Preface

This book will introduce you to the fundamentals of machine learning through TensorFlow. TensorFlow is Google's new software library for deep learning that makes it straightforward for engineers to design and deploy sophisticated deep learning architectures. You will learn how to use TensorFlow to build systems capable of detecting objects in images, understanding human text, and predicting the properties of potential medicines. Furthermore, you will gain an intuitive understanding of TensorFlow's potential as a system for performing tensor calculus and will learn how to use TensorFlow for tasks outside the traditional purview of machine learning.

Importantly, *TensorFlow for Deep Learning* is one of the first deep learning books written for practitioners. It teaches fundamental concepts through practical examples and builds understanding of machine learning foundations from the ground up. The target audience for this book is practicing developers, who are comfortable with designing software systems, but not necessarily with creating learning systems. At times we use some basic linear algebra and calculus, but we will review all necessary fundamentals. We also anticipate that our book will prove useful for scientists and other professionals who are comfortable with scripting, but not necessarily with designing learning algorithms.

Conventions Used in This Book

The following typographical conventions are used in this book:

Italic
Indicates new terms, URLs, email addresses, filenames, and file extensions.

`Constant width`
Used for program listings, as well as within paragraphs to refer to program elements such as variable or function names, databases, data types, environment variables, statements, and keywords.

Constant width bold

> Shows commands or other text that should be typed literally by the user.

Constant width italic

> Shows text that should be replaced with user-supplied values or by values determined by context.

> This element signifies a tip or suggestion.

> This element signifies a general note.

> This element indicates a warning or caution.

Using Code Examples

Supplemental material (code examples, exercises, etc.) is available for download at *https://github.com/matroid/dlwithtf*.

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Introduction to Deep Learning

Deep learning has revolutionized the technology industry. Modern machine translation, search engines, and computer assistants are all powered by deep learning. This trend will only continue as deep learning expands its reach into robotics, pharmaceuticals, energy, and all other fields of contemporary technology. It is rapidly becoming essential for the modern software professional to develop a working knowledge of the principles of deep learning.

In this chapter, we will introduce you to the history of deep learning, and to the broader impact deep learning has had on the research and commercial communities. We will next cover some of the most famous applications of deep learning. This will include both prominent machine learning architectures and fundamental deep learning primitives. We will end by giving a brief perspective of where deep learning is heading over the next few years before we dive into TensorFlow in the next few chapters.

Machine Learning Eats Computer Science

Until recently, software engineers went to school to learn a number of basic algorithms (graph search, sorting, database queries, and so on). After school, these engineers would go out into the real world to apply these algorithms to systems. Most of today's digital economy is built on intricate chains of basic algorithms laboriously glued together by generations of engineers. Most of these systems are not capable of adapting. All configurations and reconfigurations have to be performed by highly trained engineers, rendering systems brittle.

Machine learning promises to change the field of software development by enabling systems to adapt dynamically. Deployed machine learning systems are capable of learning desired behaviors from databases of examples. Furthermore, such systems