Learn PyTorch for Deep Learning – Comprehensive Beginner Course

Instructor: Daniel Bourke

- YouTube Channel: @mrdbourke

Resources:

- Code Repository
- Ask a Question
- Course Materials
- Extended Course (Zero to Mastery) (20+ hours more content)

> **Note**: Some sections are omitted due to YouTube timestamp limits.

Course Outline

0:00:00 Introduction

Chapter 0 – PyTorch Fundamentals

- 0:01:45 Welcome and "what is deep learning?"
- 0:07:41 Why use machine/deep learning?
- 0:11:15 The number one rule of ML
- 0:16:55 Machine learning vs deep learning
- 0:23:02 Anatomy of neural networks
- 0:32:24 Different learning paradigms
- 0:36:56 What can deep learning be used for?
- 0:43:18 What is/why PyTorch?
- 0:53:33 What are tensors?
- 0:57:52 Outline
- 1:03:56 How to (and how not to) approach this course
- 1:09:05 Important resources
- 1:14:28 Getting setup

- 1:22:08 Introduction to tensors
- 1:35:35 Creating tensors
- 1:54:01 Tensor datatypes
- 2:03:26 Tensor attributes (information about tensors)
- 2:11:50 Manipulating tensors
- 2:17:50 Matrix multiplication
- 2:48:18 Finding the min, max, mean & sum
- 2:57:48 Reshaping, viewing and stacking
- 3:11:31 Squeezing, unsqueezing and permuting
- 3:23:28 Selecting data (indexing)
- 3:33:01 PyTorch and NumPy
- 3:42:10 Reproducibility
- 3:52:58 Accessing a GPU
- 4:04:49 Setting up device agnostic code

Chapter 1 – PyTorch Workflow

- 4:17:27 Introduction to PyTorch Workflow
- 4:20:14 Getting setup
- 4:27:30 Creating a dataset with linear regression
- 4:37:12 Creating training and test sets (the most important concept in ML)
- 4:53:18 Creating our first PyTorch model
- 5:13:41 Discussing important model building classes
- 5:20:09 Checking out the internals of our model
- 5:30:01 Making predictions with our model
- 5:41:15 Training a model with PyTorch (intuition building)
- 5:49:31 Setting up a loss function and optimizer
- 6:02:24 PyTorch training loop intuition
- 6:40:05 Running our training loop epoch by epoch
- 6:49:31 Writing testing loop code
- 7:15:53 Saving/loading a model
- 7:44:28 Putting everything together

Chapter 2 – Neural Network Classification

- 8:32:00 Introduction to machine learning classification
- 8:41:42 Classification input and outputs
- 8:50:50 Architecture of a classification neural network
- 9:09:41 Turning our data into tensors

- 9:25:58 Coding a neural network for classification data
- 9:43:55 Using `torch.nn.Sequential`
- 9:57:13 Loss, optimizer and evaluation functions for classification
- 10:12:05 From model logits to prediction probabilities to prediction labels
- 10:28:13 Train and test loops
- 10:57:55 Discussing options to improve a model
- 11:27:52 Creating a straight line dataset
- 11:46:02 Evaluating our model's predictions
- 11:51:26 The missing piece – non-linearity
- 12:42:32 Putting it all together with a multiclass problem
- 13:24:09 Troubleshooting a multi-class model

Chapter 3 – Computer Vision

- 14:00:48 Introduction to computer vision
- 14:12:36 Computer vision input and outputs
- 14:22:46 What is a convolutional neural network?
- 14:27:49 TorchVision
- 14:37:10 Getting a computer vision dataset
- 15:01:34 Mini-batches
- 15:08:52 Creating DataLoaders
- 15:52:01 Training and testing loops for batched data
- 16:26:27 Running experiments on the GPU
- 16:30:14 Creating a model with non-linear functions
- 16:42:23 Creating a train/test loop
- 17:13:32 Convolutional neural networks (overview)
- 17:21:57 Coding a CNN
- 17:41:46 Breaking down `nn.Conv2d` / `nn.MaxPool2d`
- 18:29:02 Training our first CNN
- 18:44:22 Making predictions on random test samples
- 18:56:01 Plotting our best model predictions
- 19:19:34 Evaluating model predictions with a confusion matrix

---

Chapter 4 – Custom Datasets

- 19:44:05 Introduction to custom datasets
- 19:59:54 Downloading a custom dataset of pizza, steak, and sushi images
- 20:13:59 Becoming one with the data

- 20:39:11 Turning images into tensors
- 21:16:16 Creating image DataLoaders
- 21:25:20 Creating a custom dataset class (overview)
- 21:42:29 Writing a custom dataset class from scratch
- 22:21:50 Turning custom datasets into DataLoaders
- 22:28:50 Data augmentation
- 22:43:14 Building a baseline model
- 23:11:07 Getting a summary of our model with `torchinfo`
- 23:17:46 Creating training and testing loop functions
- 23:50:59 Plotting model 0 loss curves
- 24:00:02 Overfitting and underfitting
- 24:32:31 Plotting model 1 loss curves
- 24:35:53 Plotting all the loss curves
- 24:46:50 Predicting on custom data