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Introduction to Machine Learning

By Prof. Balaraman Ravindran | IIT Madras

Learners enrolled: 33946

ABOUT THE COURSE :

With the increased availability of data from varied sources there has been increasing attention paid to the various data driven disciplines such as analytics and machine learning. In this course we intend to introduce some of the basic concepts of machine learning from a mathematically well motivated perspective. We will cover the different learning paradigms and some of the more popular algorithms and architectures used in each of these paradigms.

INTENDED AUDIENCE : This is an elective course. Intended for senior UG/PG students. BE/ME/MS/PhD

PREREQUISITES : We will assume that the students know programming for some of the assignments.If the students have done introductory courses on probability theory and linear algebra it would be helpful. We will review some of the basic topics in the first two weeks as well.

INDUSTRY SUPPORT : Any company in the data analytics/data science/big data domain would value this course.

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Summary

Course Status :	Completed
Course Type :	Elective
Duration :	12 weeks
Category :	○ Computer Science and Engineering ○ Artificial Intelligence ○ Data Science ○ Programming ○ Robotics
Credit Points :	3
Level :	Undergraduate/Postgraduate
Start Date :	23 Jan 2023
End Date :	14 Apr 2023
Enrollment Ends :	06 Feb 2023
Exam Registration Ends :	17 Mar 2023
Exam Date :	30 Apr 2023 IST

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Note: This exam date is subjected to change based on seat availability. You can check final exam date on your hall ticket.

This is an AICTE approved FDP course

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(https://www.addtoany.com/share#url=https%3A%2F%2Fonlinecourses.nptel.ac.in%2Fnoc23_cs18%2Fpreview&title=Introduction%20to%20Machine%20Learning%20-%20Course)

Course layout

Week 0: Probability Theory, Linear Algebra, Convex Optimization - (Recap)
Week 1: Introduction: Statistical Decision Theory - Regression, Classification, Bias Variance
Week 2: Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least squares
Week 3: Linear Classification, Logistic Regression, Linear Discriminant Analysis
Week 4: Perceptron, Support Vector Machines
Week 5: Neural Networks - Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation
Week 6: Decision Trees, Regression Trees, Stopping Criterion & Pruning loss functions, Categorical Attributes, Multiway Splits, Miss[illegible]ues, Decision Trees - Instability Evaluation Measures

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Week 7: Bootstrapping n, Class Evaluation Measures, ROC curve, MDL, Ensemble Methods - Bagging, Committee Machines and Stacking, Boosting

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Week 8: Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks

Week 9: Undirected Graphical Models, HMM, Variable Elimination, Belief Propagation

Week 10: Partitional Clustering, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering

Week 11: Gaussian Mixture Models, Expectation Maximization

Week 12: Learning Theory, Introduction to Reinforcement Learning, Optional videos (RL framework, TD learning, Solution Methods, Applications)

Books and references

1. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (freely available online)
2. Pattern Recognition and Machine Learning, by Christopher Bishop (optional)

Instructor bio

Prof. Balaraman Ravindran

IIT Madras

Prof. Balaraman Ravindran is currently an Professor in Computer Science at IIT Madras and Mindtree Faculty Fellow . He has nearly two decades of research experience in machine learning and specifically reinforcement learning. Currently his research interests are centered on learning from and through interactions and span the areas of data mining, social network analysis, and reinforcement learning.

Course certificate

The course is free to enroll and learn from. But if you want a certificate, you have to register and write the proctored exam conducted by us in person at any of the designated exam centres.
The exam is optional for a fee of Rs 1000/- (Rupees one thousand only).
Date and Time of Exams: **30 April 2023** Morning session 9am to 12 noon; Afternoon Session 2pm to 5pm.
Registration url: Announcements will be made when the registration form is open for registrations.
The online registration form has to be filled and the certification exam fee needs to be paid. More details will be made available when the exam registration form is published. If there are any changes, it will be mentioned then.
Please check the form for more details on the cities where the exams will be held, the conditions you agree to when you fill the form etc.

CRITERIA TO GET A CERTIFICATE

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.
Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. None

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