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| **DETAILED SYLLABUS** | | **3-0-0** |
| **UNIT** | **TOPIC** | **PROPOSED LECTURE** |
| I | INTRODUCTION – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine  Learning and Data Science Vs Machine Learning; | 8 |
| II | REGRESSION: Linear Regression and Logistic Regression  BAYESIAN LEARNING – Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.  SUPPORT VECTOR MACHINE: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel,and Gaussiankernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM. | 8 |
| III | **DECISION TREE LEARNING** - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning.  **INSTANCE-BASED LEARNING** – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning. | 8 |
| IV | ARTIFICIAL NEURAL NETWORKS – Perception’s, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization,  Unsupervised Learning – SOM Algorithm and its variant;  DEEP LEARNING – Introduction, concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc. | 8 |
| V | REINFORCEMENT LEARNING–Introduction to Reinforcement Learning , Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning – Q Learning function, Q Learning Algorithm ), Application of Reinforcement Learning, Introduction to Deep Q Learning.  GENETIC ALGORITHMS: Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications. | 8 |
| Text books:  1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.  2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation andMachine Learning), MIT Press2004.  3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.  4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.  5. M. Gopal, “Applied Machine Learning”, McGraw Hill Education | | |
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