

# Minicourse on Machine Learning Approximation Methods:

Algorithms, Error Analyses, Curse of Dimensionality, and Partial Differential Equations

- Prof. Dr. Arnulf Jentzen (ETH Zurich) -

RTG 2131-Minicourse at University of Duisburg-Essen May 24<sup>th</sup> 2018 – 13-18 h



Machine learning approximation methods have successfully been used in a series of applications ranging from computer vision, image classification, speech recognition, and natural language processing to computational advertisement. Recently, machine learning approximation methods have also been started to use to solve complex mathematical problems such as high-dimensional partial differential equations (PDEs). The aim of this short course is to provide a self-contained introduction to machine learning approximation methods. The course covers material

- (i) on deterministic and stochastic optimization algorithms,
- (ii) on artificial neural networks and their approximation capacities,
- (iii) on the curse of dimensionality as well as
- (iv) on machine learning based approximation methods for PDEs.

In particular, we will provide an introduction to state-of-the-art stochastic gradient descent optimization methods such as the Adam optimizer.

**Information:** <https://www.uni-due.de/mathematik/grk2131/mini>

**Venue:** University Duisburg-Essen, Department of Mathematics,  
WSC-S-U-3.02 (Thea-Leymann-Str. 9, 45127 Essen)

