Machine Learning

Assignment 12.1

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Association Rules

Supervised Learning	Unsupervised learning	Reinforcement learning
T: Assign class labels to instances	**T**: Find patterns and groupings among instances	**T**: Learn the optimal policy
E: Classify/predict output from input data	**E**: Learns inherent structures from data	**E**: Performance feedback
P: Confusion matrix, ROC/AUC, Boxplots, R^2, Adjusted-R^2, SSE	**P**: Fowlkes-Mallows index, Silhouette score, Purity, AIC, BIC, SSE	**P**: Discounted rewards, Finite horizon reward, Average reward
Classification: Naive Bayes, Logistic regression, Decision Tree, Perceptron, Neural Networks, kNN, LVQ **Regression**: Linear regression, Locally weighted regression, Regression Tree	**Clustering:** k-Means, FCM, LVQ, HAC, Topic Modeling, Neural Networks (Autoencoders) **Association rules:** Apriori algorithm, Eclat, Frequent pattern-growth	**Model-free RL:** Q-Learning, Value iteration, SARSA, A3C, DQN, C51, AlphaZero, HER **Model-based RL:** I2A, MBMF, MBVE, AlphaZero

Table 1: Supervised vs. Unsupervised learning vs. Reinforcement Learning

Supervision

Association rules are categorized under unsupervised learning techniques with no class labels assigned to instances.

Learning task

Derive all association rules with a given minimal confidence and minimal support threshold.

Learning goal

To discover correlation between co-occurring attributes and find interesting relationships among them.

Support of an association rule

For a rule $X \to Y$, support is the subset of transactions from D, that satisfy the rule:

$$support(X \to Y) = \frac{|\{t \in D | (X \cup Y) \subseteq t\}|}{|D|}$$

Confidence of an association rule

For a rule $X \to Y$, support is the relation of the transactions of D, that satisfy the rule to the number of transactions that satisfy the rule body:

$$confidence(X \to Y) = \frac{|\{t \in D | (X \cup Y) \subseteq t\}|}{|\{t \in D | X \subseteq t\}|} = \frac{support(X \to Y)}{support(X)}$$