

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Computer Science and Engineering - NOC:Machine Learning for Engineering and Science Appl

Subject Co-ordinator - Prof. Ganapathy, Prof. Balaji Srinivasan

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to the Course History of Artificial Intelligence  
Lecture 2 - Overview of Machine Learning  
Lecture 3 - Why Linear Algebra ? Scalars, Vectors, Tensors  
Lecture 4 - Basic Operations  
Lecture 5 - Norms  
Lecture 6 - Linear Combinations Span Linear Independence  
Lecture 7 - Matrix Operations Special Matrices Matrix Decompositions  
Lecture 8 - Introduction to Probability Theory Discrete and Continuous Random Variables  
Lecture 9 - Conditional, Joint, Marginal Probabilities Sum Rule and Product Rule Bayes' Theorem  
Lecture 10 - Bayes' Theorem - Simple Examples  
Lecture 11 - Independence Conditional Independence Chain Rule Of Probability  
Lecture 12 - Expectation  
Lecture 13 - Variance Covariance  
Lecture 14 - Some Relations for Expectation and Covariance (Slightly Advanced)  
Lecture 15 - Machine Representation of Numbers, Overflow, Underflow, Condition Number  
Lecture 16 - Derivatives, Gradient, Hessian, Jacobian, Taylor Series  
Lecture 17 - Matrix Calculus (Slightly Advanced)  
Lecture 18 - Optimization 1 Unconstrained Optimization  
Lecture 19 - Introduction to Constrained Optimization  
Lecture 20 - Introduction to Numerical Optimization Gradient Descent - 1  
Lecture 21 - Gradient Descent 2 Proof of Steepest Descent Numerical Gradient Calculation Stopping Criteria  
Lecture 22 - Introduction to Packages  
Lecture 23 - The Learning Paradigm  
Lecture 24 - A Linear Regression Example  
Lecture 25 - Linear Regression Least Squares Gradient Descent  
Lecture 26 - Coding Linear Regression  
Lecture 27 - Generalized Function for Linear Regression  
Lecture 28 - Goodness of Fit  
Lecture 29 - Bias-Variance Trade Off

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

Lecture 30 - Gradient Descent Algorithms  
Lecture 31 - Introduction to Week 5 (Deep Learning)  
Lecture 32 - Logistic Regression  
Lecture 33 - Binary Entropy cost function  
Lecture 34 - OR Gate Via Classification  
Lecture 35 - NOR, AND, NAND Gates  
Lecture 36 - XOR Gate  
Lecture 37 - Differentiating the sigmoid  
Lecture 38 - Gradient of logistic regression  
Lecture 39 - Code for Logistic Regression  
Lecture 40 - Multinomial Classification - Introduction  
Lecture 41 - Multinomial Classification - One Hot Vector  
Lecture 42 - Multinomial Classification - Softmax  
Lecture 43 - Schematic of multinomial logistic regression  
Lecture 44 - Biological neuron  
Lecture 45 - Structure of an Artificial Neuron  
Lecture 46 - Feedforward Neural Network  
Lecture 47 - Introduction to back prop  
Lecture 48 - Summary of Week 05  
Lecture 49 - Introduction to Convolution Neural Networks (CNN)  
Lecture 50 - Types of convolution  
Lecture 51 - CNN Architecture Part 1 (LeNet and Alex Net)  
Lecture 52 - CNN Architecture Part 2 (VGG Net)  
Lecture 53 - CNN Architecture Part 3 (GoogleNet)  
Lecture 54 - CNN Architecture Part 4 (ResNet)  
Lecture 55 - CNN Architecture Part 5 (DenseNet)  
Lecture 56 - Train Network for Image Classification  
Lecture 57 - Semantic Segmentation  
Lecture 58 - Hyperparameter optimization  
Lecture 59 - Transfer Learning  
Lecture 60 - Segmentation of Brain Tumors from MRI using Deep Learning  
Lecture 61 - Activation Functions  
Lecture 62 - Learning Rate decay, Weight initialization  
Lecture 63 - Data Normalization  
Lecture 64 - Batch Norm  
Lecture 65 - Introduction to RNNs  
Lecture 66 - Example - Sequence Classification  
Lecture 67 - Training RNNs - Loss and BPTT  
Lecture 68 - Vanishing Gradients and TBPTT

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Lecture 69 - RNN Architectures  
Lecture 70 - LSTM  
Lecture 71 - Why LSTM Works  
Lecture 72 - Deep RNNs and Bi- RNNs  
Lecture 73 - Summary of RNNs  
Lecture 74 - Introduction.  
Lecture 75 - Knn  
Lecture 76 - Binary decision trees  
Lecture 77 - Binary regression trees  
Lecture 78 - Bagging  
Lecture 79 - Random Forest  
Lecture 80 - Boosting  
Lecture 81 - Gradient boosting  
Lecture 82 - Unsupervised learning and Kmeans  
Lecture 83 - Agglomerative clustering  
Lecture 84 - Probability Distributions- Gaussian, Bernoulli  
Lecture 85 - Covariance Matrix of Gaussian Distribution  
Lecture 86 - Central Limit Theorem  
Lecture 87 - Naïve Bayes  
Lecture 88 - MLE Intro  
Lecture 89 - PCA - Part 1  
Lecture 90 - PCA - Part 2  
Lecture 91 - Support Vector Machines  
Lecture 92 - MLE, MAP and Bayesian Regression  
Lecture 93 - Introduction to Generative model  
Lecture 94 - Generative Adversarial Networks (GAN)  
Lecture 95 - Variational Auto-encoders (VAE)  
Lecture 96 - Applications  
Lecture 97 - Applications  
Lecture 98 - Introduction to Week 12  
Lecture 99 - Application 1 description - Fin Heat Transfer  
Lecture 100 - Application 1 solution  
Lecture 101 - Application 2 description - Computational Fluid Dynamics  
Lecture 102 - Application 2 solution  
Lecture 103 - Application 3 description - Topology Optimization  
Lecture 104 - Application 3 solution  
Lecture 105 - Application 4 Solution of PDE/ODE using Neural Networks  
Lecture 106 - Summary and road ahead