20CS016 DEEP LEARNING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

The basic building blocks of various deep learning models. Specifically, this course focuses on feed forward neural networks, convolutional neural networks, recurrent neural networks, and auto encoders. To build, train and apply fully connected deep neural networks understand hyper parameter tuning in a neural network's architecture understand the best-practices and to effectively use the common neural network "tricks" how to build and apply convolutional networks to visual detection and recognition tasks.

Course Outcomes:

Upon the Completion of the course, students will be able to:

- ✓ Design and implement the basic building blocks used in the Deep Learning based solutions
- ✓ Analyze andtune hyper parameters of a Deep Neural network model
- ✓ Usage of tools to implement various deep learning models
- ✓ Application of Deep learning to solve various real-time problems

SKILLS:

- ✓ Develop strong foundations in Neural Networks and deep learning
- ✓ Apply the techniques learned to solve the most common applications in Computer Vision and Natural Language Processing.
- ✓ Hyperparameter Tuning of a deep Neural network model
- ✓ Neural network implementation in TensorFlow/Keras

UNIT - I

Introduction of deep learning: History of Deep Learning, What is Deep Learning?

Feedforward neural networks: McCulloch–Pitts neuron, Perceptron learning rule,Perceptron convergence theorem, Sigmoidal neuron, Multi-layer feedforward neural network, Backpropagation method, Gradient descent method, Stochastic gradient descentmethod

UNIT - II

A**utoencoders** –Autoassociative neural network, Stacked autoencoder, Autoencoders and relation to PCA, Regularization in autoencoders,Greedy layer-wisetraining, Variational autoencoder, Contractive autoencoder, Sparse autoencoder, Denoising autoencoders

UNIT - III

Optimization and regularization methods for deep feedforward neural networks: Optimization methods - Adagrad, Adadelta, RMSProp, Adam; Regularization methods-Dropout, Dropconnect, Batch normalization; Activation functions - Linear, sigmoid, sigmoid, ReLU; Improving the training process - Early stopping, Parameter sharing and tying, Better weight initialization methods

UNIT - IV

Convolutional neural networks (CNNs): Basic CNN architecture, Advanced CNNs: LeNet,AlexNet, VGGNet, ResNet, GoogleNet and other architectures; 1-d CNN, 3-d CNN

Application of CNNs for computer vision tasks: image classification, Video classification, and object recognition and localization.

UNIT - V

Sequence learning: Architecture of an RNN, Unfolding of an RNN, Backpropagation through time, Long short term memory (LSTM), Gated recurrent units,Bidirectional RNNs and Bidirectional LSTMs

TEXTBOOKS:

1. Ian Goodfellow and YoshuaBengio and Aaron, **Deep Learning,** An MIT Press book, 2016

REFERENCEBOOKS:

1. Francois Chollet, “Deep learning with python”, Manning publications, 2017
2. S. Haykin, **Neural Networks and Learning Machines**, Prentice Hall of India, 3rd Edition, 2011
3. Josh Patterson and Adam Gibson, “Deep Learning: A Practitioner’s Approach”, OReilly, 2017