Instructions for taking the TensorFlow Developer Certificate Exam

Questions? Email *tensorflow-certificate-support@google.com*

Last Updated: December 14, 2020

Confidential

Please do not share this document. Do not discuss anything mentioned in this document with anyone. Do not discuss the plugin with anyone.

Thank you for helping maintain the integrity of the TensorFlow Developer Certificate exam.

Contents

Read these instructions carefully before you start the TensorFlow Developer Certificate exam. We recommend you keep these instructions open in a web browser while taking the exam for easy reference.

Before you begin

These instructions are for people who have purchased the TensorFlow Developer Certificate exam. If you need to purchase the exam, see tensorflow.org/certificate for information.

The TensorFlow certificate exam runs inside PyCharm.

You must use Python **3.8** to ensure accurate grading of your models.

After you start the exam, you have five hours to finish.

Before you begin:

- Make sure you have the knowledge to take the exam
- Understand the refund policy
- Get your environment ready
- Understand the PyCharm restrictions

Make sure you have the knowledge to take the exam

- Check the skills checklist to ensure that you have the necessary knowledge to complete the exam. The checklist is published in the candidate handbook at https://www.tensorflow.org/certificate.

Understand the refund policy

Once you start the exam, we cannot give a refund or retake for ***any reason***.

See the Refund Policy section in Set up your environment to take the TensorFlow Developer Certificate.

Also note that after you purchase the TensorFlow Developer Certificate exam, you must complete the exam within 6 months of the date of purchase. It is your responsibility to take the exam before your exam registration expires. We cannot give refunds for expired exam purchases.

Get your environment ready

- Make sure you have Python 3.8 installed on your computer.
    - **Don't** use Anaconda.
- Check that your system meets the installation requirements for PyCharm here.
- Install the latest stable version of PyCharm 2020.**2** (the exam doesn't yet work in 2020.3):
    - You can use either PyCharm Professional or PyCharm Community Edition.
    - **Don't** use the Anaconda plugin..
- Ensure that you have a stable internet connection before starting the exam.
- Make sure you are familiar with using PyCharm and that it is configured correctly.

IMPORTANT! Your Python environment must be installed from canonical Python packages available at python.org. We cannot be responsible for errors in your submissions due to self-built or non-canonical Python environments.

IMPORTANT!

See the document Set up your environment to take the TensorFlow Developer Certificate for details on making sure that you have Python and PyCharm ready and all set up correctly for the exam.

Understand PyCharm restrictions for the exam

To help ensure that the TensorFlow Developer certificate exam plugin does not experience conflicts, please abide by these restrictions:

Before you start:

- Make sure you have installed the latest version of PyCharm.
- Make sure that PyCharm isn't subject to file loading controls
- Disable other plugins in PyCharm

During the exam:

- Don't open another project in PyCharm
- Don't upgrade the version of PyCharm

Before you start:

Make sure you have installed the latest version of PyCharm.

The plugin for the TensorFlow Developer Certificate exam is only available in the latest version of PyCharm. If you use an older version of PyCharm, you will not be able to find the plugin in the marketplace.

Make sure that PyCharm isn't subject to file-loading controls

The TensorFlow Developer certificate exam plugin needs to load files. Make sure that the software or computer that you plan to use to access PyCharm isn't subject to any controls that could block the loading of files. This advice is relevant, for example, if you plan to use a Windows server administered by your company which might have restrictions on what files can be loaded through the server.

Disable other plugins

Disable third party plugins that you might have in PyCharm. Alternatively, install and use a new instance of PyCharm that does not have third party plugins installed.

While you are taking the exam:

Don't open another project in PyCharm while you take the exam

While taking the TensorFlow Developer certificate exam, don't open another project in PyCharm. You must work only in the project that the exam plugin creates for you.

Don't upgrade the version of PyCharm while you take the exam

While you are taking the exam, do not upgrade the instance of PyCharm that you are using for the exam.

Install the plugin for the exam

After you install PyCharm, you need to install the plugin that contains the exam.

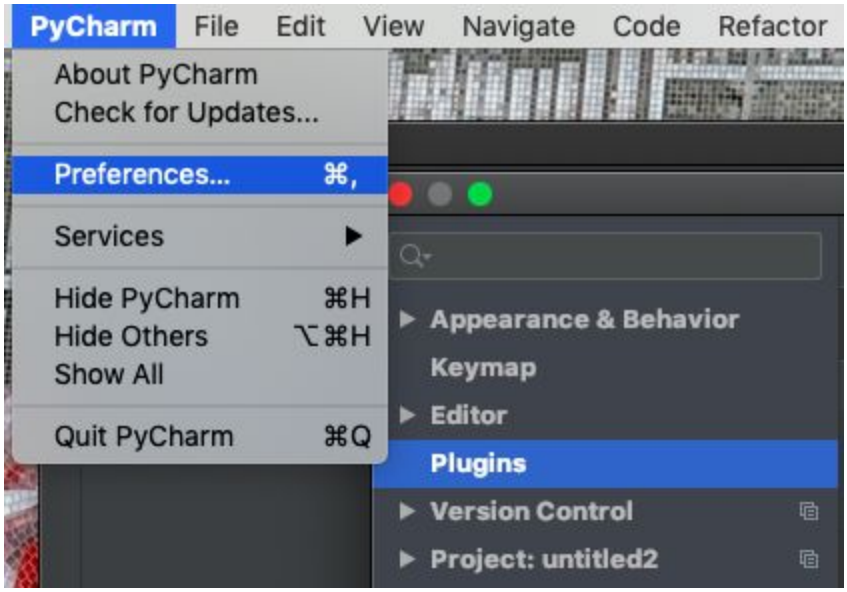
After you install the plugin, you can choose when to start the exam. Installing the plugin doesn't trigger starting the exam.

> **Note**: If you previously took the exam and already have the plugin installed in PyCharm you must uninstall it first. See the section Uninstall the plugin (when retaking the exam) for details.

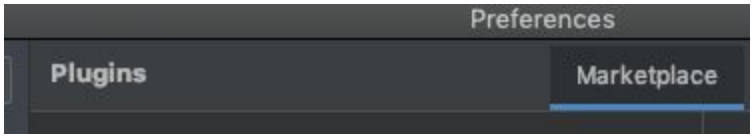
See https://www.jetbrains.com/help/idea/managing-plugins.html for more information on JetBrains plugins in general.

Here are specific instructions for installing the TensorFlow developer certificate exam plugin:

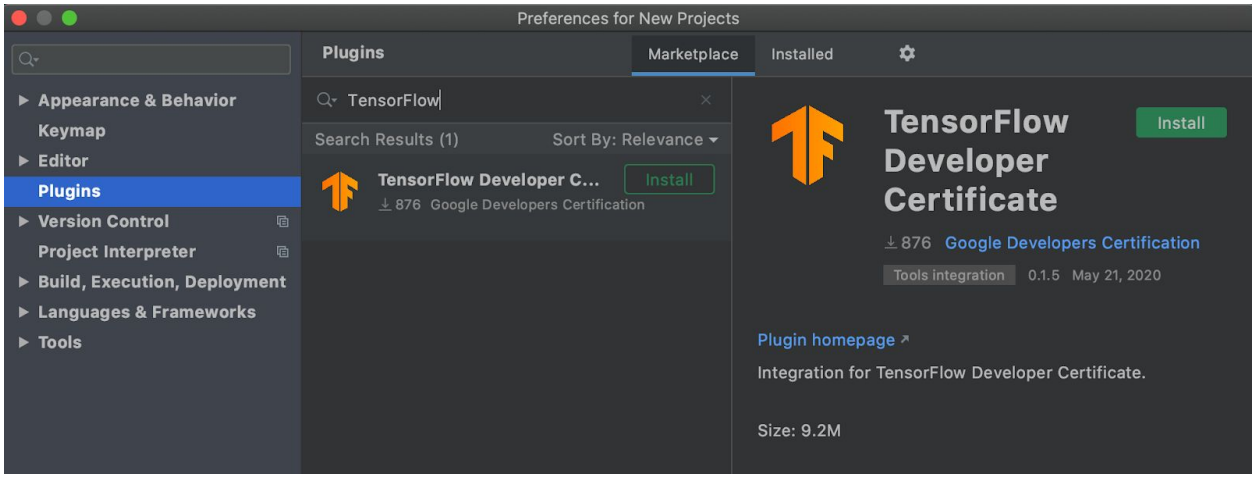
1. Open PyCharm.
2. Go to **PyCharm** > **Preferences** > **Plugins**.



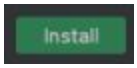
3. Select the **Marketplace** tab.



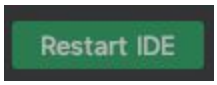
4. Search for TensorFlow Developer Certificate. (This plugin is not available in older versions of PyCharm, you must use the latest stable version of PyCharm.)



5. Click the green install button, on the top right.



6. Then restart the IDE when prompted.



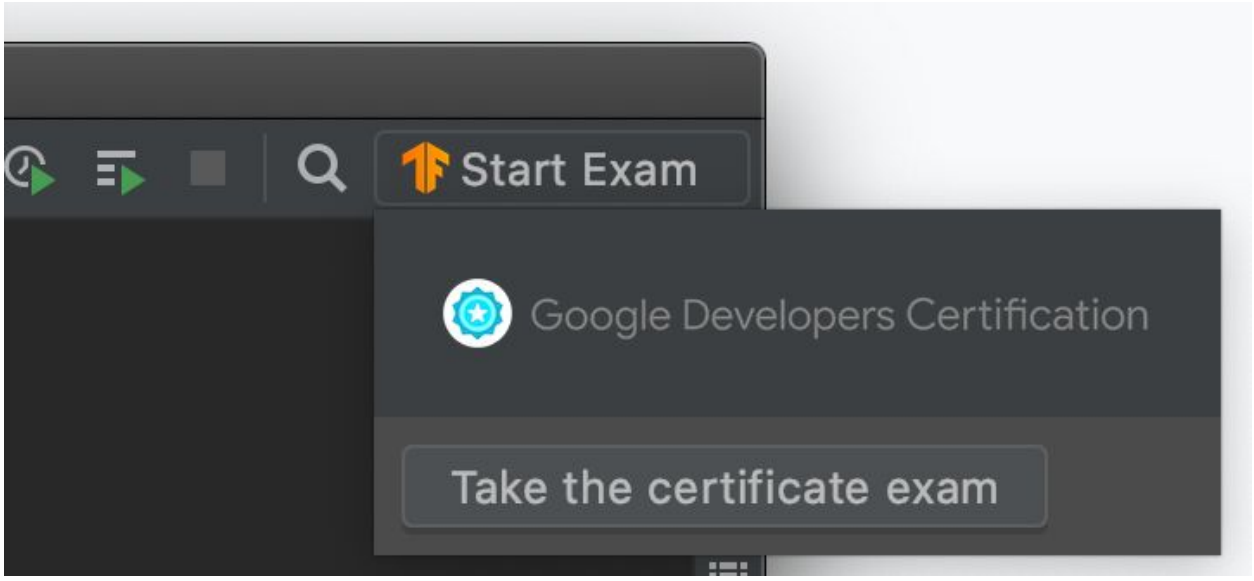
Note: If PyCharm does not prompt you to restart it, go ahead and restart anyway.

Start the Exam

You can start the exam either from the Welcome screen or from the **TF Start exam** option at the top right of the project window (if you have a project open).

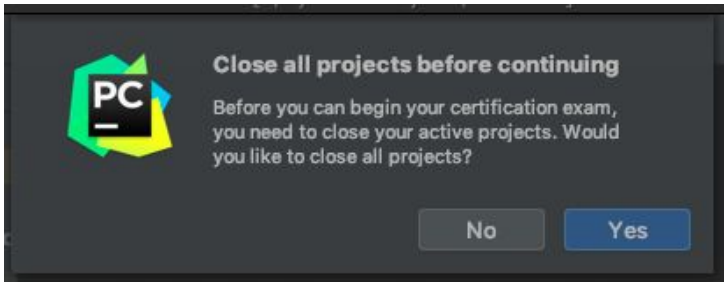
Start the exam if you have a project open

1. Select the **TF Start Exam** option at the top right of the project window:



2. Select **Take the certificate exam**.

3. PyCharm will ask you to agree to closing your project window:



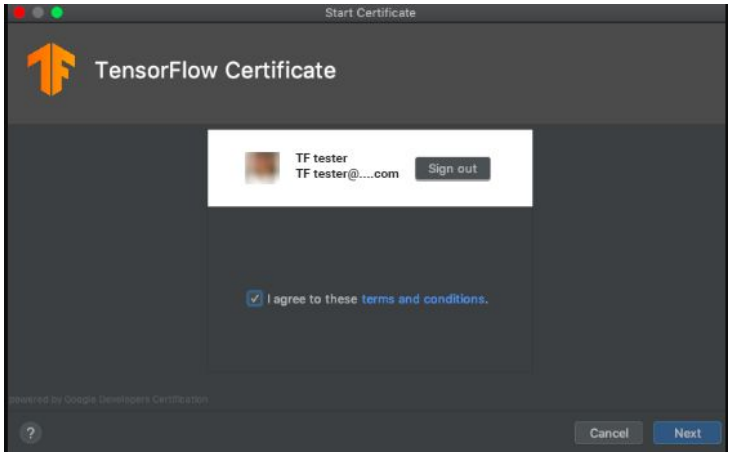
4. To continue, see the instructions below in Start the exam if you don't have a project open.

Start the exam if you don't have a project open

When PyCharm restarts, you will see the Welcome Screen.

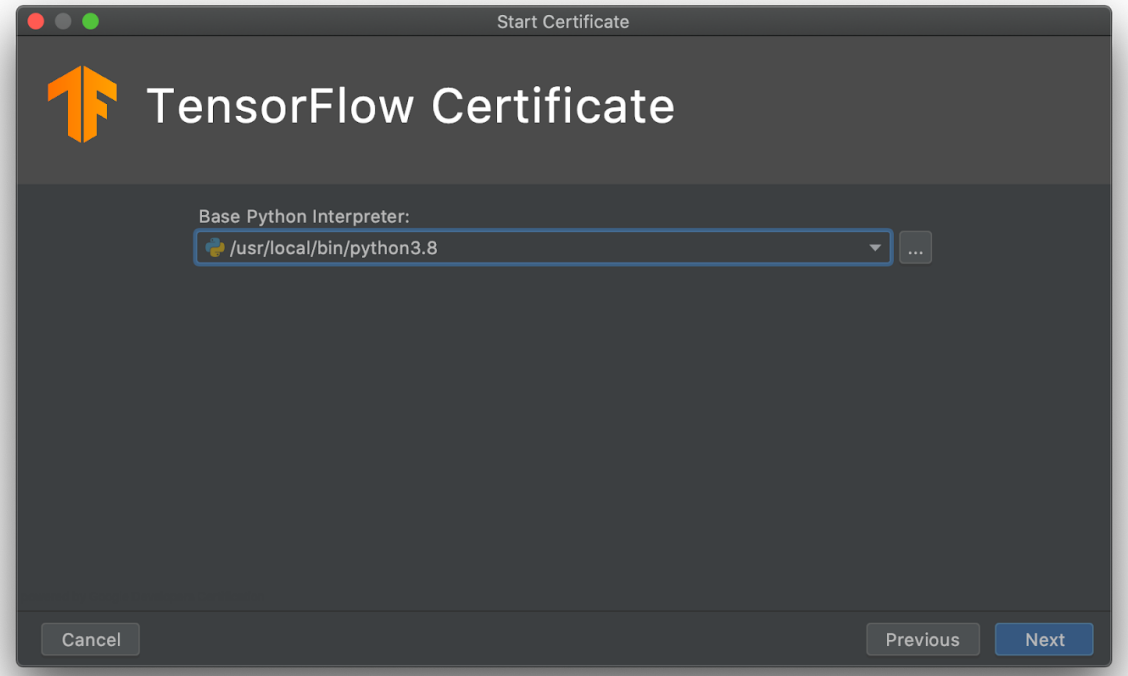
1. Click **Take the certification exam**.

2. Accept the terms and conditions in the next dialog box.



3. You will see a page on your web browser saying that you have successfully signed in. There's nothing for you to do on that page, just go back to PyCharm.

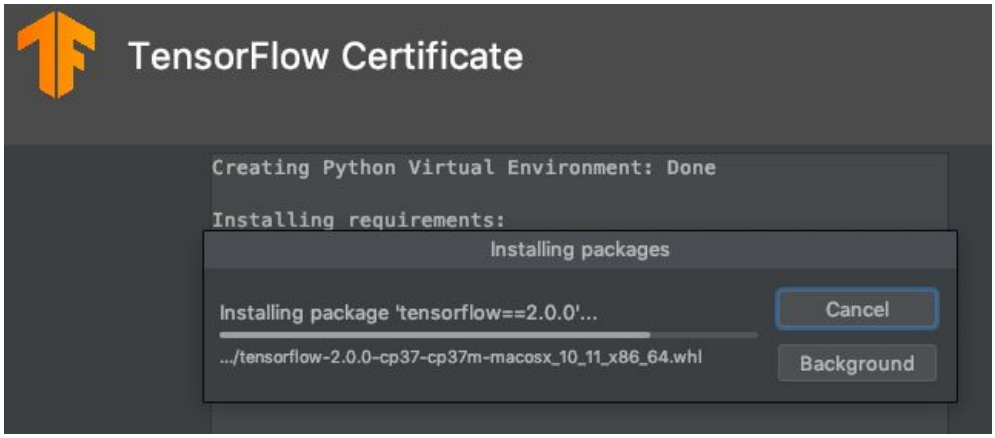
4. Next, a dialog box opens for you to select an interpreter:



5. Choose Python 3.8.

   Note: make sure you have Python **3.8** installed. The grading infrastructure uses Python 3.8. To ensure that your models run on the grading infrastructure, you must compile and train them in Python 3.8.

6. Step through the wizards as the interpreter gets installed. (Be patient.)

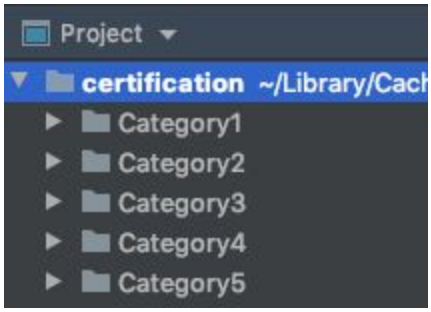


7. When everything is ready, you will see a **Start Exam** button. If you are sure you are ready, start the exam.

   WARNING! After you start the exam you will have five hours to complete it. If you're not ready to start the exam, then don't press the **Start Exam** button.

The exam project opens

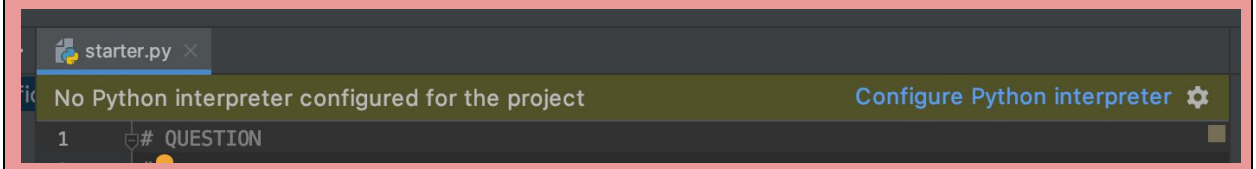
After you install the plugin and choose **Start Exam**, the project containing your exam opens.



You will see five folders, each one contains a starter.py file that contains the starter code for that category of question.

You will need to complete the code in each of the starter.py files.

Note: On some machines there is a bug where the process of setting up the exam environment doesn't set up the Python interpreter correctly and you see a message "No Python interpreter configured for the project":

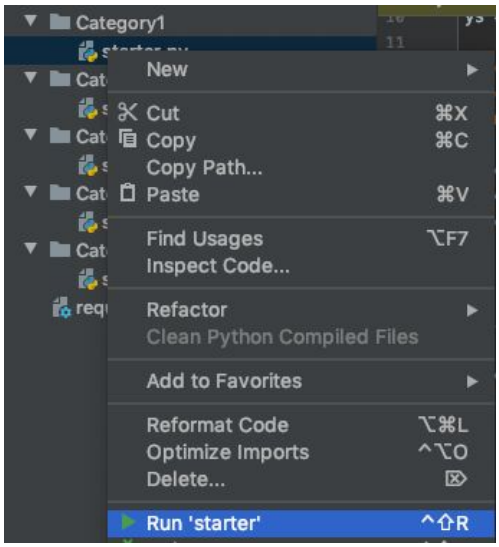


See the section You see 'No Python Interpreter Configured for this Project' when you start the exam in the Troubleshooting section for information on how to fix this.

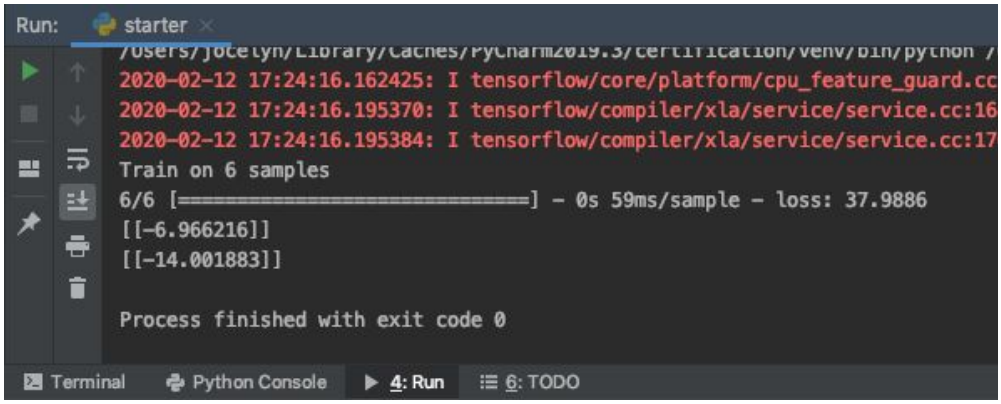
Run your code

You can run your code at any time as follows:

1. Select the file in the project list, right click and choose **Run 'starter.'**



The run window at the bottom of the screen pops open to display any output from your program.



Write the code for the exam

After you install the plugin and choose **Start Exam**, the project containing your exam opens. You will see five folders. Each one contains a starter.py file that contains the starter code for that category of question.

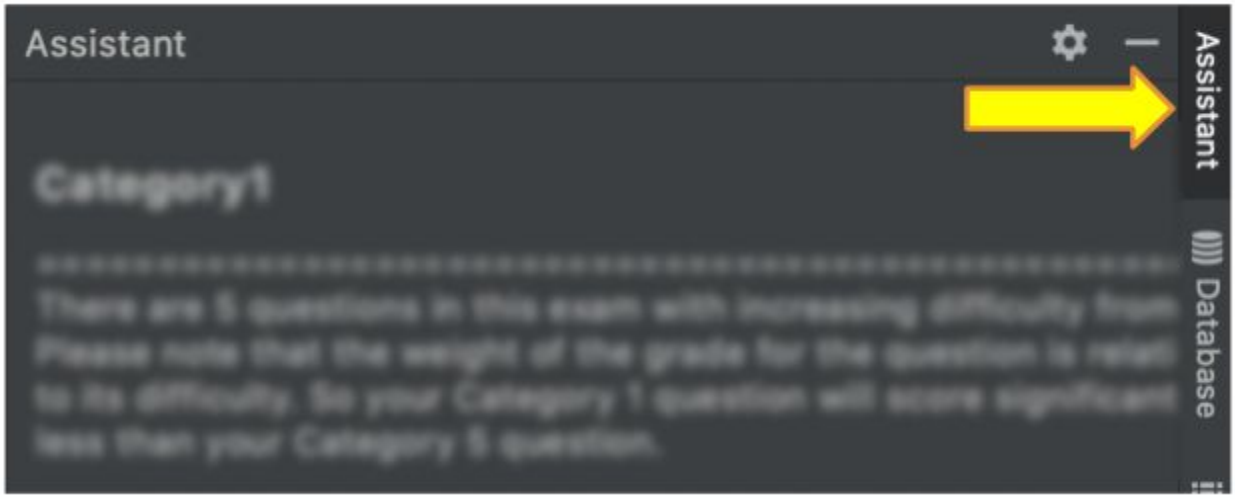
You will need to complete the code in each of the starter.py files.

You need to complete the starter code for all five categories within the allotted time. You can test your models as you go (see details below).

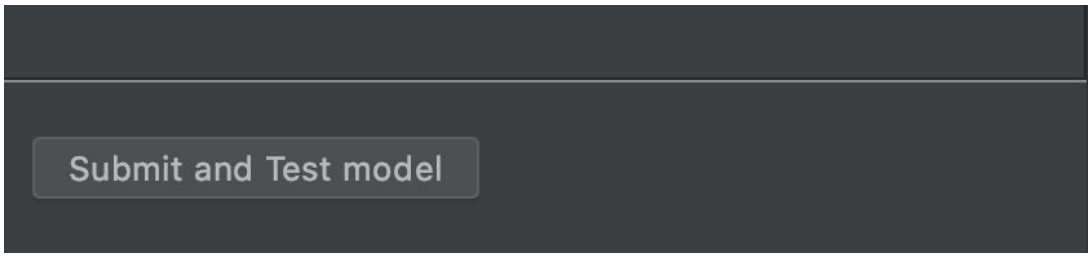
View instructions

Each starter file has instructions explaining what you need to do for that category.

The instructions are displayed in the Assistant panel. To view or hide the instructions, use the vertical **Assistant** tab on the right.



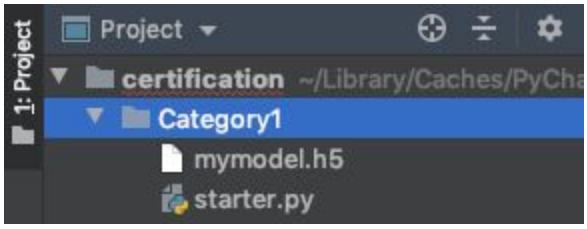
When the Assistant panel is open, the **Submit and Test model** button is displayed at the bottom of the Assistant panel.



Save your model

You will need to make sure each starter file includes the code to save your model as a `.h5` file.

When you save the model, it doesn't matter what the filename is, but it must have the `.h5` extension.



Don't use lambda layers in your model

Don't use lambda layers in your models in any of the categories. None of the models require lambda layers to pass the tests. Lambda layers are not supported on the grading infrastructure.

The saved model must be a reasonable size

It is expected that you will code your model so that it uses a reasonable amount of memory when it is run, and that the file size of the saved model is reasonable for the problem being solved.

Model files that are too large or need too much memory might fail to complete the upload process or, even if they upload successfully, might fail to complete the evaluation process. If you find yourself waiting for a while for a response after pressing the Submit and Test button, it's likely that your file is too large.

We cannot provide exact limits on file size, but if your model has been coded efficiently, it should successfully upload and be evaluated.

Train on validation as well as training data

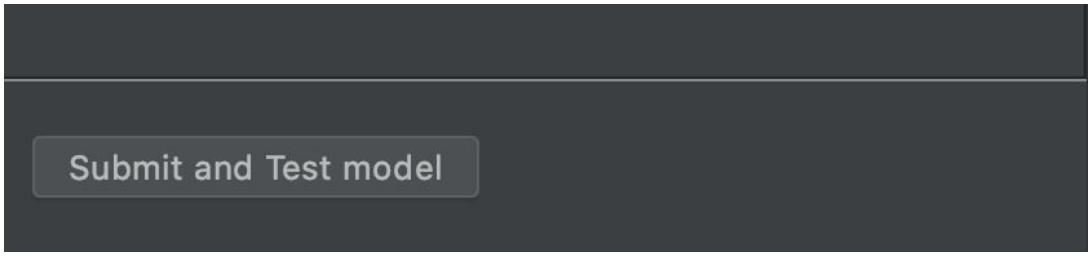
When you submit your model for testing, the grading system uses your model to make predictions using randomly selected values from a validation dataset.

For the highest marks you should have a model that trains to a high degree of accuracy on both a test set and a validation set. Overfitting towards the training set might impact your model's ability to score highly on our tests. So, for example, if your model is 99% accurate on a training set, but only 60% accurate on a validation set, it's likely to score 3 out of 5 or less on our tests.

A successful model engineer knows how to create models with high accuracy that do not overfit heavily to training data, and this is one of the valuable skills that is tested in all scenarios.

Test your models

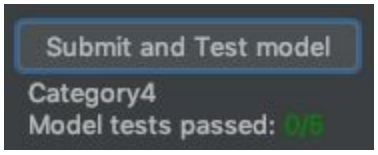
After you have saved the model in a category, you can submit it for testing by pressing the **Submit and Test model** button in the Assistant Panel. (You cannot submit and test the model if it has not been saved.)



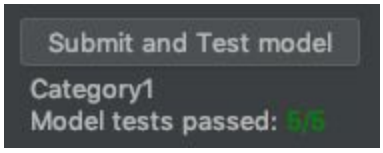
When you are ready to Submit and Test your model, make sure that the Assistant panel is open so that you can see the button. (See View instructions for details on how to open the Assistant panel.)

When you press the **Submit and Test model** button, the plugin sends your saved model file to the grading infrastructure across the internet. The grading infrastructure runs your model against randomly selected values from the validation dataset and reports the results back to the plugin.

You see the results of the tests below the button in the Assistant panel . For example, this model needs more work, it passed 0/5 tests:



This model is looking good, it passed 5/5 tests:



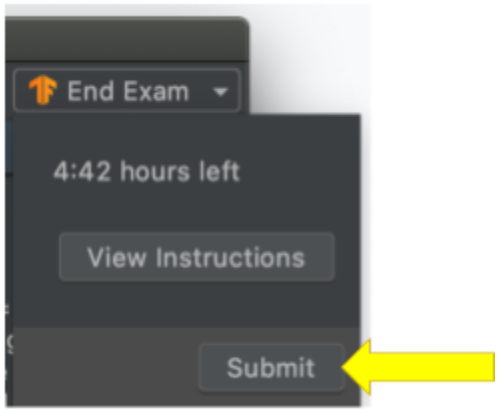
You can update your code and press the **Submit and Test model** button as many times as you like (within the time limits of the exam).

If you have more than one saved model in a category, then when you press **Submit and Test model**, you will get an error such as "more than one model found." You will need to delete the extra models before you can Submit and Test the model again.

When you finally submit the exam, the latest version of each model that you tested using the **Submit and Test Model** button will be submitted to the backend grading system. If you did not submit a model in any category, ***you will score zero for that category***.

Submit your exam

When you are ready to submit your exam, press the **TF End Exam** option at the top right of the screen and choose **Submit**.



When you press the **Submit** button, the plugin sends each of your models to the backend grading infrastructure. For each category, it will send the model that you most recently tested using the **Submit and Test model** button.

WARNING!
If there is a category where you didn't save a model and test it with the **Submit and Test model** button, no model will be submitted for that category and you will score zero for that category.

If there is a category where you updated and ran your code to save an improved model but did not test it with the **Submit and Test model** button, the previous version of your model (before you improved it) will be submitted for that category.

CAUTION! Once you submit the exam, you will not be able to work on your models anymore. So make sure you really are done before you press **Submit**.

If you have not completed the exam within the allotted time, the exam will be automatically submitted and you will be locked out from the plugin, you will not be able to continue working on the exam.

FAQs

How do I get my workstation ready for the exam?

See Set up your environment to take the TensorFlow Developer Certificate Exam.

CALLING WINDOWS 10 USERS!

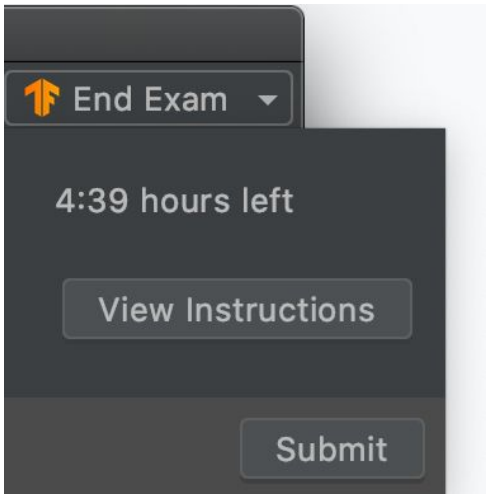
If you use Windows 10, pause Automatic Updates before taking the exam. You don't want your computer to start running a background update once you start training your models.

What is the scoring system?

The categories progress in complexity, with Category 1 being the easiest and Category 5 being the most complex. The points awarded for each category increase with the complexity of the question. However, it is expected that you will submit a model in each category. If you do not submit a model in every category you are unlikely to pass the exam.

How long do I have left?

To check how long you have left before your exam attempt ends, select the menu at the right of the **End Exam** option on the top right of the screen. (If you accidentally click End Exam, cancel the dialog box that asks if you are sure you want to end the exam.)



What happens if I close PyCharm during the exam?

If you close PyCharm while the exam is in progress, then when you re-open PyCharm, the exam project will open automatically and you can continue working on it. However, if five hours has passed since you initially started the project, then when you open PyCharm next, the exam will submit automatically and you will not be able to continue working on it.

Don't uninstall PyCharm until your exam has finished submitting, otherwise the grading of your exam will be unable to finish. PyCharm must be open for the exam submission process to finish.

What happens if I don't submit my exam before the time is up?

If you have not completed the exam within the allotted time, the exam will be automatically submitted and you will be locked out from the plugin. You will not be able to continue working on the exam. If PyCharm is closed when the time is up, then the exam will automatically submit the next time PyCharm opens.

Don't uninstall PyCharm until your exam has finished submitting, otherwise the grading of your exam will be unable to finish.

I can't find the Submit and Test model button

The **Submit and Test model** button is displayed in the Assistant panel. You must have the Assistant panel open to see it.

See View instructions for information on how to open the Assistant panel.

Sometimes when the exam starts, the Assistant panel takes a few minutes to load and display properly. If you do not see the Submit and Test model button, try opening the starter.py files in the project panel and switch between them in the file editor. Also try refreshing the Assistant Panel. Make sure that the file editor is showing the starter.py file for the question that you want to test. Eventually the Assistant panel will display the Submit and Test model button for the file that is currently displayed and selected.

Can I load additional libraries into PyCharm?

Yes.

When you install the TensorFlow certificate plugin in PyCharm, it installs TensorFlow and other relevant libraries.

However, if you find that your model implementation requires additional libraries, you can go ahead and install them into PyCharm.

You can see the libraries that the plugin loads in the requirements.txt file.

Can I change the version of TensorFlow that the plugin uses?

The grading infrastructure uses a specific version of TensorFlow. If you change the version of TensorFlow in the PyCharm project after you start the exam, then your models will be built with a different version of TensorFlow than the version that they will be tested against and consequently might run into errors during testing.

You can see the version of TensorFlow that the plugin loads in the **`requirements.txt`** file in the exam project in PyCharm.

What can I use in the exam?

The exam will test you on your ability to define, train and test models with TensorFlow. You may use whatever learning resources you would normally use during your ML development work. During the exam, you are welcome to experiment with training models using GCP, AWS, Jupyter Notebooks or Google Colab, but you will still need to submit and test the models inside PyCharm.

Be aware that your models will be tested using the version of TensorFlow that is supported by the grading infrastructure. You cannot change the version of TensorFlow that is used to test and grade your models. You can see the version of TensorFlow that the grading infrastructure uses in the requirements.txt file in the exam project in PyCharm.

Will I be able to pass the exam using my computer?

The TensorFlow Developer Certificate exam will require you to create and train models similar to those found on tensorflow.org/tutorials, such as:

- Image classification
- Word embeddings

We recommend that you practice these to make sure your hardware can handle them. We allow 5 hours for the exam because we know that it will take some time to train the models.

We rely on you, as an experienced ML practitioner, to understand the usage and capabilities of your own environment, be it a laptop, a desktop, a cloud-based virtual machine, or anything in between.

Troubleshooting

This troubleshooting section includes:

- Errors when run your code with the Run command
- Errors from Submit and Test your model
- General PyCharm Issues

Errors when run your code with the Run command

When you run your code, PyCharm displays the output in the Run window. Read any error messages that get displayed, these will typically relate to errors in your code.

URLs for datasets use HTTPS

The starter code in several of the categories include the URL to the dataset. In some cases, this URL is shown with HTTP**S**.

If you do not have the appropriate security certificates installed, when you try to run the code that accesses a URL that uses HTTPS, you might get this error:

[SSL: CERTIFICATE_VERIFY_FAILED]

The fix is to remove the "S" from HTTP**S** in the code. So for example, the URL to the dataset would become:

`http://dataset_is_here_etc…/`

Errors from Submit and Test your model

When you Submit and Test your model, the plugin attempts to upload the saved model in the current category to the grading infrastructure, which then runs your model against randomly selected values from the test data.

Errors can occur while the plugin is attempting to upload the file to the backend grading infrastructure as well as while the grader is attempting to load and evaluate the model.

- Failures while the plugin is **uploading** your model file
- Failures while the the grader is **evaluating** your model

Failures while the plugin is uploading your model file

The submit and test process doesn't finish

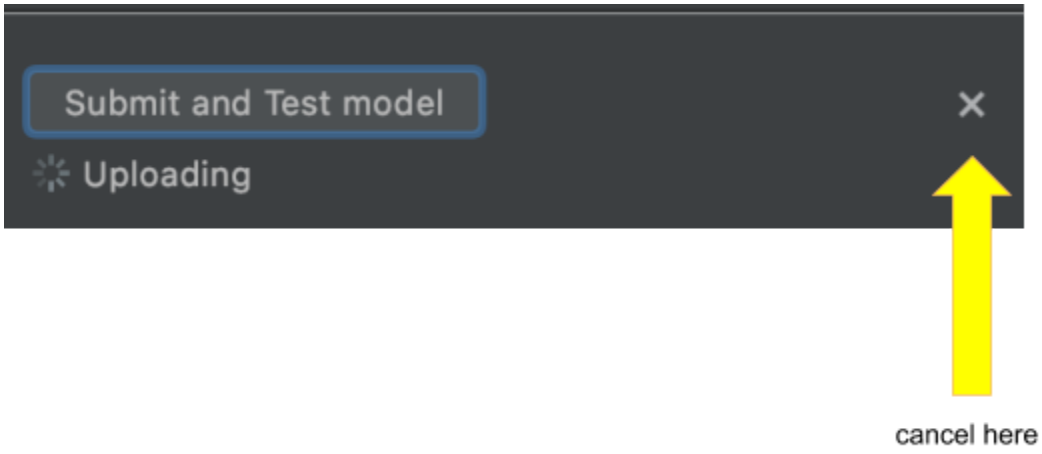
A model file that is too large or needs too much memory might fail to complete the upload process from your environment to the backend grading infrastructure. Even if the file uploads

successfully, it might fail to complete the evaluation process. In these cases, when you press the Submit and Test button, you will not get feedback other than that you keep waiting.

If you find yourself waiting for a while after pressing the Submit and Test button, it's likely that your model file is too large or requires too much memory to run.

It is expected that you will code your model so that it uses a reasonable amount of memory when it is run, and that the file size of the saved model is reasonable for the problem being solved.

To stop the submission process, press the X to the right of the **Submit and Test model** button.



The file uploads but the grader can't evaluate it

If the grader can't load the model, the error returned by `tf.keras.models.load_model` will be displayed in the format:

```
"Error when loading model. From tensorflow.keras.models.load_model: <error>"
```

For example:

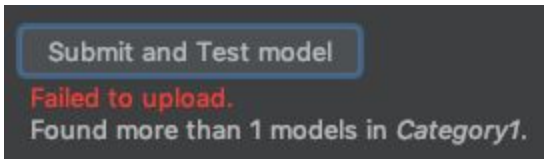
```
Error when loading model. From tensorflow.keras.models.load_model:
bad marshal data (unknown type code)
```

Read the error message carefully; it can include information that will help you fix your model.

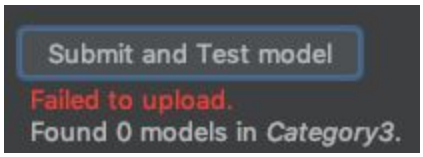
Important: If you get an error while your model is being loaded or tested, it is your responsibility to investigate and fix the error.

Save one, and only one, model in each category

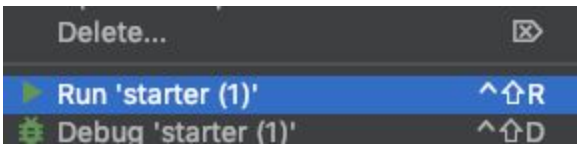
The error message "Failed to upload, Found more than one models in Category" means that you have more than one model in that category. Delete all models except one.



The error message "Failed to upload, Found 0 models in Category" means that you have not saved any models in that category.



Inspect the code for that category, make sure it creates and saves a model, and then run the code using the **Run** command.



Failures **evaluating** your model

If the grader is able to load the model but the evaluation process fails, the error returned from the grading test will be displayed in the form:

"Model loaded successfully but could not be scored: <error>".

For example:

```
Model loaded successfully but could not be scored: Error when
checking input: expected conv2d_input to have 4 dimensions, but got
array with shape (1, 28, 28)
```

Read the error message carefully; it can include information that will help you fix your model.

Important: If you get an error while your model is being loaded or tested, it is your responsibility to investigate and fix the error.

As an experienced ML practitioner, you are expected to be able to investigate the error messages you get from the grading infrastructure and adjust your code accordingly.

Note that the grading infrastructure uses specific versions of TensorFlow and other libraries. You can look at `requirements.txt` in your PyCharm project to check the versions.

General PyCharm Issues

When the exam starts it creates a virtual environment containing everything you need for the exam. If you have set up your environment correctly as discussed in Before you begin: Get your environment ready to take the exam, you are unlikely to have configuration issues when you start the exam in PyCharm. However, in some rare cases you might run into the problems listed here.

Check the supported version of Python in PyCharm

If you aren't sure what version of Python is being used in your PyCharm environment, go the the 'Python Console' window in PyCharm, which will usually be a tab at the bottom of your screen, and type

```
print(sys.version)
```

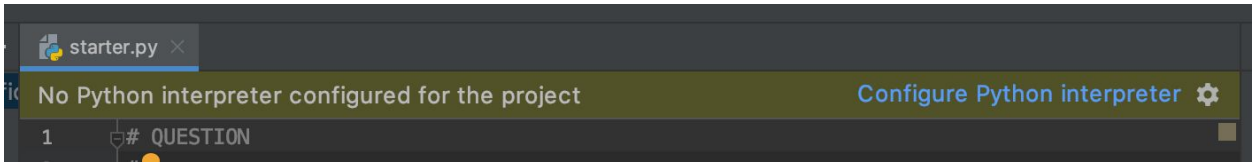
The terminal will report back the Python version as shown here:

```
PyDev console:
>>>print (sys.version)
'3.8.6 (v3.8.6:db455296be, Sep 23 2020, 13:31:39)

>>>
```

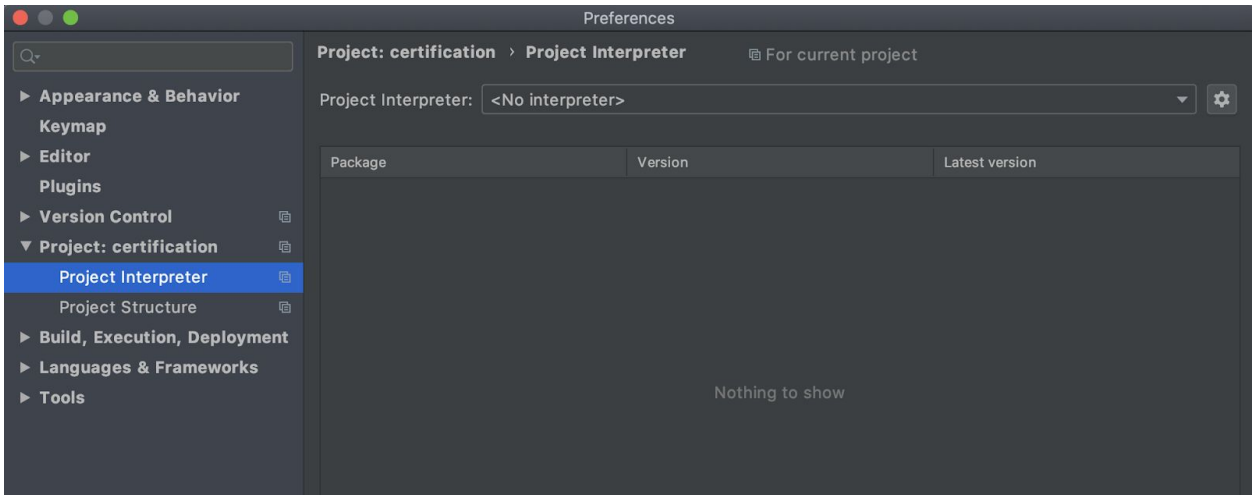
You see "No Python Interpreter Configured for this Project"

On some machines there is a bug where the process of setting up the exam environment doesn't set up the Python interpreter correctly and you see a message saying "No Python interpreter configured for the project:



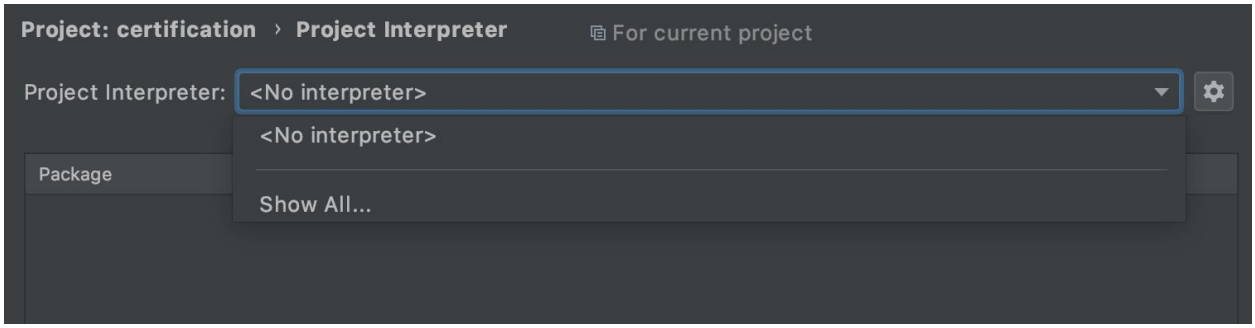
To fix this:

1. Click the blue 'Configure Python interpreter' link at the top right. This will open the project preferences dialog with the 'Project Interpreter' settings highlighted.

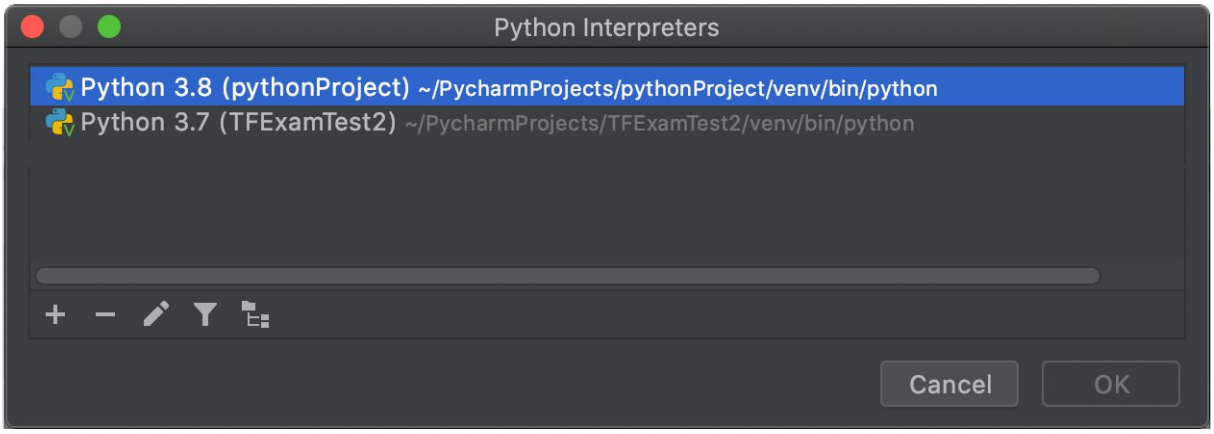


2. At the top of the screen there's a drop down saying 'Project Interpreter', select this, and you'll see a list of available Python interpreters.

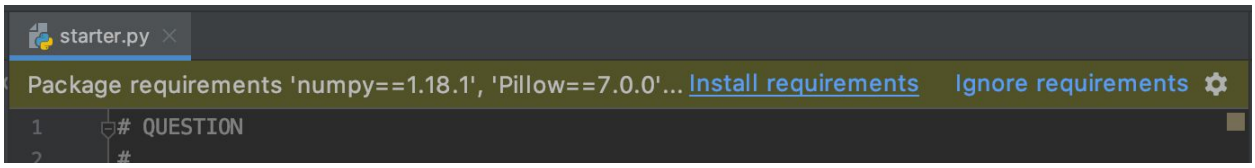
   Often it will look like this, where there's nothing available. This is why the environment didn't recognize the interpreter.



3. Click 'Show All...' to see a list of available interpreters. If you had created one earlier with the instructions from the 'Before you Begin' section, it will show up here and you can use it.



Once you've done that and said 'OK' to return to the code editor, you may still see something like this:

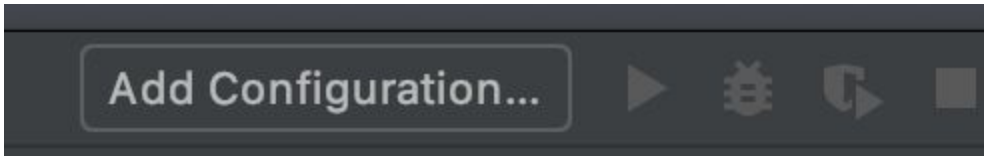


That means the interpreter environment you created didn't have all the required dependencies.

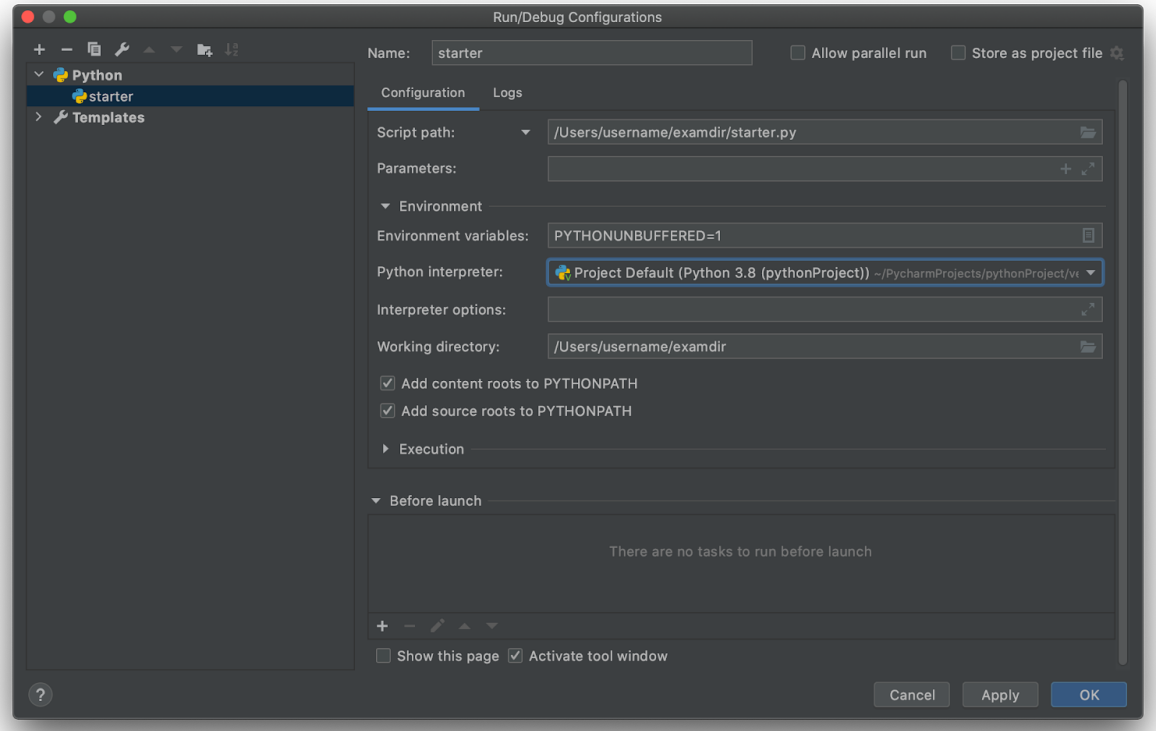
4. Click the 'Install requirements' link and PyCharm will handle that for you.

If you don't see the 'Run...' link on a .py file.

To run a Python file in PyCharm, you right click on it and select Run.... If you do not see this option, wait briefly. Often it takes a moment for PyCharm to recognize the interpreter environment. If it takes more than 30 seconds, close PyCharm and re-open. It should now work. If it still isn't visible, select the 'Add configuration...' button from the top right hand side of the IDE



Click the + button and select Python.

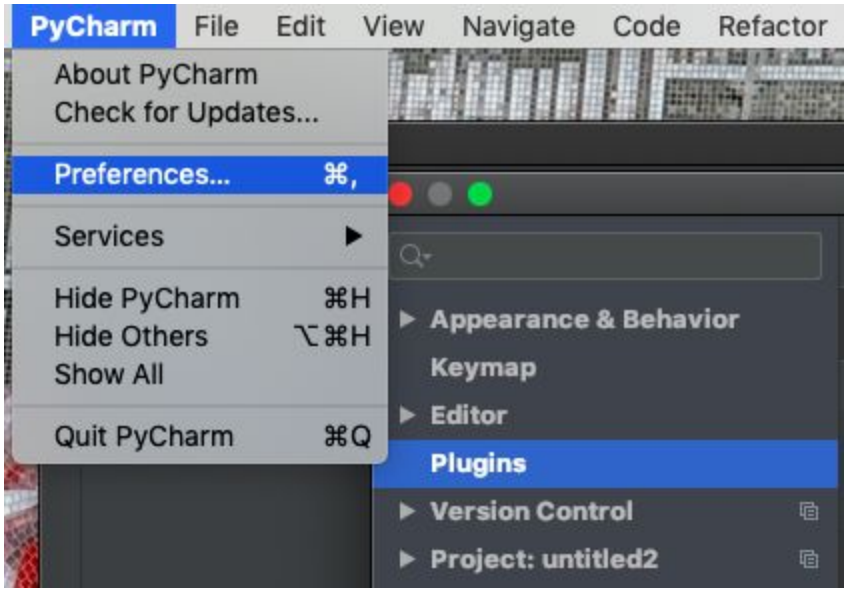


Check that the Python Interpreter setting is correct. If it isn't you can change it. On the script path setting, browse to the file that you want to run, select it, and press 'OK'. Now you'll see the configuration in the top right hand side of the screen has the 'Run' and 'Debug' buttons enabled. You should also be able to right click a .py file to get it to run.

Uninstall the plugin (when retaking the exam)

If you are retaking the exam, you will need to uninstall the TensorFlow certificate plugin first, then install it again.

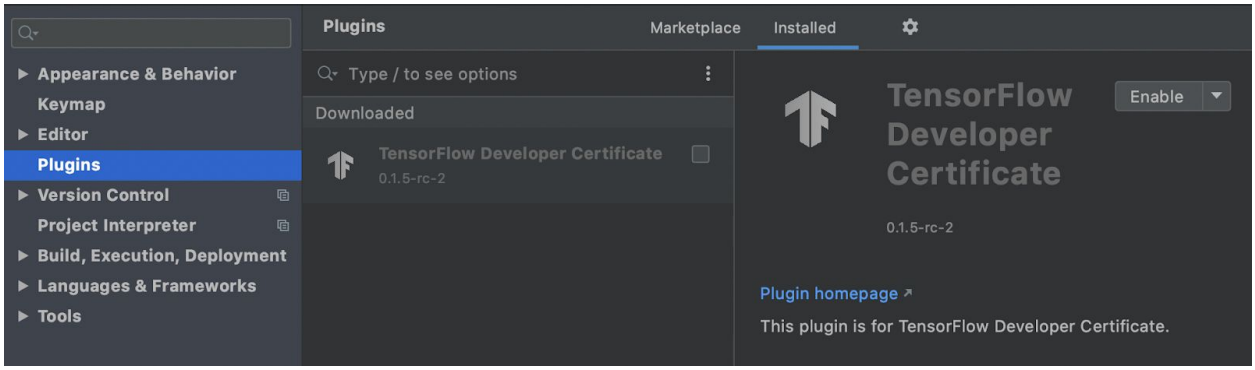
1. Open PyCharm.
2. Go to PyCharm > Preferences > Plugins.



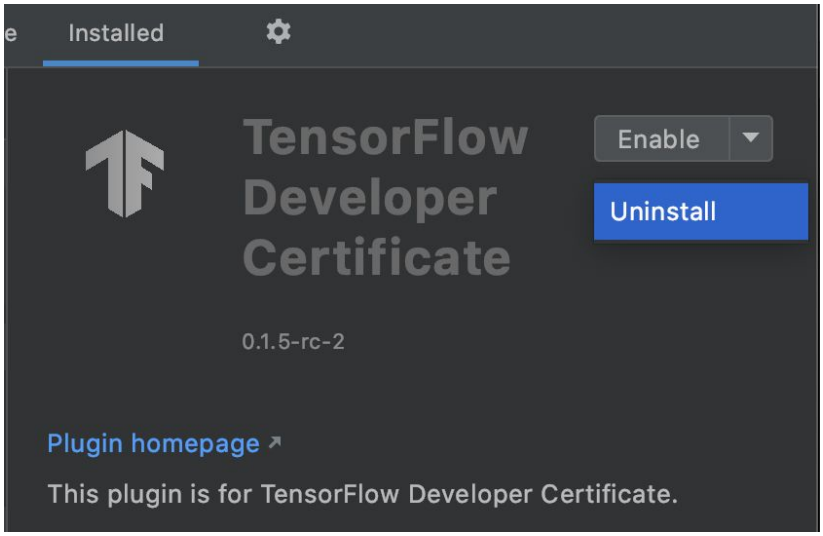
3. Check if the plugin is already installed. Click the **Installed** tab.

   If the TensorFlow Developer Certificate plugin is not installed, then you won't see it and you can continue installing the plugin, as described in Install the plugin for the exam.

If the plugin is already installed, you will see it:



4. If you already have the plugin installed, even if it is disabled, you must uninstall it first. From the grayed-out **Enable** menu, choose **Uninstall**.



5. After uninstalling the plugin, you will need to restart the IDE again.
6. To reinstall it, see the section Install the plugin for the exam.