Dan Van Boxel

Hands-On Deep Learning with TensorFlow

Uncover what is underneath your data!

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Hands-On Deep Learning with TensorFlow

Hands-On Deep Learning with TensorFlow is based on Dan's best-selling TensorFlow video course. With deep learning going mainstream, making sense of data and getting accurate results using deep networks is possible. Dan Van Boxel will be your guide to exploring the possibilities of deep learning; he will enable you to understand data like never before. With the efficiency and simplicity of TensorFlow, you will be able to process your data and gain insights that will change how you look at data.

With Dan's guidance, you will dig deeper into the hidden layers of abstraction using raw data. Dan then shows you various complex algorithms for deep learning and various examples that use these deep neural networks. You will also learn how to train your machine to craft new features to make sense of deeper layers of data.

In this book, Dan shares his knowledge across topics such as logistic regression, convolutional neural networks, recurrent neural networks, training deep networks, and high level interfaces. With the help of novel practical examples, you will become an ace at advanced multilayer networks, image recognition, and beyond.

Things you will learn:

- Set up your computing environment and install TensorFlow
- Build simple TensorFlow graphs for everyday computations
- Apply logistic regression for classification with TensorFlow
- Design and train a multilayer neural network with TensorFlow
- Intuitively understand convolutional neural networks for image recognition
- Bootstrap a neural network from simple to more accurate models
- See how to use TensorFlow with other types of network
- Program networks with SciKit-Flow, a high-level interface to TensorFlow

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BIRMINGHAM - MUMBAI

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About the Author

Dan Van Boxel is a data scientist and machine learning engineer with over 10 years of experience. He is most well-known for `Dan Does Data`, a YouTube livestream demonstrating the power and pitfalls of neural networks. He has developed and applied novel statistical models of machine learning to topics such as accounting for truck traffic on highways, travel time outlier detection, and other areas. Dan has also published research articles and presented findings at the Transportation Research Board and other academic journals.

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Preface

TensorFlow is an open source software library for machine learning and training neural networks. TensorFlow was originally developed by Google, and was made open source in 2015.

Over the course of this book, you will learn how to use TensorFlow to solve a novel research problem. You'll use one of the most popular machine learning approaches, neural networks with TensorFlow. We'll work on both the simple and deep neural networks to improve our models.

You'll study images of letters and digits in various fonts with the goal of identifying fonts based on one specific image of a single letter. This will be a straightforward classification problem.

As no single pixel or position—but local structures among pixels—is important, it's an ideal problem for deep learning with TensorFlow. Though we'll start with simple models, this series will gradually introduce more nuanced approaches and explain the code line by line. By the end of this book, you'll have created your own advanced model for font recognition.

So let's put on our helmets; we're going deep into data mines with TensorFlow.

What this book covers

Chapter 1, Getting Started, discusses the techniques and the models we'll apply using TensorFlow. In this chapter, we will install TensorFlow on a machine we can use. After some small steps with basic computations, we will jump into a machine learning problem, successfully building a decent model with just logistic regression and a few lines of TensorFlow code.

Chapter 2, Deep Neural Networks, shows TensorFlow in its prime with deep neural networks. You will learn about the single and multiple hidden layer model. You will also learn about the different types of neural networks and build and train our first neural network with TensorFlow.

Chapter 3, Convolutional Neural Networks, talks about the most powerful developments in deep learning and applies the concepts of convolution to a simple example in TensorFlow. We will tackle the practical aspects of understanding convolution. We will explain what a convolutional and pooling layer is in a neural net, following with a TensorFlow example.

Chapter 4, Introducing Recurrent Neural Networks, introduces the concept of RNN models, and their implementation in TensorFlow. We will look at a simple interface to TensorFlow called TensorFlow learn. We will also walk through dense neural networks as well as understand convolutional neural networks and extracting weights in detail.

Chapter 5, Wrapping Up, wraps up our look at TensorFlow. We'll revisit our TensorFlow models for font classification, and review their accuracy.

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What you need for this book

While this book will show you how to install TensorFlow, there are a few dependencies you need to be aware of. At a minimum, you need a recent version of Python 2 or 3 and NumPy. To get the most out of the book, you should also have Matplotlib and IPython.

Who this book is for

With deep learning going mainstream, making sense of data and getting accurate results using deep networks is possible. Dan Van Boxel is your guide to exploring the possibilities with deep learning; he will enable you to understand data like never before. With the efficiency and simplicity of TensorFlow, you will be able to process your data and gain insights that will change how you look at data.

Conventions

In this book, you will find a number of styles of text that distinguish between different kinds of information. Here are some examples of these styles, and an explanation of their meaning.

Code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles are shown as follows: "The first thing you need to do is download the source code pack for this book and open the `simple.py` file."

A block of code is set as follows:

```
import tensorflow as tf
# You can create constants in TF to hold specific values
a = tf.constant(1)
b = tf.constant(2)
```

When we wish to draw your attention to a particular part of a code block, the relevant lines or items are set in bold:

```
import tensorflow as tf
# You can create constants in TF to hold specific values
a = tf.constant(1)
b = tf.constant(2)
```

Any command-line input or output is written as follows:

```
sudo pip3 install ./tensorflow-1.2.1-cp35-cp35m-linux_x86_64.
whl
```

New terms and **important words** are shown in bold. Words that you see on the screen, in menus or dialog boxes for example, appear in the text like this: "Click on **+New** to create a new file. Here we'll create a Jupyter notebook".

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The code bundle for the book is also hosted on GitHub at `https://github.com/PacktPublishing/Hands-On-Deep-Learning-with-TensorFlow`. We also have other code bundles from our rich catalog of books and videos available at `https://github.com/PacktPublishing/`. Check them out!

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