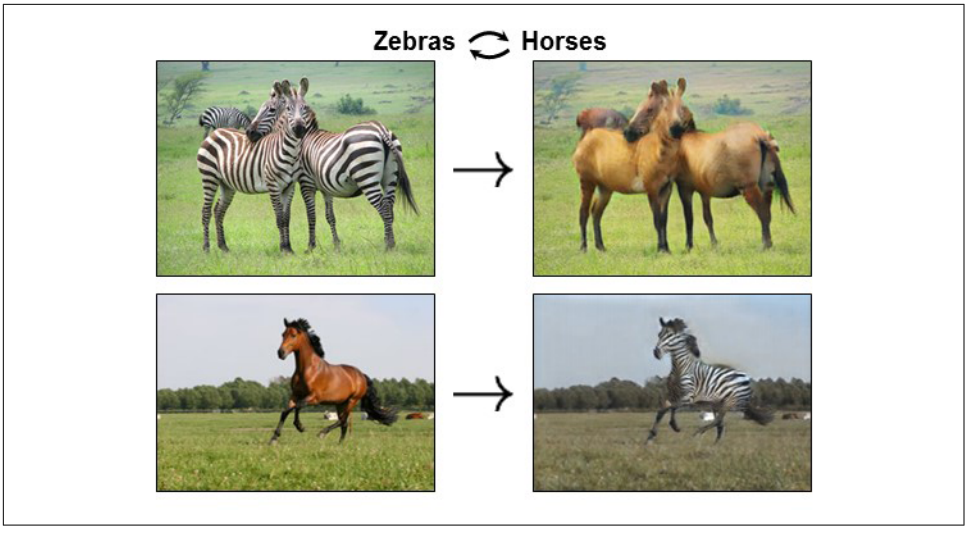

Figure 6-16. The CycleGAN is capable of performing complex image transformations, such as transforming images of horses into those of zebras (and vice versa).

Unfortunately, generative adversarial networks are still challenging to train in practice. Making generators and discriminators learn reasonable functions requires a deep bag of tricks. As a result, while there have been many exciting GAN demonstrations, GANs have not yet matured into a state where they can be widely deployed in industrial applications.

Training a Convolutional Network in TensorFlow

In this section we consider a code sample for training a simple convolutional neural network. In particular, our code sample will demonstrate how to train a LeNet-5 convolutional architecture on the MNIST dataset using TensorFlow. As always, we recommend that you follow along by running the full code sample from the GitHub repo associated with the book.

The MNIST Dataset

The MNIST dataset consists of images of handwritten digits. The machine learning challenge associated with MNIST consists of creating a model trained on the training set of digits that generalizes to the validation set. Figure 6-17 shows some images drawn from the MNIST dataset.

Figure 6-17. Some images of handwritten digits from the MNIST dataset. The learning challenge is to predict the digit from the image.

MNIST was a very important dataset for the development of machine learning methods for computer vision. The dataset is challenging enough that obvious, non-learning methods don't tend to do well. At the same time, MNIST is small enough that experimenting with new architectures doesn't require very large amounts of computing power.

However, the MNIST dataset has mostly become obsolete. The best models achieve near one hundred percent test accuracy. Note that this fact doesn't mean that the problem of handwritten digit recognition is solved! Rather, it is likely that human scientists have overfit architectures to the MNIST dataset and capitalized on its quirks to achieve very high predictive accuracies. As a result, it's no longer good practice to use MNIST to design new deep architectures. That said, MNIST is still a superb dataset for pedagogical purposes.

Loading MNIST

The MNIST codebase is located online on Yann LeCun's website. The download script pulls down the raw file from the website. Notice how the script caches the download so repeated calls to `download()` won't waste effort.