

Following are Machine Learning NPTEL Courses available on NPTEL Repository

- <https://nptel.ac.in/courses/106/106/106106139/>
- <https://nptel.ac.in/courses/106/106/106106202/>
- <https://nptel.ac.in/courses/106/106/106106198/>
- <https://nptel.ac.in/courses/106/105/106105152/>
- <https://nptel.ac.in/courses/106/106/106106213/>
- <https://nptel.ac.in/courses/106/106/106106046/>
- <https://www.coursera.org/learn/machine-learning>

Online Book:

- <https://web.stanford.edu/~hastie/ElemStatLearn/>
- <http://www.springer.com/in/book/9780387310732>
- <http://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/>
- <https://www.cs.cornell.edu/jeh/book.pdf>

<p>Unit I Introduction Introduction to Machine Learning, Examples of Machine Learning Applications, Learning Types Supervised Learning -Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm Dimensionality Reduction- Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isomap, Locally Linear Embedding</p>	<ul style="list-style-type: none"> ● https://youtu.be/fC7V8QsPBec, https://youtu.be/T3PsRW6wZSY ● https://youtu.be/YLczBemZpaE, https://youtu.be/Z9ZGie4Kcww ● https://youtu.be/Hw_MZw5zigI, https://youtu.be/whSKA8aO6xQ ● https://youtu.be/OTAR0kT1swg, https://youtu.be/PVhhLKodQ7c ● https://youtu.be/EWmCkVfPnJ8, https://youtu.be/Tw8PmfMXuDG ● https://youtu.be/PN1-U6ZpOOE, https://youtu.be/8PJ24SrQqy8 ● https://youtu.be/n3VpYNXIDzg, https://youtu.be/2KT_QEdsGyA ● https://youtu.be/O_tMgYcA8j0, https://youtu.be/U9bURX-UGVU ● https://youtu.be/gRkBOH7Cftg, https://youtu.be/FdzK33RymyQ ● https://youtu.be/7nqtWNnq_Dk, https://youtu.be/49EkCUbbKNO ● https://youtu.be/UF2YKP5ph8I, https://youtu.be/GYu24VtiB1g ● https://youtu.be/Yt0o8ukIOKU, https://youtu.be/n3y3xLNoPk4 ● https://people.cs.pitt.edu/~milos/courses/cs3750/lectures/class9.pdf ● https://youtu.be/Y1TBFuj-8iw, https://youtu.be/yBwpo-L80Mc
<p>Unit II Linear Methods for Regression Introduction, Linear Regression Models and Least Squares, Subset Selection, Shrinkage Methods-Ridge Regression, Lasso Regression, Least Angle Regression, Methods Using Derived Input Directions-Principal Components Regression, Partial Least Squares, A Comparison of the Selection and Shrinkage Methods, Multiple Outcome Shrinkage and Selection, More on the Lasso and Related Path Algorithms, Logistic Regression-Fitting Logistic Regression Models, Quadratic Approximations and Inference, L1 Regularized Logistic Regression</p>	<ul style="list-style-type: none"> ● https://youtu.be/_M7Km1XZERU, https://youtu.be/U9bURX-UGVU ● https://youtu.be/kETBe_InfHs, https://youtu.be/gRkBOH7Cftg ● https://youtu.be/KfuCtcj1qnc, https://youtu.be/FdzK33RymyQ ● https://youtu.be/7XE7Vggat_8, https://youtu.be/eLgifSnumpk ● https://youtu.be/yGJgI9rPqXQ, https://youtu.be/w8XgrnDdtQ4 ● https://youtu.be/NGf0voTMLcs, https://youtu.be/5h7emSudT1E ● https://youtu.be/g_LURKulj4, https://youtu.be/UV5yj5A3QIM ● https://youtu.be/lfgbDRaTE2w, https://youtu.be/1q3Z-oIDdlg
<p>Unit III Support Vector Machines and Tree-Based Models SVM-Introduction to SVM, The Support Vector Classifier, Support Vector Machines and Kernels- Computing the SVM for Classification, The SVM as a Penalization Method, Function</p>	<ul style="list-style-type: none"> ● https://youtu.be/gidJbK1gXmA, https://youtu.be/YOsrYl1JRrc ● https://youtu.be/WLhvjp0CPIY, https://youtu.be/GcCG0PPV6cg ● https://youtu.be/Z0CtYBPR5sA, ● https://academic.oup.com/bioinformatics/article/25/13/1711/196569 ● https://youtu.be/S0HnCjKq8-s, https://youtu.be/SMaa3pnQmbg

<p>Estimation and Reproducing Kernels, SVMs and the Curse of Dimensionality, A Path Algorithm for the SVM Classifier, Support Vector Machines for Regression, Regression and Kernels Tree Based Methods-Regression Trees, Classification Trees, Random Forests-Definition of Random Forests, Details of Random Forests- Out of Bag Samples, Variable Importance, Proximity Plots, Random Forests and Overfitting, Analysis of Random Forests-Variance and the De-Correlation Effect, Bias, Adaptive Nearest Neighbors</p>	<ul style="list-style-type: none"> ● https://icml.cc/ims/conferences/2007/proceedings/papers/60.pdf ● https://youtu.be/8qsF122c5Lk, ● https://towardsdatascience.com/a-complete-view-of-decision-trees-and-svm-in-machine-learning-f9f3d19a337b ● https://dl.acm.org/doi/10.1145/1143844.1143888 ● https://youtu.be/PnbQ4tCF-oc, https://youtu.be/waBlrjzs4Tc ● https://youtu.be/Ncln-zvLM2w, https://youtu.be/-2DIAMYioqY ● https://rdr.io/cran/rfPermute/man/proximityPlot.html ● https://datascience.stackexchange.com/questions/1028/do-random-forest-overfit ● https://mljar.com/blog/random-forest-overfitting/ ● https://statweb.stanford.edu/~tibs/book/chap17.pdf ● https://towardsdatascience.com/random-forests-and-the-bias-variance-tradeoff-3b77fee339b4 ● https://youtu.be/g2eeH9ve5bQ, https://youtu.be/DIQli0O0ckf8
<p>Unit IV Multilayer Perceptrons Introduction-Understanding the Brain, Neural Networks as a Paradigm for Parallel Processing, The Perceptron, Training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, MLP as a Universal Approximator, Backpropagation Algorithm-Nonlinear Regression, Two-Class Discrimination, Multiclass Discrimination, Multiple Hidden Layers, Training Procedures-improving Convergence, Overtraining, Structuring the Network, Tuning the Network Size, Bayesian View of Learning, Dimensionality Reduction, Learning Time-Delay Neural Networks, Recurrent Networks, Regularization in Neural Networks, Bayesian Neural Networks</p>	<ul style="list-style-type: none"> ● https://youtu.be/412SI_kvDyc, https://youtu.be/hxpGzAb-pyc ● https://youtu.be/Xv_JJ2ZuDJM, https://youtu.be/h9MqCkAopqw ● http://meseec.ce.rit.edu/756-projects/spring2013/1-4.pdf ● https://web.stanford.edu/~rezab/classes/cme323/S16/projects_reports/hedge_usmani.pdf ● https://youtu.be/xbYgKoG4x2g, https://youtu.be/vbNDNkvzzuk ● https://youtu.be/VQ1O-pSPX2O, https://youtu.be/trG-OnnQ9g4 ● https://youtu.be/PN1-U6ZpO0E, https://youtu.be/Q2gyX36LDyY ● https://youtu.be/HOHjNuNvFVI, https://youtu.be/HnVYF6VQryU ● https://youtu.be/E3I26bTdtxl, https://youtu.be/480a_2jRdK0 ● https://youtu.be/YSqFB7Srx-4, https://youtu.be/MDVVUY-sftQ ● https://youtu.be/lkha188L4Gs, https://youtu.be/U_Fs5sNk91M ● https://youtu.be/VRcixOuG-TU, https://youtu.be/P7WhKIG6j4g ● https://youtu.be/bqBRET7tbiQ, https://youtu.be/s8pDf2Pt9sc ● https://youtu.be/gkEa9ff7HGc ● https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/understanding-machine-learning-theory-algorithms.pdf
<p>Unit V Unsupervised Learning Introduction, Association Rules-Market Basket Analysis, The Apriori Algorithm, Unsupervised as Supervised Learning, Generalized Association Rules, Cluster Analysis-Proximity Matrices, Clustering Algorithms-K-mean, Gaussian Mixtures as Soft K-means Clustering, Example: Human Tumor Microarray Data, Vector Quantization, K-medoids, Hierarchical Clustering, Self-Organizing Maps, PCA-Spectral Clustering</p>	<ul style="list-style-type: none"> ● https://youtu.be/HTSCbxSxs-g, https://youtu.be/N_whCVtfl9M ● https://youtu.be/hEQkqpmx-Y, https://youtu.be/QHLDpLWyDGM ● https://youtu.be/1FZ0A1QCMWc, https://youtu.be/kE5QZ8G_78c ● https://youtu.be/2otyDye_V0o, https://youtu.be/ZYUPlch9TLQ ● https://youtu.be/dIJKBqBcTo, https://youtu.be/qg_M37WGKG8 ● https://youtu.be/FK9izGvLzU8, https://youtu.be/aaQrSN18qGI ● https://www.jocpr.com/articles/clustering-analysis-of-cancerous-microarray-data.pdf ● https://youtu.be/JmyxDMTpQ4o, https://youtu.be/RqT_h5vX5P0 ● https://youtu.be/NCsHRMkDRE4, https://towardsdatascience.com/self-organizing-maps-for-dimension-reduction-data-visualization-and-clustering-ff966edd311c ● https://youtu.be/K4WuE7zIOZo, https://youtu.be/zkgm0i77jQ8
<p>Unit VI Hidden Markov and Graphical Models Hidden Markov Models-Introduction, Discrete Markov Processes, Hidden Markov Models, Three Basic Problems of HMMs, Evaluation Problem, Finding the State Sequence, Learning Model Parameters, Continuous Observations, The HMM with Input, Model Selection in HMM Graphical Models-Introduction, Canonical Cases for Conditional Independence, Example</p>	<ul style="list-style-type: none"> ● https://www.cc.gatech.edu/~hic/CS7616/pdf/lecture6.pdf ● https://jonathan-hui.medium.com/machine-learning-hidden-markov-model-hmm-31660d217a61 ● https://youtu.be/jY2E6ExLxaw, https://youtu.be/TPRoLreU9IA ● https://youtu.be/M_IW0VYMEA ● http://www.igntu.ac.in/eContent/IGNTU-eContent-804059256131-MA-Linguistics-4-HarjitSingh-ComputationalLinguistics-3.pdf ● https://towardsdatascience.com/introduction-to-hidden-markov-models-cd2c93e6b781 ● https://youtu.be/hHHP89oyYkA https://youtu.be/iYZP5uP7enQ

Graphical Models-Naive Bayes' Classifier, Hidden Markov Model, Linear Regression, d-Separation, Belief Propagation-Chains, Trees, polytrees, Junction Trees, Undirected Graphs: Markov Random Fields, Learning the Structure of a Graphical Model, Influence Diagrams

- <https://web.stanford.edu/~jurafsky/slp3/A.pdf>
- https://www.cs.hmc.edu/~yjw/teaching/cs158/lectures/17_19_HM_Ms.pdf
- http://www.phon.ox.ac.uk/jcoleman/old_SLP/Lecture_6/HMM_prob_lems.htm
- <http://jedlik.phy.bme.hu/~gerjanos/HMM/node6.html>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4804157/>
- <https://www.cs.cmu.edu/~ggordon/siddiqi-gordon-moore.fast-hmm.pdf>
- <https://www.cs.jhu.edu/~ayuille/courses/Stat161-261-Spring14/lecture15.pdf>
- <https://www.cc.gatech.edu/~hic/CS7616/pdf/lecture6.pdf>
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