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Advanced Computer Vision with TensorFlow

4.8 • 86 ratings • 21 reviews



Laurence Moroney +1 more instructor

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About this Course

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In this course, you will:

- a) Explore image classification, image segmentation, object localization, and object detection. Apply transfer learning to object localization and detection.
- b) Apply object detection models such as regional-CNN and ResNet-50, customize existing models, and build your own models to detect, localize, and label your own rubber duck images.
- c) Implement image segmentation using variations of the fully convolutional network (FCN) including U-Net and d) Mask-RCNN to identify and detect numbers, pets, zombies, and more.
- d) Identify which parts of an image are being used by your model to make its predictions using class activation maps and saliency maps and apply these ML interpretation methods to inspect and improve the design of a famous network, AlexNet.

The DeepLearning.AI TensorFlow: Advanced Techniques Specialization introduces the features of TensorFlow that provide learners with more control over their model architecture and tools that help them 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

Salience • Image Segmentation • Model Interpretability • Class Activation Maps
TensorFlow Object Detection API



Shareable Certificate

Earn a Certificate upon completion



100% online

Start instantly and learn at your own schedule.



Course 3 of 4 in the

TensorFlow: Advanced Techniques Specialization



Flexible deadlines

Reset deadlines in accordance to your schedule.



Intermediate Level

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



Approx. 24 hours to complete



English

Subtitles: English

Instructors

Instructor rating 4.91/5 (25 Ratings) [\(1\)](#)**Laurence Moroney**

Instructor

Lead AI Advocate, Google

288,084 Learners

14 Courses

**Eddy Shyu**

Senior Curriculum Developer

Product Lead, DeepLearning.AI

113,105 Learners

11 Courses

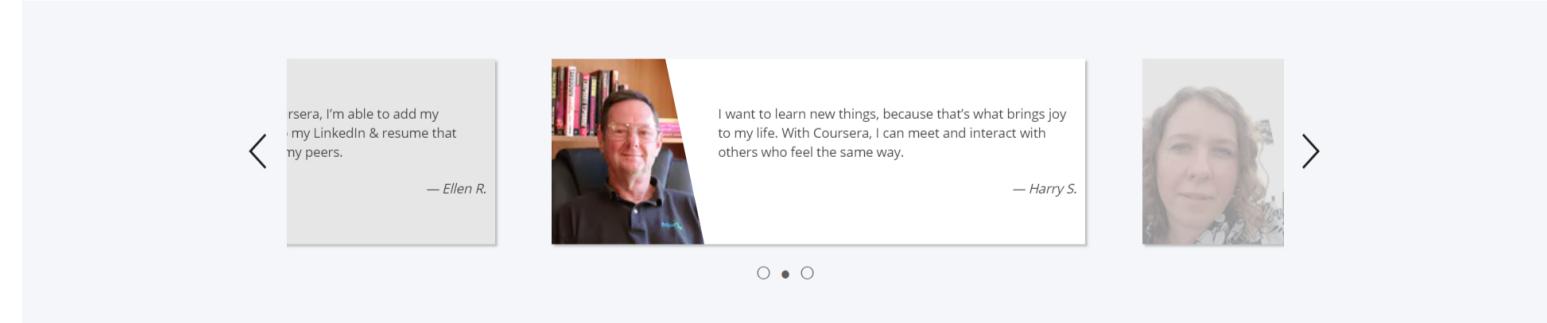
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DeepLearning.AI's expert-led educational experiences provide AI practitioners and non-technical professionals with the necessary tools to go all the way from foundational basics to advanced application, empowering them to build an AI-powered future.



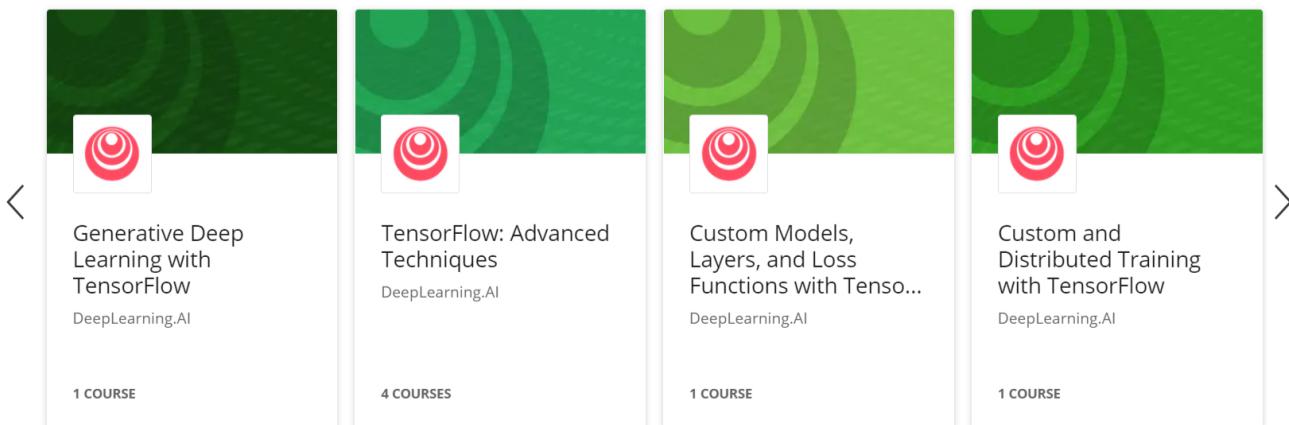
A horizontal testimonial slider showing three user reviews. Each review includes a photo of the user, their quote, and their name. Navigation arrows are on the left and right sides of the slider.

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Ellen R. says: "I can add my LinkedIn & resume that my peers." — Ellen R.

Harry S. says: "I want to learn new things, because that's what brings joy to my life. With Coursera, I can meet and interact with others who feel the same way." — Harry S.

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Course Title	Provider	Courses
Generative Deep Learning with TensorFlow	DeepLearning.AI	1 COURSE
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Custom Models, Layers, and Loss Functions with Tensorflow	DeepLearning.AI	1 COURSE
Custom and Distributed Training with TensorFlow	DeepLearning.AI	1 COURSE

Syllabus - What you will learn from this course

WEEK



6 hours to complete

1

Introduction to Computer Vision

Get a conceptual overview of image classification, object localization, object detection, and image segmentation. Also be able to describe multi-label classification, and distinguish between semantic segmentation and instance segmentation. In the rest of this course, you will apply TensorFlow to build object detection and image segmentation models.



10 videos (Total 41 min), 2 readings, 2 quizzes SEE LESS



10 videos

Welcome to Course 3 7m

Classification and Object Detection Intro 4m

Segmentation Intro 2m

Why Transfer Learning? 4m

What is Transfer Learning? 4m

Options in Transfer Learning 3m

Transfer Learning with ResNet50 3m

ResNet50 in code 4m

Network architecture for Object Localization 3m

Evaluating Object Localization 2m

2 readings

Pre-Requisite & References 10m

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

1 practice exercise

Introduction and Concepts of Computer Vision 30m

WEEK

6 hours to complete

2

Object Detection

This week, you'll get an overview of some popular object detection models, such as regional-CNN and ResNet-50. You'll use object detection models that you'll retrieve from TensorFlow Hub, download your own models and configure them for training, and also build your own models for object detection. By using transfer learning, you will train a model to detect and localize rubber duckies using just five training examples. You'll also get to manually label your own rubber ducky images!

12 videos

Object Detection and Sliding Windows 5m

R-CNN 3m

Fast R-CNN 3m

Faster R-CNN 1m

Getting the Model from TensorFlow Hub 1m

Running the Model on an Image 2m

Installation and overview of APIs 4m

Visualization with APIs 3m

Loading a RetinaNet Model 5m

Loading Weights 4m

Data Prep and Training Overview 3m

Custom Training Loop Code 4m

7 readings

References: Amazon Rekognition, PowerAI & DIGITS 10m

Reference: R-CNN, Fast R-CNN 10m

Reference: TensorFlow Hub 10m

Read about the Object Detection API 10m

Use the Object Detection API 30m

Reference: RetinaNet, Model Garden 10m

Eager Few Shot Object Detection 30m

1 practice exercise

Object Detection 30m

WEEK

 6 hours to complete

3

Image Segmentation

This week is all about image segmentation using variations of the fully convolutional neural network. With these networks, you can assign class labels to each pixel, and perform much more detailed identification of objects compared to bounding boxes. You'll build the fully convolutional neural network, U-Net, and Mask R-CNN this week to identify and detect numbers, pets, and even zombies!

 11 videos (Total 45 min), 3 readings, 2 quizzes [SEE LESS](#)

11 videos

Image Segmentation Overview 5m

Popular Image Segmentation Architectures 4m

FCN Architecture Details 5m

Upsampling Methods 3m

Encoder in Code 2m

Decoder in Code 4m

Evaluation with IoU and Dice Score 4m

U-Net Overview 5m

U-Net Code: Encoder 3m

U-Net Code: Decoder 3m

Instance Segmentation 2m

3 readings

References: FCN 10m

Reference: CamVid 10m

Reference: U-Net 10m

1 practice exercise

Image Segmentation 30m

WEEK

 7 hours to complete

4

Visualization and Interpretability

This week, you'll learn about the importance of model interpretability, which is the understanding of how your model arrives at its decisions. You'll also implement class activation maps, saliency maps, and gradient-weighted class activation maps to identify which parts of an image are

being used by your model to make its predictions. You'll also see an example of how visualizing a model's intermediate layer activations can help to improve the design of a famous network, AlexNet.



6 videos (Total 30 min), 4 readings, 2 quizzes [SEE LESS](#)



6 videos

Why Interpretation Matters? 6m

Class Activation Maps 3m

Fashion MNIST Class Activation Map code walkthrough 4m

Saliency 5m

GradCAM 5m

ZFNet 5m



4 readings

Reference: GradCam 10m

Reference: ZFNet 10m

References 10m

Acknowledgments 10m



1 practice exercise

Visualization and Interpretation 30m

Reviews

4.8 21 reviews

5 stars		82.22%
4 stars		11.11%
3 stars		5.55%
1 star		1.11%

TOP REVIEWS FROM ADVANCED COMPUTER VISION WITH TENSORFLOW



by TM Dec 28, 2020

Very interesting course and complex content. Perfect place to start if you're planning to enter into a research field in Computer Vision.



by MS Jan 3, 2021

Great course to know all about image segmentation, localization and other image stuffs, great course



by NS Feb 28, 2021

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



by RL Jan 20, 2021

This course was super useful because it's practical and not only focusing on the theory part.

[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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1 COURSE



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1 COURSE



Generative Deep Learning with TensorFlow

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1 COURSE

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