

Deep Learning—CIVICA Workshop

Instructor

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Course Description

Neural networks—long believed dead—are back. Advances in training deep neural network architectures have had a tremendous impact on Computer Science and Machine Learning for a decade. Today, they are the foundation of many modern data science applications in academia and industry.

This class will provide an introduction into deep neural networks. Starting from flat architectures, we will understand how neural networks use backward propagation of prediction errors to optimize their performance. Adding more layers to the initial set-up, we will then go on and build increasingly “deep” architectures. We implement fully connected deep learning architectures and learn about classical pitfalls and how to tackle them. If time permits, we will also give up the full connectedness between nodes and take a first look at models that aggregate information to more abstract data representations and recurrent data.

For teaching, the class will alternate between lecture style blocks and more hands-on workshop phases where participants implement code themselves. A range of different languages exist to build deep learning models. This class relies on R and KERAS as main APIs, since they might offer the most intuitive entry point for Social Scientists. You do not have to prepare your local machines, since we will deploy all code on [RStudio Cloud](#).

For the class, it is certainly helpful if you are confident in using R and if you are familiar with the maths behind a logistic regression. It is also of great help if you take the Machine Learning workshop a day before.

Course Objectives

1. Understand what Deep Learning is.
2. Apply Deep Learning algorithms.
3. Think about how you could apply Deep Learning in your own work.

Literature

Chollet, François and Joseph J Allaire (2018). *Deep Learning with R*.

Goodfellow, Ian, Yoshua Bengio, and Aaron Courville (2016). *Deep Learning*. <http://www.deeplearningbook.org>. MIT Press.