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Generative Deep Learning with TensorFlow

★★★★★ 4.9 • 44 ratings • 5 reviews



Laurence Moroney +1 more instructor

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About this Course

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In this course, you will:

- a) Learn neural style transfer using transfer learning: extract the content of an image (eg. swan), and the style of a painting (eg. cubist or impressionist), and combine the content and style into a new image.
- b) Build simple AutoEncoders on the familiar MNIST dataset, and more complex deep and convolutional architectures on the Fashion MNIST dataset, understand the difference in results of the DNN and CNN AutoEncoder models, identify ways to de-noise noisy images, and build a CNN AutoEncoder using TensorFlow to output a clean image from a noisy one.
- c) Explore Variational AutoEncoders (VAEs) to generate entirely new data, and generate anime faces to compare them against reference images.
- d) Learn about GANs; their invention, properties, architecture, and how they vary from VAEs, understand the function of the generator and the discriminator within the model, the concept of 2 training phases and the role of introduced noise, and build your own GAN that can generate faces.

The DeepLearning.AI TensorFlow: Advanced Techniques Specialization introduces the features of TensorFlow that provide learners with more control over their model architecture, and gives them the tools to create and train advanced ML models.

This Specialization is for early and mid-career software and machine learning engineers with a foundational understanding of TensorFlow who are looking to expand their knowledge and skill set by learning advanced TensorFlow features to build powerful models.

SKILLS YOU WILL GAIN

Variational AutoEncoders Auto Encoders Generative Adversarial Networks
Neural Style Transfer



Shareable Certificate

Earn a Certificate upon completion



100% online

Start instantly and learn at your own schedule.



Course 4 of 4 in the

TensorFlow: Advanced Techniques Specialization



Flexible deadlines

Reset deadlines in accordance to your schedule.



Intermediate Level

- Python, TensorFlow, and deep learning
- TensorFlow's Functional API and Gradient Tape (covered in course 1 and 2 of this specialization)



Approx. 22 hours to complete



English

Subtitles: English

Instructors

Instructor rating 4.9/5 (11 Ratings) ⓘ



Laurence Moroney

Instructor

Lead AI Advocate, Google

288,084 Learners

14 Courses



Eddy Shyu

Senior Curriculum Developer

Product Lead, DeepLearning.AI

113,105 Learners

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Syllabus - What you will learn from this course

WEEK



6 hours to complete

1

Week 1: Style Transfer

This week, you will learn how to extract the content of an image (such as a swan), and the style of a painting (such as cubist, or impressionist), and combine the content and style into a new image. This is called neural style transfer, and you'll learn how to extract these kinds of features using transfer learning.



13 videos (Total 48 min), 6 readings, 2 quizzes SEE LESS



13 videos

Welcome to Course 4 6m

Style Transfer Intro 3m

Style Transfer Conceptual Overview 4m

Pre-Processing Inputs 2m

Extracting Style and Content Features 6m

Total Loss and Content Loss 3m

Style Loss 3m

Update the Generated Image 1m

Optional - Gram Matrix 4m

Optional - Einstein Notation 6m

Optional - Einsum in Code 1m

Total Variation Loss 1m

Fast Neural Style Transfer 1m

6 readings

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

Reference: A Neural Algorithm of Artistic Style 10m

Reference: Perceptual Losses for Real-Time Style Transfer and Super-Resolution 10m

Reference: Visualizing and Understanding Convolutional Networks 10m

Reference: numpy.einsum 10m

Reference: Exploring the structure of a real-time, arbitrary neural artistic stylization network 10m

1 practice exercise

Style Transfer 30m

7 hours to complete

2

Week 2: AutoEncoders

This week, you'll get an overview of AutoEncoders and how to build them with TensorFlow. You'll learn how to build a simple AutoEncoder on the familiar MNIST dataset, before diving into more complicated deep and convolutional architectures that you'll build on the Fashion MNIST dataset. You'll get to see the difference in results of the DNN and CNN AutoEncoder models, and then identify ways to denoise noisy images. You'll finish the week building a CNN AutoEncoder using TensorFlow to output a clean image from a noisy one!

6 videos (Total 22 min) [SEE LESS](#)

6 videos

Introduction 4m

First AutoEncoder 4m

MNIST AutoEncoder 3m

MNIST Deep AutoEncoder 2m

Convolutional AutoEncoder 4m

Denoising with an AutoEncoder 2m

1 practice exercise

AutoEncoders 30m

WEEK

3



Week 3: Variational AutoEncoders

This week you will explore Variational AutoEncoders (VAEs) to generate entirely new data. In this week's assignment, you will generate anime faces and compare them against reference images.



6 videos (Total 16 min), 2 readings, 2 quizzes [SEE LESS](#)



6 videos

Variational AutoEncoders Overview 2m

VAE Architecture and Code 2m

Sampling Layer and Encoder 3m

Decoder 2m

Loss Function and Model Definition 2m

Train the VAE Model 1m



2 readings

References: Kullback–Leibler divergence, Balancing reconstruction error and Kullback–Leibler divergence in Variational Autoencoders 10m

Convolutional Variational AutoEncoders 10m



1 practice exercise

Variational AutoEncoders 30m

WEEK

4



Week 4: GANs

This week, you'll learn about GANs. You'll learn what they are, who invented them, their architecture and how they vary from VAEs. You'll get to see the function of the generator and the discriminator within the model, and the concept of 2 training phases and the role of introduced noise. Then you'll end the week building your own GAN that can generate faces! How cool is that!



7 videos (Total 26 min), 7 readings, 2 quizzes [SEE LESS](#)



7 videos

Introduction 3m

First GAN Architecture 3m

First GAN Training Loop 4m

DCGANs 3m

Face Generator 6m

Face Generator Discriminator 2m

Conclusions 1m



7 readings

Reference: GANs Specialization 10m

Reference: Self-Normalizing Neural Networks 10m

Reference: - Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks ,
tf.keras.layers.LeakyReLU 10m

Reference: Layer Normalization 10m

References 10m

What next? 10m

Acknowledgments 10m

1 practice exercise

GANs 30m

Reviews

4.9 
5 reviews

5 stars  86.95%

4 stars  13.04%

TOP REVIEWS FROM GENERATIVE DEEP LEARNING WITH TENSORFLOW



by YH Feb 21, 2021

Clear explanation on all generative methods. However, I find it too short. The course can be longer and include more generative methods.



by TM Jan 29, 2021

Outstanding course that deals with complex topics in Deep Learning explained in short yet precise manner and flawlessly executed.



by NS Feb 28, 2021

This course was fantastic! Laurence and DeepLearning.ai team did great job. Definitely recommended.

[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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