Advanced Deep Learning with Python

Train models to evolve using advanced deep learning techniques

Enhance your deep learning knowledge by working with advanced architectures using Keras

Pavlos Mitsoulis Ntompos

Duration- 210 minutes

Overview

Deep learning allows you to solve problems where traditional Machine Learning methods might give poor performance. Detecting and extracting objects from images, extracting meaning from text and predicting outcomes based on complex dependencies to name a few. In this course, you will learn how to use deep learning in practice by going through many use cases and concepts.

You will start by applying Deep Neural Networks to text, image and other data sets using Keras/Tensorflow. By building advanced deep learning architectures like GANs, LSTMs & Variational AutoEncoders you will train Deep Learning models to solve the problems at hand.

By the end of the course, you'll become proficient to work on Deep Learning architectures like GANs, LSTMs, VAEs, Siamese Networks, etc and implement them on Keras/Tensorflow.

Target Audience

If you know deep learning concepts and want to take your understanding of these to the next level, this course is all you need to get started. Knowledge of the Python programming language and understanding of the machine learning concepts is a must, to get the best out of this course.

Key Features

1. Work with advanced neural network architectures for problems in computer vision, natural language processing, ranking and others.
2. The projects built here are easily applied to proprietary image, text or other datasets from nearly any industrial context.
3. Become proficient in building and training advanced neural networks using Keras/Tensorflow in your real-world projects.

Approach

A practical, code-focused approach for walking you through the applications that are possible with more advanced neural network architectures.

What Will You Learn

1- Develop a neural network architecture specific to the problem and data
2- Build an autoencoder for the noisy image problem
3- Develop a generative model using the GAN architecture
4- Process language automatically with Recurrent Neural Networks
5- Generate new text from existing examples with LSTMs
6- Explore the internal processing of a model, and use it to improve systems

About The Author:

Pavlos Mitsoulis Ntompos has 7 years of Machine Learning and Software Engineering experience. Currently, he is a Staff Software Engineer (Machine Learning) at Vrbo (part of Expedia Group), leading Machine Learning initiatives to support Growth Marketing. Additionally, he is the creator of Sagify, an open-source library to simplify training, evaluation and deployment of ML models to SageMaker. In the past, he used to be an instructor at the MSc in Business Analytics offered by Athens University of Economics and Business, teaching applications of Machine Learning using Big Data technologies. He has a Master's degree in Computer Science from Imperial College London. Finally, Pavlos always seeks to apply and discover new Machine Learning theories and best practices.

Summary of Content

COURSE ROADMAP

SECTION ONE – Unsupervised Learning with AutoEncoders (30 mins)
We begin our exploration of advanced neural network architectures with the AutoEncoders. They are one of the easiest ways to perform unsupervised learning with neural networks and are also valuable when paired with other modules of neural networks.

Video 1- Course Overview
Video 2- Advanced Neural Network Architectures
Video 3- AutoEncoders architecture and training
Video 4- Implementing the AutoEncoder on Fashion-MNIST in Keras
Video 5- Other Applications of AutoEncoders
QUIZ

SECTION TWO – Face generation & image processing with GANs (40 mins)
This module builds on the autoencoder, demonstrated how we can employ the same architecture but turn around and start generating images. We'll then explore the preferred method for generative models today, Generative Adversarial Networks. We'll utilise these methods to generate new pictures of people.

Video 1- Turning an AutoEncoder into a generator
Video 2- Image denoising
Video 3- Let's play a game: Adversarial Networks
Video 4 - Generating celebrity faces with GANs
Video 5 - GANs as a hint for future architectures
QUIZ

SECTION THREE - Time Series analysis & topic classification with RNNs (35 mins)
Convolutional neural networks excel at data which has spatial patterns in it, but problems, where the data has natural sequencing like time series and language, have been found to respond well to a different architecture, the Recurrent Neural Network. We'll explore how this advanced architecture generalizes the Multi-layer Perceptrons to work for series data, and apply it on some natural language processing tasks.

Video 1- Sequence data and Multi-layer Perceptrons
Video 2- Time Series predictions with RNNs
Video 3- The natural language problems & deep learning
Video 4- Using Topic Classification
Video 5- Limitations of the RNN
QUIZ

SECTION FOUR - Generate novel movie scripts from original datasets with LSTMs (40 mins)
We'll explore generative models in the natural language context as well, demonstrating a further use of the Recurrent Neural Network Architecture. This section walks through the development of a generative model which generates novel movie scripts based on the original dataset.

Video 1- RNNs & LSTMs for generating language
Video 2- Overview of the strategy and architecture
Video 3- Advanced language processing with embeddings - Word2Vec
Video 4- Non-NLP Applications of Word2Vec

QUIZ

SECTION FIVE - Learning-to-rank using Deep Learning (35 mins)

In this section we'll learn what Learning-To-Rank (LTR) is and how many use cases can be solved as a ranking problem such as ranking search results, recommending products, etc. We'll understand the differences between the various LTR approaches: pointwise, pairwise and listwise. Finally, we'll build neural networks that solve the LTR problem.

Video 1- What is Learning-to-rank
Video 2- Pointwise, Pairwise and Listwise LTR
Video 3- Siamese Neural Network for LTR
Video 5- Using other Neural Networks Architectures for LTR
Video 6- Evaluation Metrics for LTR
QUIZ

SECTION SIX - High-Performance training with Transfer Learning (30 mins)

Deep Learning architectures typically have hundreds of thousands or millions of parameters, requiring as many or more training examples to effectively train, and that volume of data is often not available for a problem. However, we can employ large datasets such as ImageNet as a substitute in many cases, and then apply the already trained neural network on a related problem. In this module, we'll explore the different ways to do this with Keras.

Video 1- What is Transfer Learning and when can be used
Video 2- Approaching similar problems with small datasets
Video 3- Approaching different problems with small datasets
Video 4- Working on similar or different problems with a large dataset
QUIZ

SETUP AND INSTALLATION

All software for this course is free and open source.

Minimum Hardware Requirements:
For successful completion of this course, students will require the computer systems with at least the following:

- OS: MacOS or Linux
- Processor: 2.3GHz quad-core Intel Core i5
- Memory: 16GB
- Storage: 10GB for libraries and data sets

Software Requirements:
Python: 3.6
Standard Python Scientific Library: Anaconda 4.0+ or Numpy & Pandas
Tensorflow: 1.13.0+
Keras: 2.2.0+