SEMESTER S7

DEEP LEARNING TECHNIQUES

Course Code	PEBMT745	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	5/3	Exam Hours	2 Hrs.30 Min.
Prerequisites (if any)	None	Course Type	PE

Course Objectives:

1. Illustrate the basic concepts of neural networks and its practical issues (Cognitive Knowledge level: Apply)

2. Outline the standard regularization and optimization techniques for deep neural network (Cognitive Knowledge Level: Understand)

3. Implement the foundation layers of CNN (Cognitive Knowledge Level: Apply)

4. Implement a sequence model using recurrent neural networks (Cognitive Knowledge Level: Apply)

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to Neural networks, Perceptron model-Single layer perceptron and Multi-layer perceptron, Activation functions-Sigmoid, Tanh and ReLu, McCulloch & Pitts model, Back propagation, The Problem of Overfitting, Vanishing and exploding gradient problems, Difficulties in convergence, Local and spurious optima.	9
2	Introduction to Deep Learning Bayesian Learning, Decision Surfaces , Deep feed forward network, Training deep models, Optimization techniques - Gradient Descent (GD), GD with momentum, Nesterov accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam. Regularization Techniques - L1 and L2 regularization, Early stopping, Dataset augmentation, Parameter	9

	sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Parameter initialization	
3	Introduction to convolution neural networks– Convolution, pooling, architecture, Convolution and Pooling as an infinitely strong prior, variants of convolution functions, structured outputs, data types, efficient convolution algorithms.	**7**
4	Recurrent neural networks – Computational graphs, RNN design, encoder – decoder sequence to sequence architectures, deep recurrent networks, recursive neural networks, modern RNNs LSTM . Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc	**11**

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

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Attendance	Internal Ex	Evaluate	Analyse	Total
5	**15**	**10**	**10**	**40**

Criteria for Evaluation(Assignment/microproject):15 marks

Students should Analyse and apply deep learning technique for implementing a network for the application in biomedical field.

Criteria for evaluation

1.Problem Definition(K4- 5 points)

a)Identify the problem

b)Examine the relevant factors causing the problem

2.Problem Analyse(K4-5 points)

a)Find the best solution

3)Apply(K3 -5 points)

a)Apply any deep learning technique for implementing the solution

Scoring

1 Accomplished (4 points) :Analysis and depth of understanding the concept

2 Competent(3 points): Solid performance with minor area for improvement

3 Developing(2 points) :Adequate effort but lacks clarity

4 Minimal(1 point):Incomplete

End Semester Examination Marks (ESE)

In Part A, all 32questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

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Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Illustrate the basic concepts of neural networks and its practical issues	**K2**
CO2	Outline the standard regularization and optimization techniques for deep neural network	**K3**
CO3	Outline the standard regularization and optimization techniques for deep neural network	**K3**
CO4	Implement a sequence model using recurrent neural networks	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2									1
CO2	2	2	2		1							2
CO3	2		2									
CO4	2	2	2		2							2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Neural Networks and Deep learning	Charu C. Aggarwal	Springer International Publishing	2018
2	Deep Learning	Goodfellow, I., Bengio,Y., and Courville	MIT Press	2016
3	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	Nikhil Buduma and Nicholas Locascio		2017

Reference Books

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Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Principles of soft computing	Deepa, S. N., and S. N. Sivanandam	WILEY	2011
2	Neural Networks and Deep Learning	Michael Nielsen		2018

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://elearn.nptel.ac.in/shop/nptel/introduction-to-soft-computing/?v=c86ee0d9d7ed
2	https://onlinecourses.nptel.ac.in/noc22_cs124/preview
3	https://elearn.nptel.ac.in/shop/nptel/introduction-to-soft-computing/?v=c86ee0d9d7ed
4	https://onlinecourses.nptel.ac.in/noc22_cs124/preview

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