Introduction

January 15, 2025

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   Association Rule Learning -->

   Association Rule Learning is a popular machine learning technique used to␣
↪discover
   interesting relationships, patterns, or associations between variables in␣
↪large datasets.
   It is often applied in the context of market basket analysis, where the␣
↪goal is to
   find rules like: "If a customer buys item A, they are likely to buy item B."
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   Key Terms in Association Rule Learning -->

   Support :
   Indicates how frequently an itemset appears in the dataset.
   Example : If 3 out of 10 transactions include milk, the support for milk is␣
↪0.3 or 30%.

   Confidence :
   Measures how often the rule A->B is true, given that A is true.
   Example : If out of 10 transactions, 4 contain both bread and butter, and 5␣
↪contain bread,
   the confidence of "bread → butter" is 4/5 = 0.8 or 80%.

   Lift :
   Evaluates the strength of a rule by comparing its confidence to the␣
↪probability of B
   occurring independently of A.
   Lift > 1 indicates a positive association between A and B;
   Lift < 1 suggests a negative association.
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   Common Algorithms for Association Rule Learning -->
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   Apriori Algorithm :
   Generates frequent itemsets using a bottom-up approach and prunes␣
↪infrequent items.
   Efficient for smaller datasets.

   FP-Growth (Frequent Pattern Growth):
   Uses a tree-based structure to find frequent itemsets without candidate␣
↪generation.
   Faster than Apriori for large datasets.

   ECLAT (Equivalence Class Transformation):
   Uses vertical data format (item-to-transaction mapping) for efficient␣
↪computation.
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   Applications -->

   Market Basket Analysis :
   Identifying product bundles or cross-selling opportunities.
   Example : "Customers who buy diapers are likely to buy beer."

   Healthcare :
   Finding associations between symptoms and diagnoses.

   Recommendation Systems :
   Suggesting items or products based on user behavior.

   Fraud Detection :
   Discovering unusual patterns in transactions.
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