

## **NEURAL NETWORKS AND DEEP LEARNING**

**Course Code: CSA 401**

**Credit Units: 03**  
**Total Hours: 45**

**Course Objective:**

The main objective of the course is to introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

**Course Contents:**

**Module I: Introduction: (9 Hours)**

Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

**Module II: Artificial Neural Network: (9 Hours)**

Artificial Neural Network, Basics of ANN, Activation Functions, Architectures of Neural Network. Learning Process in ANN, Error functions, Back Propagation Neural network.

**Module III: Probabilistic Neural Network(9 Hours)**

Speech Recognition, Probabilistic Neural Networks, Convolutional Neural Network, Recurrent Neural Network.

**Module IV: Deep Learning: (9 Hours)**

Deep Feed Forward network, regularizations, training deep models, dropouts,, Deep Belief Network, Limitations of Deep Learning.

**Module V: Deep Learning Research and Tools: (9 Hours)**

Object recognition, sparse coding, computer vision, natural language processing, Deep Learning Tools: Caffe, Theano, Torch.

**Course Outcomes:**

At the end of this course, students will demonstrate ability to:

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

**Examination Scheme:**

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	20	60

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

**Text & References:**

**Text:**

- Machine Learning by Saikat Dutt , Subramanian Chandramouli, Pearson Education; First edition (1 October 2018)
- Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016..
- Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

**References:**

- Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
- Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.

- Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

## **NEURAL NETWORKS AND DEEP LEARNING LAB**

**Course Code: CSA 421**

**Credit Unit: 01**

**Total Hours: 30**

**Course Objective:**

The course objective is to understand major deep learning algorithms.

**SOFTWARE REQUIREMENTS: Python**

**List of experiments/demonstrations:**

- Introductory session on neural network tools
- Neural Network with Python
- Implementing, training, and evaluating neural networks
- Image Classification with Deep Convolutional Networks
- Feedforward Networks for Handwritten Digit Recognition
- Deep Feedforward Networks.
- Recurrent and Recursive Networks.
- Convolutional Networks.
- R Adversarial Learning.

**Course Outcomes:**

Learner will learn

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

**Examination Scheme:**

IA			EE			
A	PR	Practical Based Test	Major Experiment	Minor Experiment	LR	Viva
5	20	15	25	15	10	10

Note: IA –Internal Assessment, EE- External Exam, A- Attendance PR- Performance, LR – Lab Record, V – Viva.

**Text & References:**

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- Machine Learning by Saikat Dutt , Subramanian Chandramouli, Pearson Education; First edition (1 October 2018)
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