INT423:MACHINE LEARNING-II

L:2 T:0 P:2 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: discuss the fundamental concept of unsupervised learning

CO2 :: apply popular clustering algorithms like K-means clustering, hierarchical tree, agglomerative clustering, DBSCAN clustering on a real dataset

CO3 :: assess the performance of clustering algorithms using appropriate metrics

CO4 :: define the foundational concepts in reinforcement learning, including agents, environments, actions, rewards, and policies.

CO5 :: associate the concept of Temporal Difference (TD) learning methods, such as Q-learning.

CO6 :: analyze knowledge about different types of recommender systems, including collaborative filtering, content-based filtering

Unit I

Machine learning clustering algorithms-I : Introduction to unsupervised learning, What is clustering?, K-means intuition, K-means algorithm, Optimization objective, Initializing K-means, Choosing the number of clusters, hard versus soft clustering, using the elbow method to find the optimal number of clusters

Unit II

Machine learning clustering algorithms-II : Finding unusual events, Gaussian (normal) distribution, Anomaly detection algorithm, Anomaly detection vs. supervised learning, Choosing what features to use(PCA), organizing clusters as a hierarchical tree, agglomerative clustering, DBSCAN clustering

Unit III

Clustering metrics : Silhouette Score, Davies-Bouldin Index, Dunn Index, Adjusted Rand Index (ARI), Normalized Mutual Information (NMI), Homogeneity, Completeness, and V-measure, Fowlkes-Mallows Index, Adjusted Mutual Information (AMI)

Unit IV

Reinforcement Learning-I : What is Reinforcement Learning?, The Return in reinforcement learning, Making decisions: Policies in reinforcement learning, Review of key concepts, State-action value function definition, State-action value function example, Bellman Equation, Learning the state-value function

Unit V

Reinforcement Learning-II : Introduction to Q learning, Q learning algorithm, Algorithm refinement: Improved neural network architecture, Algorithm refinement: ?-greedy policy, Algorithm refinement: Mini-batch and soft updates, The state of reinforcement learning

Unit VI

Recommender Systems : Making recommendations, Using per-item features, Collaborative filtering algorithm, Binary labels: favs, likes and clicks, Mean normalization, Content-based filtering, Collaborative filtering vs Content based filtering, Ethical use of recommender systems

List of Practicals / Experiments:

List of Practical

- Write a Program to implement K-means clustering algorithm on a given dataset
- Write a program to find the optimum value of K for K means clustering using the elbow method on a given dataset.
- Write a program to implement the anomaly detection algorithm.
- Write a program to implement the hierarchical clustering algorithm on a given dataset.
- Write a program to implement the agglomerative clustering algorithm on a given dataset.
- Write a program to implement the DBScan clustering algorithm on a given dataset.
- Write a program to implement PCA for dimension reduction for a given dataset.

- Write a program to evaluate the performance of clustering algorithms using different evaluation metrics.
- Write a program to demonstrate the reinforcement learning task.
- Write a program to implement the reinforcement learning using Q learning approach.
- Write a program to make a simple recommendation system using a rule base approach.
- Write a program to implement a recommendation system using collaborative filtering approach.

Text Books:

1. MACHINE LEARNING : A PRACTITIONER by CHANDRA S.S., VINOD HAREENDRAN S., ANAND, PHI Learning

References:

1. HANDS-ON DATA SCIENCE AND PYTHON MACHINE LEARNING by FRANK KANE, PACKT PUBLISHING