COURSE MODULE FOR THE SESSION 2023-24(ODD SEMESTER)

Course Syllabi with CO's

Academic Year: 2024 - 2025

Department: Computer Science & Engineering (Data science)

Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
21CS753	**Deep Learning**	Core	**Linear Algebra, Probability and Statistics**	3	0	0	40

Objectives:

CLO 1. Understand the fundamentals of deep learning.
CLO 2. Know the theory behind Convolutional Neural Networks, Autoencoders, RNN
CLO 3. Illustrate the strength and weaknesses of many popular deep learning approaches.
CLO 4. Understand Bayesian techniques for problems appear in machine learning
CLO 5.Learn the open issues in deep learning, and have a grasp of the current research directions.

Topics Covered as per Syllabus

Module -1

Introduction to Deep Learning: Introduction, Deep learning Model, Historical Trends in Deep Learning,

Machine Learning Basics: Learning Algorithms, Supervised Learning Algorithms, Unsupervised Learning Algorithms.

Module -2

Feedforward Networks: Introduction to feedforward neural networks, Gradient-Based Learning, Back Propagation and Other Differentiation Algorithms. Regularization for Deep Learning,

Module -3

Optimization for Training Deep Models: Empirical Risk Minimization, Challenges in Neural Network
Optimization, Basic Algorithms: Stochastic Gradient Descent, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates: The AdaGrad algorithm, The RMSProp algorithm, Choosing the Right Optimization Algorithm.

Module -4

Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely
Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features- LeNet, AlexNet

Module -5

Recurrent and Recursive Neural Networks: Unfolding Computational Graphs, Recurrent Neural Network, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Long Short Term Memory and Other Gated RNNs.
Applications: Large-Scale Deep Learning, Computer, Speech Recognition, Natural Language Processing and Other Applications.

TextBooks:
1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
Reference Books
1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning, 2009. 2. N.D.Lewis, "Deep Learning Made Easy with R: A Gentle Introduction for Data Science", January 2016. 3. Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications.
List of URL's
● https://faculty.iitmandi.ac.in/~aditya/cs671/index.html ● https://nptel.ac.in/courses/106/106/106106184/ ● https://www.youtube.com/watch?v=7x2YZhEj9Dw
Course outcomes: The students should be able to:
CO1: Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc., CO2: Describe various knowledge on deep learning and algorithms CO3: Apply CNN and RNN model for real time applications CO4: Identify various challenges involved in designing and implementing deep learning algorithms. CO5: Relate the deep learning algorithms for the given types of learning tasks in varied domain
Continuous Internal Evaluation (CIE): The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code	**21AI63**			**Title: Machine Learning**									
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO10**	**PO 11**	**PO1 2**	**Total**
CO-1	2	2	1	1	-	-	-	1	-	1	-	2	10
CO-2	2	2	1	1	-	-	-	1	-	-	-	2	09
	3	2	1	2	-	-	-	1	-	-	-	2	11
CO-4	3	2	1	2	-	-	-	1	-	-	-	2	11
CO-5	3	2	1	2	-	-	-	1	-	-	-	2	11
Total	**12**	**10**	**05**	**08**		**-**	**-**	**5**	**-**	**1**	**-**	**10**	**51**

The Correlation of Program Specific Outcome's (PS0's) and Course Outcome (CO's)

Subject Code	**21AI63**	**Title: Machine Learning**	
List of Course Outcome's	**PSO1**	**PSO2**	**Total**
CO-1	3	-	**3**
CO-2	3	-	**3**
CO-3	3	-	**3**
CO-4	3	-	**3**

CO-5	3	-	**3**
Total	**15**	**-**	**15**

Note: 3 = Strong Contribution 2 = Average Contribution 1= Weak Contribution - = No Contribution