



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

Second Semester 2024-2025

Course Handout Part II

Date : 06.01.2025

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : BITS F464
Course Title : Machine Learning
Instructor In Charge : Prof. Paresh Saxena

1. Scope

Machine Learning is an exciting topic to learn to design machines that can learn from examples. This course provides a broad introduction to machine learning while emphasizing the role of probability and optimization in developing theoretical foundations, algorithms and methodologies for machine learning. The course covers the overview of several probability distributions relevant to understand the ML algorithms. Further, the course also covers linear models for regression and classification, neural networks, Kernel methods and mixture models. In addition to the theoretical concepts, the course will also provide several coding examples and exercises.

2. Objectives of the course

The objectives of the course are as follows:

- To understand a wide variety of learning algorithms.
- To understand how to evaluate models generated from data.
- To apply the algorithms to a real problem, optimize the models learned and understand the achievable expected accuracy by applying the models.

3. TEXT BOOK:

T1. Christopher Bishop: Pattern Recognition and Machine Learning, Springer, 1st ed. 2006.
T2. Tom M. Mitchell: Machine Learning, The McGraw-Hill International Edition, 1997.

4. Course Plan:

Lecture No. (1 lecture = 1 hour)	Learning objectives	Topics to be covered	Chapter in the Text Book
1 – 3	To introduce several relevant materials to understand ML algorithms	ML overview.	Lecture Notes
3 – 8	To understand linear models for regression	Gradient Descent, Bias-Variance, Bayesian Regression, Bayesian Model Comparison.	T1 – Ch. 3
9–14	To understand linear models for classification	Discriminant Functions, Probabilistic Generative and Discriminative Models, Bayesian Logistic Regression	T1 – Ch. 4
15-22	To understand Neural networks	Feed-forward Network Functions, Network Training, Backpropagation, Regularization.	T1 – Ch.5
23-32	To understand Kernel methods and Sparse Kernel Machines	Radial basis function networks, Gaussian processes, SVMs, Multiclass SVMs	T1 – Ch. 6 and 7
32-40	To develop the understanding of Mixture models and combining models	K-means Clustering, Mixture Models, EM, Bagging, Boosting, Decision Trees.	T2 – Ch. 9 and Ch. 14

5. Evaluation Scheme:

Component	Duration (Minutes)	Weightage	Date & Time	Nature
Midsemester Test	90 Mins	35%	06/03 4.00 - 05.30PM	Closed Book
Course Project (with presentation/viva)	-	25% (5% will be evaluated before the mid-sem)	Details will be announced during the lecture sessions.	Open Book
Comprehensive Examination	180 Mins	40%	09/05AN	Closed Book

Note: 40% of the evaluation to be completed by midsem grading.

6. CHAMBER CONSULTATION HOUR: To be announced.

7. Make-up: The make-up policy will be in accordance with the AUGSD guidelines.

8. NOTICES: All notices pertaining to this course will be displayed on the LMS.

9. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
BITS F464