Jansons Institute of Technology

Karumathampatti, Coimbatore - 641 659

Approved by AICTE and Affiliated to Anna University

An ISO 9001:2015 certified institution

Industry Readiness Course - Syllabus

Department of Computer Science and Engineering

Introduction to NN, CNN and GNN

2023 - 2024 (ODD Semester)

Learning Objectives

- Develop a comprehensive understanding of neural networks, covering linear and logistic regression, artificial neurons, single and multi-layer perceptrons, activation functions, and feed-forward network functions.
- Explore regularization techniques for deep learning, including dataset augmentation, noise robustness, semi-supervised learning, multi-task learning, early stopping, and ensemble methods.
- Understand convolutional networks, including the convolution operation, pooling, variants of the basic convolution function, and famous convnet architectures like AlexNet, VGG, ResNet, and EfficientNet.

Learning Outcomes

- Implement deep neural networks and Convolutional Neural Networks for solving problems.
- Employ regularization techniques in deep learning to enhance model robustness and generalization.
- Use transfer learning concepts to solve problems.
- Implement Graph Neural Network to learn the structural relationship in data.

MODULE 1

Neural Networks: Basic concepts of artificial neurons, single and multilayer perceptron, perceptron learning algorithm, activation functions, loss function. Feed-forward Network Functions – Network Training – Backpropagation – Parameter optimization – Hyperparameter Tuning - Regularization for Deep Learning: Dataset Augmentation – Noise Robustness – Early Stopping

MODULE 2

Dropout – Sparse Representation – Bagging and Other Ensemble Methods – Semi-Supervised Learning – Multi-Task Learning – Parameter Tying and Parameter Sharing - Convolutional Networks: The Convolution Operation – Motivation – Pooling – Convolution and Pooling as an Infinitely Strong Prior – Variants of the Basic Convolution Function – ConvNet Architectures – Transfer learning

MODULE 3

Graph representation learning – Node embedding models – Knowledge graph embedding models – Graph neural networks – Graph neural network architectures – Graph neural networks and knowledge graphs

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