GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering Syllabus

Subject Code : 3730309

Subject Name : Artificial Intelligence and Deep Learning for Instrumentation

WEF Academic Year :	2023-24
Semester:	3
Category of the Course :	Program Elective

Prerequisite :	Working knowledge of Linear Algebra, Probability Theory. Pattern Recognition and Machine Learning.
Rationale :	Deep learning is vital in preparing students for the systems in AI-driven industries, fostering innovation in multidisciplinary area and ethical AI development.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Course Content :

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Machine Learning: Knowledge and Learning, learning by Advise, Examples, learning in problem Solving, Symbol Based Learning, Explanation Based Learning, Version Space, ID3 Decision Based Induction Algorithm, Unsupervised Learning, Reinforcement Learning, Supervised Learning: Perceptron Learning, Back propagation Learning, Competitive Learning.	5	8
2	Feed Forward Neural Networks, Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD.	4	10
3	Principal Component Analysis and its interpretations, Singular Value Decomposition.	3	10
4	Auto encoders and relation to PCA, Regularization in auto encoders, De noising auto encoders, Sparse auto encoders.	4	10
5	Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation.	4	10
6	Learning Vectorial Representations Of Words.	4	10
7	Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet.	7	16
8	Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs.	7	16
9	Encoder Decoder Models, Attention Mechanism, Attention over images.	6	10
	Total	**44**	**100**

Reference Book :

(1) Ian Goodfellow and Yoshua Bengio and Aaron Courville. Deep Learning. An MIT Press book. 2016.
(2) Charu C. Aggarwal. Neural Networks and Deep Learning: A Textbook. Springer. 2019.
(3) Dive into Deep Learning.

Course Outcome :

After Completion of the Course, Student will able to :

No.	Course Outcomes	RBT Level*
01	Understand the concept of Artificial Neural Networks and machine learning	RM UN
02	Select and use Datasets in implementing the machine learning algorithm	UN AP EL
03	Implement the machine learning concepts and algorithms in any suitable language of choice.	AP AN EV CR
04	Learn the fundamentals of various deep learning models CNN, RNN, Encoder-Decoder models.	RM UN

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

List of Laboratory/Learning Resources Required :

NPTEL: https://nptel.ac.in/courses/106106184

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