

Department	07 Computer Science and Mathematics
Course title	Deep Learning
Hours per week (SWS)	4
Number of ECTS credits	5
Course objective	Learning and understanding basic theoretical principles of Deep Learning and practical application of the algorithms to a wide variety of problems. Learn skills to implement and apply the algorithms in Python (one of the leading programming languages in machine learning). Skills to understand, implement and apply different Deep Learning architectures.
Prerequisites	Knowledge of linear algebra and calculus, basic programming skills.
Recommended reading	Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep learning. MIT press. Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.
Teaching methods	Presentations with slides, whiteboard, Jupyter Notebooks.
Assessment methods	Seminar Paper Presentation
Language of instruction	English
Name of lecturer	Prof. Dr. David Spieler
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Course content	Deep Learning has become a rapidly growing area in the field of machine learning and is successfully used in a wide variety of different technologies, e.g., natural language recognition, image and object recognition, or autonomous systems and robots. In this course, we will first explore the basics of neural networks and then learn about more complex systems and architectures. * Introduction to neural networks (Perceptron) * Adaptive Linear Neurons, Gradient Descent, Stochastic Gradient Descent, Mini-batch Gradient Descent * Multilayer Neural Networks and training using backpropagation * Activation functions and loss functions * Normalization and regularization * Modern methods of hyperparameter optimization * More complex optimization methods (AdaGrad, RMSProp, Adam) * Convolutional Neural Networks * Different Network Architectures * Transfer Learning and Neural Style Transfer * Object Recognition, Object Detection * Recurrent Neural Networks
Remarks	