



Deep learning - IIT Ropar

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INTENDED AUDIENCE: Any Interested Learners

PRE-REQUISITES : Working knowledge of Linear Algebra, Probability Theory. It would be beneficial if the participants have done a course on Machine Learning.

COURSE OUTLINE :

Deep Learning has received a lot of attention over the past few years and has been employed successfully by companies like Google, Microsoft, IBM, Facebook, Twitter etc. to solve a wide range of problems in Computer Vision and Natural Language Processing. In this course we will learn about the building blocks used in these Deep Learning based solutions. Specifically, we will learn about feedforward neural networks, convolutional neural networks, recurrent neural networks and attention mechanisms. We will also look at various optimization algorithms such as Gradient Descent, Nesterov Accelerated Gradient Descent, Adam, AdaGrad and RMSProp which are used for training such deep neural networks. At the end of this course students would have knowledge of deep architectures used for solving various Vision and NLP tasks

ABOUT INSTRUCTOR :

Prof. Sudarshan Iyengar, Associate Professor at the CSE at IIT Ropar has a Ph.D. from the Indian Institute of Science (IISc). An exemplary teacher who has delivered over 350 popular science talks to students of high school and advanced graduate programmes. Prof. Sudarshan has offered more than 100 hours of online lectures with novel teaching methodologies that have reached lakhs of Students. His research interests include Data Sciences, Social Computing, Social Networks, Collective Intelligence, Crowdsourced Technologies and Secure Computation.

Prof. Padmavati received B.E degree in Computer Science & Engineering with distinction from PDACE, Gulbarga, V.T.U, Belgaum, Karnataka, M.E. degree in Computer Science & Engineering and Ph.D from Punjab Engineering College (Deemed to be University), Chandigarh. Currently, she is working as Assistant Professor at Punjab Engineering College (Deemed to be University), Chandigarh, India. She has been teaching this course since two years for M.Tech students. She has also offered courses like Data structure, Analysis and design of algorithms, Object oriented programming, Research methodology, and Wireless sensor networks. Her research interests are in the areas of Wireless sensor networks, IoT, machine learning and deep learning. Her current research projects include "Classification of Parkinson's disease using machine learning algorithms", "Major depressive disorder using EEG Signal", and "Detection of neurological disorder - Epilepsy using EEG Signals".

COURSE PLAN :

Week 1: History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron

Week 2: Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent

Week 3: Feed Forward Neural Networks, Back propagation

Week 4: Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD

Week 5: Principal Component Analysis and its interpretations, Singular Value Decomposition

Week 6: Auto encoders and relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders

Week 7: Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation

Week 8: Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

Week 9: Learning Vectorial Representations Of Words

Week 10: Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet

Week 11: Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs

Week 12: Encoder Decoder Models, Attention Mechanism, Attention over images