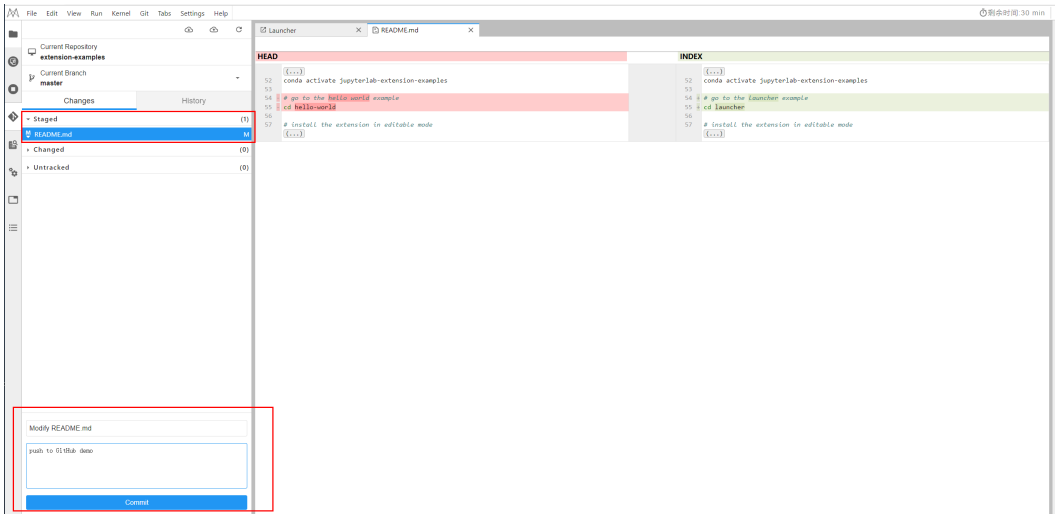
Figure 4-26 Viewing modifications



Committing Modifications

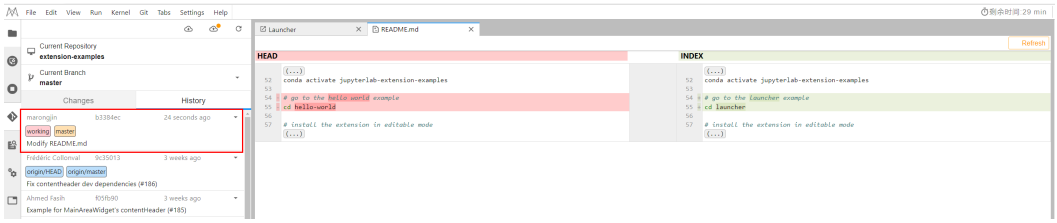
After confirming that the modifications are correct, click **Stage this change** on the right of the file name, which is equivalent to running the **git add** command. The file enters the **Staged** state. Enter the message to be committed in the lower left corner and click **Commit** that is equivalent to running the **git commit** command.

Figure 4-27 Committing modifications



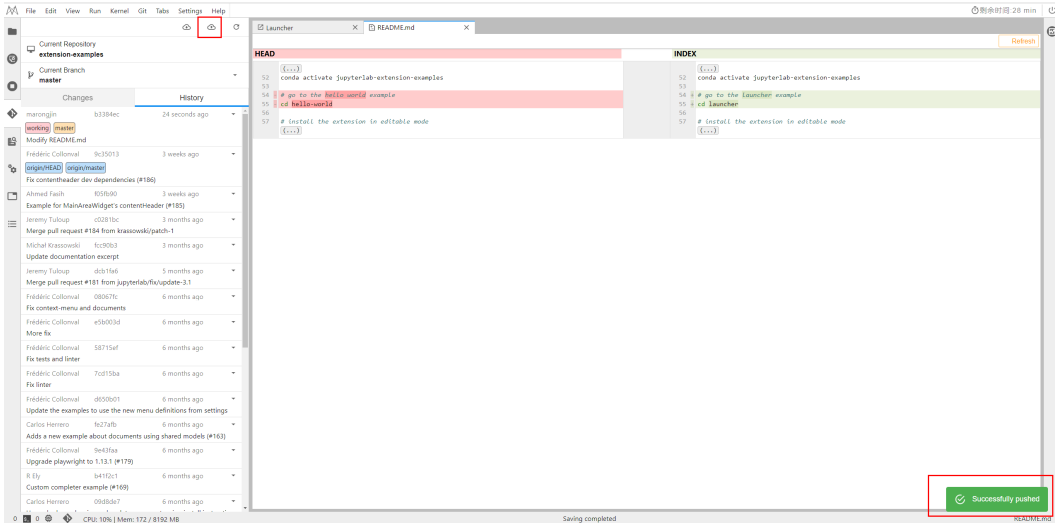
On the **History** tab page, view the committing status.

Figure 4-28 Checking whether the committing is successful



Click the **push** icon, which is equivalent to running the **git push** command, to push the code to the GitHub repository. After the pushing is successful, the message "Successfully completed" is displayed. If the token used for OAuth authentication has expired, a dialog box is displayed asking you to enter the user token or account information. Enter the information as prompted.

Figure 4-29 Pushing code to the GitHub repository



After the preceding operations are complete, on the **History** tab page of the JupyterLab Git plug-in page, you can see that **origin/HEAD** and **origin/master** point to the latest push. In addition, you can find the corresponding information in the committing records of the GitHub repository.

5 Local IDE

5.1 Operation Process in a Local IDE

ModelArts allows you to remotely access notebook instances from a local IDE to develop AI models based on PyTorch, TensorFlow, or MindSpore. The following figure shows the operation process.

1. Configure a local IDE.

   Configure a local IDE on your PC.

2. **Create a notebook instance.**

   On the ModelArts management console, create a notebook instance with a proper AI engine and remote SSH enabled.

3. Use the local IDE to remotely access ModelArts DevEnviron.
4. **Upload data and code to the development environment.**
   - Copy the code to the local IDE, which will automatically synchronize the code to the in-cloud development environment.
   - If the data is less than or equal to 500 MB, directly copy the data to the local IDE.
   - If the data is larger than 500 MB, upload it to OBS and then to the EVS disk.
5. Upload the training script and dataset to the OBS directory.
6. Submit a training job.

   Perform this operation on the ModelArts management console.
   - Submit a training job in the local IDE.

5.2 Local IDE (PyCharm)

5.2.1 Configuring a Local IDE Accessed Using PyCharm Toolkit

ModelArts provides the PyCharm plug-in PyCharm Toolkit for you to remotely access a notebook instance through SSH.

Prerequisites

PyCharm professional 2019.2 or later has been installed locally. Remote SSH applies only to the PyCharm professional edition.

Step 1 Download and Install PyCharm Toolkit

The PyCharm Toolkit package has been integrated into the ModelArts management console. Download and install PyCharm Toolkit.

For details, see **Downloading and Installing PyCharm Toolkit**.

Step 2 Log In to PyCharm Toolkit

and so PyCharm Toolkit can exchange data with ModelArts.

Obtain an access key (**Creating Access Keys (AK and SK)**) and use the key for login authentication (**Using Access Keys for Login**) so the local IDE can exchange data with the in-cloud environment.

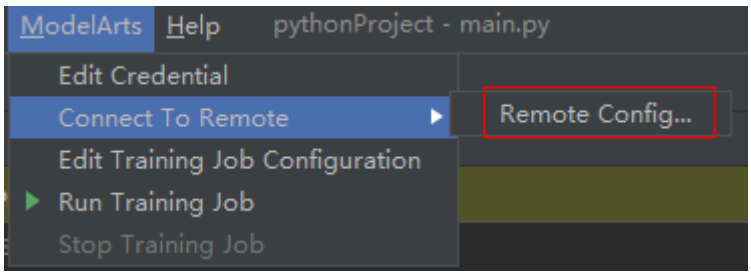
Step 3 Create a Notebook Instance

Create a notebook instance with remote SSH enabled and whitelist configured. Ensure that the instance is running. For details, see **Creating a Notebook Instance**.

Step 4 Automatically Configure PyCharm Toolkit

1. In the local PyCharm development environment, choose **ModelArts** > **Connect To Remote** > **Remote Config** and configure PyCharm Toolkit.

   Figure 5-1 Remotely connecting to PyCharm Toolkit

NOTE

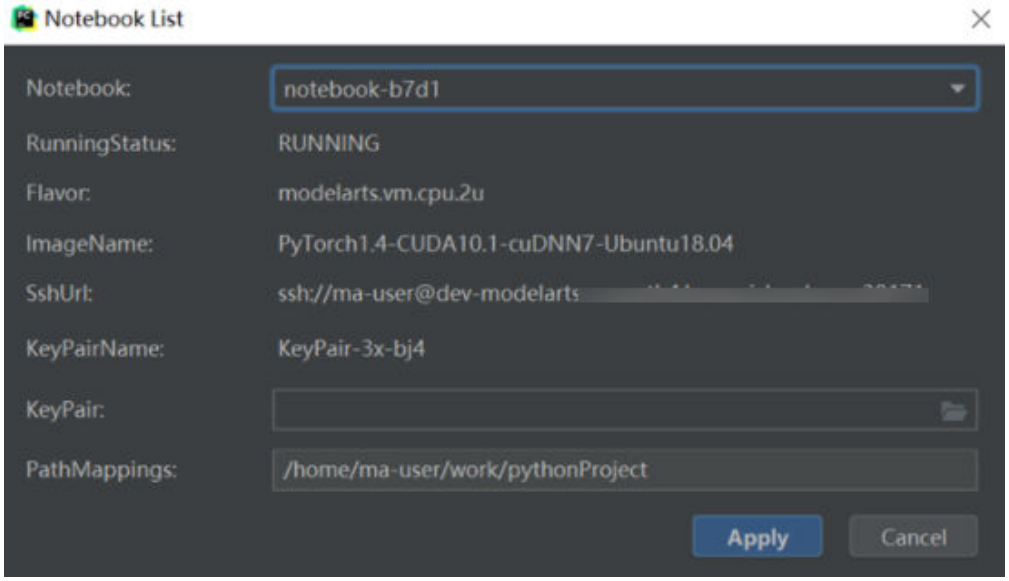
If **Connect To Remote** is unavailable, create a notebook instance with remote SSH enabled. For details, see **Creating a Notebook Instance**.

If the fault persists, check whether the PyCharm Toolkit version is the latest one. If not, download the latest version.

Before downloading PyCharm Toolkit, clear the browser cache. If PyCharm Toolkit of an earlier version has been downloaded, the browser cache may lead to the failure in downloading a new version.

2. All notebook instances with remote SSH enabled under the account are displayed. Choose the target instance from the drop-down list.

Figure 5-2 Notebook list



- **KeyPair**: Select the locally stored key pair of the notebook instance for authentication. The key pair created during the notebook instance creation is saved in your browser's default downloads folder.
- **PathMappings**: Synchronization directory for the local IDE project and notebook, which defaults to **/home/ma-user/work/***Project name* and is adjustable.

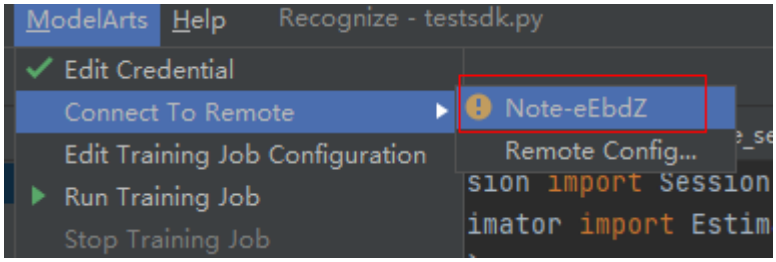
3. Click **Apply**. After the configuration is complete, restart the IDE for the configuration to take effect.

   After the restart, it takes about 20 minutes to update the Python interpreter for the first time.

Step 5 Access a Notebook Instance Through PyCharm Toolkit

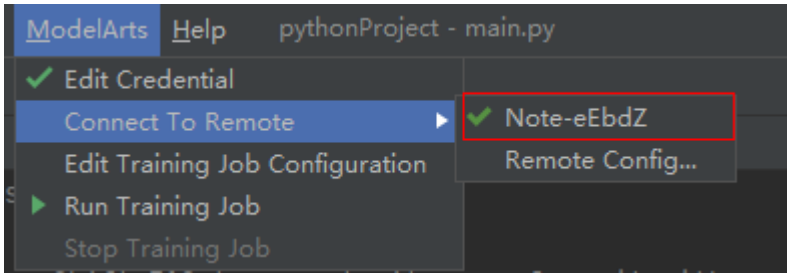
Click the notebook instance name and connect it to the local IDE as prompted. The connection is kept for 4 hours by default.

Figure 5-3 Starting the connection



To interrupt the connection, click the notebook name and disconnect it from the local IDE as prompted.

Figure 5-4 Interrupting the connection



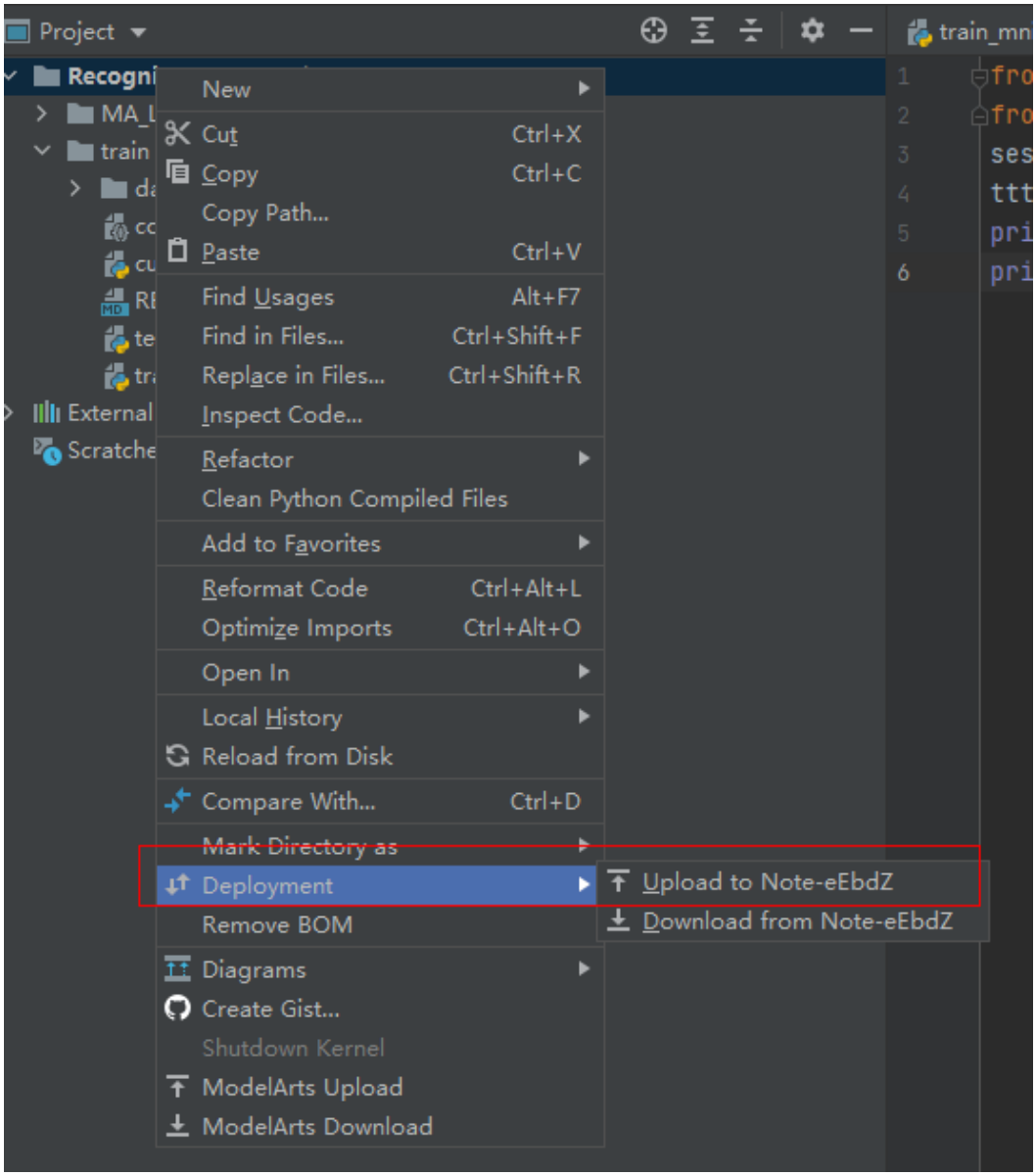
Step 6 Upload Local Files to the Notebook Instance

Code in a local file can be copied to the local IDE, which will automatically synchronize the code to the in-cloud development environment.

Initial synchronization

In the **Project** directory of the local IDE, right-click **Deployment** and choose **Upload to** *Notebook name* from the shortcut menu to upload the local project file to the specified notebook instance.

Figure 5-5 Synchronizing local data to a notebook instance

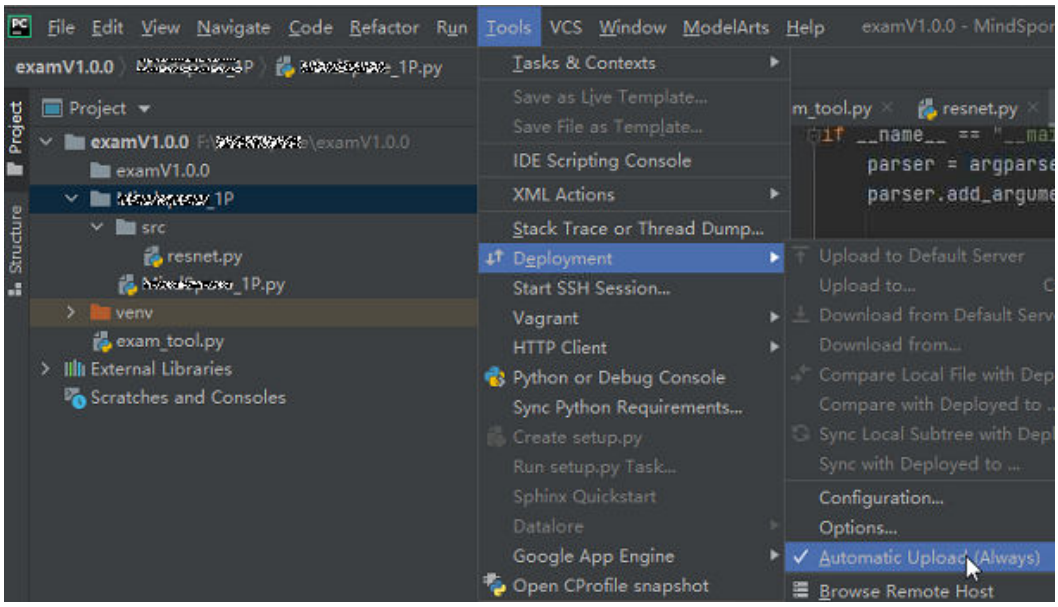


Follow-up synchronization

After modifying the code, press **Ctrl+S** to save it. The local IDE will automatically synchronize the modification to the specified notebook instance.

After PyCharm Toolkit is installed, **Automatic Upload** is automatically enabled in the local IDE for automatically uploading the files in the local directory to the target notebook instance. If **Automatic Upload** is not enabled, enable it by referring to the following figure.

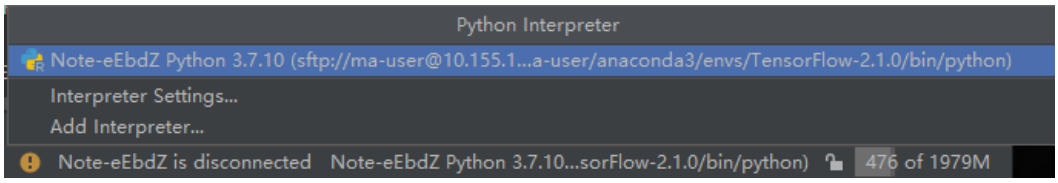
Figure 5-6 Enabling Automatic Upload



Step 7 Remotely Debug the Code

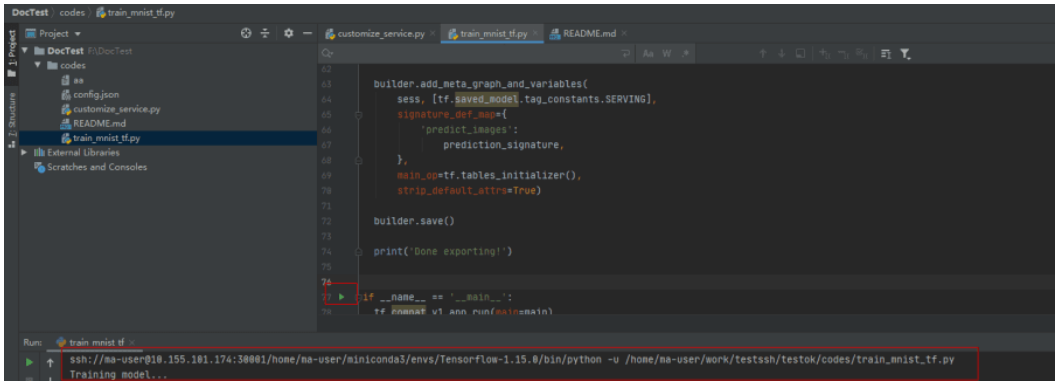
Click **Interpreter** in the lower right corner of the local IDE and select a notebook Python interpreter.

Figure 5-7 Selecting a Python interpreter



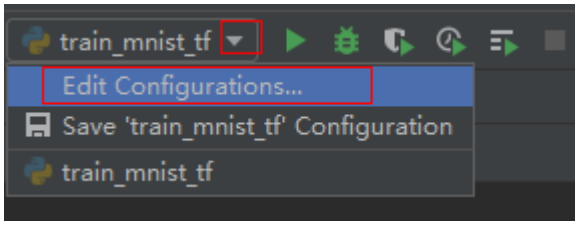
Run the code in the notebook instance. The logs are displayed locally.

Figure 5-8 Runtime logs



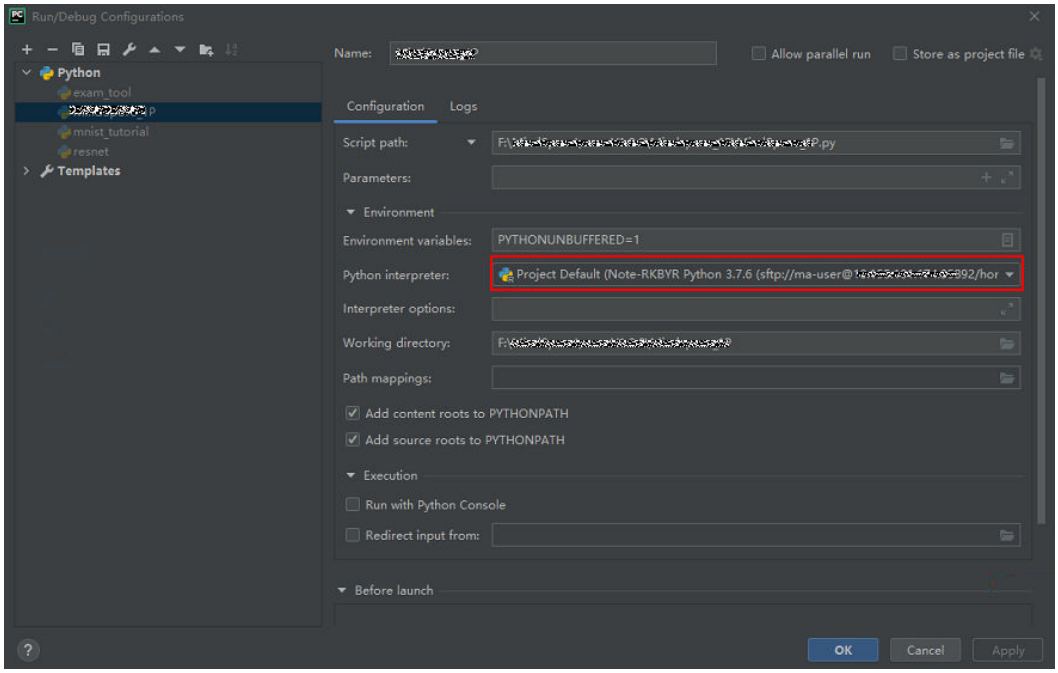
Click **Run/Debug Configurations** in the upper right corner of the local IDE to set runtime parameters.

Figure 5-9 Setting runtime parameters (1)



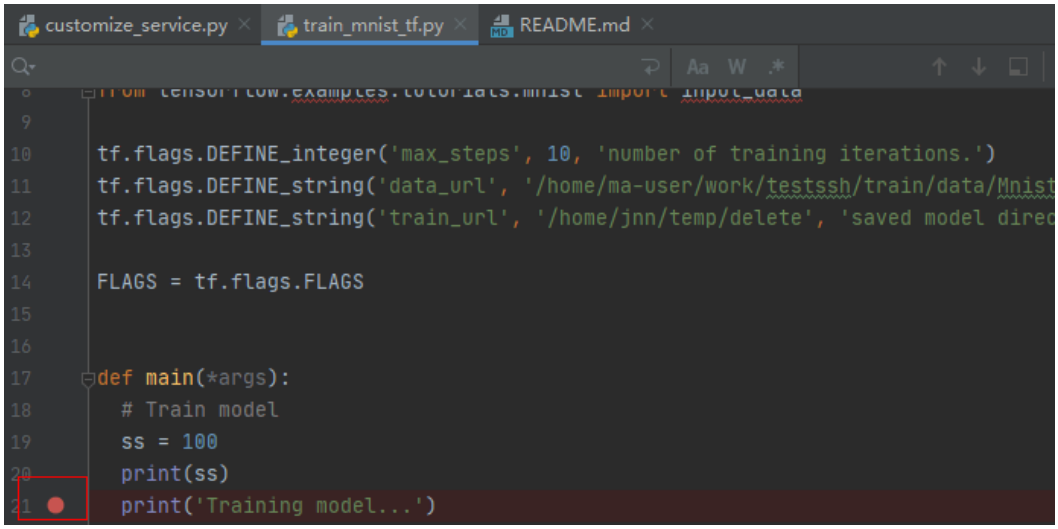
Select the Python interpreter that remotely connects to the target notebook instance.

Figure 5-10 Setting runtime parameters (2)



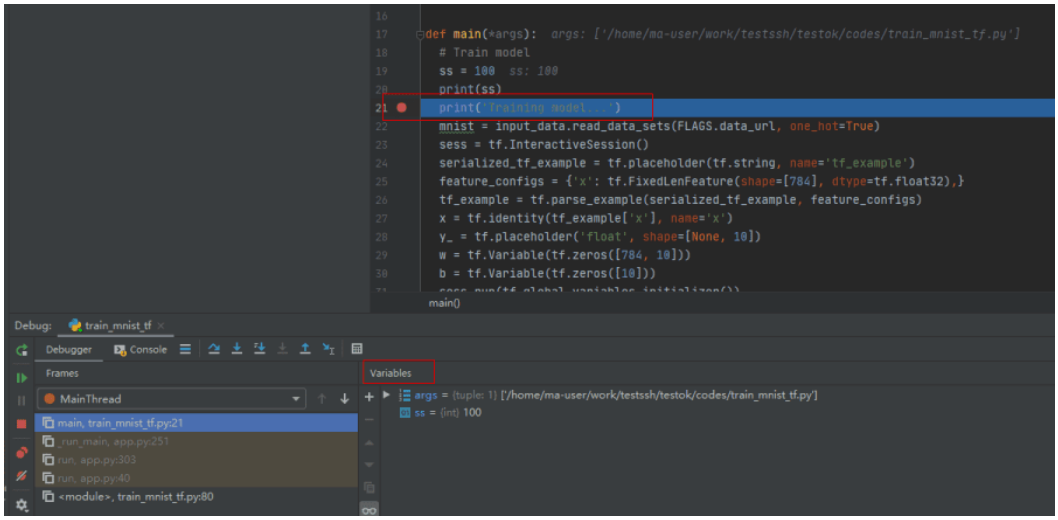
To debug code, set breakpoints and run the program in debug mode.

Figure 5-11 Running the program in debug mode



In debug mode, the code execution is suspended in the specified line, and you can obtain variable values.

Figure 5-12 Viewing variable values in debug mode



5.2.2 Configuring a Local IDE Manually Accessed Using PyCharm

A local IDE supports PyCharm and VS Code. You can use PyCharm or VS Code to remotely connect the local IDE to the target notebook instance on ModelArts for running and debugging code.

This section describes how to use PyCharm to access a notebook instance.

Prerequisites

- PyCharm professional 2019.2 or later has been installed locally. The PyCharm professional edition is available because remote SSH applies only to the professional edition.
- A notebook instance has been created with remote SSH enabled. Ensure that the instance is running. For details, see **Creating a Notebook Instance**.
- The address and port number of the development environment are available. To obtain this information, go to the notebook instance details page.

  Figure 5-13 Instance details page

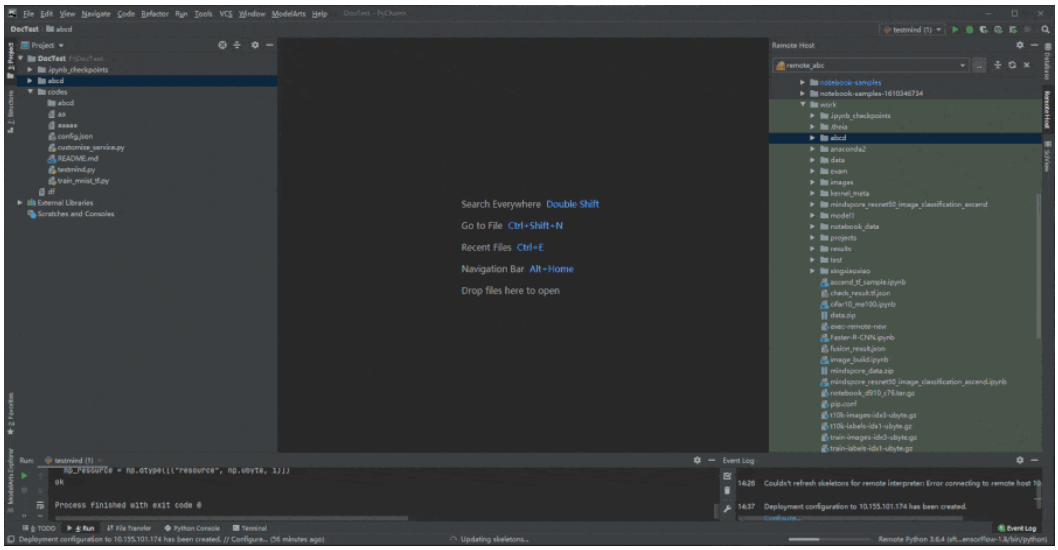
- The key pair is available.

  A key pair is automatically downloaded after you create it. Securely store your key pair. If an existing key pair is lost, create a new one.

Step 1 Configure SSH

1. In your local PyCharm development environment, choose **File** > **Settings** > **Tools** > **SSH Configurations** and click **+** to add an SSH configuration.
   - **Host**: address for accessing the cloud development environment. Obtain the address on the page providing detailed information of the target notebook instance .
   - **Port**: port number for accessing the cloud development environment. Obtain the port number on the page providing detailed information of the target notebook instance.
   - **User name**: consistently set to **ma-user**.
   - **Authentication type**: key pair
   - **Private key file**: locally stored private key file of the cloud development environment. It is the key pair file automatically downloaded when you created the notebook instance.
2. Click  to rename the connection. Then, click **OK**.
3. After the configuration is complete, click **Test Connection** to test the connectivity.
4. Select **Yes**. If "Successfully connected" is displayed, the network is accessible. Then, click **OK**.
5. Click **OK** at the bottom to save the configuration.

Figure 5-14 Configuring SSH

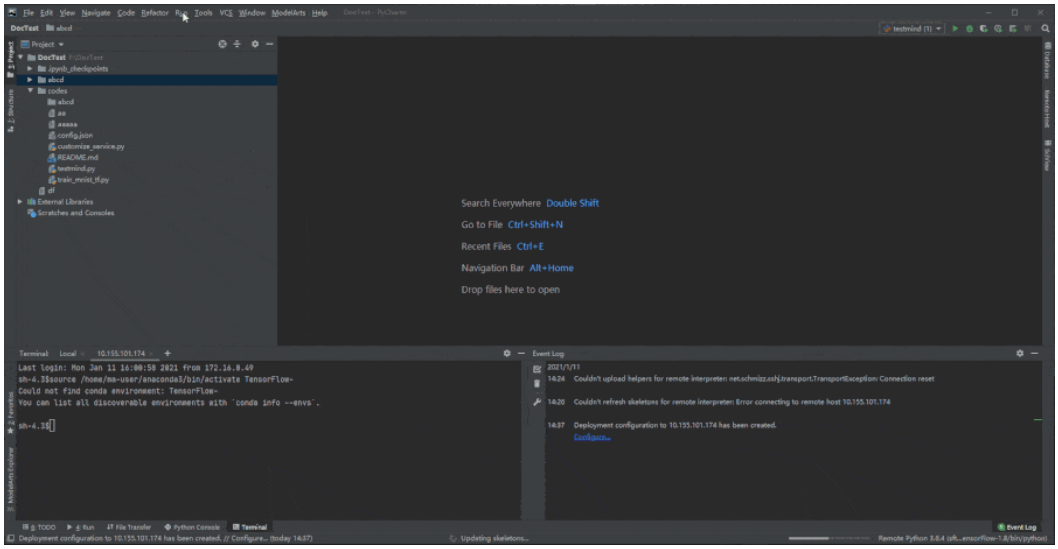


Step 2 Obtain the Path to the Virtual Environment Built in the Development Environment

1. Choose **Tools** > **Start SSH Session** to access the cloud development environment.
2. Run the following command to view the Python virtual environments built in the current environment in the **README** file in **/home/ma-user/**:
   ```
   cat /home/ma-user/README
   ```


3. Run the **source** command to switch to a specific Python environment.
4. Run **which python** to obtain the Python path and copy it for configuring the Python interpreter on the cloud.

Figure 5-15 Obtaining the path to the virtual environment built in the development environment



Step 3 Configure a Python Interpreter

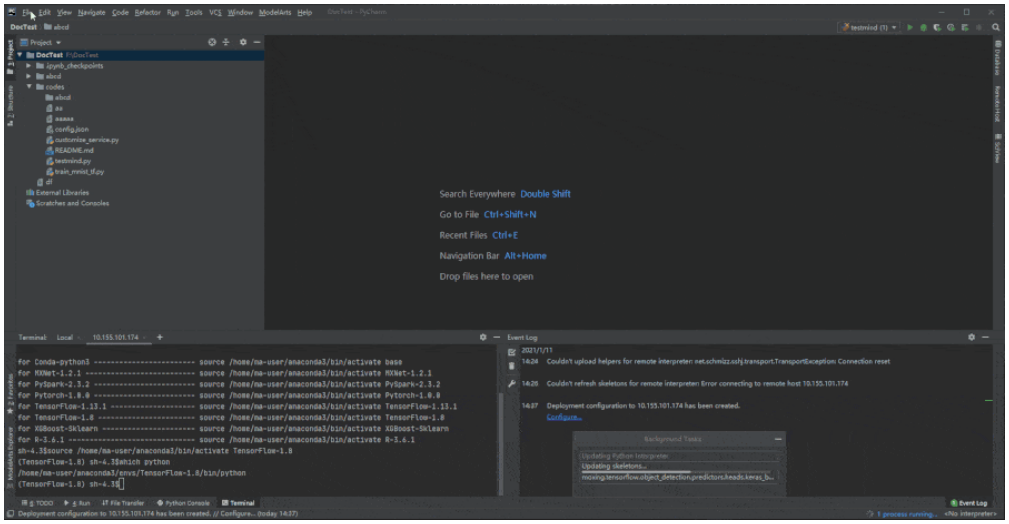
1. Choose **File** > **Settings** > **Project:** *Python project* > **Python Interpreter**. Then, click  and **Add** to add an interpreter.
2. Select **Existing server configuration**, choose the SSH configuration from the drop-down list, and click **Next**.
3. Configure the Python interpreter.
   - **Interpreter**: Enter the Python path copied in step 1, for example, **/home/ma-user/anaconda3/envs/Pytorch-1.0.0/bin/python**.

     If the path is **~/anaconda3/envs/Pytorch-1.0.0/bin/python**, replace **~** with **/home/ma-user**.
   - **Sync folders**: Set this parameter to a directory in the cloud development environment for synchronizing local project directory files. A directory in **/home/ma-user** is recommended, for example, **/home/ma-user/work/projects**, because other directories may be prohibited from accessing.
4. Click **!** on the right and select **Automatically upload** so that the locally modified file can be automatically uploaded to the container.
5. Click **Finish**.

   The local project file has been automatically uploaded to the cloud environment. Each time a local file is modified, the modification is automatically synchronized to the cloud environment.

   In the lower right corner, the current interpreter is displayed as a remote interpreter.

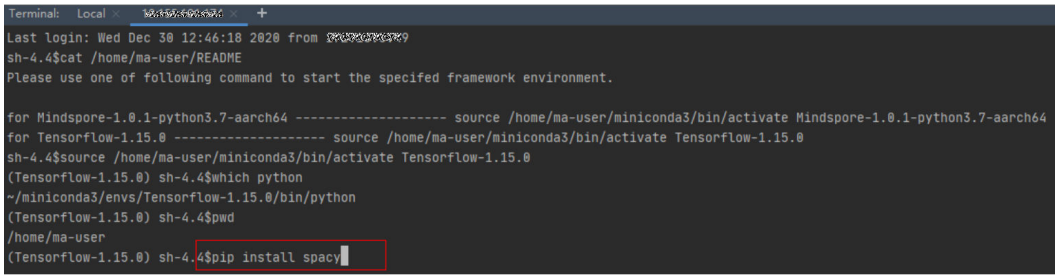
Figure 5-16 Configuring a Python interpreter



Step 4 Install the Dependent Library for the Cloud Environment

After accessing the development environment, you can use different virtual environments, such as TensorFlow and PyTorch. However, in actual development, you need to install dependency packages. Then, you can access the environment through the terminal to perform operations.

Choose **Tools** > **Start SSH Session** and select the configured development environment. Run the **pip install** command to install the required dependency packages.

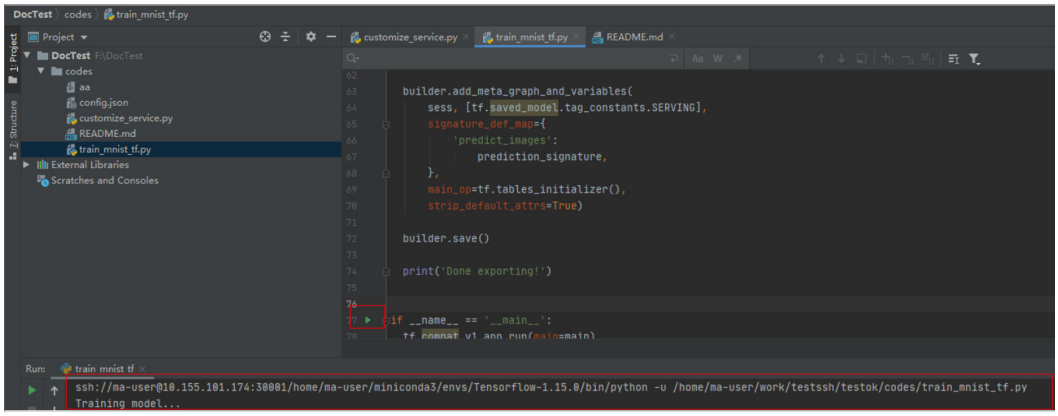


Step 5 Debug Code in the Development Environment

You have accessed the cloud development environment. Then, you can write, debug, and run the code in the local PyCharm. The code is actually executed in the cloud development environment, and the Ascend AI resources on the cloud are used. In this way, you compile and modify code locally and run the code in the cloud.

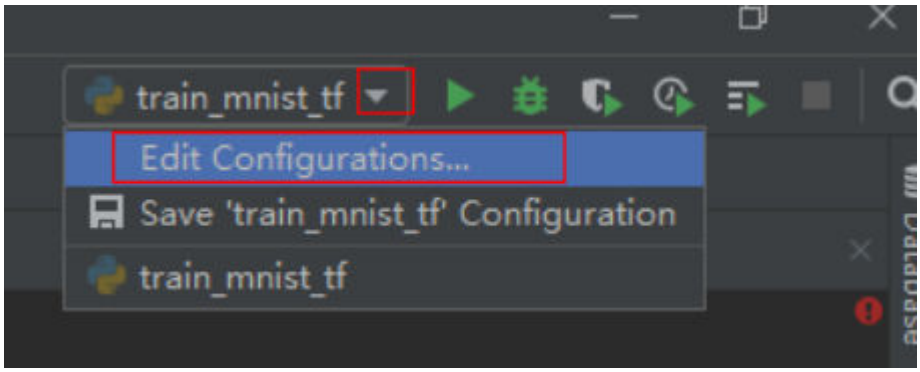
Run the code in the local IDE. The logs can be displayed locally.

Figure 5-17 Debugging code



Click **Run/Debug Configurations** in the upper right corner of the local IDE to set runtime parameters.

Figure 5-18 Setting runtime parameters



To debug code, set breakpoints and run the program in debug mode.

Figure 5-19 Code breakpoint

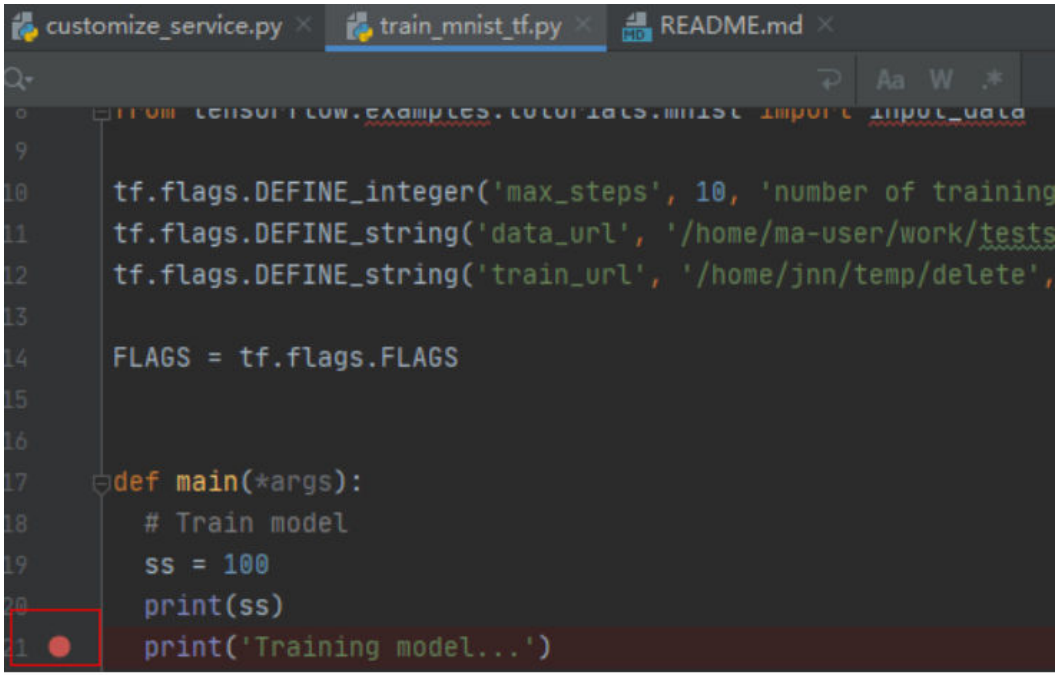
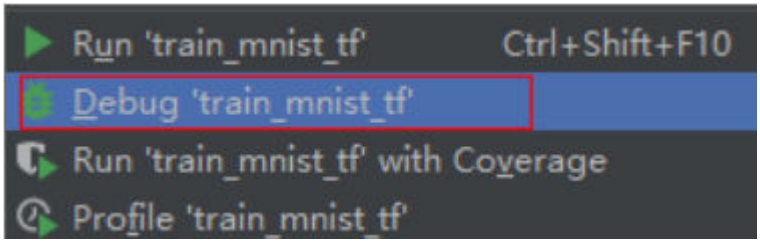
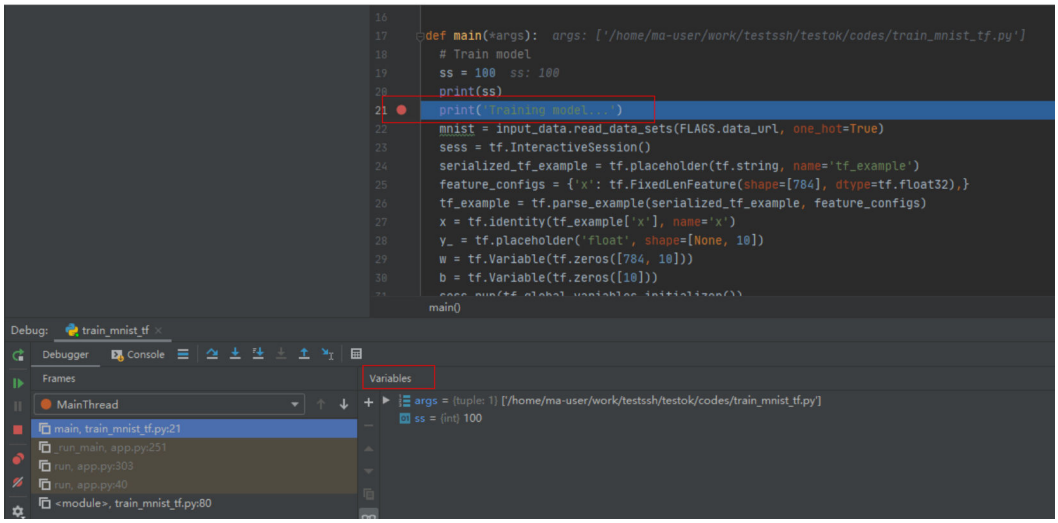


Figure 5-20 Debugging in debug mode



In debug mode, the code execution is suspended in the specified line, and you can obtain variable values.

Figure 5-21 Debug mode



Before debugging code in debug mode, ensure that the local code is the same as the cloud code. If they are different, the line where a breakpoint is added locally may be different from the line of the cloud code, leading to errors.

When configuring a Python interpreter in the cloud development environment, you are advised to select **Automatically upload** so that any local file modification can be automatically uploaded to the cloud. If you do not select **Automatically upload**, manually upload the directory or code after you modify the local code. For details, see **Step 6 Upload Local Files to the Notebook Instance**.

5.3 Local IDE (VS Code)

5.3.1 Connecting to a Notebook Instance Through VS Code

After creating a notebook instance with remote SSH enabled, you can use VS Code to access the development environment in any of the following ways:

- **Connecting to a Notebook Instance Through VS Code with One Click** (Recommended)

  In this mode, click **Access VSCode** in the **Operation** column of a notebook instance on the ModelArts console to open VS Code and connect to the instance.
- **Connecting to a Notebook Instance Through VS Code Toolkit** (Recommended)

  In this mode, log in to the ModelArts VS Code Toolkit plug-in and use it to connect to an instance.
- **Manually Connecting to a Notebook Instance Through VS Code**

  In this mode, use the VS Code Remote-SSH plug-in to configure connection information and connect to an instance.

5.3.2 Installing VS Code

Download URL:

- URL for Windows: **https://update.code.visualstudio.com/1.57.1/win32-x64-user/stable**

  NOTE

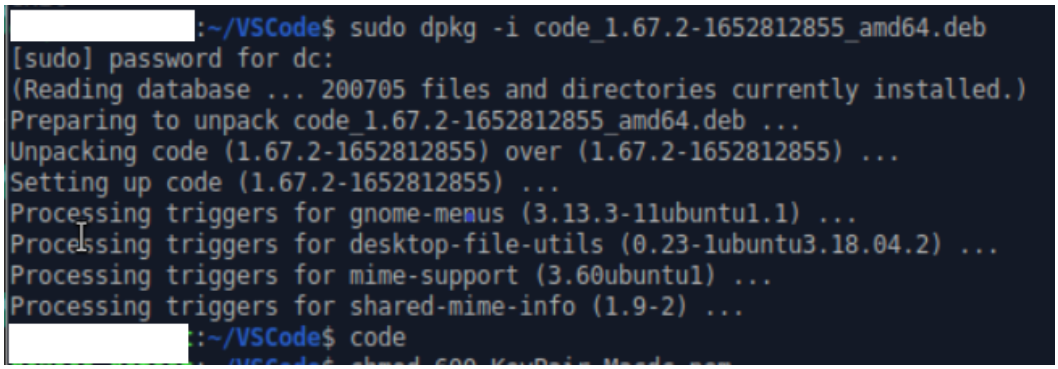
  Linux system users must install VS Code as a non-root user.
- URL for other OSs: **https://code.visualstudio.com/updates/v1_57**

Figure 5-22 VS Code download URL

VS Code version requirements:

You are advised to use VS Code 1.57.1 or the latest version for remote connection.

Figure 5-23 VS Code installation guide in Linux



5.3.3 Connecting to a Notebook Instance Through VS Code with One Click

Prerequisites

- The notebook instance with remote SSH enabled is running. For details, see **Creating a Notebook Instance**.
- You have downloaded the key file of the instance to a following local directory or its subdirectory based on your operating system:

  Windows: **C:\Users\{{user}}**

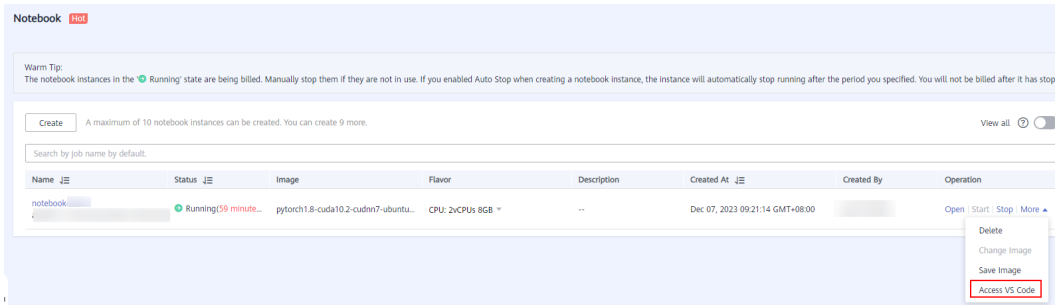
  Mac or Linux: **Users/{{user}}**

Procedure

Step 1 Log in to the ModelArts management console. In the left navigation pane, choose **DevEnviron** > **Notebook** to switch to the new-version **Notebook** page.

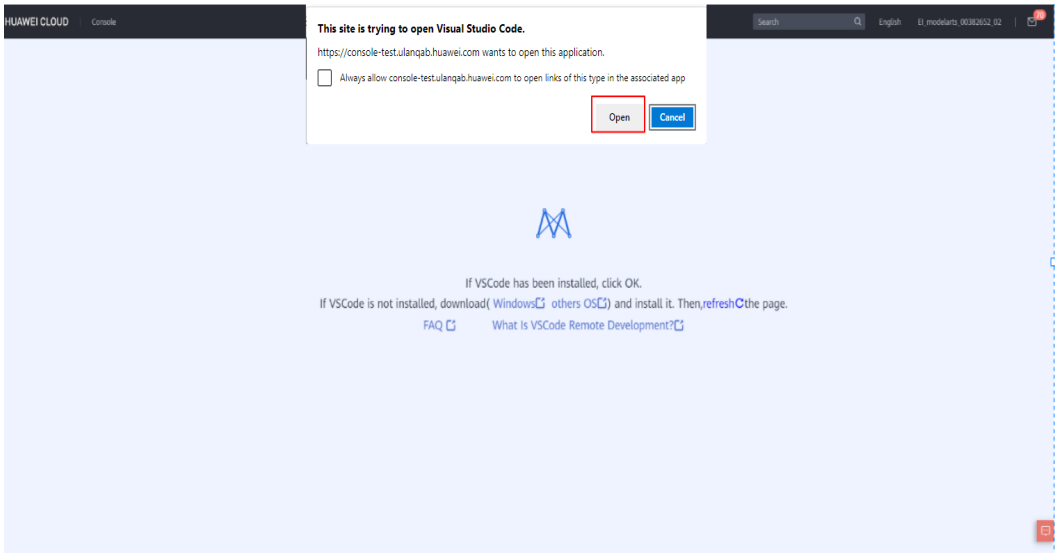
Step 2 In the **Operation** column of a running instance, choose **More** > **Access VS Code**.

Figure 5-24 Accessing VS Code



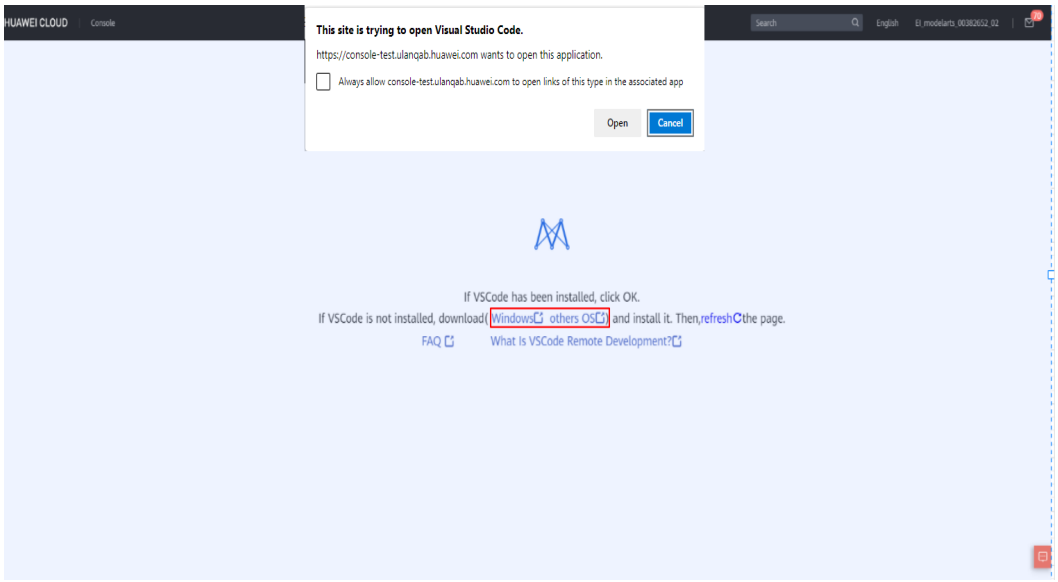
Step 3 If you have installed VS Code, click **Open**. The **Visual Studio Code** page is displayed.

Figure 5-25 Opening Visual Studio Code



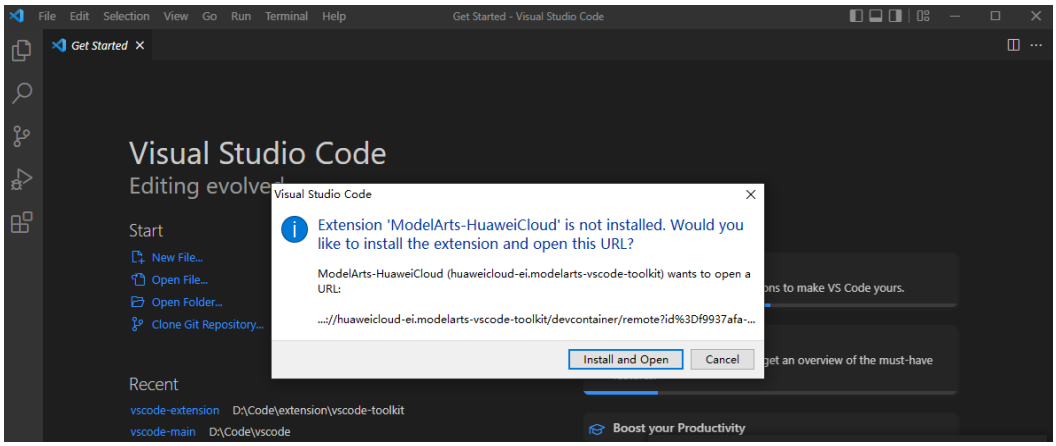
If VS Code has not been installed, click **Windows** or **other OS** as required to download and install VS Code. For details about how to install VS Code, see **Installing VS Code**.

Figure 5-26 Downloading and Installing VS Code



Step 4 If the ModelArts VS Code plug-in has not been installed, click **Install and Open**. If you have installed the plug-in, perform **Step 5**.

Figure 5-27 Installing the VS Code plug-in

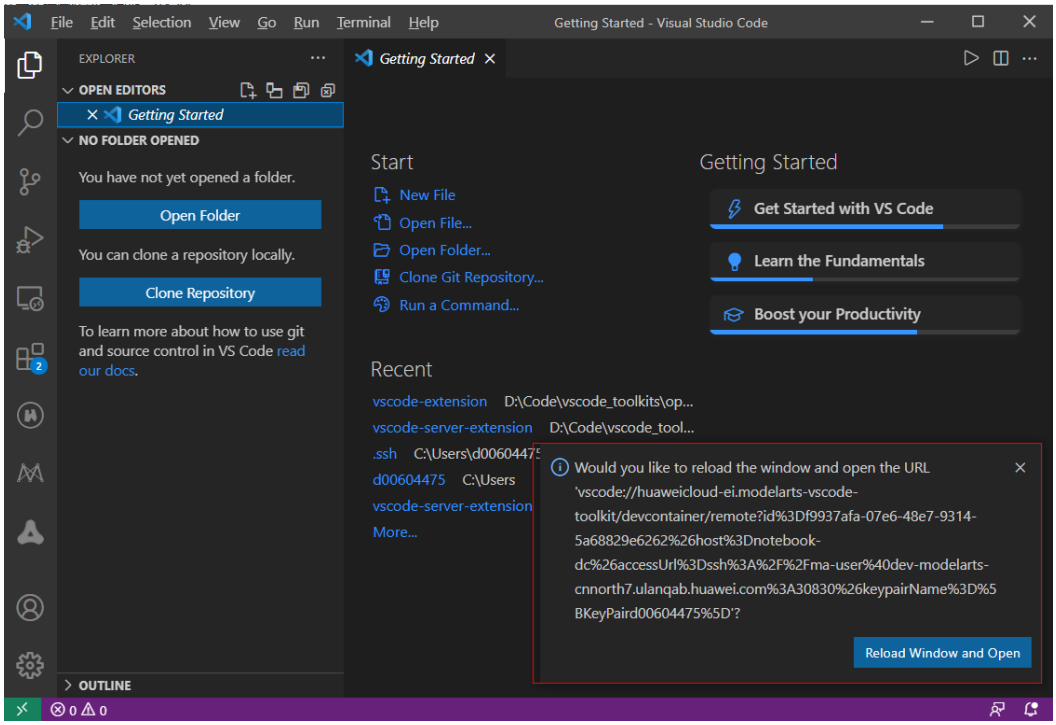


The installation takes about 1 to 2 minutes. After the installation is complete, a dialog box is displayed in the lower right corner. Then, click **Reload Window and Open**.

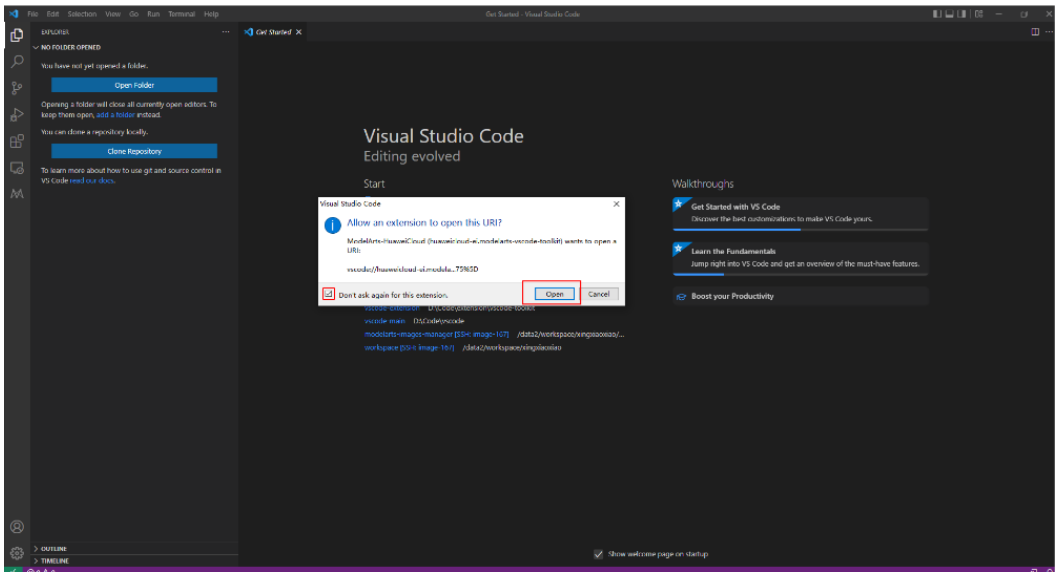
NOTE

This section uses VS Code 1.57.1 as an example. The **Reload Window and Open** dialog box may not be displayed when you install other versions of VS Code. In this case, perform **Step 5**.

Figure 5-28 Reload Window and Open



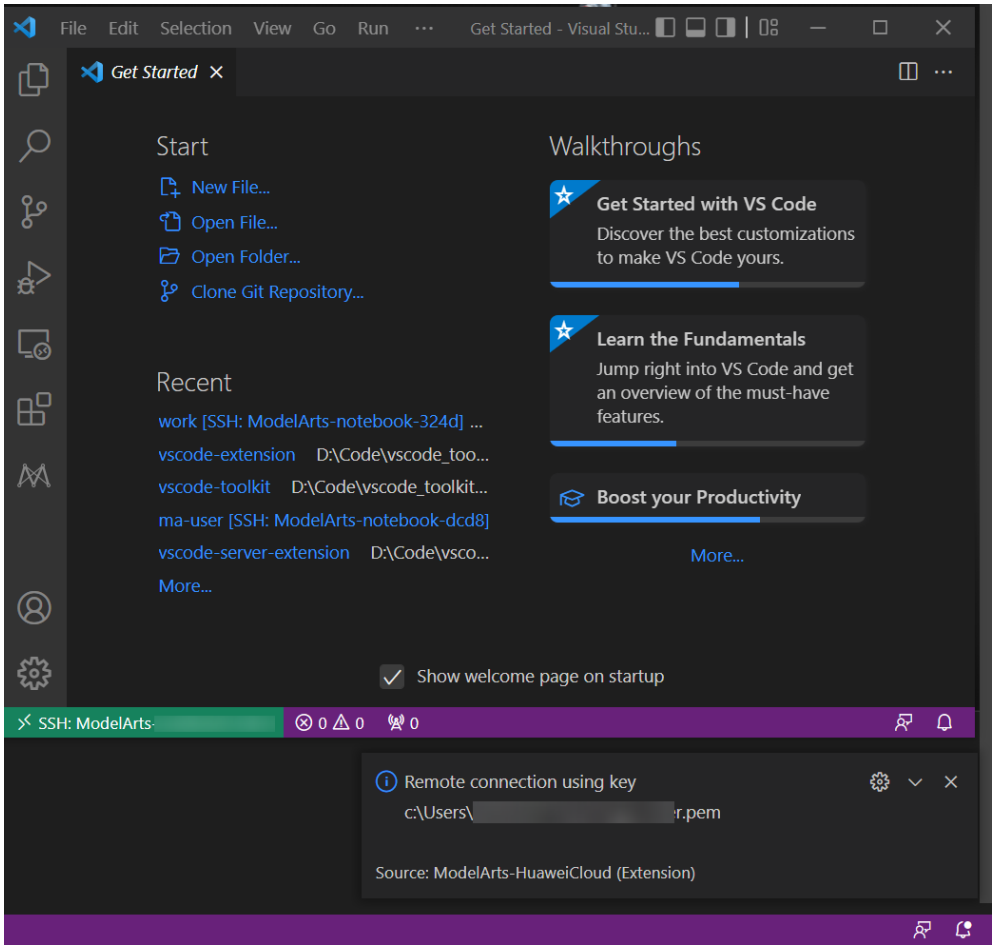
In the displayed dialog box, select **Don't ask again for this extension** and click **Open**.



Step 5 Remotely connect to a notebook instance.

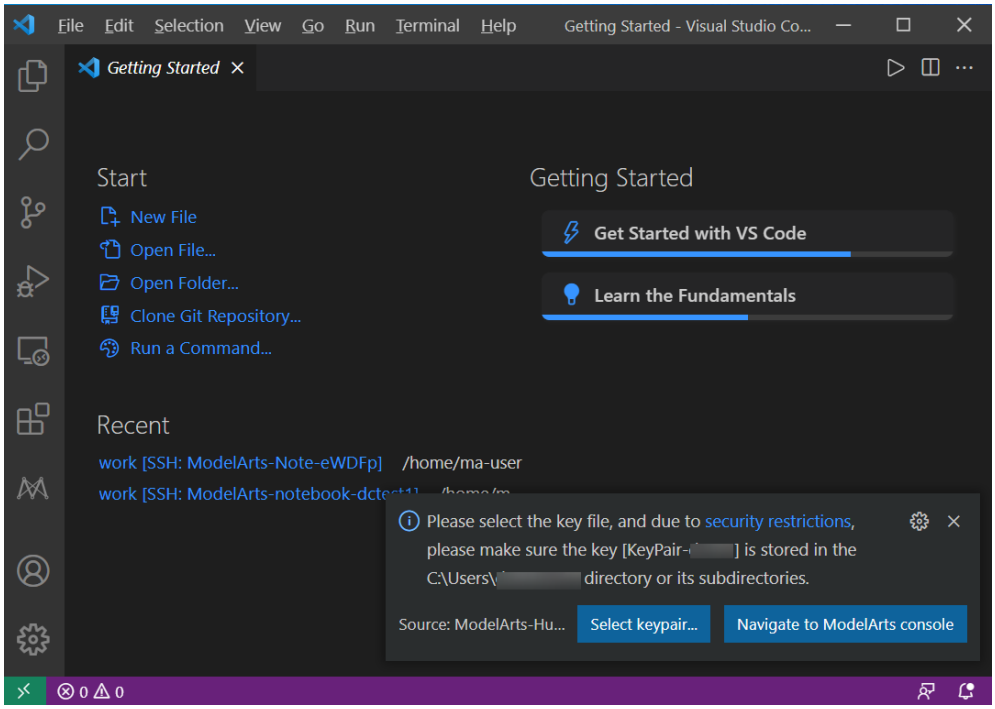
- Before the remote connection is executed, the system automatically searches for the key file. If the key is found, a new window will be displayed and the system connects to the instance. In this case, you do not need to select the key.

Figure 5-29 Remotely connecting to a notebook instance



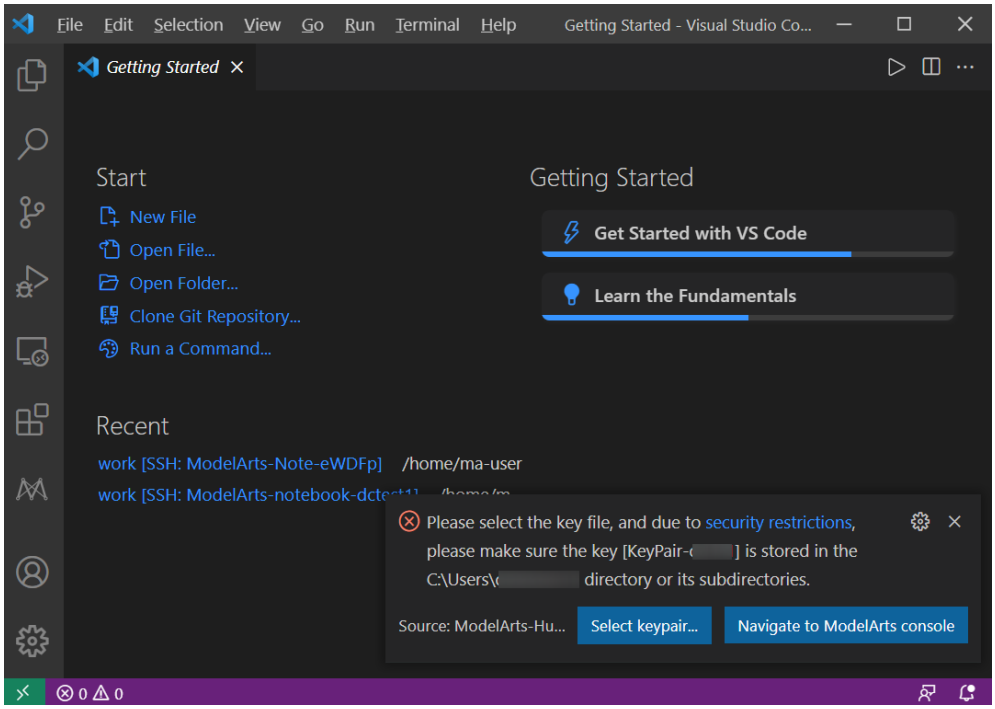
- If the key file is not found, a dialog box is displayed. Select the correct key as prompted.

Figure 5-30 Selecting a key file



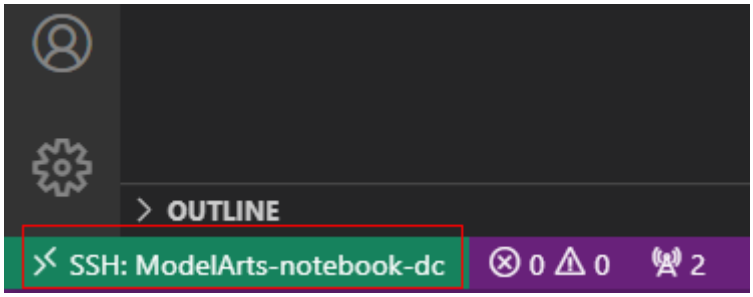
- If an incorrect key is selected, a message will be displayed. Then, select the correct key as prompted.

Figure 5-31 Selecting the correct key file



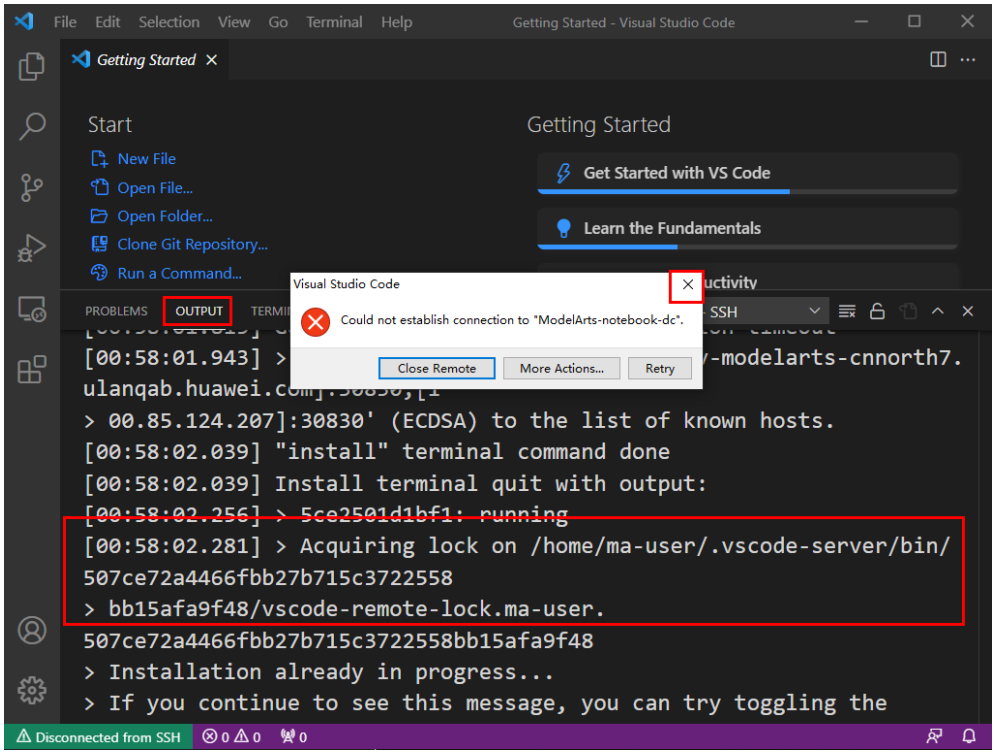
When the information shown in the following figure is displayed, the instance is accessed.

Figure 5-32 Connection successful



The following error message indicates that accessing the instance failed. In this case, close the dialog box and view the output logs in the **OUTLINE** window. Then, check the **FAQs** and locate the cause.

Figure 5-33 Connection failed



----End

5.3.4 Connecting to a Notebook Instance Through VS Code Toolkit

This section describes how to use the ModelArts VS Code Toolkit plug-in to remotely connect to a notebook instance.

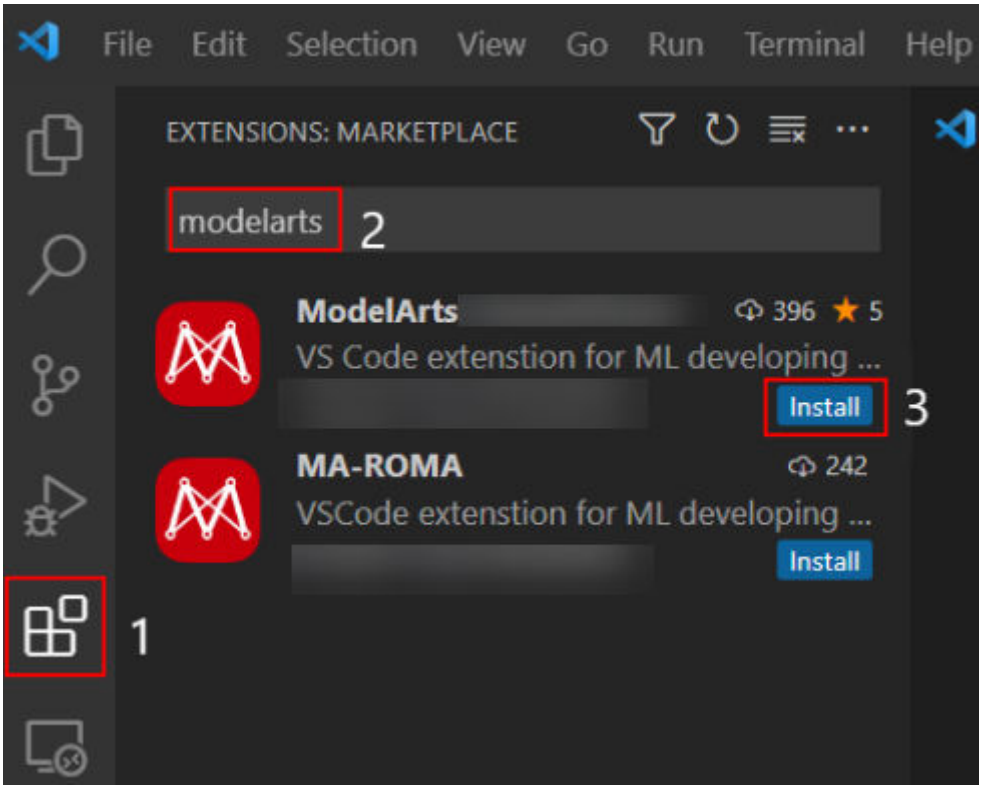
Prerequisites

You have downloaded and installed VS Code. For details, see **Installing VS Code**.

Step 1 Install the VS Code Plug-in

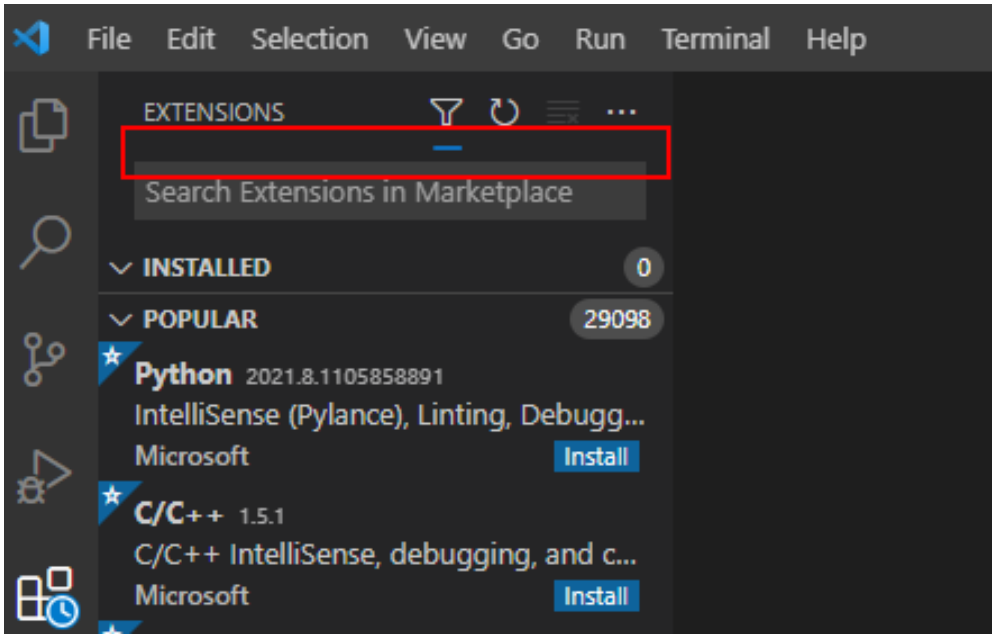
1. Search for **ModelArts** in the **EXTENSIONS** text box and click **Install**..

   Figure 5-34 Install the VS Code Plug-in



2. Wait for about 1 to 2 minutes.

Figure 5-35 Installation process



3. After the installation is complete, check the message displayed in the lower right corner. If the ModelArts icon  and remote SSH icon  are displayed in the navigation pane on the left, the VS Code plug-in is installed.

Figure 5-36 Installation completion message

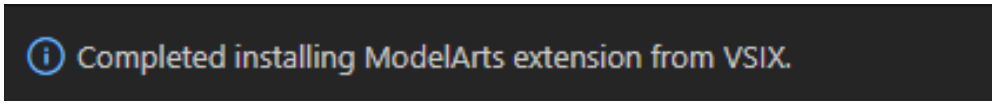
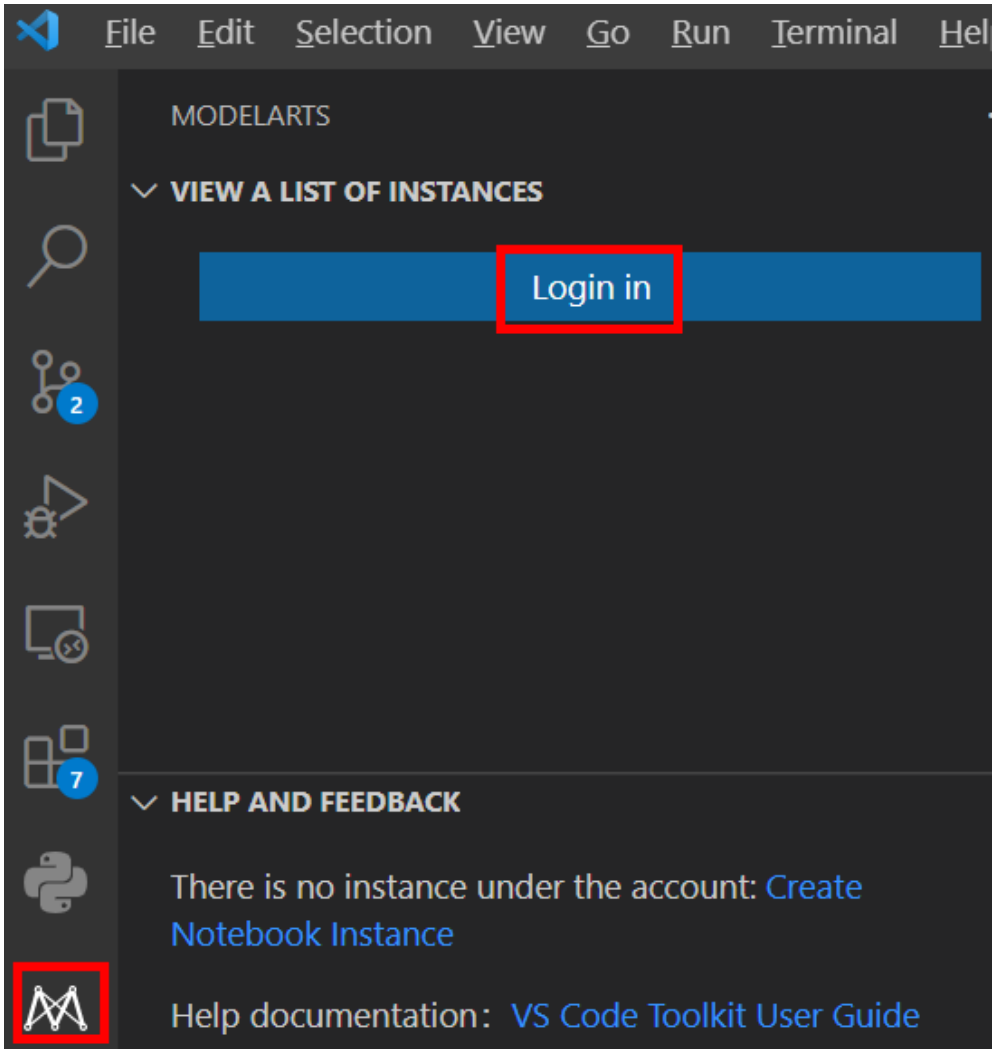
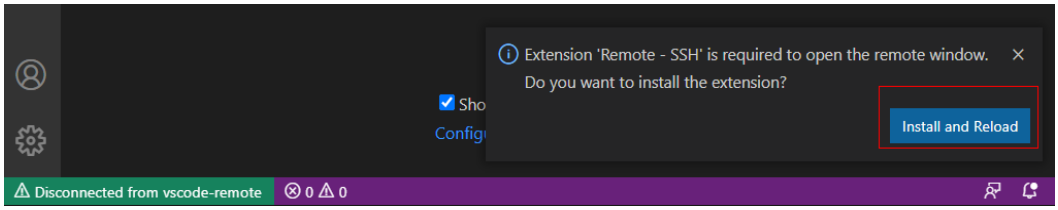


Figure 5-37 Installation completed



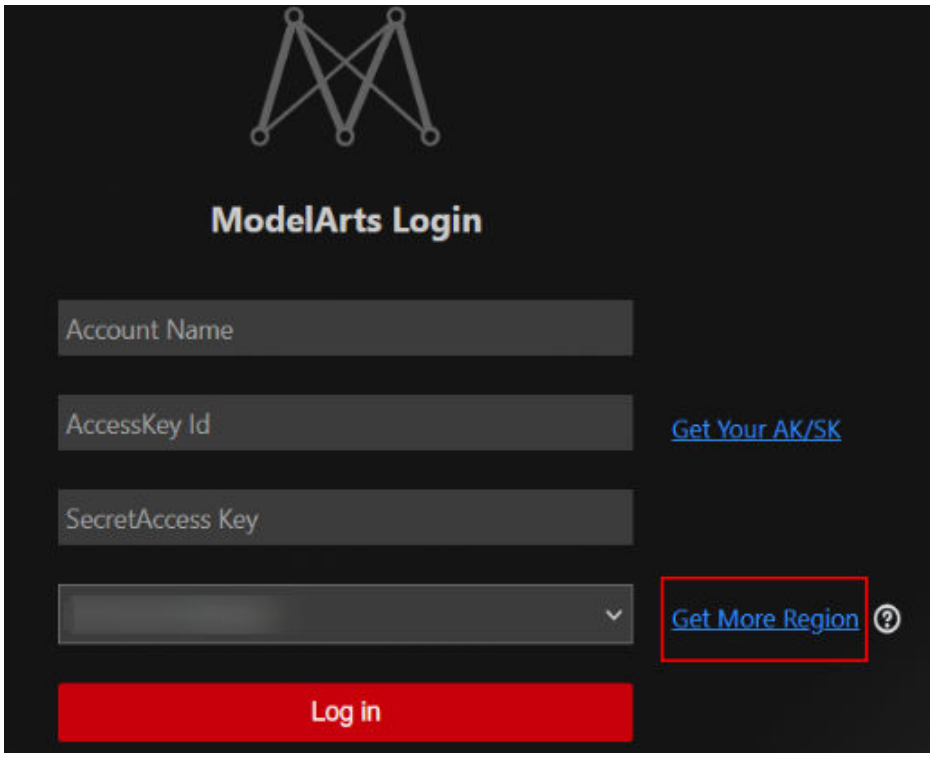
Network issues may cause an installation failure. If this occurs, proceed with follow-up operations. After **1** in **Step 5 Connect to the Notebook Instance** is performed, the system will automatically display a dialog box shown in the following figure. In this case, click **Install and Reload**.

Figure 5-38 Reconnecting remote SSH



Step2 Adding More Regions

1. Click **Get More Region**.



2. Go to the folder corresponding to your region. (View the region information in the console address.)
3. Click the YAML file, right-click **Raw**, and choose **Copy link address** from the shortcut menu to copy the file address.

⚠ CAUTION

Obtain the host information.

The plug-in must be used by calling APIs. The API domain names of some HCSO regions are not registered. You need to configure the corresponding IP addresses and API domain names in the **hosts** file on the local PC. The **hosts** file is generally stored in **C:\Windows\System32\drivers\etc**.

---

4. Import the configuration file in the VS Code plug-in.

   Open the VS Code plug-in. Click ..., choose **Import Region Profile**, click **From url** in the lower right corner, enter the URL of the YAML configuration file, and press **Enter**.

5. Log in to the VS Code plug-in to use more functions.

   After the configuration file is imported, the region changes to your region. Enter the account name and AK/SK to log in to the plug-in.

   Note: If the configuration file cannot be downloaded from the URL copied in Gitee, perform the following steps:

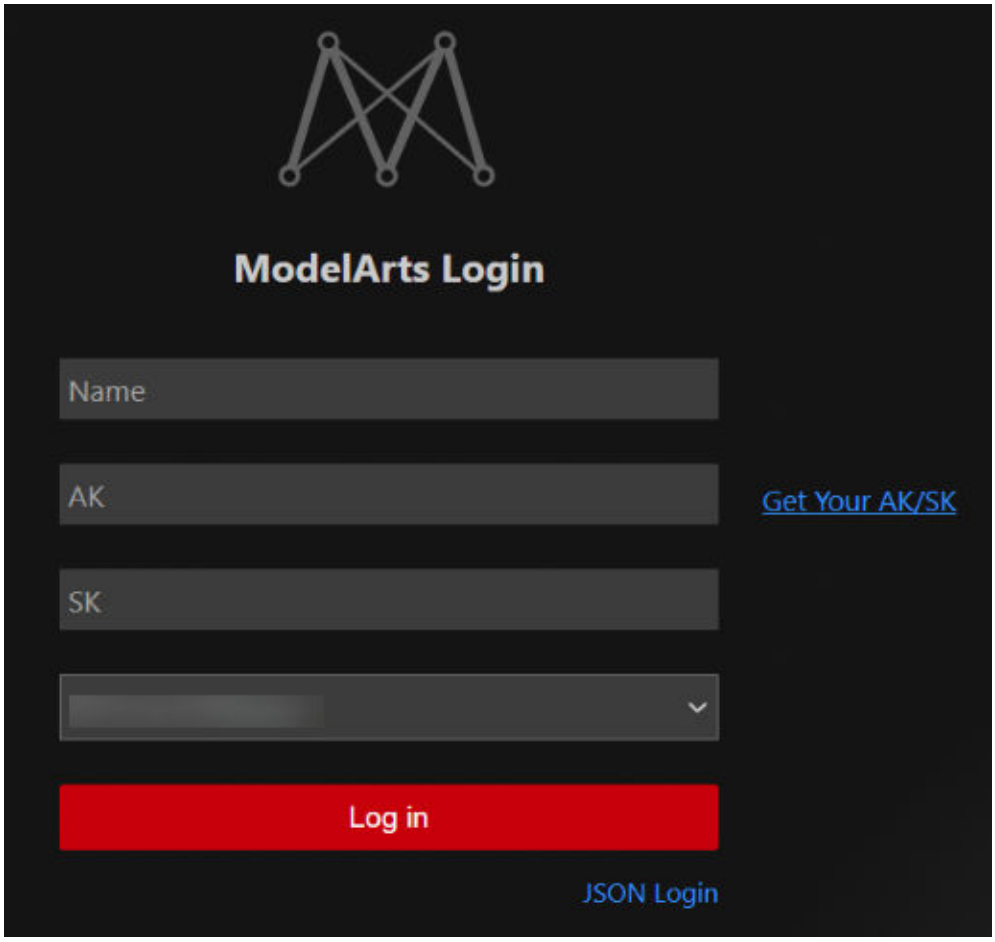
   a. Right-click **Raw** and choose **Save link as** from the shortcut menu to save the file to the local PC.

b. Open the VS Code plug-in. Click  and choose **Import Region Profile**. In the dialog box that is displayed in the lower right corner, click **From local file** and select the downloaded **ModelArts-region-profile.yaml** file.

Step 3 Log In to the VS Code Plug-in

1. In the local VS Code development environment, click  and **User Settings**, and configure the login information.

Figure 5-39 Logging in to the plug-in



Enter the login information and click **Log In**.

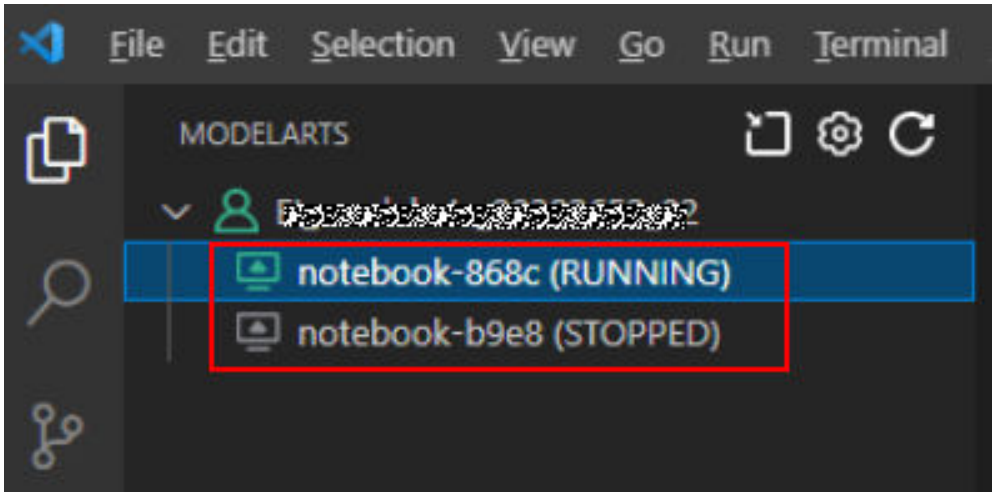
- **Name**: Custom username, which is displayed only on the VS Code page and is not associated with any account.
- **AK** and **SK**: Access key pair. To create a key pair, log in to Huawei Cloud, choose **My Credentials > API Credentials > Access Keys**, and click **Create Access Key**.
- Region: must be the same as that of the notebook instance to be remotely connected. Otherwise, the connection will fail.

Alternatively, you can switch the login mode, enter your login information, and press **Ctrl+S** to save the information.

Figure 5-40 Configuring login information

2. After the login, check the notebook instance list.

Figure 5-41 Login succeeded



Step 4 Create a Notebook Instance

CAUTION

- Create a notebook instance with remote SSH enabled, and download the key file to either of the following directories based on your OS:

  Windows: **C:\Users\{{user}}**

  Mac or Linux: **Users/{{user}}**
- A key pair is automatically downloaded after you create it. Securely store your key pair. If an existing key pair is lost, create a new one.

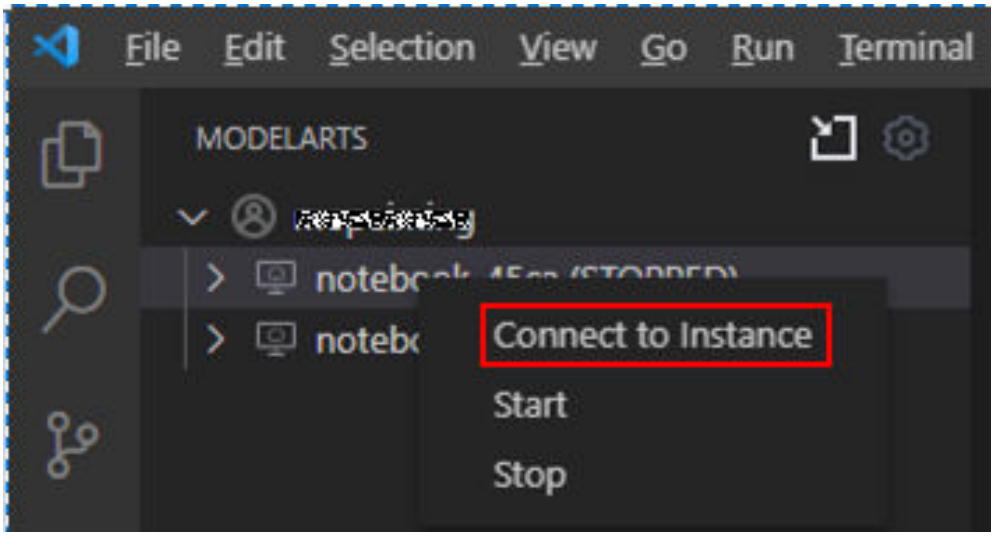
Create a notebook instance with remote SSH enabled. For details, see **Creating a Notebook Instance**.

Step 5 Connect to the Notebook Instance

1. In the local VS Code development environment, right-click the instance name and choose **Connect to Instance** from the shortcut menu to start and connect to the notebook instance.

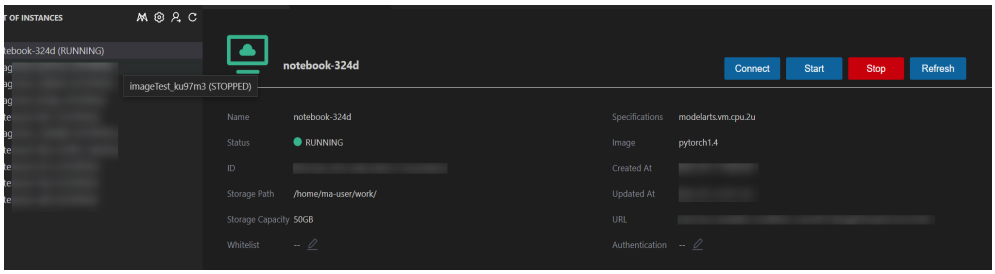
The notebook instance can either be running or stopped. If it is stopped, the VS Code plug-in starts the instance and then connects to it.

Figure 5-42 Connecting to a notebook instance



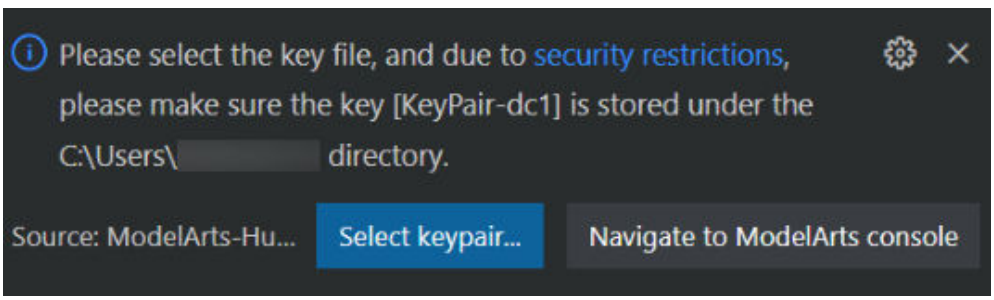
Alternatively, click the instance name. On the instance details page, click **Connect**. Then, the system automatically starts and connects to the notebook instance.

Figure 5-43 Viewing details about a notebook instance



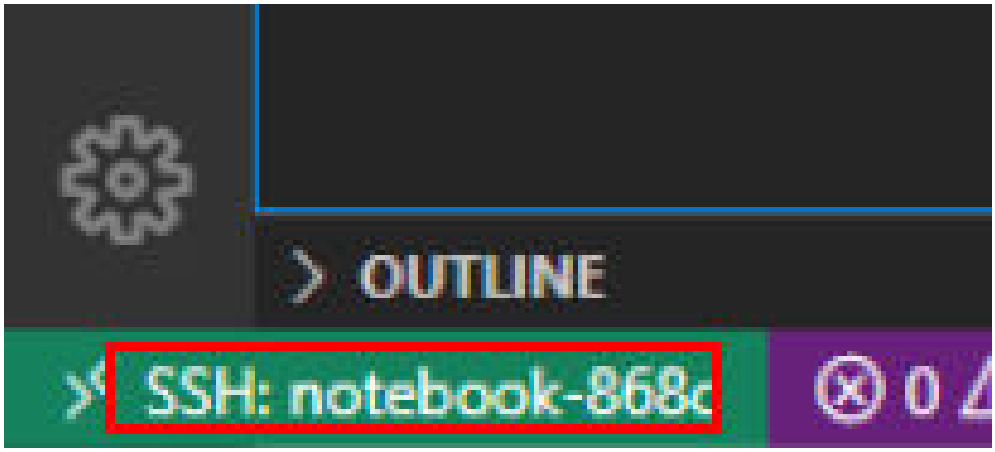
2. When you connect to a notebook instance for the first time, the system prompts you in the lower right corner to configure the key file. In this case, select the local .pem key file and click **OK**.

Figure 5-44 Configuring the key file



3. Wait for about 1 to 2 minutes until the notebook instance is accessed. After information similar to the following is displayed in the lower left corner of the VS Code environment, the connection is succeeded.

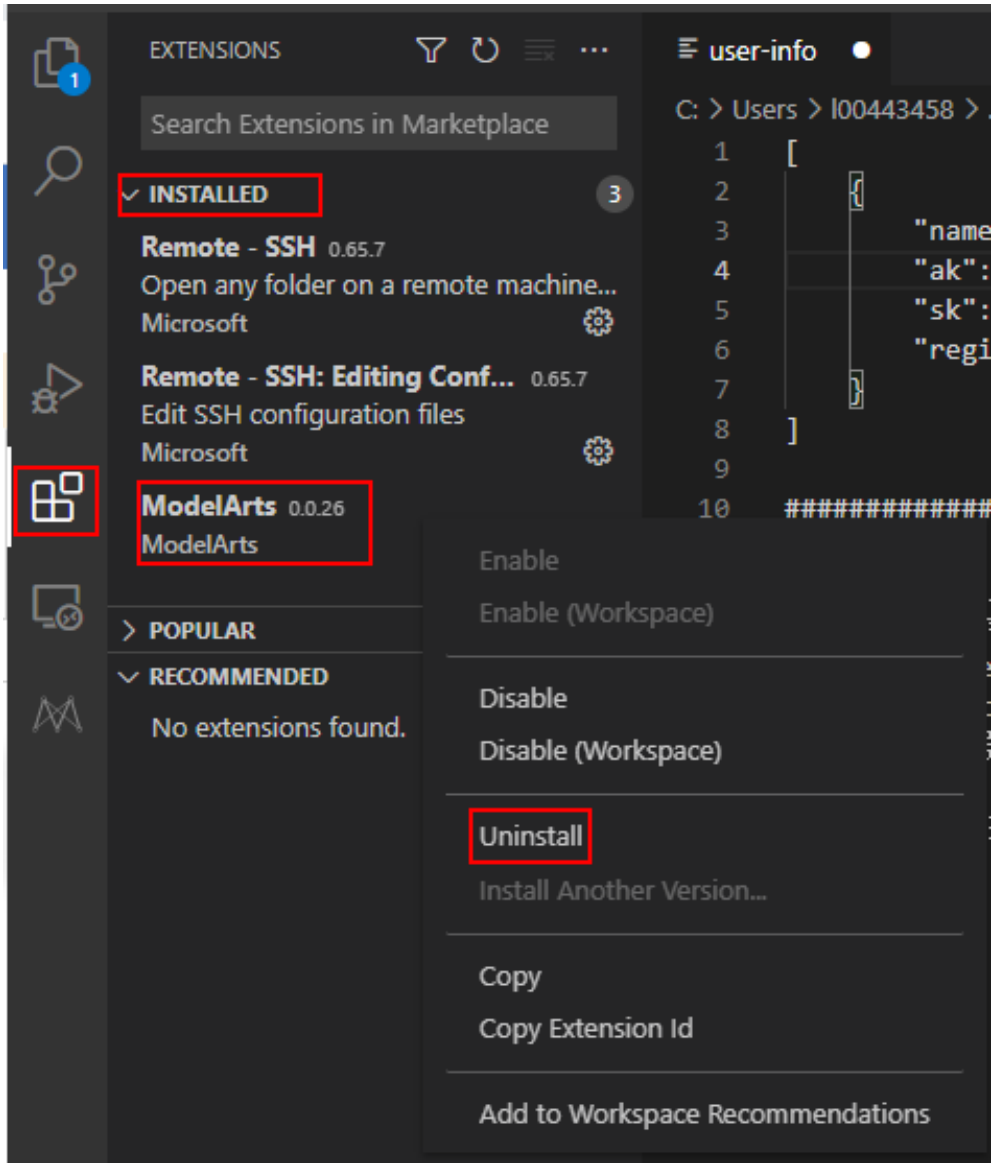
Figure 5-45 Connection succeeded



Related Operations

For details about uninstalling the VS Code plug-in, see **Figure 13**.

Figure 5-46 Step 1 Download the VS Code Plug-in



5.3.5 Manually Connecting to a Notebook Instance Through VS Code

A local IDE supports PyCharm and VS Code. You can use PyCharm or VS Code to remotely connect the local IDE to the target notebook instance on ModelArts for running and debugging code.

This section describes how to use VS Code to access a notebook instance.

Prerequisites

- You have downloaded and installed VS Code. For details, see **Installing VS Code**.
- Python has been installed on your local PC or server. For details, see **VS Code official documentation**.

- A notebook instance has been created with remote SSH enabled. Ensure that the instance is running. For details, see **Creating a Notebook Instance**.
- The address and port number of the development environment are available. To obtain the information, go to the notebook instance details page.

  Figure 5-47 Instance details page

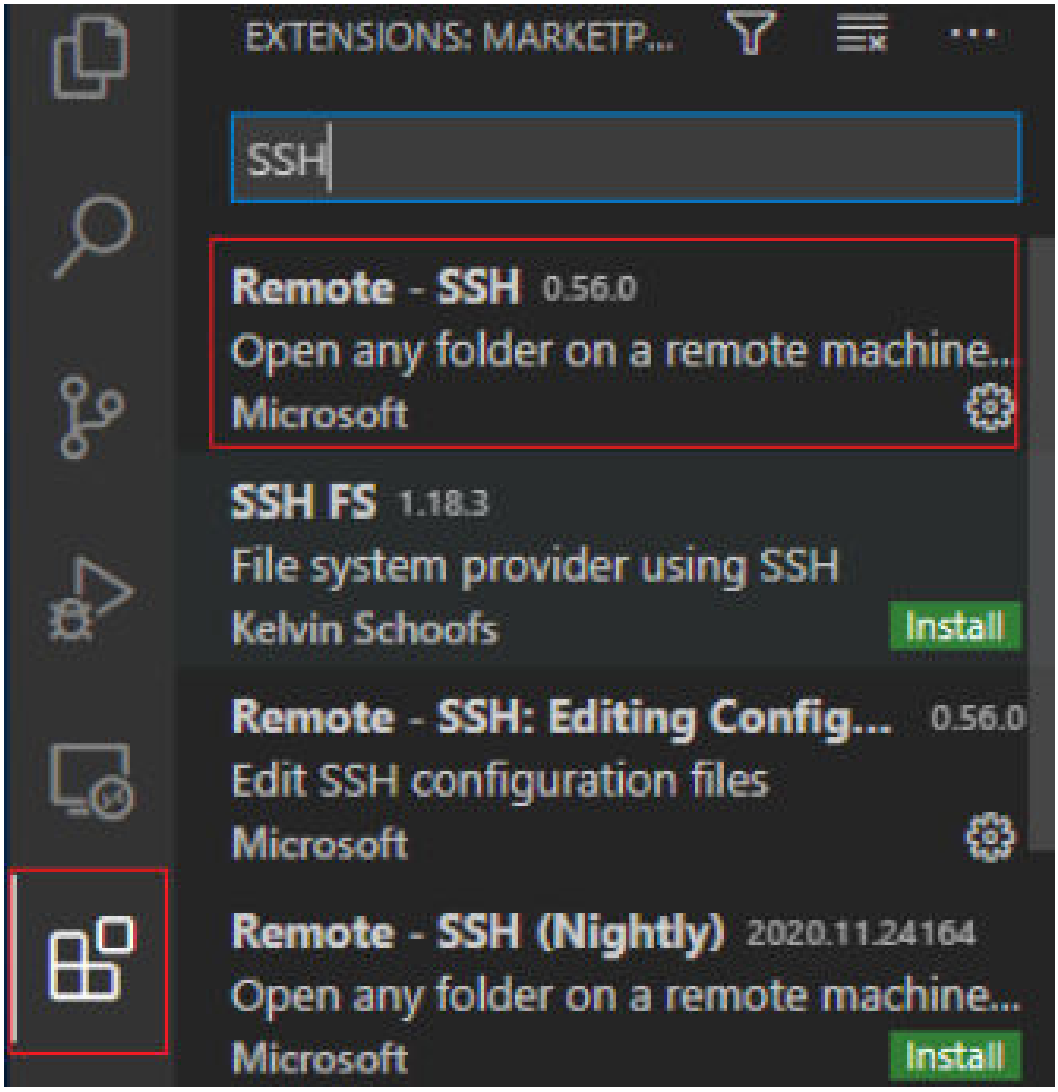
- The key pair is available.

  A key pair is automatically downloaded after you create it. Securely store your key pair. If an existing key pair is lost, create a new one.

Step 1 Add the Remote-SSH Plug-in

In the local VS Code development environment, click  , enter **SSH** in the search box, and click **install** of the Remote-SSH plug-in to install the plug-in.

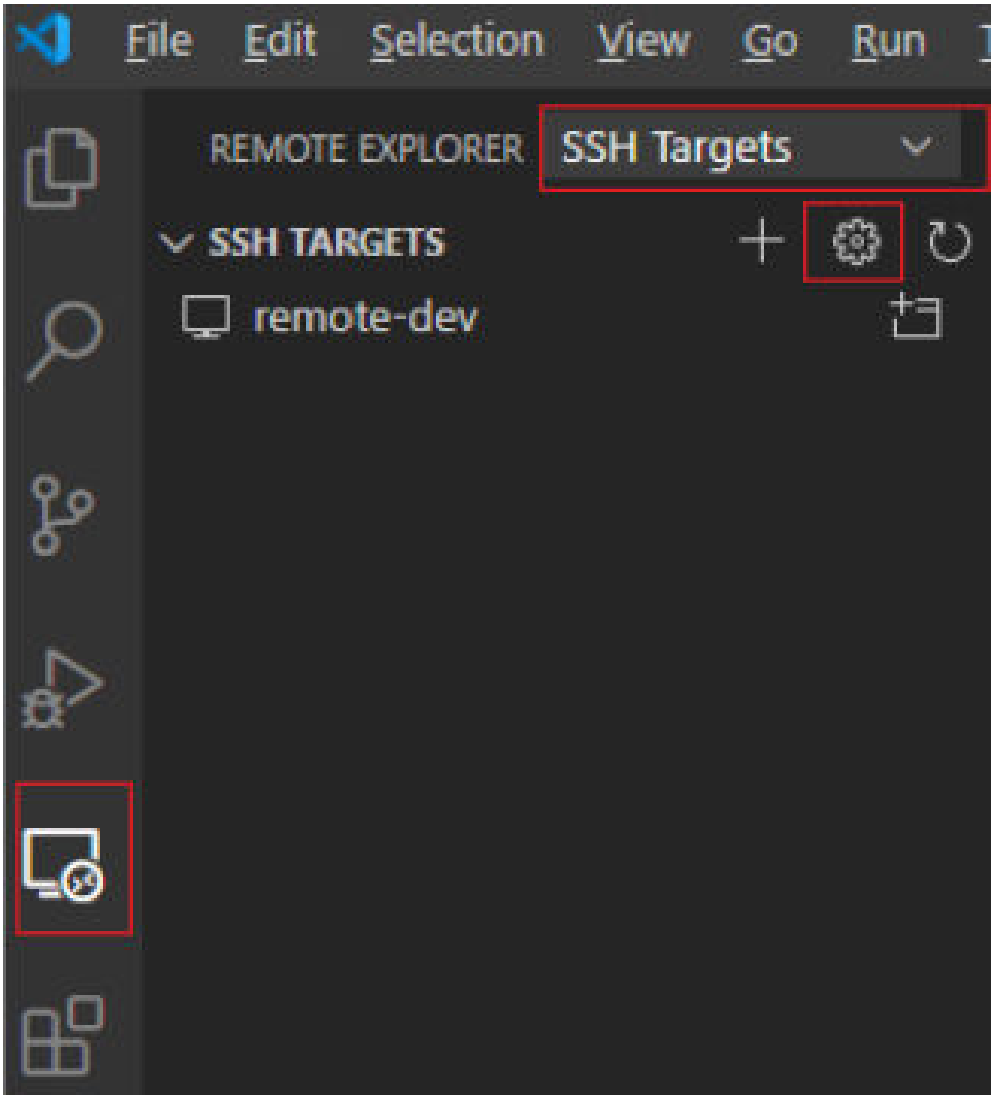
Figure 5-48 Adding the Remote-SSH plug-in



Step 2 Configure SSH

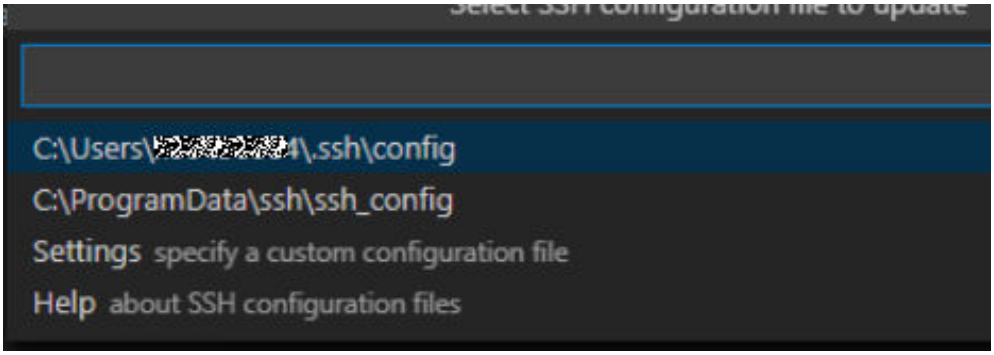
1. In the local VS Code development environment, click  on the left, select **SSH Targets** from the drop-down list box, and click  . The SSH configuration file path is displayed.

Figure 5-49 Configuring SSH Targets



2. Click the SSH configuration path and configure SSH.

Figure 5-50 SSH configuration file path




```
HOST remote-dev
    hostname <instance connection host>
    port <instance connection port>
    user ma-user
    IdentityFile ~/.ssh/test.pem
```

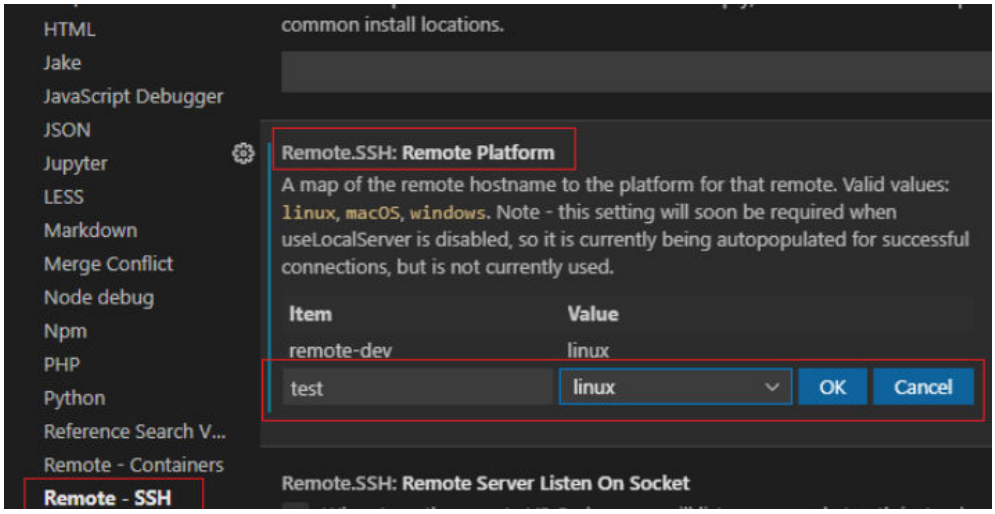


```
UserKnownHostsFile=/dev/null
StrictHostKeyChecking no
```

- **HOST**: name of the cloud development environment
- **HostName**: address for accessing the cloud development environment. Obtain the address on the page providing detailed information of the target notebook instance.
- **Port**: port number for accessing the cloud development environment. Obtain the port number on the page providing detailed information of the target notebook instance.
- **user**: **ma-user**
- **IdentityFile**: locally stored private key file of the cloud development environment. It is the key pair file in **Prerequisites**.

3. Choose **File** > **Preference** > **Settings** > **Extensions** > **Remote-SSH**. On the **Remote Platform** page, click **Add Item**, set **Item** and **Value**, and click **OK**.

Figure 5-51 Configuring Remote Platform

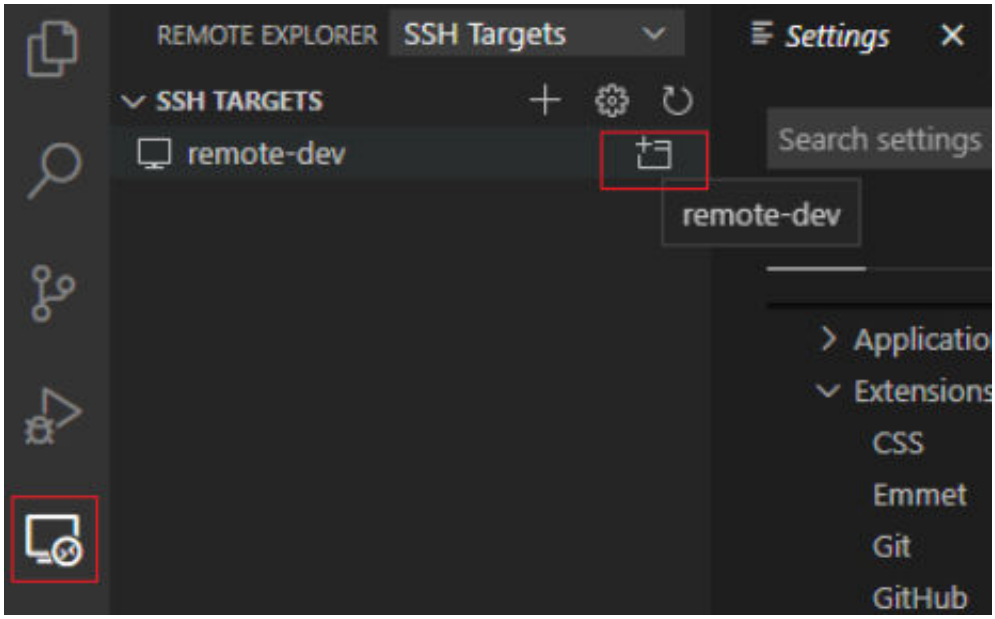


Item: host name configured in SSH configuration

Value: remote development environment platform

4. Go back to the **SSH Targets** page and click  on the right. Then, click the development environment name to open the development environment.

Figure 5-52 Opening the development environment



After the page shown in the following figure is displayed, the connection is succeeded.

Figure 5-53 Remote connection succeeded

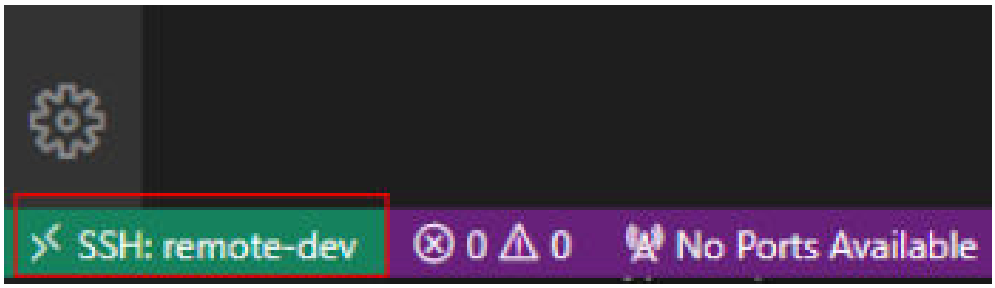
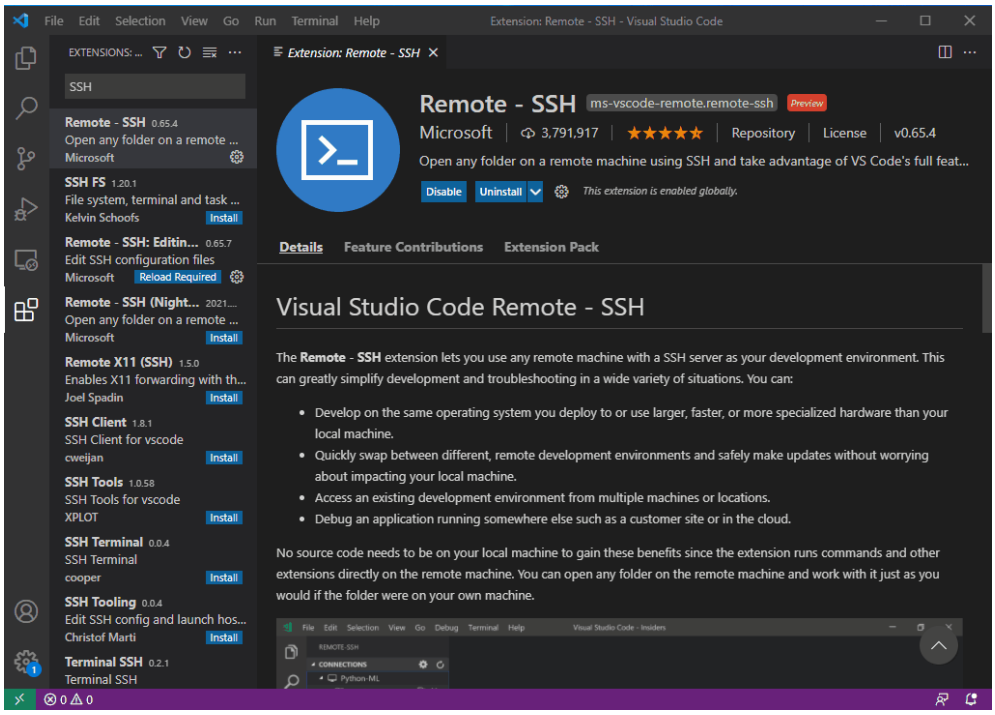


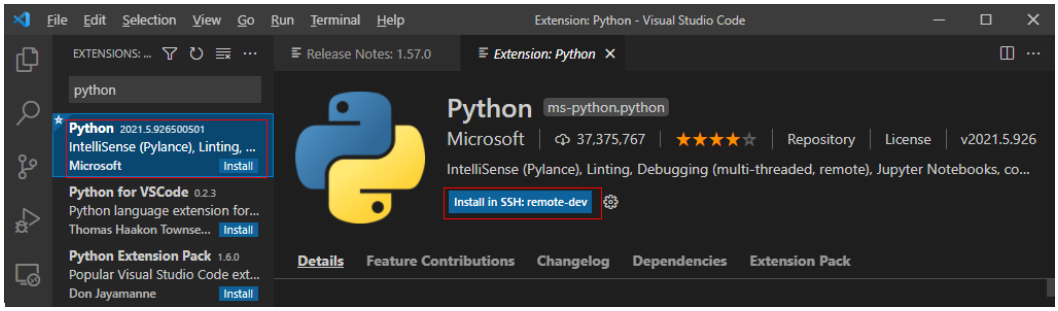
Figure 5-54 Complete configuration example



Step 3 Install the Python Plug-in in the Cloud Development Environment

On the displayed VS Code page, click  on the left, enter **Python** in the search box, and click **Install**.

Figure 5-55 Installing the Python plug-in in the cloud development environment



If the Python plug-in fails to be installed on the cloud, install it using an offline package.

Step 4 Install the Dependent Library for the Cloud Environment

After accessing the container environment, you can use different virtual environments, such as TensorFlow and PyTorch. However, in actual development, you need to install dependency packages. Then, you can access the environment through the terminal to perform operations.

1. In VS Code, press **Ctrl+Shift+P**.

2. Search for **Python: Select Interpreter** and select the target Python.
3. Choose **Terminal > New Terminal**. The CLI of the remote container is displayed.
4. Run the following command to install the dependency package:
```
pip install spacy
```

5.3.6 Remotely Debugging in VS Code

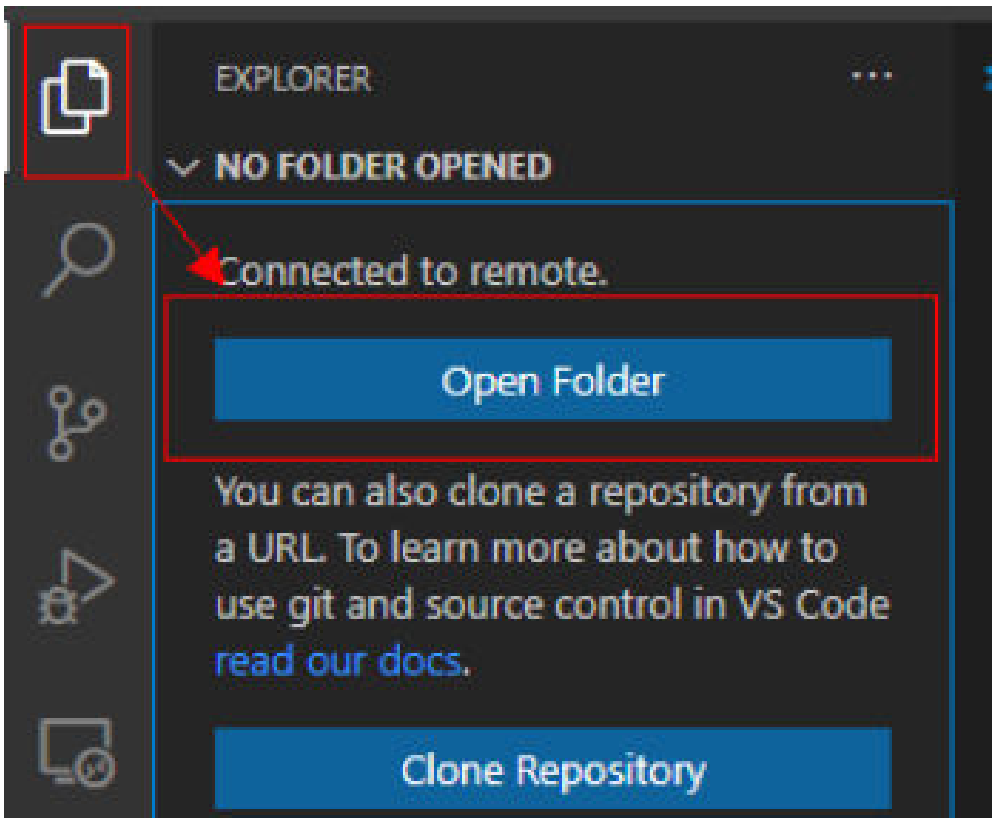
Prerequisites

A notebook instance has been accessed through VS Code.

Step 1 Upload Local Code to the Cloud Development Environment

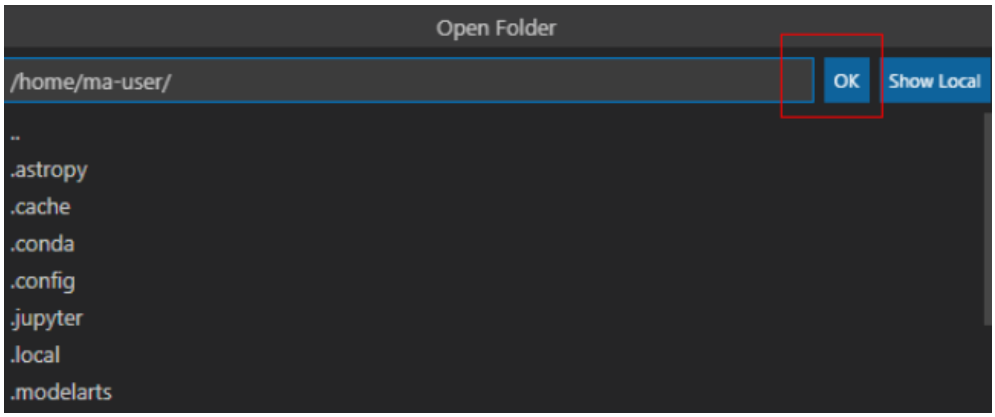
1. On the VS Code page, choose **File** > **Open Folder** to access the cloud path.

Figure 5-56 Open Folder



2. Select a path and click **OK**.

Figure 5-57 Selecting a file path

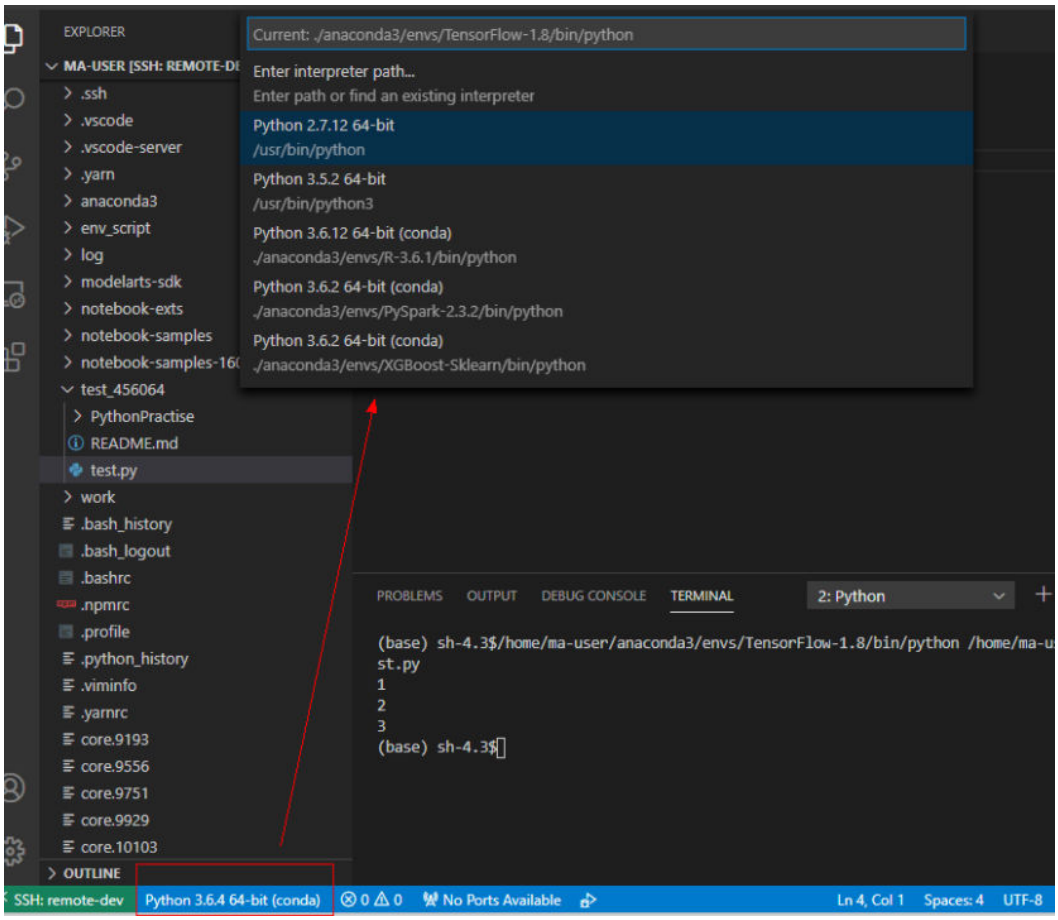


3. In the displayed directory structure on the left of the IDE, drag the code and files you want to upload to the corresponding folders. Then, the code is uploaded to the cloud development environment.

Step 2 Debug Code Remotely

Open the code file to be debugged in VS Code. Before running the code, click the default Python version in the lower left part and select a version as required.

Figure 5-58 Selecting a Python version



- Click the execution button to run the code. The code output is shown on the **TERMINAL** tab page.
- If a training job takes a long time to execute, run the job at the backend through the nohup command. This prevents the disconnection of an SSH session or a network failure from affecting job execution. The following shows an example nohup command:
  ```
  nohup your_train_job.sh > output.log 2>&1  &  tail -f  output.log
  ```
- To debug the code, perform the following operations:
  a. Choose **Run > Run and Debug** on the left.
  b. Select the default Python code file.
  c. Click on the left of the code to set breakpoints.
  d. Debug the code according to the debug procedure which is displayed above the code, and the debug information is displayed on the left of the page.

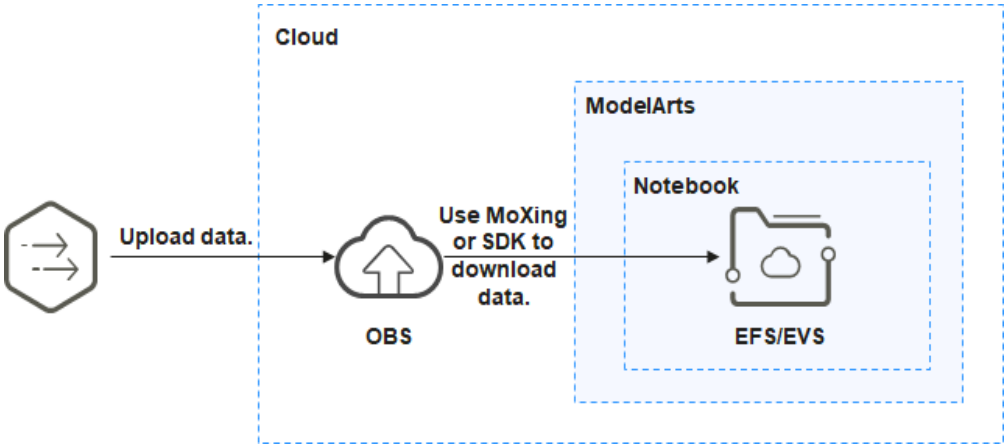
5.3.7 Uploading and Downloading a File in VS Code

Uploading Data from a Local IDE to a Notebook Instance

If the data is less than or equal to 500 MB, directly copy the data to the local IDE.

If the data is larger than 500 MB, upload the code to OBS and then to the EVS disk associated with the target notebook instance.

Figure 5-59 Uploading data to a notebook instance through OBS

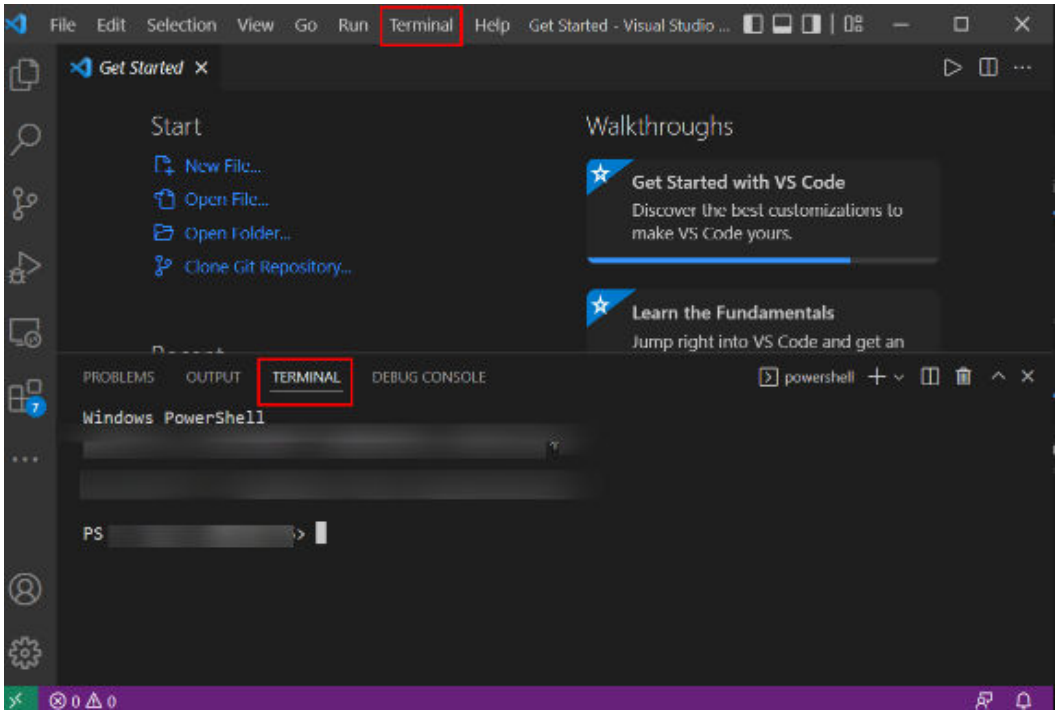


Procedure

Upload data to OBS. . Alternatively, use ModelArts SDK on a local VS Code terminal.

The following shows how to enable Terminal in the VS Code environment.

Figure 5-60 Enabling Terminal in the local VS Code environment

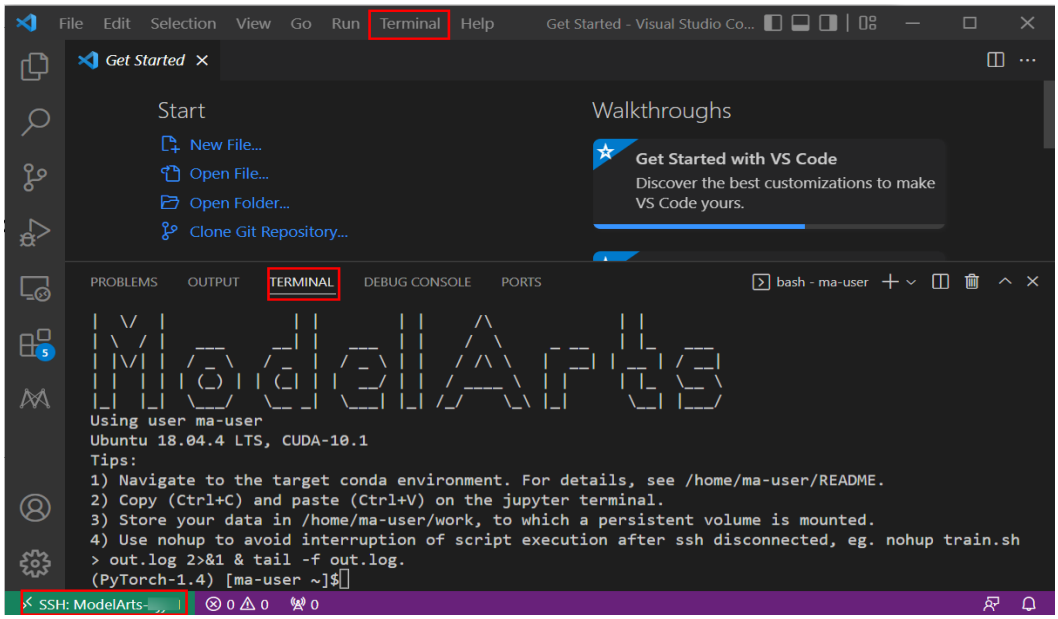


The following shows how to use ModelArts SDK on a local VS Code terminal to upload a local file to OBS:

```
# Enter python and press Enter to enter the Python environment.
```

Then, upload the file to OBS by referring to Uploading a File to OBS.

Figure 5-61 Enabling Terminal in the remote VS Code environment



2. The following shows how to use ModelArts SDK in the terminal of the remote VS Code environment to download files from OBS to a development environment:

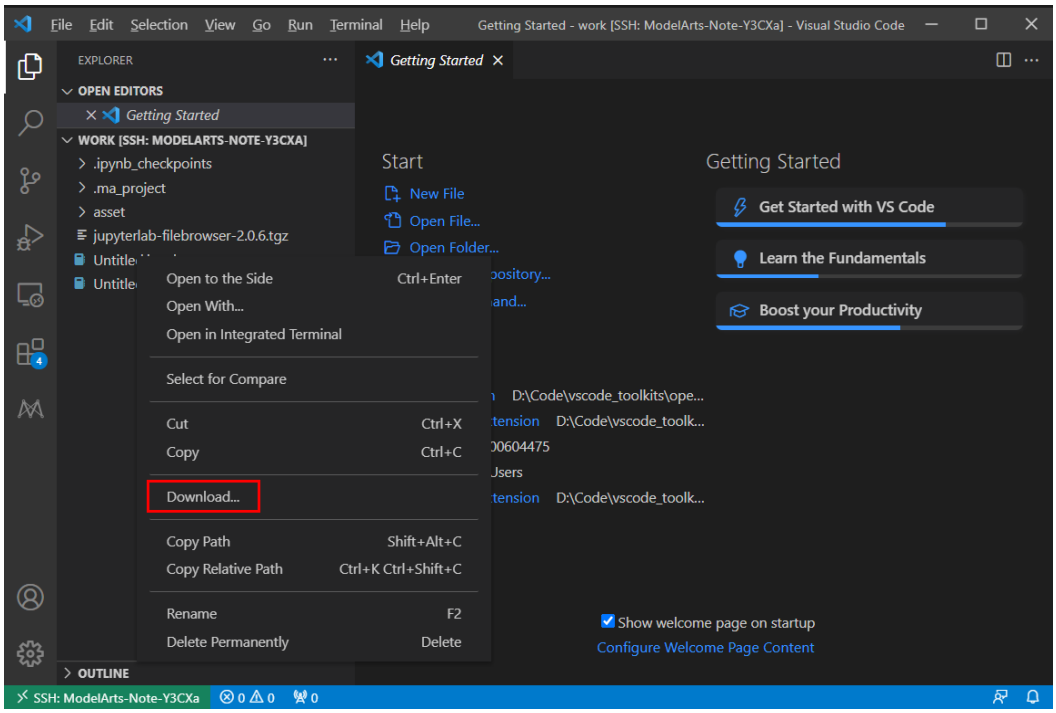

```
# Manually access the development environment.
cat /home/ma-user/README
# Select the source environment.
source /home/ma-user/miniconda3/bin/activate MindSpore-python3.7-aarch64
# Enter python and press Enter to enter the Python environment.
```

Then, upload the file to OBS by referring to Uploading a File to OBS.

Downloading Files from a Notebook Instance to a Local Directory

Files created in Notebook can be downloaded to a local path. The operations for downloading a file are the same, regardless of whether the created notebook instance uses the default or EVS storage. In the **Project** directory of the local IDE, right-click the **Notebook2.0** project and choose **Download** from the shortcut menu to download the project file to the local PC.

Figure 5-62 Downloading files from a notebook instance to a local directory in VS Code



5.4 Configuring a Local IDE Accessed Using SSH

This section describes how to use PuTTY to remotely log in to a notebook instance on the cloud in the Windows environment.

Prerequisites

- You have created a notebook instance with remote SSH enabled and whitelist configured. Ensure that the instance is running. For details, see **Creating a Notebook Instance**.
- The address and port number of the development environment are available. To obtain this information, go to the notebook instance details page.

Figure 5-63 Instance details page

- The key pair is available.

  A key pair is automatically downloaded after you create it. Securely store your key pair. If an existing key pair is lost, create a new one.

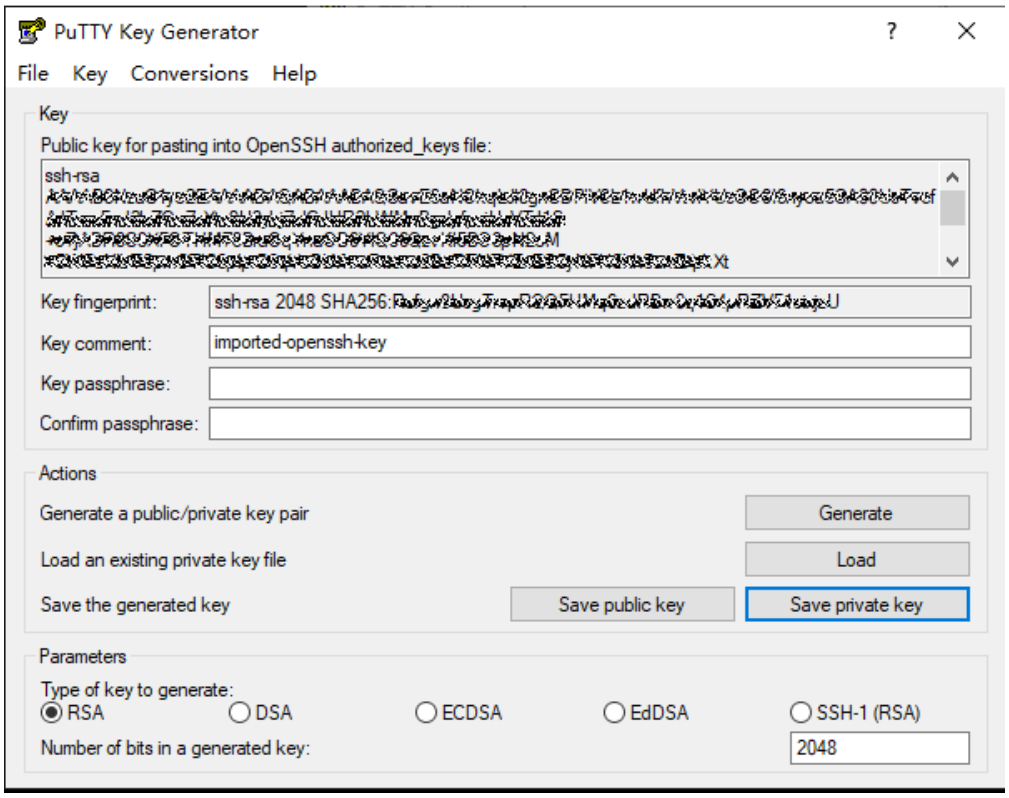
Step 1 Install the SSH Tool

Download and install the SSH remote connection tool, for example, PuTTY.

Step 2 Use PuTTYgen to Convert the .pem Key Pair File to a .ppk Key Pair File

1. **Download PuTTYgen** and double-click it to run it.
2. Click **Load** to load the .pem key file created and saved during notebook instance creation.
3. Click **Save private key** to save the generated .ppk file. The file name can be customized, for example, **key.ppk**.

Figure 5-64 Converting the .pem key pair file to a .ppk key pair file

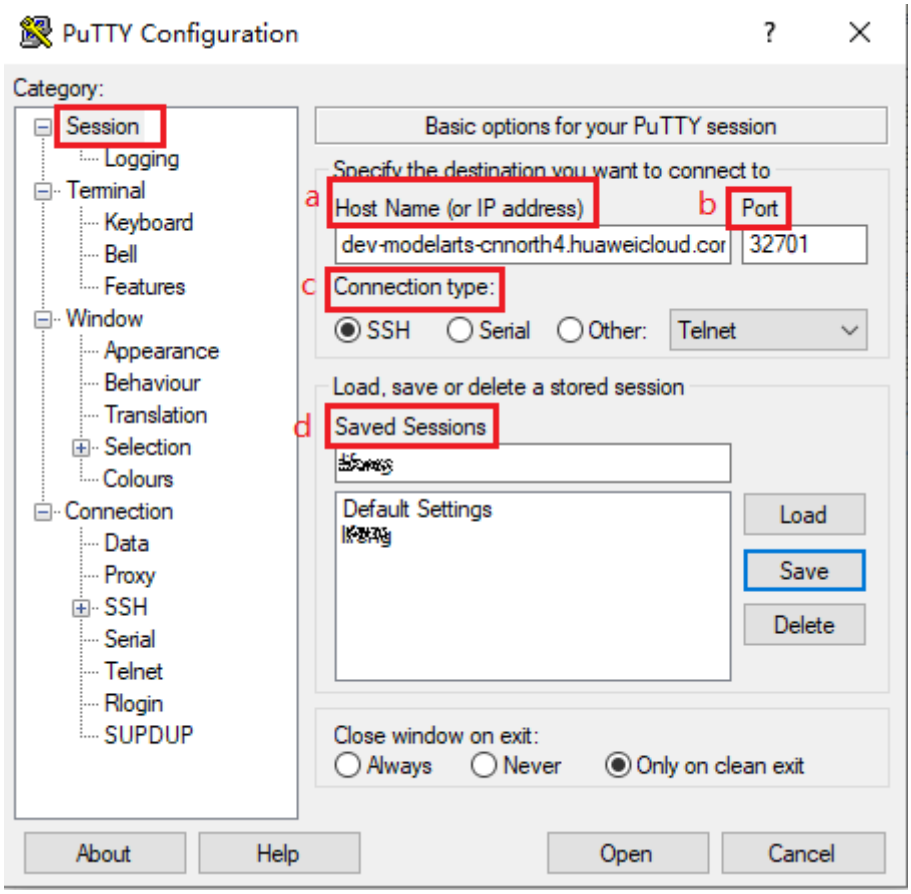


Step 3 Use SSH to Connect to a Notebook Instance

1. Run PuTTY.

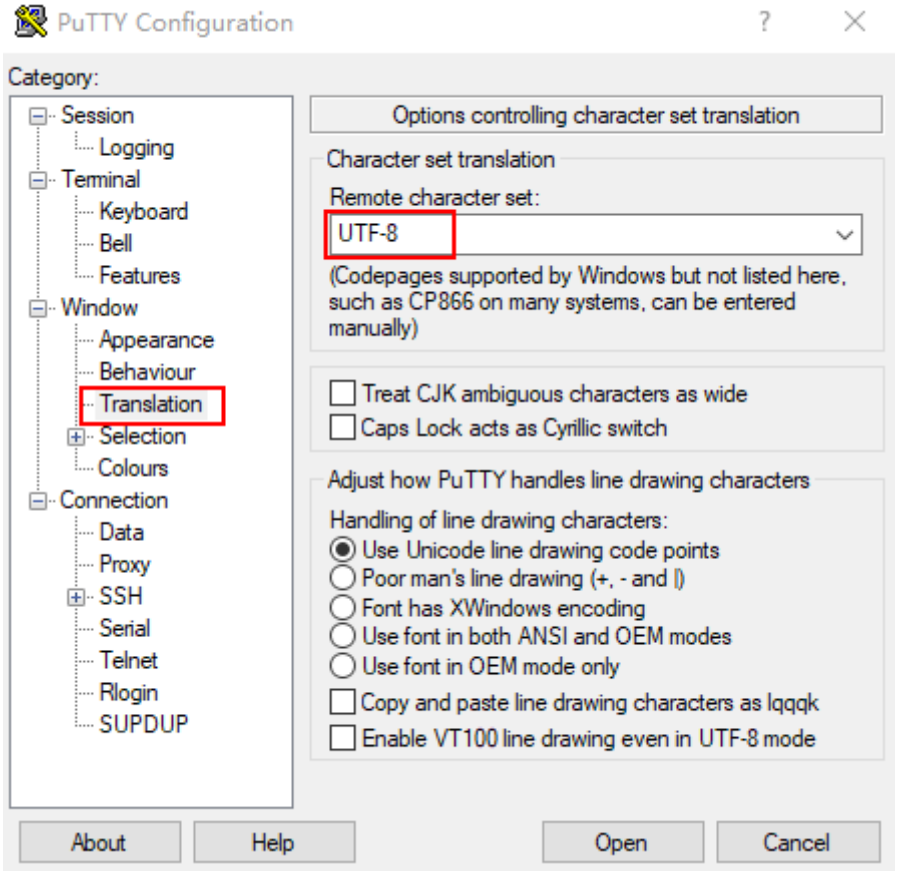
2. Click **Session** and set the following parameters:
   a. **Host Name (or IP address)**: address for accessing the in-cloud notebook instance. Obtain the address on the page providing detailed information of the target notebook instance .
   b. **Port**: port number for accessing the in-cloud notebook instance. Obtain the port number on the page providing detailed information of the target notebook instance, for example, **32701**.
   c. **Connection type**: **SSH**
   d. **Saved Sessions**: task name, which can be clicked for remote connection when you use PuTTY next time

Figure 5-65 Configuring **Session**



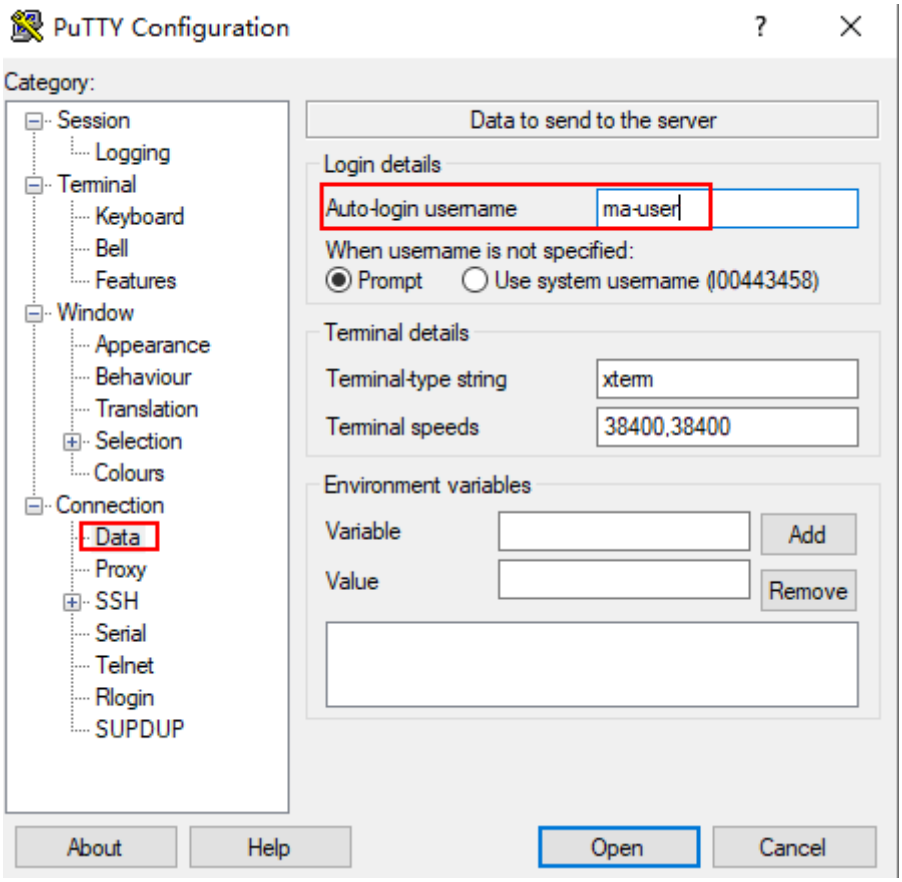
3. Choose **Window** > **Translation** and select **UTF-8** from the drop-down list box in the **Remote character set** area.

Figure 5-66 Setting the character format

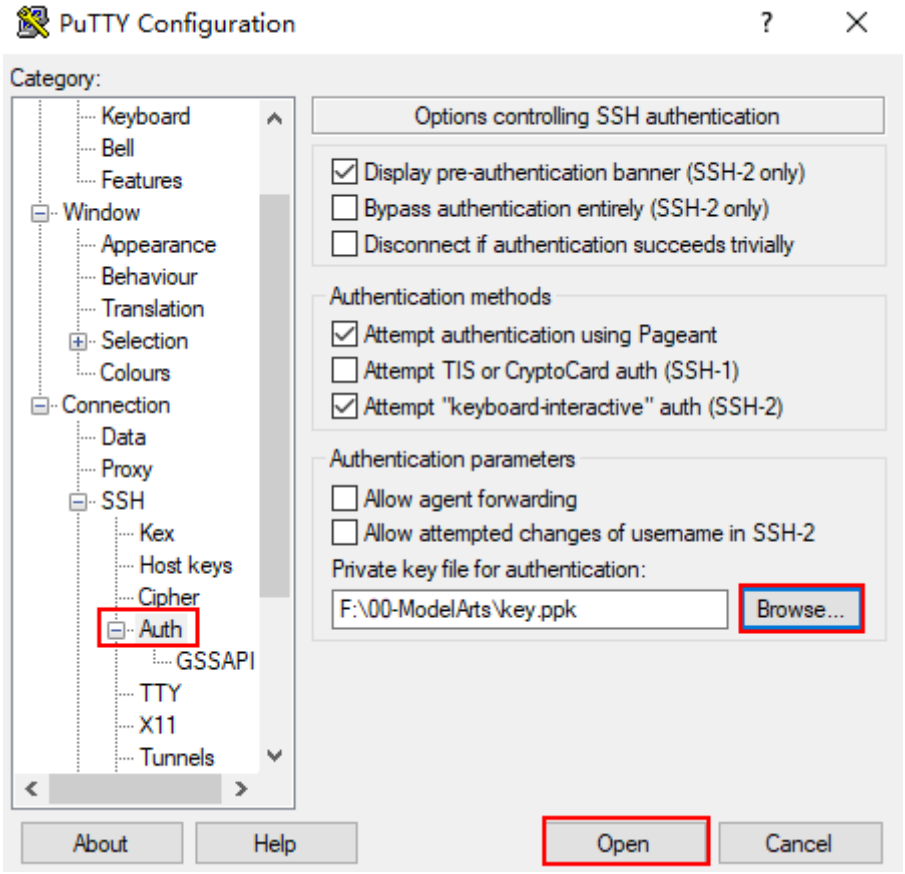


4. Choose **Connection** > **Data** and enter **ma-user** for **Auto-login username**.

Figure 5-67 Entering a username

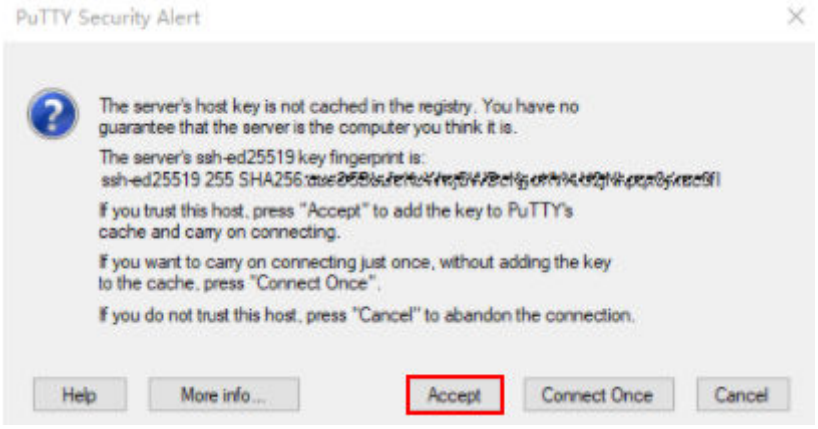


5. Choose **Connection** > **SSH** > **Auth**, click **Browse**, and select the .ppk file generated in **step 2**.



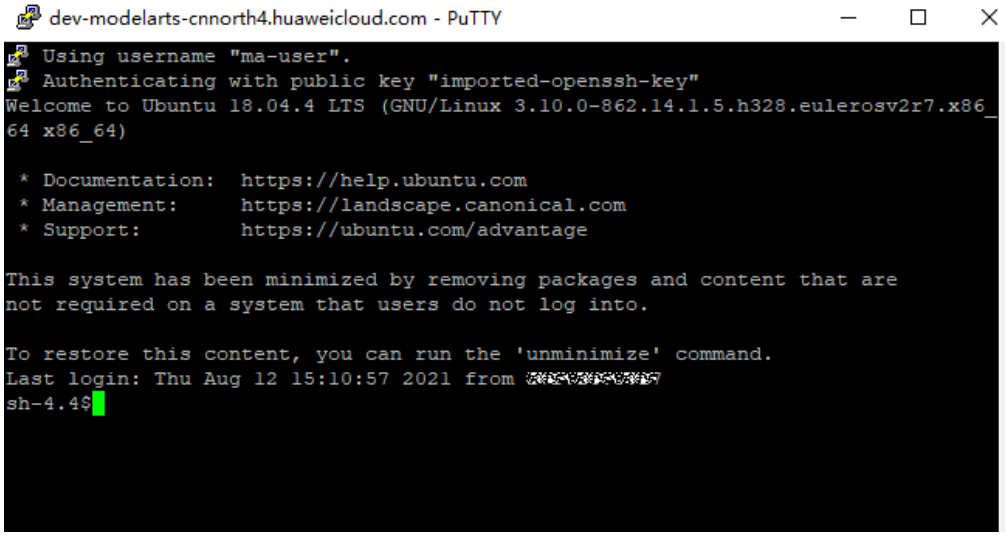
6. Click **Open**. If you are logging in to the instance for the first time, PuTTY displays a security warning dialog box, asking if you want to accept the instance security certificate. Click **Accept** to save the certificate to your local registry.

   Figure 5-68 Asking if you want to accept the instance security certificate



7. Connect to the notebook instance.

Figure 5-69 Connecting to a notebook instance



6 ModelArts Tool Guide

6.1 PyCharm Toolkit

AI developers use PyCharm tools to develop algorithms or models. Therefore, ModelArts provides PyCharm Toolkit to help AI developers quickly submit locally developed code to a training environment on ModelArts. With PyCharm Toolkit, developers can quickly upload code, submit training jobs, and obtain training logs for local display so that they can better focus on local code development. For details about how to download and install PyCharm Toolkit, see **Downloading and Installing PyCharm Toolkit**.

Constraints

- Currently, only PyCharm 2019.2 or later is supported, including the community and professional editions.
- Only PyCharm of the professional edition can be used to access the notebook development environment.
- You can use a community or professional edition of PyCharm Toolkit to submit training jobs. PyCharm Toolkit 2.x can be used only to submit training jobs of the old version, and the latest version of PyCharm Toolkit can be used only to submit training jobs of the new version.
- PyCharm Toolkit supports PyCharm of the Windows, Linux, or Mac version.

Available Functions

Table 6-1 Toolkit functions of the latest version

Function	Description	Reference
Remote SSH	The notebook development environment can be accessed through remote SSH.	**Configuring PyCharm Toolkit to Remotely Connect to a Notebook Instance**
Model training	Code developed locally can be quickly submitted to ModelArts and a training job of the new version is automatically created. During the running of the training job, training logs can be obtained and displayed on a local host.	• **Submitting a Training Job (New Version)** • **Stopping a Training Job** • **Viewing Training Logs**

6.2 Preparations

6.2.1 Downloading and Installing PyCharm Toolkit

Before using PyCharm Toolkit, install and configure it in PyCharm by following the instructions provided in this section.

Prerequisites

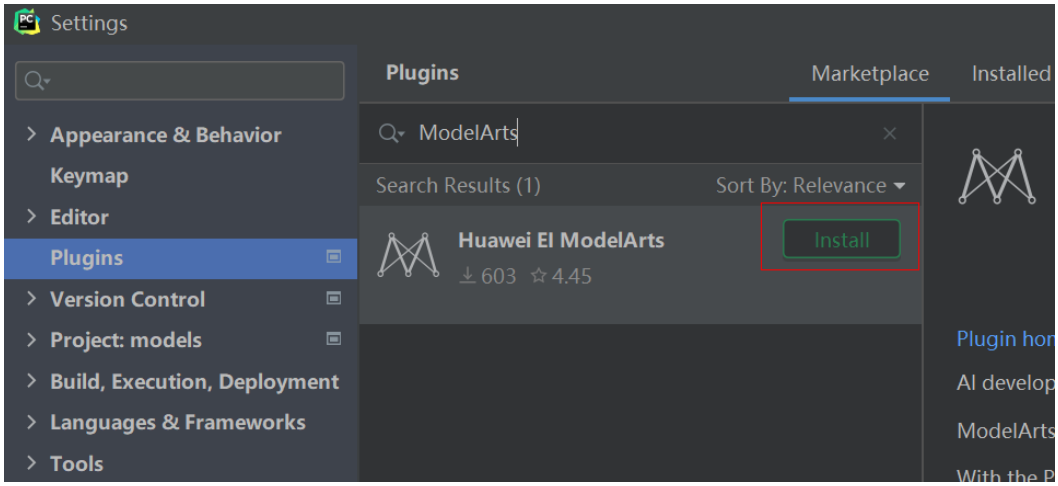
PyCharm community or professional 2019.2 or later has been installed locally.

- Only PyCharm of the professional edition can be used to access the notebook development environment.
- You can use a community or professional edition of PyCharm Toolkit to submit training jobs. PyCharm Toolkit 2.x can be used to submit only the old version of training jobs, and the latest version of PyCharm Toolkit can be used to submit only the new version of training jobs.

Method 1: Install PyCharm Toolkit in Marketplace

Choose **File** > **Settings** > **Plugins**, search for **ModelArts** in Marketplace, and click **Install**.

Figure 6-1 Installation using Marketplace



NOTE

The version installed in Marketplace is the latest version.

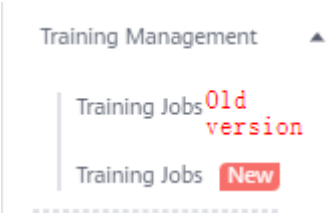
Method 2: Install PyCharm Toolkit Using a Toolkit Package

1. Download Toolkit.

   The PyCharm Toolkit package is stored in the public OBS bucket of the target site. Contact the administrator to obtain it.

   PyCharm Toolkit package name: For interconnection with ModelArts Training Management of the old version, use **Pycharm-ToolKit-2.2.1.zip**. For interconnection with ModelArts Training Management of the new version, use **Pycharm-ToolKit-latest.zip**. Select a name as required.

   Figure 6-2 ModelArts Training Management

2. Installing Toolkit in PyCharm

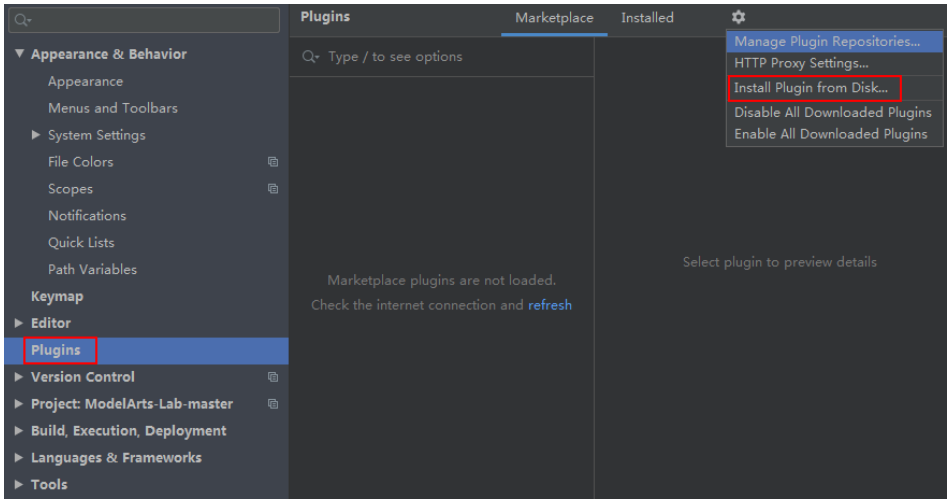
   Install Toolkit in PyCharm by performing the following operations:

   a. Start PyCharm on the local PC.

   b. On the PyCharm interface, choose **File > Settings**. The **Settings** dialog box is displayed.

   c. In the **Settings** dialog box, click **Plugins** in the left navigation pane. Click the setting icon on the right, and choose **Install Plugin from Disk**. The dialog box for selecting files is displayed.

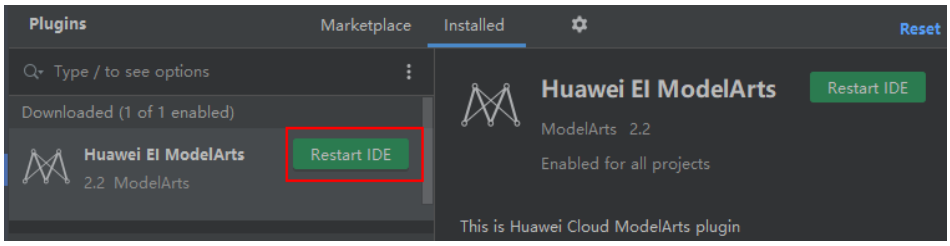
Figure 6-3 Selecting a plug-in from the local host



d. In the displayed dialog box, select the Toolkit package from the local directory and click **OK**.

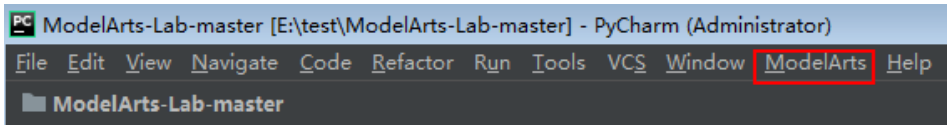
e. Click **Restart IDE** to restart PyCharm. In the displayed dialog box, click **Restart**.

Figure 6-4 Restarting PyCharm



f. Open a project after the restart. If the **ModelArts** tab page is displayed on the PyCharm toolbar, Toolkit has been installed.

Figure 6-5 Installation successful



6.2.2 Configuring Toolkit Using a YAML File

Configuring PyCharm Toolkit

After PyCharm is restarted, perform the following steps to configure PyCharm Toolkit:

1. On the PyCharm interface, choose **ModelArts > Edit Credential**. The **Edit Credential** dialog box is displayed.
2. Click **Get more region** to go to the YAML file download page.
3. Go to the folder of the target region.

   Click the link on the web page to view the region information.

4. Download the YAML file to the local host.

   Click the YAML file to be downloaded. The file details page is displayed. On the file details page, right-click **Raw** and choose **Save link as** from the shortcut menu to save the YAML file to the local PC.

5. In the **Edit Credential** dialog box, click **Config** to import the downloaded YAML file. After the file is imported, the message **Import successful** is displayed, indicating that the region information is configured.

Setting Domain Names and IP Addresses

Toolkit must be used by calling APIs. The API domain names of some regions are not registered. You need to configure the corresponding IP addresses and API domain names in the **hosts** file on the local PC. Generally, the **hosts** file on the local PC is stored in **C:\Windows\System32\drivers\etc**.

6.2.3 Creating Access Keys (AK and SK)

This section describes how to create access keys (AKs and SKs) on the ModelArts management console. A pair of AK and SK is used to encrypt the signature of a request, ensuring that the request is secure and integral, and that identities of the request sender and receiver are correct.

Obtaining an Access Key

1. On the ModelArts management console, hover the cursor over the username in the upper right corner and choose **My Credentials** from the drop-down list.
2. On the **My Credentials** page, choose **Access Keys** > **Create Access Key**.
3. In the **Create Access Key** dialog box that is displayed, enter the verification code received by SMS or email.
4. Click **OK** and save the access key file as prompted. The access key file is saved in the default download folder of the browser. Open the **credentials.csv** file to view the AK and SK.

6.2.4 Using Access Keys for Login

To connect Toolkit to ModelArts, use the access keys of the current account for login authentication.

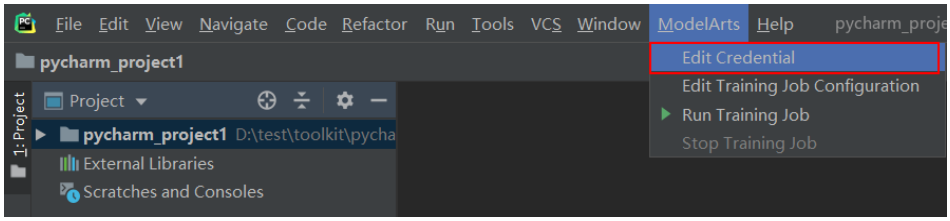
Prerequisites

- Toolkit has been installed. If it is not installed, install it by referring to **Downloading and Installing PyCharm Toolkit**.
- The access keys of the current account have been created, and the corresponding AK and SK have been obtained. If they are not created, create them by referring to **Creating Access Keys (AK and SK)**.
- Before using Toolkit, go to the ModelArts console to configure access authorization. If the global configuration is not complete on the ModelArts management console, you cannot access and connect to ModelArts after logging in to Toolkit.

Logging In to ModelArts

1. Open PyCharm with Toolkit installed. Choose **ModelArts > Edit Credential** from the menu bar.

   Figure 6-6 Edit Credential

2. In the displayed dialog box, select the region where ModelArts is located, enter the AK and SK, and click **OK**.
   - **Region**: Select a region from the drop-down list.
   - **Access Key ID**: Enter the AK.
   - **Secret Access Key**: Enter the SK.
3. View the verification result.

   In the **Event Log** area, if information similar to the following is displayed, the access key has been successfully added:

   ```
   16:01Validate Credential Success: The credential is valid.
   ```

6.3 PyCharm Toolkit (Latest Version)

6.3.1 Training a Model

6.3.1.1 Submitting a Training Job (New Version)

You can use PyCharm Toolkit of the latest version to quickly submit the locally developed training code to ModelArts for training.

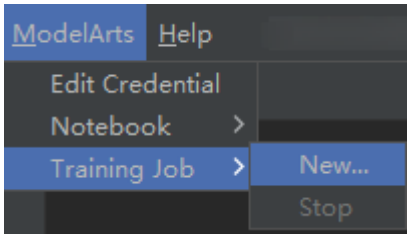
Prerequisites

- A training code project exists in the local PyCharm.
- You have created a bucket and folders in OBS for storing datasets and trained models. Data used by the training job has been uploaded to OBS.
- The credential has been configured. For details, see **Using Access Keys for Login**.
- PyCharm Toolkit of the latest version is available for submitting a training job of the new version only.

Configuring Training Job Parameters

1. In PyCharm, open the training code project and training boot file, and choose **ModelArts** > **Training Job** > **New...** on the menu bar.

Figure 6-7 Edit training job configuration



2. In the displayed dialog box, set the training job parameters. For details about the parameters, see **Table 6-2**.

Table 6-2 Training job parameters

Parameter	Description
Job Name	Name of a training job
Job Description	Brief description of a training job
Algorithm Souce	Source of the training algorithm. The options are **Frequently-used** and **Custom**. **Frequently-used** refers to the frequently-used AI engines supported by ModelArts Training Management. If the AI engine you use is not in the supported list, you are advised to create a training job using a custom image.
AI Engine	Select the AI engine and the version used in code. The supported AI engines are the same as the frequently-used frameworks supported by training jobs on the ModelArts management console.
Boot File Path	Training boot file. The selected boot file must be a file in the current PyCharm training project.
Code Directory	Training code directory. The system automatically sets this parameter to the directory where the training boot file is located. You can change the parameter value to a directory that is in the current project and contains the boot file. If the algorithm source is a custom image and the training code has been built in the image, this parameter can be left blank.
Image Path (optional)	URL of the SWR image

Parameter	Description
Boot Command	Command for starting a training job, for example, **bash /home/work/run_train.sh python {***Python boot file and parameters***}**. This parameter is displayed if **Algorithm Source** is set to **Custom**. If the command does not contain the **--data_url** or **--train_url** parameter, the tool automatically adds the two parameters to the end of the command when submitting the training job. The two parameters correspond to the OBS path for storing training data and the OBS path for storing training output, respectively.
Data Obs Path	OBS path for storing training data, for example, **/test-modelarts2/mnist/dataset-mnist/**, in which **test-modelarts2** indicates a bucket name.
Training Obs Path	OBS path. A directory is automatically created in the path for storing a trained model and training logs.
Running Parameters	Running parameters. If you want to add some running parameters to your code, add them here. Separate multiple running parameters with semicolons (;), for example, **key1=value1;key2=value2**. This parameter can be left blank.
Specifications	Type of resources used for training. Currently, public resource pools and dedicated resource pools are supported. Dedicated resource pool specifications are identified by **Dedicated Resource Pool**.
Compute Nodes	Number of compute nodes. If this parameter is set to **1**, the system runs in standalone mode. If this parameter is set to a value greater than 1, the distributed computing mode is used at the background.
Available/Total Nodes	When **Specifications** is set to a dedicated resource pool, the number of available nodes and the total number of nodes are displayed. The value of **Compute Nodes** cannot exceed the number of available nodes.

Figure 6-8 Configuring training job parameter (public resource pool)

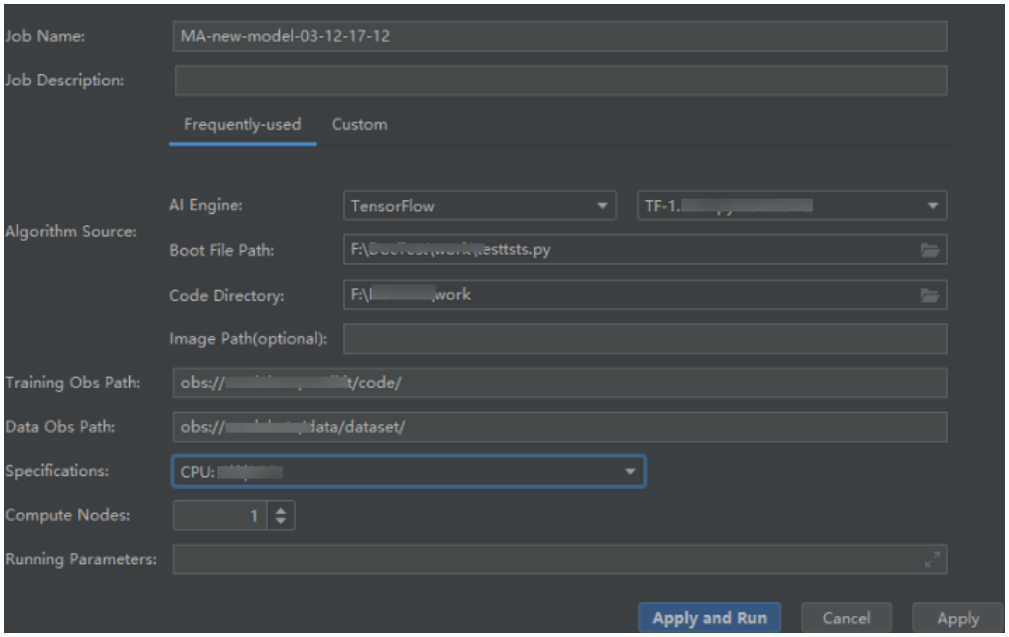


Figure 6-9 Configuring training job parameter (dedicated resource pool)

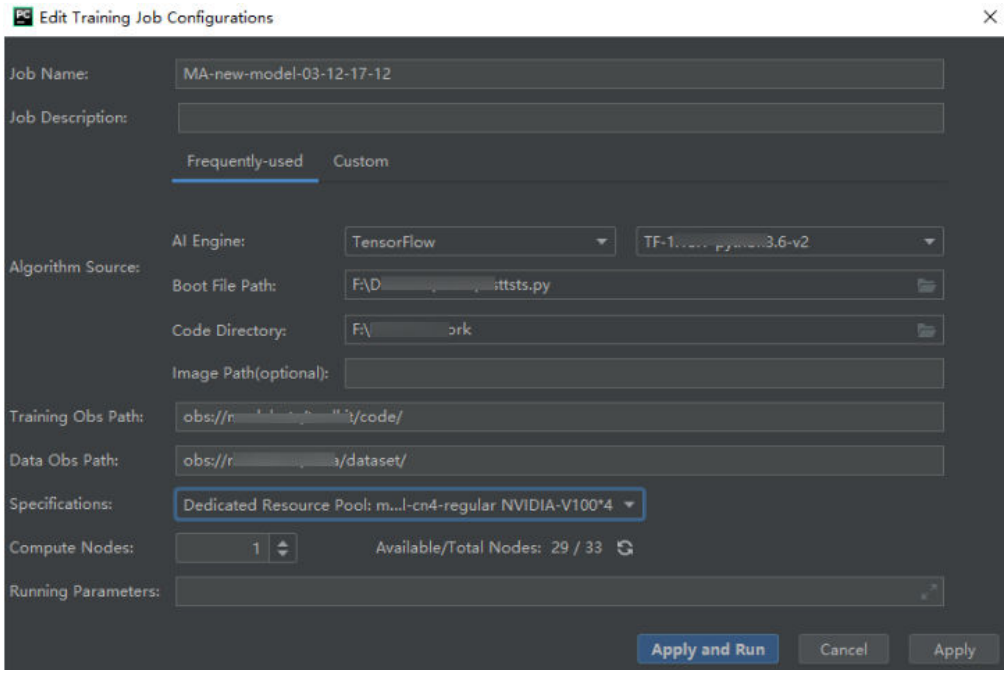
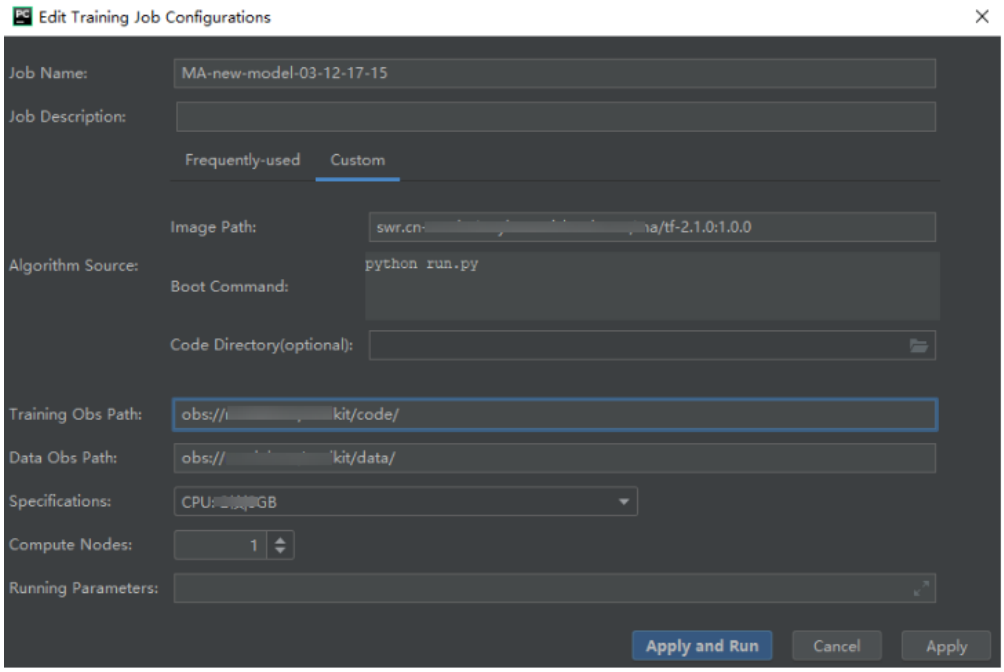


Figure 6-10 Configuring training job parameter (custom image)

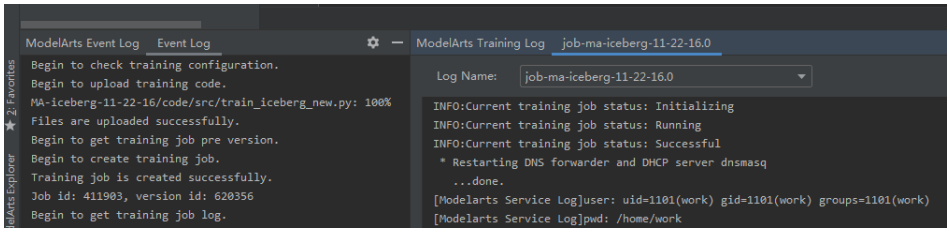


3. After setting the parameters, click **Apply and Run**. Then, local code is automatically uploaded to the cloud and training is started. The training job running status is displayed in the **Training Log** area in real time. If information similar to **Current training job status: Successful** is displayed in the training log, the training job has been successfully executed.

   NOTE

   - After you click **Apply and Run**, the system automatically executes the training job. To stop the training job, choose **ModelArts** > **Training Job** > **Stop** on the menu bar.
   - If you click **Apply**, the job is not started directly, and the training job settings are saved instead. To start the job, click **Apply and Run**.

Figure 6-11 Training log example



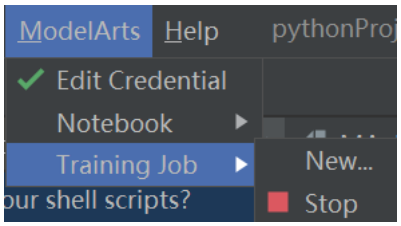
6.3.1.2 Stopping a Training Job

You can stop a running training job.

Stopping a Job

When a training job is running, choose **ModelArts** > **Training Job** > **Stop** on the PyCharm menu bar to stop the job.

Figure 6-12 Stopping a job



6.3.1.3 Viewing Training Logs

This section describes how to view training job logs.

Viewing Training Logs in OBS

When you submit a training job, the system automatically creates a folder with the same name as the training job in the configured OBS path to store the model, logs, and code outputted after training is complete.

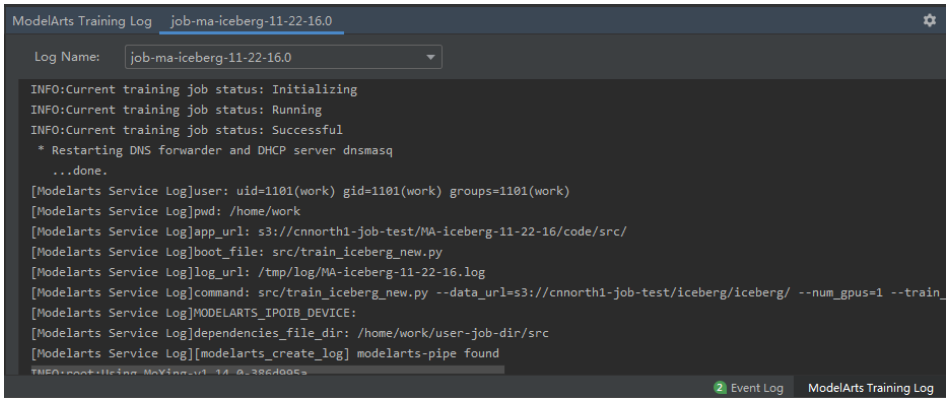
For example, when the **train-job-01** job is submitted, a folder named **train-job-01** is created in the **test-modelarts2** bucket. In this folder, three sub-folders (**output**, **log**, and **code**) are created to store the outputted model, logs, and training code, respectively. Sub-folders will be created in the **output** folder based on your training job version. The following is an example of the folder structure:

```
test-modelarts2
  |---train-job-01
      |---output
      |---log
      |---code
```

Viewing Training Logs in Toolkit

In PyCharm, click **ModelArts Training Log** in the lower right corner of the page. The training logs are displayed.

Figure 6-13 Viewing Training Logs



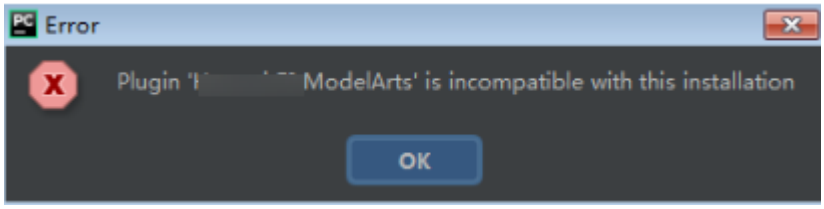
6.4 FAQs

6.4.1 What Should I Do If an Error Occurs During ToolKit Installation?

Issue

The following error message is displayed during ToolKit installation.

Figure 6-14 Error



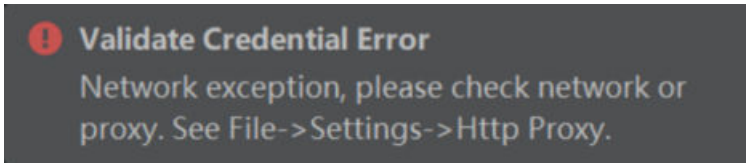
Solution

This issue occurs because the plug-in version is inconsistent with the PyCharm version. You need to obtain the plug-in of the same version as the PyCharm version, that is, version 2019.2 or later.

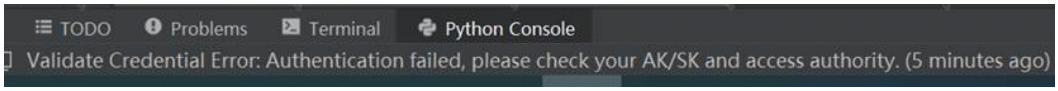
6.4.2 An Error Occurs When You Edit a Credential in PyCharm Toolkit

Symptom

When you edit a credential in PyCharm Toolkit, the message "Validate Credential error" is displayed.



Or



Possible Causes

- Possible cause 1: Information such as the region is incorrectly configured.
- Possible cause 2: The **hosts** file is not configured or is incorrectly configured.
- Possible cause 3: The network proxy settings are incorrect.
- Possible cause 4: The AK/SK is incorrect.
- Possible cause 5: The computer time is incorrectly set.

Solution

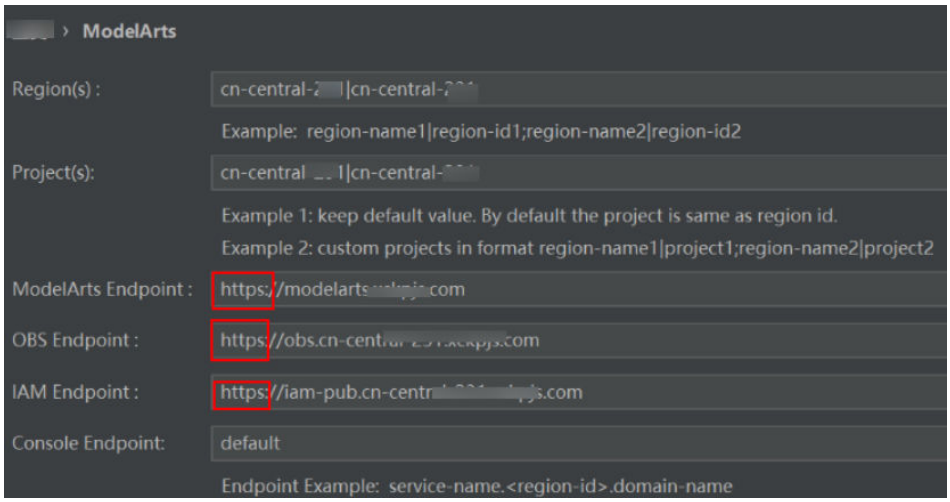
1. Information such as the region is incorrectly configured.

Configure the correct information. For details, see **Configuring Toolkit Using a YAML File**.

For example, if the endpoint is incorrect, the authentication fails.

Incorrect example: The endpoint is preceded by **https**.

Figure 6-15 Configuring PyCharm Toolkit



2. The hosts file is not configured or is incorrectly configured.

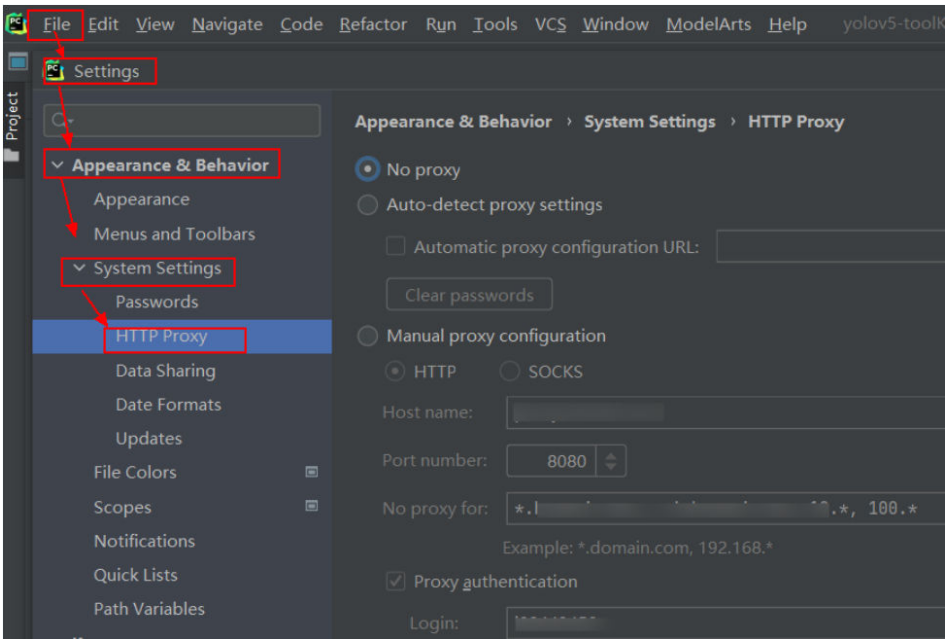
Configure the domain names and IP addresses in the **hosts** file on the local PC. For details, see **Setting Domain Names and IP Addresses**.

Network proxy settings are incorrect.

If the network requires proxy settings, check whether the proxy settings are correct. You can also use the mobile hotspot to test.

Check whether the proxy settings are correct.

Figure 6-16 PyCharm network proxy settings



4. The AK/SK is incorrect.

The obtained AK/SK is incorrect. Obtain the correct AK/SK and try again. For details, see **Creating Access Keys (AK and SK)**.

If you use a RightCloud account, contact the technical support of the region to obtain the AK/SK.

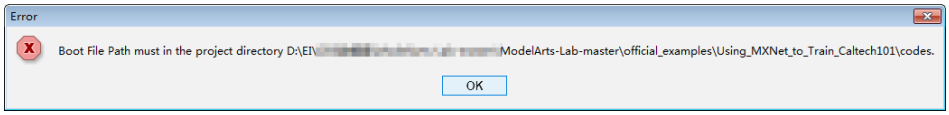
5. The computer time is incorrectly set.

Set the computer time to the correct time.

6.4.3 Why Cannot I Start Training?

If code that does not belong to the used project is selected in a boot script, training cannot be started. The following figure shows error information. You are advised to add the boot script to the project or open the project where the boot script is located, and then start the training job.

Figure 6-17 Error



6.4.4 What Should I Do If Error "xxx isn't existed in train_version" Occurs When a Training Job Is Submitted

Symptom

Error "xxx isn't existed in train_version" occurs when a training job is submitted. See the following figure.

Figure 6-18 Error "xxx isn't existed in train_version"

Possible Causes

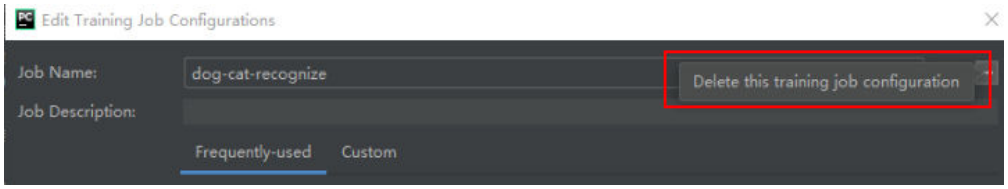
The preceding error occurs because the user logs in to the ModelArts management console and deletes the training job after submitting the training job using PyCharm ToolKit.

PyCharm Toolkit records the training job IDs of ModelArts on the cloud. If you manually delete the job on the ModelArts management console, a message is displayed indicating that the job with the ID cannot be found when you submit the job locally.

Solution

If you have deleted a job on the ModelArts management console, you also need to delete the local configuration from ToolKit. To delete the local configuration, click **Edit Training Configuration**, find the job name, click the minus sign in the upper right corner, and confirm the deletion.

Figure 6-19 Deleting the local configuration



In the displayed confirmation dialog box, confirm the information and click **Yes** to delete the configuration. After the deletion, you can create a training job configuration and submit the training job.

6.4.5 What Should I Do If an Error Occurs When I Submit a Training Job

When a training job is running, the "Invalid OBS path" error is reported.

Figure 6-20 "Invalid OBS path" error

To locate the fault, perform the following operations:

- If you are using ModelArts for the first time, log in to the ModelArts management console and complete access authorization configuration. The agency authorization mode is recommended. After the global configuration is complete, submit the job again.
- Check whether the configured **Data Path in OBS** exists and whether data files exist in the directory. If the directory does not exist, create a directory on OBS and upload the training data to the directory.

6.4.6 What Should I Do If an Error Occurs During Service Deployment

Before deploying a model as a service, you need to compile the configuration file and inference code based on the trained model.

If the **confi.json** configuration file or the **customize_service.py** inference code is missing in the model storage path, an error is displayed, as shown in the following figure.

Solutions:

Write the configuration file and inference code, and save them to the OBS directory where the model to be deployed resides. For details, see **Introduction to Model Package Specifications**.

Figure 6-21 Error

6.4.7 How Do I View Error Logs of PyCharm ToolKit?

The error logs of PyCharm ToolKit are recorded in the **idea.log** file of PyCharm. For example, in the Windows operating system, the path of the **idea.log** file is **C:\Users\xxx\.IdeaIC2019.2\system\log\idea.log**.

Search for **modelarts** in the log file to view all logs related to PyCharm ToolKit.

7 Uploading and Downloading Data in Notebook

7.1 Uploading Files to JupyterLab

7.1.1 Scenarios

Easy and fast file uploading is a common requirement in AI development.

Before the optimization, ModelArts only allowed local files not exceeding 100 MB to be directly uploaded to a notebook instance. However, the files to be uploaded are not all stored locally, which may be from an open-source repository of GitHub, an open-source dataset (**https://nodejs.org/dist/v12.4.0/node-v12.4.0-linux-x64.tar.xz**), or OBS. Additionally, ModelArts did not show the file uploading progress or speed.

ModelArts has been optimized for better file uploading experience. It not only provides more file upload functions, but also displays more file upload details.

Optimized file uploading:

- Supports local files.
- Supports cloning files from open-source repositories in GitHub.
- Supports OBS files.
- Supports remote files.
- Supports visualized upload progress.

7.1.2 Uploading Files from a Local Path to JupyterLab

7.1.2.1 Upload Scenarios and Entries

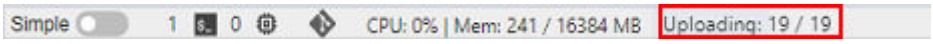
JupyterLab provides multiple methods for uploading files.

Methods for Uploading a File

- For a file that does not exceed 100 MB, directly upload it, and details such as the file size, upload progress, and upload speed are displayed.
- For a file that exceeds 100 MB but does not exceed 5 GB, upload the file to OBS (an object bucket or a parallel file system), and then download the file from OBS to a notebook instance. After the download is complete, the file is deleted from OBS.
- For a file that exceeds 5 GB, upload it by calling ModelArts SDK or MoXing.
- For a file that shares the same name with an existing file in the current directory of a notebook instance, overwrite the existing file or cancel the upload.
- A maximum of 10 files can be uploaded at a time. The other files are in awaiting upload state. No folders can be uploaded. If a folder is required, compress it into a package, upload the package to notebook, and decompress the package in Terminal.

  ```
  unzip xxx.zip # Directly decompress the package in the path where the package is stored.
  ```

  For more details, search for the decompression command in mainstream search engines.
- When multiple files are uploaded in a batch, the total number of files to be uploaded and the number of files that have been uploaded are displayed at the bottom of the JupyterLab window.

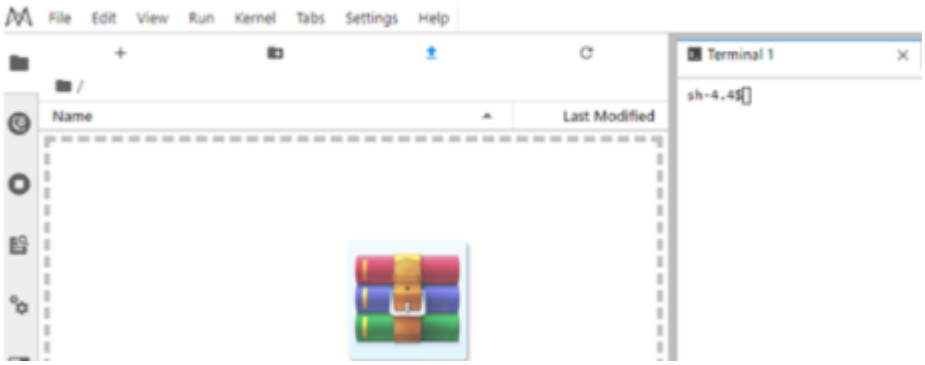
  

Prerequisites

You have used JupyterLab to open a running notebook environment.

Upload Entry 1: Dragging a File to the File Browser Window

Drag the file to the blank area on the left of the JupyterLab window and upload it.



Upload Entry 2: Clicking the File Upload Icon and Uploading a File

Click in the navigation bar on the top of the window. In the displayed dialog box, drag or select a local file and upload it.

Figure 7-1 File upload icon

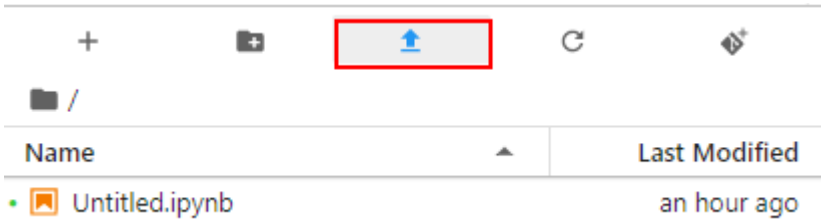
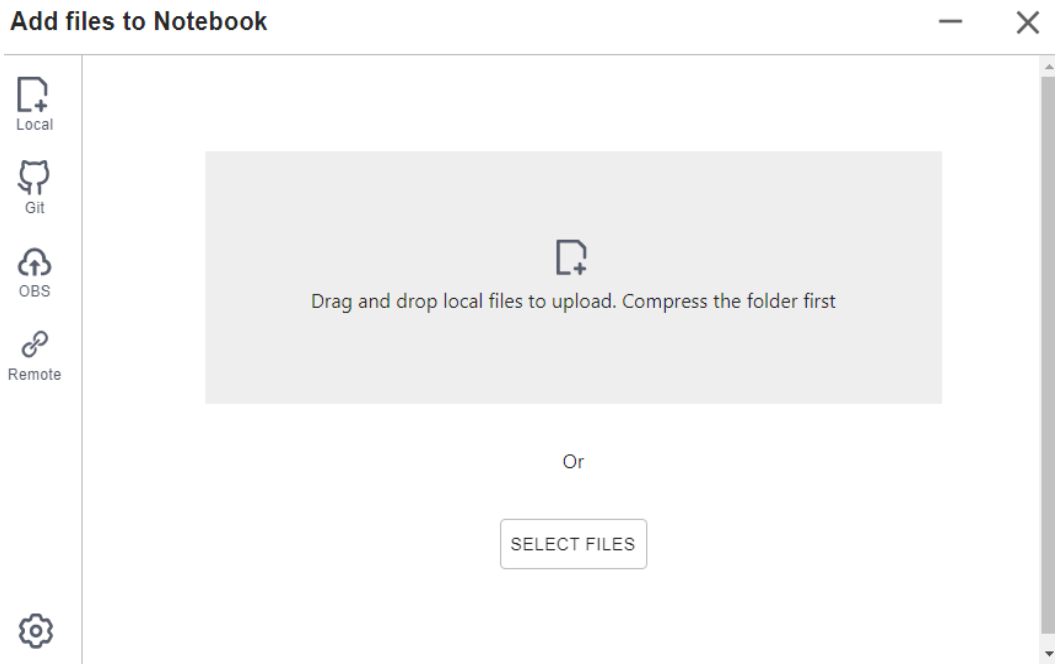


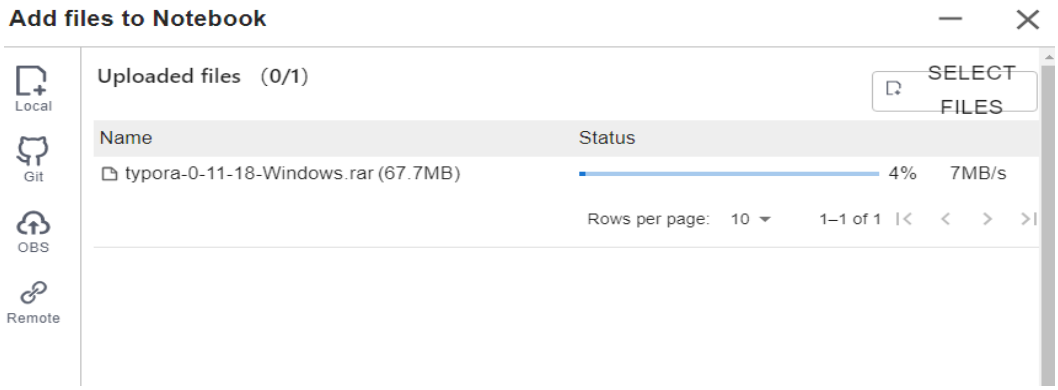
Figure 7-2 File upload page



7.1.2.2 Uploading a Local File Less Than 100 MB to JupyterLab

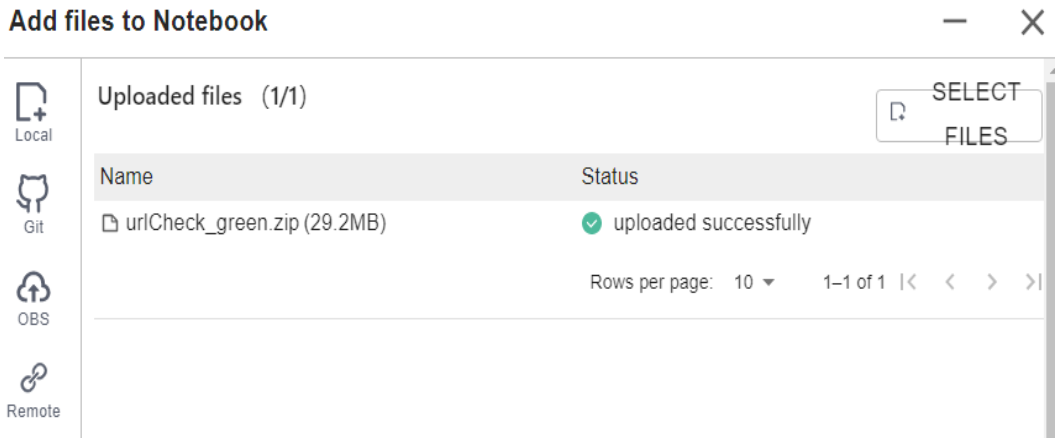
For a file not exceeding 100 MB, directly upload it to the target notebook instance. Detailed information, such as the file size, upload progress, and upload speed are displayed.

Figure 7-3 Uploading a file less than 100 MB



A message is displayed after the file is uploaded.

Figure 7-4 Uploaded

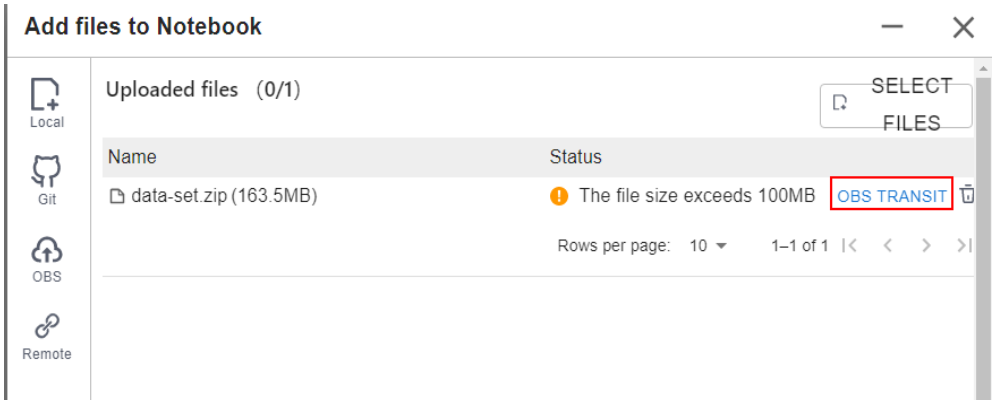


7.1.2.3 Uploading a Local File with a Size Ranging from 100 MB to 5 GB to JupyterLab

For a file that exceeds 100 MB but does not exceed 5 GB, upload the file to OBS (an object bucket or a parallel file system), and then download the file from OBS to the target notebook instance. After the download is complete, the file is automatically deleted from OBS.

For example, in the scenario shown in the following figure, upload the file through OBS.

Figure 7-5 Uploading a large file through OBS



To upload a large file through OBS, set an OBS path.

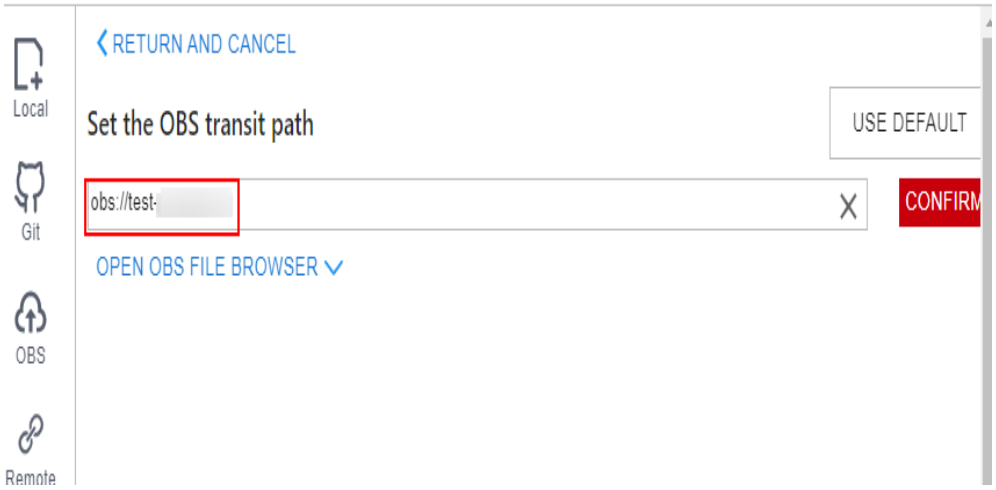
Figure 7-6 Uploading a file through OBS

NOTE

Set an OBS path for uploading local files to JupyterLab. After the setting, this path is used by default in follow-up operations. To change the path, click in the lower left corner of the file upload window.

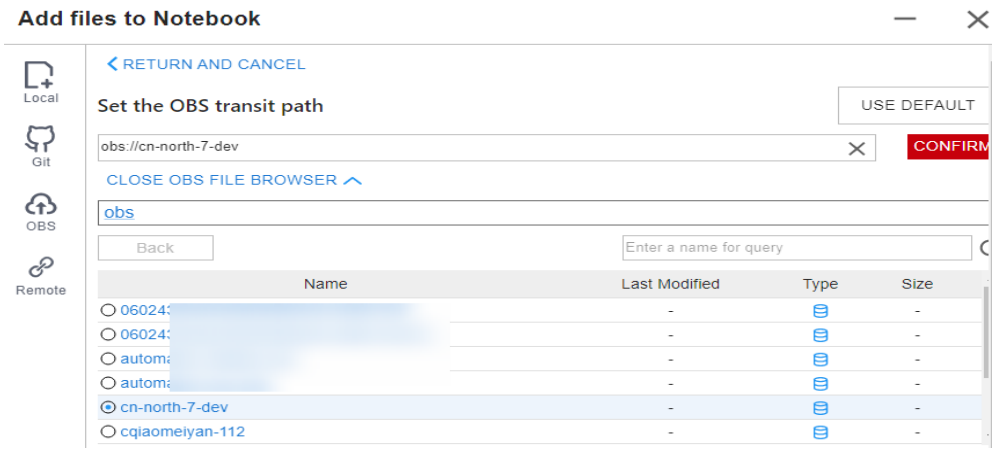
- Method 1: Enter a valid OBS path in the text box and click **OK**.

  Figure 7-7 Configuring an OBS path

- Method 2: Select an OBS path in **OBS File Browser** and click **OK**.

Figure 7-8 OBS File Browser



- Method 3: Use the default path.

Figure 7-9 Using the default path to upload a file

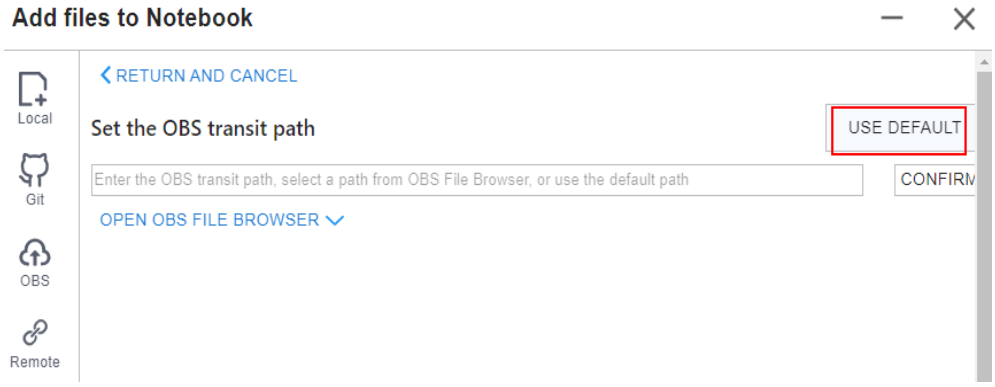
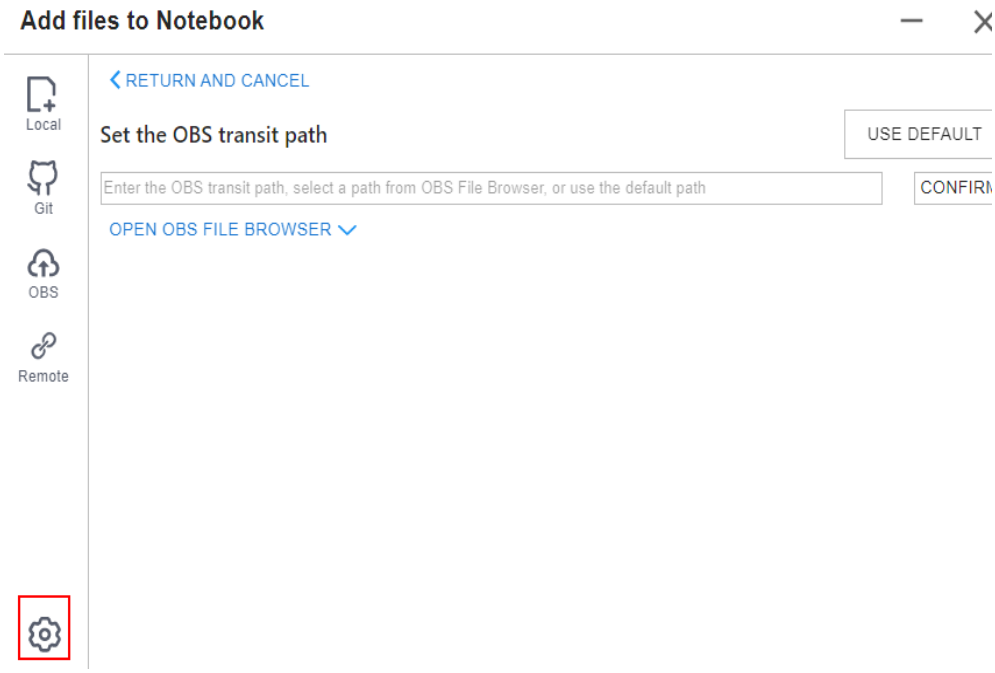
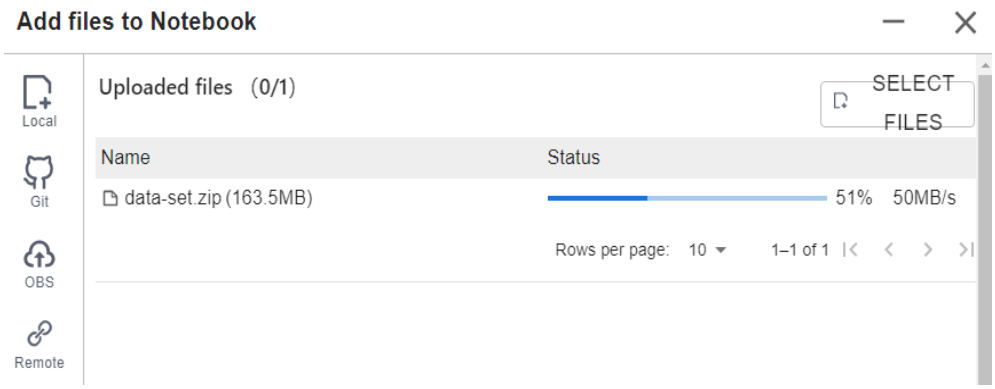


Figure 7-10 Setting an OBS path for uploading a local file



After the OBS path is set, upload a file.

Figure 7-11 Uploading a file



Decompressing a package

After a large file is uploaded to Notebook JupyterLab as a compressed package, you can decompress the package in Terminal.

```
unzip xxx.zip  # Directly decompress the package in the path where the package is stored.
```

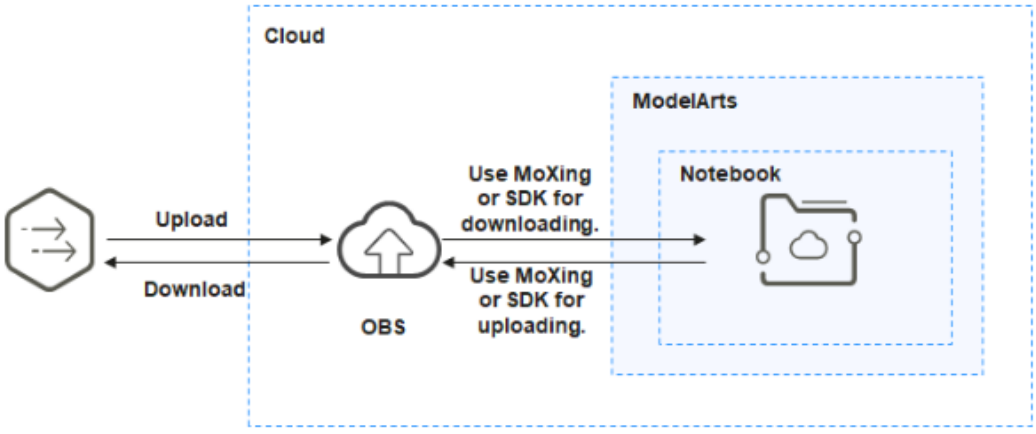
For more details, search for the decompression command in mainstream search engines.

7.1.2.4 Uploading a Local File Larger Than 5 GB to JupyterLab

A file exceeding 5 GB cannot be directly uploaded to JupyterLab.

To upload files exceeding 5 GB, upload them to OBS. Then, call the ModelArts MoXing or SDK API in the target notebook instance to read and write the files in OBS.

Figure 7-12 Uploading and downloading large files in a notebook instance



The procedure is as follows:

1. Upload the file from a local path to OBS.

2. Download the file from OBS to the notebook instance by calling the ModelArts SDK or MoXing API.
   - Method 1: Call the ModelArts SDK to download a file from OBS.

     Example code:

     ```
     from modelarts.session import Session
     session = Session()
     session.obs.copy("obs://bucket-name/obs_file.txt","/home/ma-user/work/")
     ```

   - Method 2: Call the ModelArts MoXing API for reading an OBS file.

     ```
     import moxing as mox

     # Download the OBS folder sub_dir_0 from OBS to a notebook instance.
     mox.file.copy_parallel('obs://bucket_name/sub_dir_0', '/home/ma-user/work/sub_dir_0')
     # Download the OBS file obs_file.txt from OBS to a notebook instance.
     mox.file.copy('obs://bucket_name/obs_file.txt', '/home/ma-user/work/obs_file.txt')
     ```

     If a .zip file is downloaded, run the following command on the terminal to decompress the package:

     ```
     unzip xxx.zip  # Directly decompress the package in the path where the package is stored.
     ```

     After the code is executed, open the terminal shown in **Figure 2** and run the **ls /home/ma-user/work** command to view the file downloaded to the notebook instance. Alternatively, view the downloaded file in the left navigation pane of Jupyter. If the file is not displayed, refresh the page.

Figure 7-13 Opening the terminal

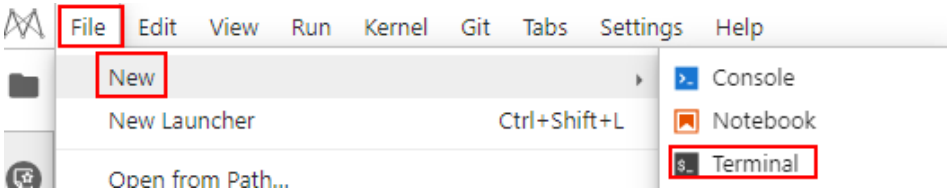
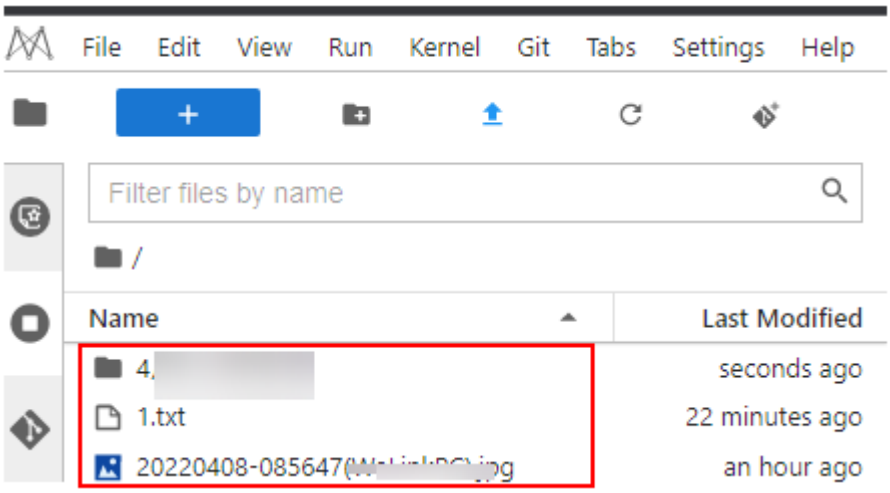


Figure 7-14 File downloaded to a notebook instance



Error Handling

If you download a file from OBS to your notebook instance and the system displays error message "Permission denied", perform the following operations for troubleshooting:

- Ensure that the target OBS bucket and notebook instance are in the same region. If the OBS bucket and notebook instance are in different regions, the access to OBS is denied.
- Ensure that the notebook account has the permission to read data in the OBS bucket.

7.1.3 Cloning an Open-Source Repository in GitHub

Files can be cloned from a GitHub open-source repository to JupyterLab.

1. Use JupyterLab to open a running notebook instance.
2. Click in the navigation bar on the top of the JupyterLab window. In the displayed dialog box, click Git on the left to go to the page for cloning files from a GitHub open-source repository.

Figure 7-15 File upload icon

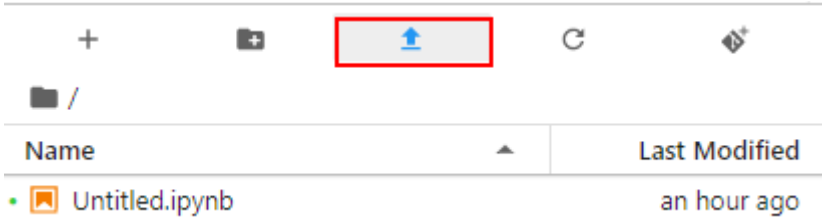
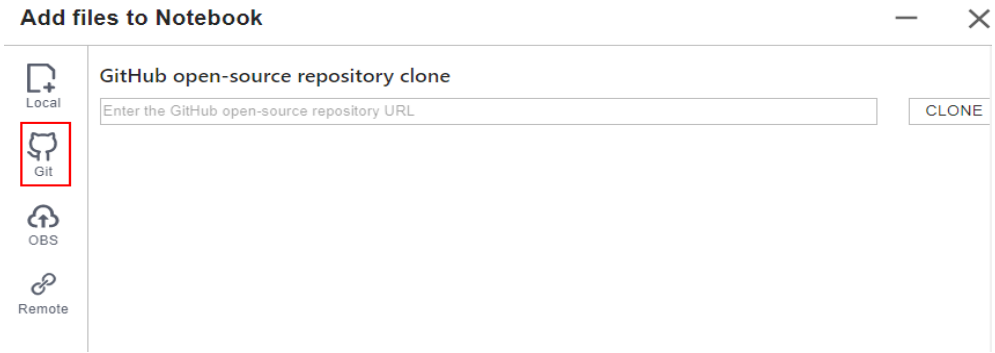


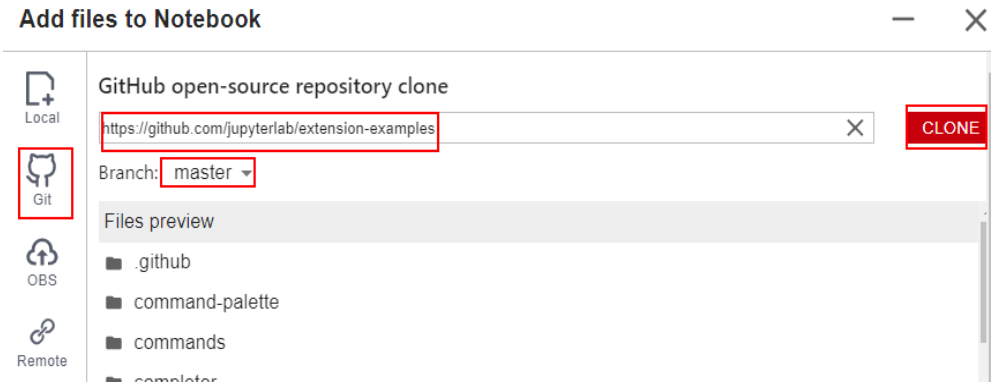
Figure 7-16 Page for cloning files from a GitHub open-source repository



3. Enter a valid address of a GitHub open-source repository, select files from the displayed files and folders, and click **Clone**.

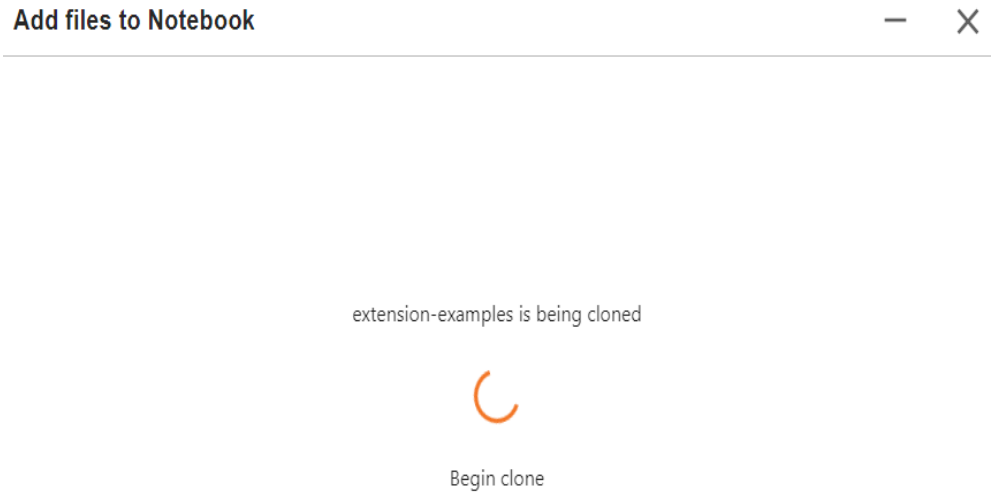
   GitHub open-source repository address: https://github.com/jupyterlab/extension-examples

Figure 7-17 Entering a valid address of a GitHub open-source repository



4. View the clone process.

Figure 7-18 Process of cloning a repository



5. Complete the clone.

Error Handling

- Failing to clone the repository may be caused by network issues. In this case, run the **git clone https://github.com/jupyterlab/extension-examples.git** command on the **terminal** page to test the network connectivity.
- If the repository already exists in the current directory of the notebook instance, the system displays a message indicating that the repository name already exists. In this case, you can overwrite the existing repository or click to cancel the cloning.

7.1.4 Uploading OBS Files to JupyterLab

In JupyterLab, you can download files from OBS to a notebook instance.

1. Use JupyterLab to open a running notebook instance.
2. Click in the navigation bar on the top of the JupyterLab window. In the displayed window, click on the left to go to the OBS file upload page.

Figure 7-19 File upload icon

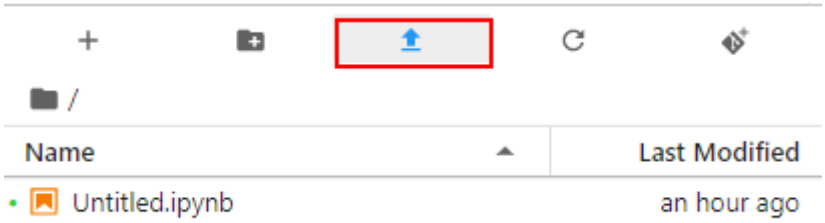
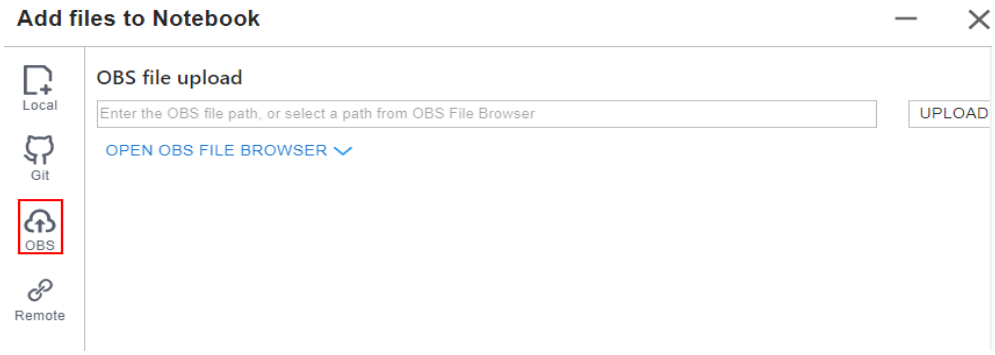
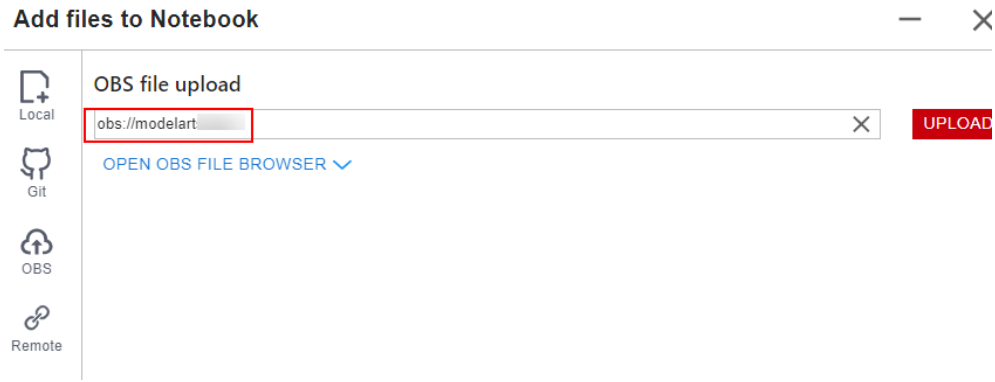


Figure 7-20 OBS file upload



3. Set an OBS file path in either of the following ways:
   - Method 1: Enter a valid OBS file path in the text box and click **Upload**.

Figure 7-21 Entering a valid OBS file path

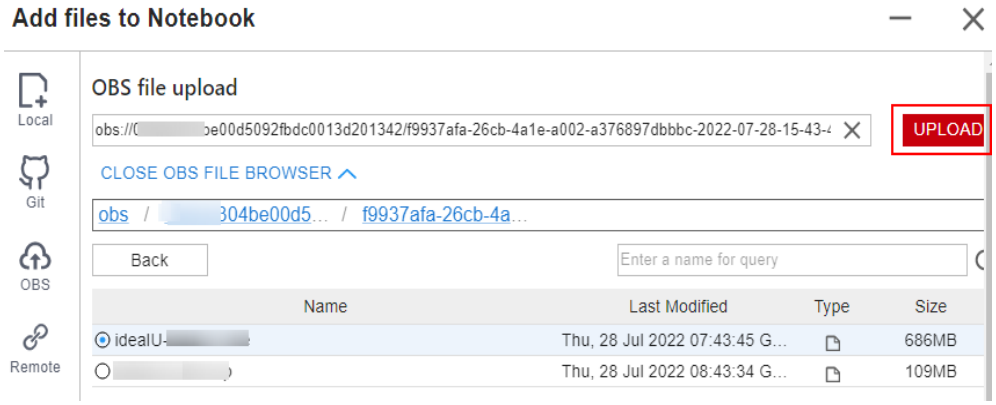


NOTE

Enter an OBS file path instead of a folder path. Otherwise, the upload fails.

- Method 2: Open **OBS File Browser**, select an OBS file path, and click **Upload**.

Figure 7-22 Uploading an OBS File



Error Handling

Files may not be uploaded successfully.

Possible causes:

- The OBS path is set to a folder instead of a file path.
- The file in OBS is encrypted. In this case, go to the OBS console and check whether the file is encrypted.
- The OBS bucket and notebook instance are not in the same region. In this case, ensure that the target OBS bucket and notebook instance are in the same region. If the OBS bucket and notebook instance are in different regions, the access to OBS is denied.
- The account does not have the permission to access the OBS bucket. In this case, ensure that the notebook account has the permission to read data in the OBS bucket.

7.1.5 Uploading Remote Files to JupyterLab

Files can be downloaded through remote file addresses to JupyterLab.

Method: Enter the URL of a remote file in the text box of a browser, and the file is directly downloaded.

1. Use JupyterLab to open a running notebook instance.
2. Click in the navigation bar on the top of the JupyterLab window. In the displayed window, click on the left to go to the remote file upload page.

Figure 7-23 File upload icon

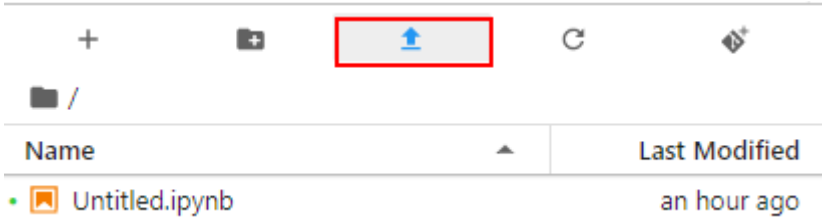
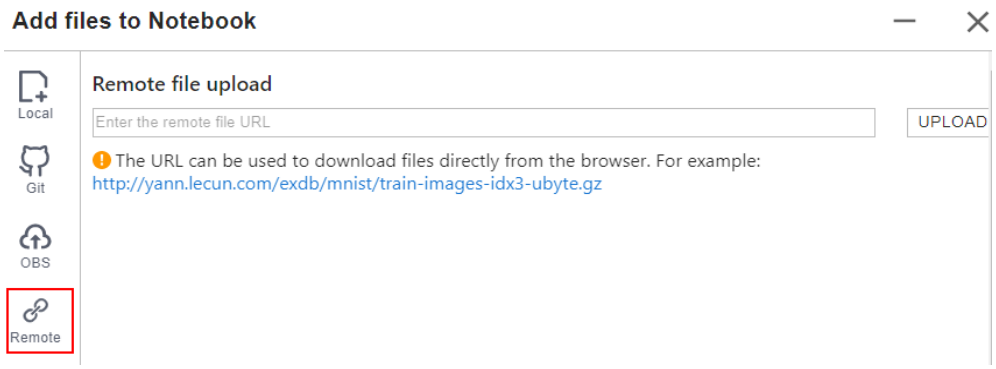
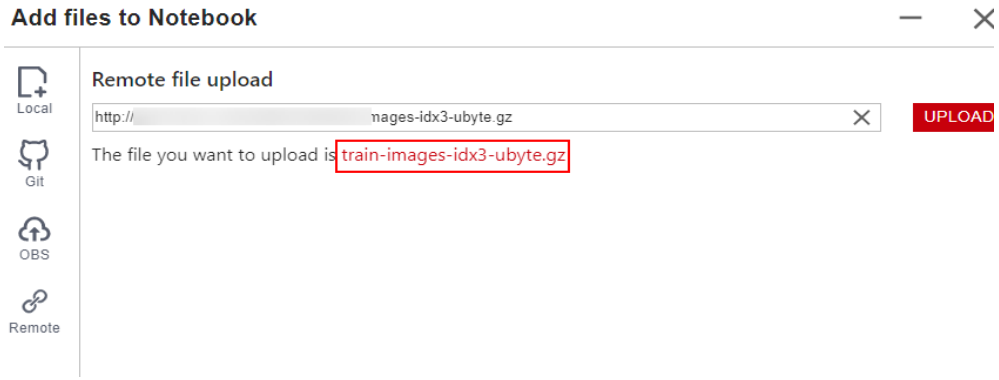


Figure 7-24 Remote file upload page



3. Enter a valid remote file URL, and the system automatically identifies the file name. Then, click **Upload**.

Figure 7-25 Entering a valid remote file URL



Error Handling

Failing to upload the remote file may be caused by network issues. In this case, enter the URL of the remote file in the text box of a browser to check whether the file can be downloaded.

7.2 Downloading a File from JupyterLab to a Local Path

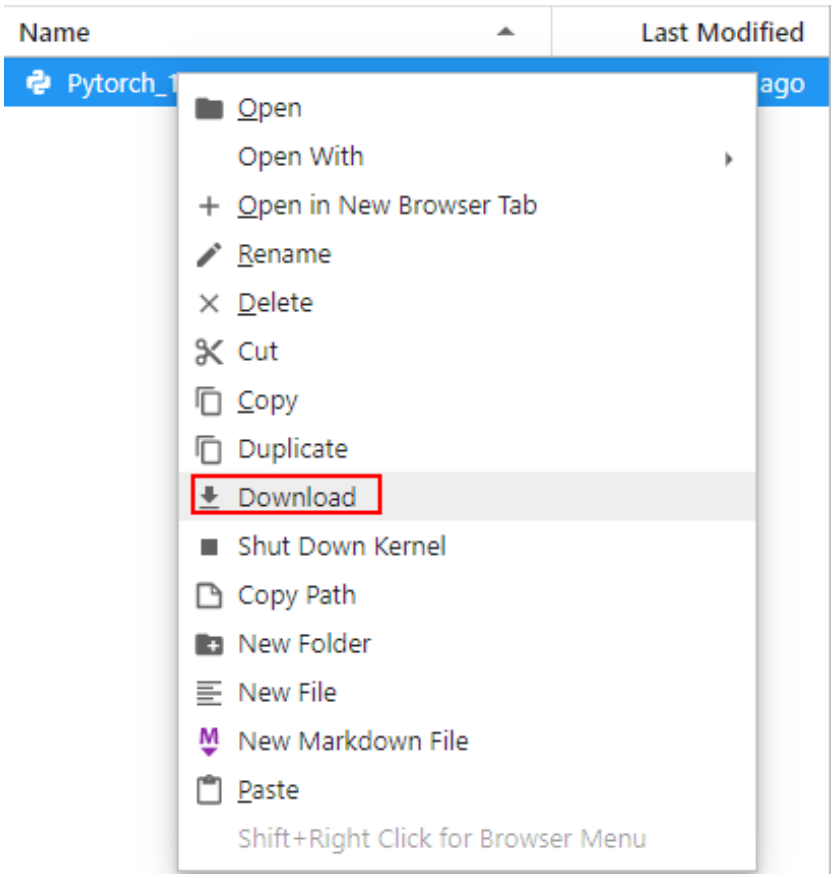
Files created in JupyterLab can be downloaded to a local path. The operations for downloading a file are the same, regardless of whether the created notebook instance uses the default or EVS storage.

- If a file is less than or equal to 100 MB, directly download it from JupyterLab. For details, see **Downloading a File Less Than or Equal to 100 MB**.
- If a file is larger than 100 MB, use OBS to transfer it to your local path. For details, see **Downloading a File Larger Than 100 MB**.

Downloading a File Less Than or Equal to 100 MB

In the JupyterLab file list, right-click the file to be downloaded and choose **Download** from the shortcut menu. The file is downloaded to your browser's downloads folder.

Figure 7-26 Downloading a file



Downloading a File Larger Than 100 MB

Use OBS to transfer the file from the target notebook instance to the local path. To do so, perform the following operations:

1. In the notebook instance, create an IPYNB file larger than 100 MB and use MoXing to upload it to OBS. Example code is as follows:

   ```
   import moxing as mox
   mox.file.copy('/home/ma-user/work/obs_file.txt', 'obs://bucket_name/obs_file.txt')
   ```

   /home/ma-user/work/obs_file.txt is the path to the file stored in the notebook instance. **obs://bucket_name/obs_file.txt** is the path of the file uploaded to OBS, where **bucket_name** is the name of the bucket created in OBS, and **obs_file.txt** is the uploaded file.

2. Use OBS or ModelArts SDK to download the file from OBS to the local path.
   - Method 1: Use OBS to download the file.
   - Download **obs_file.txt** from OBS to the local path. If a large amount of data is to be downloaded, use OBS Browser+ to download.

- Method 2: Use ModelArts SDK to download the file.
  i. Download and install the SDK locally.
  ii. Authenticate sessions.
  iii. Download the file from OBS to the local path. Example code is as follows:

```
from modelarts.session import Session
session=Session(access_key='***',secret_key='***',project_id='***',region_name='***')
session.download_data(bucket_path="/bucket_name/obs_file.txt",path="/home/user/
obs_file.txt")
```

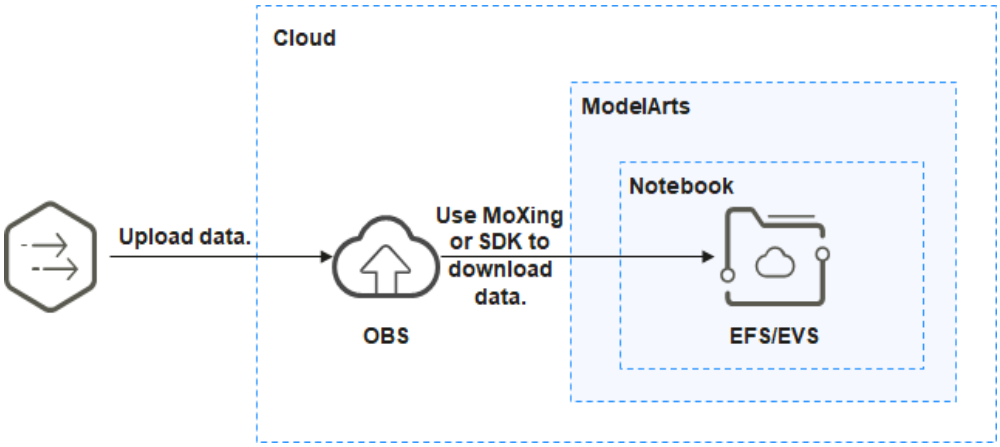
7.3 Uploading Data from a Local IDE to a Notebook Instance

If the data is less than or equal to 500 MB, directly copy the data to the local IDE.

If the data is larger than 500 MB, upload the code to OBS and then to the EVS disk associated with the target notebook instance.

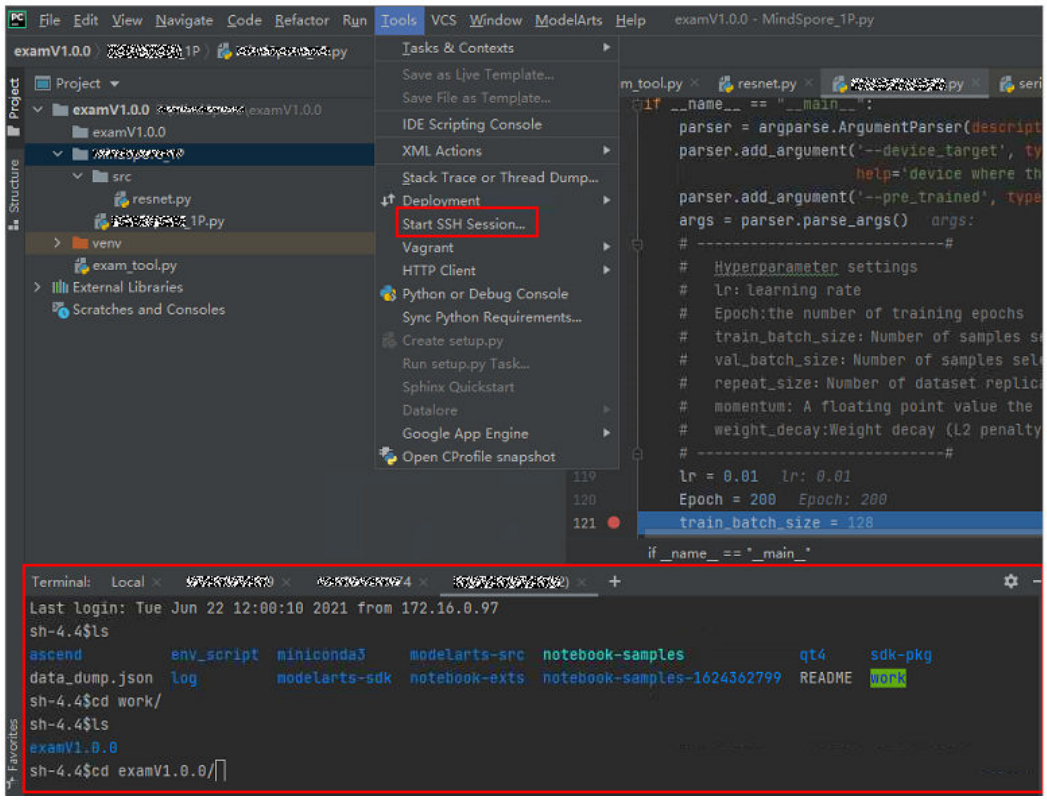
1. Upload data to OBS.
2. Call the **mox.file.copy_parallel** MoXing API provided by ModelArts in the terminal of the local IDE to transfer data from OBS to EVS of the notebook instance.

Figure 7-27 Uploading data to a notebook Instance through OBS



The following shows how to enable terminal in PyCharm.

Figure 7-28 Enabling the terminal in PyCharm



The following shows how to use MoXing in the terminal of the local IDE to download files from OBS to a development environment:

```
# Manually access the development environment.
cat /home/ma-user/README
# Select the source environment.
source /home/ma-user/miniconda3/bin/activate MindSpore-python3.7-aarch64
# Use MoXing for access.
import moxing as mox
# Download a folder from OBS to EVS.
mox.file.copy_parallel('obs://bucket_name/sub_dir_0', '/tmp/sub_dir_0')
```

7.4 Downloading Files from a Notebook Instance to a Local Directory

Files created in Notebook can be downloaded to a local path. The operations for downloading a file are the same, regardless of whether the created notebook instance uses the default or EVS storage.

Downloading Files from a Notebook Instance to a Local Directory in PyCharm

In the **Project** directory of the local IDE, right-click and choose **Deployment** from the shortcut menu. Click **Download from xxx** (notebook instance name) to download the Notebook2.0 project file to the local PC.

Figure 7-29 Downloading files from a notebook instance to a local directory in PyCharm