National Institute of Technology Calicut
Department of Computer Science and Engineering
Course Plan (Tentative) | Monsoon 2021-2022
CS4044D Machine Learning

Course Outcomes:

CO1 Apply Bayesian Decision theory for minimum error rate classification.

CO2 Understand and apply parameter estimation techniques for classification

CO3 Employ non-parametric techniques for classification

CO4 Apply linear discriminant function principle for decision making and apply various linear methods like linear regression, logistic regression and Principle Component Analysis.

CO5 Understand multi-layer neural network learning using back propagation algorithm and apply it for deep learning techniques like Convolutional Neural Networks.

Lecture Details: Lecture Hours: C slot | Lecture mode: Online via Webex platform
Instructors: **G**opakumar G | Email Id: gopakumarg@nitc.ac.in
Pranesh Das | Email Id: praneshdas@nitc.ac.in
References

- C. M Bishop, Pattern Recognition and Machine Learning, Springer, 2006

- J. T. Tou and R. C. Gonzalez, Pattern Recognition Principles, Wiley, 1974.

- R. O. Duda, P. E. Hart and D.G Stork, Pattern Classification, 2/e, John Wiley, 2004.

Grading, mark distribution and tentative schedule of evaluations
Grading will be relative
Following are the details of split-up of marks for various evaluations:
Quiz: 4 quizzes - 5 marks each, total 20 marks | Assignment (2 Nos; Group), $2 \times 10 = 20$ marks | 2 Mid semester examinations - 15 marks each, total 30 | End semester examination - 30 marks

Tentative schedule of evaluations:

Evaluation	Tentative Date
Quiz 1	25 Aug 2021
Test 1	Sep first week
Quiz 2	27 Sep 2021
Test 2	6 Oct 2021
Assignment 1	15 Oct 2021-05 Nov 2021
Quiz 3	22 Oct 2021
Quiz 4	10 Nov 2021
End Sem	Nov third week

All issues regarding valuation of exams must be resolved within one week after the marks are announced.

Absence for exams/assignments/quizzes without prior permission from the instructor will be equivalent to zero marks in the corresponding exam/assignment/quiz.

There will be no makeup exam except in case of genuine reason. In the event of such exceptional cases, the student must discuss the matter with the instructor and must get permission at least one day before the date of exam.

There will not be any change in the submission date once announced. Late submission/s will not be valued at any cost, and will be awarded zero marks.

Attendance
80% attendance is compulsory for writing the end semester exam.

Standard of Conduct

Each student is expected to adhere to high standards of ethical conduct, especially those related to cheating and plagiarism. Any submitted work MUST BE an individual effort. Any academic dishonesty will result in zero marks in the corresponding exam or evaluation and will be reported to the department council for record keeping and for permission to assign F grade in the course. The department policy on academic integrity can be found at
http://cse.nitc.ac.in/sites/default/files/Academic-Integrity.pdf

Tentative Schedule
Week 01 Introduction: Machine Perception, Pattern Recognition Systems, The Design Cycle, Learning and Adaptation.
Week 02 Bayes Decision Theory, Minimum Error rate Classification, Classifiers
Week 03 Discriminant functions and Decision Surfaces, Normal Density
Week 04 Discriminant functions for the Normal Density, Bayes Decision Theory for Discrete features.
Week 05 Parameter Estimation :Maximum Likelihood Estimation, Maximum A Posteriori Estimation and Bayesian Parameter Estimation.
Week 06 Gaussian Case and General Theory, Non Parametric Techniques:

Density Estimation, Parzen Windows

Week 07 K- Nearest Neighbor Estimation, NN rule, Metrics and NN Classification

Week 08 Unsupervised Methods - Clustering Algorithms- K Means, Gaussian Mixture Models, Fuzzy Classification

Week 09 Linear Discriminant Functions : Linear Discriminant Functions and Decision Surfaces, Generalized Discriminant Functions

Week 10 The two-category linearly separable case , Minimizing the perceptron criterion function, relaxation procedures, non- separable behavior, Minimum Squared- Error procedures

Week 11 Linear Methods : Linear regression, logistic regression, Principal Component Analysis

Week 12 Fisher's Linear Discriminant Analysis, Non-linear methods - Kernel Methods - Kernel version of PCA

Week 13 LDA and SVMs

Week 14 Multi Layer Neural Networks : Feedforward Operation, Classification

Week 15 Back – propagation Algorithm, Error Surfaces, Back-propagation as Feature mapping

Week 16 Convolutional Neural Networks and Deep Learning.