CSE (DATA SCIENCE)

DEEP LEARNING – C87PC2

B.Tech VII Semester **L/T/P/C**
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COURSE OBJECTIVE:

The course will cover the deep learning and its applications to perceptions in different modalities focusing on those relevant for robotics. It will also cover the algorithms for visual perception and procedure for map building. The course deal with simultaneous localization and mapping based techniques and aspects of imaging techniques used in robotic applications.

COURSE OUTCOMES:

1. Students will be able to understand the concepts of deep learning and Convolution Networks
2. Students will be able to understand the robot perception and cognition.
3. Students will be able to learn the planning of Randomized path for robotic perception.
4. Students will be able to acquire knowledge about localization and mapping techniques.

UNIT I

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

UNIT II

Deep Feed Forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

UNIT III

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuro scientific Basis for Convolutional Networks.

UNIT IV

Sequence Modeling: Recurrent and Recursive Nets: *Unfolding Computational Graphs, Recurrent Neural Networks and Bidirectional RNN, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory.*

UNIT V

Autoencoders: *Under complete Auto encoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders, Learning Manifolds with Autoencoders, Contractive Autoencoders, Predictive Sparse Decomposition, Applications of Autoencoders.*

TEXT BOOKS:

1. Deep Learning, Ian Good Fellow, Yoshua Bengio and Aaron Courville.