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Custom Models, Layers, and Loss Functions with TensorFlow

4.8 • 274 ratings • 72 reviews

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About this Course

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In this course, you will:

- Compare Functional and Sequential APIs, discover new models you can build with the Functional API, and build a model that produces multiple outputs including a Siamese network.
- Build custom loss functions (including the contrastive loss function used in a Siamese network) in order to

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SKILLS YOU WILL GAIN

[Functional API](#) [Custom Layers](#) [Custom and Exotic Models with Functional API](#)
[Custom Loss Functions](#)

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Course 1 of 4 in the

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Intermediate Level

- Basic calculus, linear algebra, stats
- Knowledge of AI, deep learning
- Experience with Python, TF/Keras/PyTorch framework, decorator, context manager



Approx. 31 hours to complete



English

Subtitles: English

Instructors

Instructor rating 4.8/5 (103 Ratings) [\(i\)](#)**Laurence Moroney**

Instructor

Lead AI Advocate, Google

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**Eddy Shyu**

Senior Curriculum Developer

Product Lead, DeepLearning.AI

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— Zeeshan U.



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— Chaitanya A.



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Syllabus - What you will learn from this course

Content Rating 96% (1,177 ratings) [\(i\)](#)

WEEK



8 hours to complete

1

Functional APIs

Compare how the Functional API differs from the Sequential API, and see how the Functional API gives you additional flexibility in designing models. Practice using the functional API and build a Siamese network!



11 videos (Total 47 min), 5 readings, 2 quizzes [SEE LESS](#)

11 videos

A conversation with Andrew Ng: Overview of the specialization 6m

A conversation with Andrew Ng: Overview of course 1 4m

Welcome to the course 23s

Introduction to the Functional APIs 6m

Declaring and stacking layers 2m

Branching models 2m

Creating a Multi-Output model 4m

Multi-Output code walkthrough 5m

Siamese network: a Multiple-Input model 2m

Coding a Multi-Input Siamese network 4m

Siamese network code walkthrough 8m

5 readings

Connect with your mentors and fellow learners on Slack! 10m

Learn more about the Inception Model Architecture 10m

Energy efficiency dataset 3m

References about the Siamese network 3m

Reference "The distance between two vectors" 3m

1 practice exercise

Functional API 30m

WEEK

7 hours to complete

2

Custom Loss Functions

Loss functions help measure how well a model is doing, and are used to help a neural network learn from the training data. Learn how to build custom loss functions, including the contrastive loss function that is used in a Siamese network.

9 videos

Welcome to Week 2 1m

Creating a custom loss function 3m

Coding the Huber Loss function 2m

Huber Loss code walkthrough 2m

Adding hyperparameters to custom loss functions 2m

Turning loss functions into classes 1m

Huber Object Loss code walkthrough 3m

Contrastive Loss 3m

Coding Contrastive Loss 2m

2 readings

Huber Loss reference 5m

 **1 practice exercise**

Custom Loss 30m

WEEK



3

Custom Layers

Custom layers give you the flexibility to implement models that use non-standard layers. Practice building off of existing standard layers to create custom layers for your models.



10 videos (Total 31 min) [SEE LESS](#)



Intro custom layers 43s

Introduction to Lambda Layers 2m

Custom Functions from Lambda Layers 1m

Exploring custom Relu with Lambda Layers 4m

Architecture of a Custom Layer 2m

Coding your own custom Dense Layer 4m

Training a neural network with your Custom Layer 2m

Custom Layer code walkthrough 5m

Activating your Custom Layer 3m

Custom Layer with activation code walkthrough 3m

 **1 practice exercise**

Custom Layers 30m

WEEK



4

Custom Models

You can build off of existing models to add custom functionality. This week, extend the TensorFlow Model Class to build a ResNet model!



7 videos (Total 29 min), 1 reading, 2 quizzes [SEE LESS](#)



Intro to custom models 1m

Complex architectures with the Functional API 3m

Coding a Wide and Deep model 2m

Using the Model class to simplify architectures 3m

Understanding Residual networks 7m

Coding a Residual network with the Model class 5m

ResNet code walkthrough 5m



1 reading

Residual networks lectures (optional) 10m



1 practice exercise

Custom Models 30m

WEEK



3 hours to complete

5

Bonus Content - Callbacks

Custom callbacks allow you to customize what your model outputs or how it behaves during training. This week, implement a custom callback to stop training once the callback detects overfitting.



3 videos (Total 20 min), 3 readings [SEE LESS](#)



3 videos

Built-in Callbacks 7m

Custom Callbacks 7m

Custom Callbacks code walkthrough 5m



3 readings

TensorBoard visualization toolkit 10m

References 10m

Acknowledgments 10m

Show Less

Reviews

4.8 72 reviews

5 stars		86.57%
4 stars		11.30%
3 stars		1.06%
2 stars		1.06%

TOP REVIEWS FROM CUSTOM MODELS, LAYERS, AND LOSS FUNCTIONS WITH TENSORFLOW



by PK Feb 4, 2021

It is advanced TF specialization and the way contents are presented in the course are very systematically. Definitely recommended for developers already familiar with TF and wanted to explore further.



by MS Nov 25, 2020

Really great course, it teaches you all about the TF API and how to customize it for your needs, i thought only pytorch can make that as it's really pythonic, but i am a nieve noob what can i say.



by PD Jan 15, 2021

Wow! What a course it is! Amazing. Thanks to DeepLearningAi and Laurence for this course. But the mentors should be more active in the discussion forum. Not everyone is not comfortable with slack.



by EL Dec 14, 2020

This course was fantastic! After learning about the functional API, I found tensorflow/keras are far more flexible than I had realized and am much more excited about the possibilities.

[View all reviews](#)

About the TensorFlow: Advanced Techniques Specialization

About TensorFlow

TensorFlow is an end-to-end open-source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries, and community resources that let you build and deploy machine learning models quickly and easily.

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