



# TensorFlow Developer Certificate

## Candidate Handbook

Please review this handbook in its entirety before registering and taking the exam.

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# Contents

## Exam details

- Criteria
- Skills checklist
- Exam environment
- Exam time limit
- Exam URL

## Candidate identification and authentication

## Resources allowed during exam

## Eligibility

## Registration

## Fees and payment

## Taking the exam

## Results

## Retaking the exam

## Length of validity of the certificate

## Statement of non-discrimination

## Contact

Email: [tensorflow-certificate-support@google.com](mailto:tensorflow-certificate-support@google.com)

Web: [www.tensorflow.org/certificate](http://www.tensorflow.org/certificate)

# Exam details

## Criteria

The exam tests students in their ability to solve problems by building models using **TensorFlow 2.x**.

## Skills checklist

The TensorFlow Developer Certificate exam will test you on this set of skills.

### (1) TensorFlow developer skills

You need to demonstrate that you understand how to develop software programs using TensorFlow and that you can find the information you need to work as an ML practitioner. You need to:

- Know how to program in Python, resolve Python issues, and compile and run Python programs in PyCharm.
- Know how to find information about TensorFlow APIs, including how to find guides and API references on tensorflow.org.
- Know how to debug, investigate, and solve error messages from the TensorFlow API.
- Know how to search beyond tensorflow.org, as and when necessary, to solve your TensorFlow questions.
- Know how to create ML models using TensorFlow where the model size is reasonable for the problem being solved.
- Know how to save ML models and check the model file size.
- Understand the compatibility discrepancies between different versions of TensorFlow.

### (2) Building and training neural network models using TensorFlow 2.x

You need to understand the foundational principles of machine learning (ML) and deep learning (DL) using TensorFlow 2.x. You need to know how to:

- Use TensorFlow 2.x.
- Build, compile and train machine learning (ML) models using TensorFlow.
- Preprocess data to get it ready for use in a model.
- Use models to predict results.
- Build sequential models with multiple layers.

- Build and train models for binary classification.
- Build and train models for multi-class categorization.
- Plot loss and accuracy of a trained model.
- Identify strategies to prevent overfitting, including augmentation and dropout.
- Use pretrained models (transfer learning).
- Extract features from pre-trained models.
- Ensure that inputs to a model are in the correct shape.
- Ensure that you can match test data to the input shape of a neural network.
- Ensure you can match output data of a neural network to specified input shape for test data.
- Understand batch loading of data.
- Use callbacks to trigger the end of training cycles.
- Use datasets from different sources.
- Use datasets in different formats, including json and csv.
- Use datasets from `tf.data.datasets`.

### (3) Image classification

You need to understand how to build image recognition and object detection models with deep neural networks and convolutional neural networks using TensorFlow 2.x. You need to know how to:

- Define Convolutional neural networks with Conv2D and pooling layers.
- Build and train models to process real-world image datasets.
- Understand how to use convolutions to improve your neural network.
- Use real-world images in different shapes and sizes..
- Use image augmentation to prevent overfitting.
- Use `ImageDataGenerator`.
- Understand how `ImageDataGenerator` labels images based on the directory structure.

### (4) Natural language processing (NLP)

You need to understand how to use neural networks to solve natural language processing problems using TensorFlow. You need to know how to:

- Build natural language processing systems using TensorFlow.
- Prepare text to use in TensorFlow models.
- Build models that identify the category of a piece of text using binary categorization
- Build models that identify the category of a piece of text using multi-class categorization

- ❑ Use word embeddings in your TensorFlow model.
- ❑ Use LSTMs in your model to classify text for either binary or multi-class categorization.
- ❑ Add RNN and GRU layers to your model.
- ❑ Use RNNS, LSTMs, GRUs and CNNs in models that work with text.
- ❑ Train LSTMs on existing text to generate text (such as songs and poetry)

## (5) Time series, sequences and predictions

You need to understand how to solve time series and forecasting problems in TensorFlow. You need to know how to:

- ❑ Train, tune and use time series, sequence and prediction models.
- ❑ Train models to predict values for both univariate and multivariate time series.
- ❑ Prepare data for time series learning.
- ❑ Understand Mean Absolute Error (MAE) and how it can be used to evaluate accuracy of sequence models.
- ❑ Use RNNs and CNNs for time series, sequence and forecasting models.
- ❑ Identify when to use trailing versus centred windows.
- ❑ Use TensorFlow for forecasting.
- ❑ Prepare features and labels.
- ❑ Identify and compensate for sequence bias.
- ❑ Adjust the learning rate dynamically in time series, sequence and prediction models.

### Note

Our website, [tensorflow.org/certificate](https://www.tensorflow.org/certificate) recommends courses for learning the skills that are tested in this exam. However, the exam does not test the syllabus of any particular course. The exam may include questions not specifically addressed in any of the suggested courses. All knowledge tested in the exam is adequately covered in the guides and tutorials on [tensorflow.org](https://www.tensorflow.org).

## Exam environment

See "[Set up your environment to take the TensorFlow Developer Certificate Exam](#)" for more details on how to make sure your computer is ready to take the exam..

- You can take the exam from any computer that supports the [PyCharm IDE](#) requirements, anywhere there is internet, any time. There is no need to go to a test center.
- This exam is an online, performance-based test that requires implementing TensorFlow models using TensorFlow within a PyCharm environment.
- The exam duration is 5 hours.
- In order to take the exam you will install the TensorFlow Exam plugin using the PyCharm IDE. We recommend you install the PyCharm IDE and become familiar with using it prior to taking the exam. [Here](#) are the system requirements for the PyCharm IDE.

## Exam time limit

You have 5 hours to complete the exam.

If you don't submit your exam before the 5 hours has elapsed, your exam will be auto submitted. This in itself does not cause you to fail the exam, but you will only be graded for the questions for which you have already submitted and tested models during the course of taking the exam.

## Exam URL to take the exam

Once you have read this document in its entirety, you can start the process of purchasing the exam [here](#).

# Candidate identification and authentication

You are required to provide a non-expired Primary ID that contains your photograph, signature and full name (see acceptable forms of ID in the table below).

If your full name on their Primary ID contains non-latin characters, then you must ALSO provide a non-expired Secondary ID containing your full name in Latin Characters and signature, OR a notarized English translation of your Primary ID along with the non-latin character Primary ID.

Primary ID (non-expired and including photograph and signature)	Secondary ID (non-expired and including signature with Candidate name in Latin characters)
Passport  Government-issued driver's license/permit Government-Issued local language ID (plastic card with photo and signature)  National Identity card  State or province-issued identity card	Health Insurance Card  U.S. Social Security Card

Exams may be administered to citizens of a sanctioned country listed below PROVIDED the citizens are tested OUTSIDE the sanctioned country and their exam registration and current ID show an address OUTSIDE the sanctioned country. This list can be updated at any time without notice.

- Cuba
- Iran
- Syria
- Sudan
- North Korea
- Crimea Region of Ukraine

## Resources allowed during exam

You may use whatever learning resources you would normally use during your ML development work.

## Eligibility

You must test as an individual. The certificate is only available for natural persons, not corporations or other legal entities.

## Registration

You must be registered to be eligible to take the exam. To register for the exam, go [here](#). To complete the checkout, you will be prompted to enter payment information, and read and accept the Terms and Conditions for Exam Registration. The exam may be taken at your convenience. You are not required to take the exam at the time of registration and payment.

## Fees and payment

The exam cost is \$100 USD, which includes one exam attempt. You have months from the date of purchasing the exam to take the exam before your purchase expires. Please note that we are offering a limited number of stipends to partially cover the cost of taking the TensorFlow certificate to help ensure this opportunity is accessible for everyone. More details can be found on [our website](#).

## Taking the exam

After you download the plugin and sign in, your exam will be provided to you. You will have a maximum of five hours to complete the exam. If you have not completed the exam after five hours it will be auto-submitted for you.

## Results

After you submit your exam, it will be graded and your score will be posted to your [Candidate Portal](#). If you pass the exam, your name and email will be sent to a third party company who will



use your information for the purpose of sending your digital certificate to the email address you used to purchase the exam.

Please contact us at [tensorflow-certificate-support@google.com](mailto:tensorflow-certificate-support@google.com) if you passed the exam, but have not received your digital certificate within ten days or if you would like to opt out of receiving your certificate.

## Retaking the exam

Please note that you must register and pay for each exam attempt. Our exam retake policy is as follows:

- If you don't pass on your first attempt, you must wait 14 days before you take the exam again.
- If you don't pass on your second attempt, you must wait two months before you take the exam again.
- If after three attempts you still have not passed the exam, you must wait one year before you take the exam again.

## Length of validity of the certificate

Your certification expires 36 months from the date when you receive your digital badge. To renew your certification at that time, you need to complete the registration and certificate process again.

## Statement of non-discrimination

TensorFlow endorses the principles of equal opportunity. Eligibility criteria for the TensorFlow certificate is applied equally to all individuals regardless of age, race, religion, gender, national origin, veteran status, or disability.