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ASSOCIATION RULES

Association rules are expressions used to uncover meaningful relationships between items in large datasets. They are used to identify patterns, correlations, or associations between items frequently occurring together in transactions. This technique is widely applied in areas like market basket analysis, healthcare diagnostics, and recommendation systems to support decision-making and strategy development.

KEY METRICS

Support

- Frequency of itemset in total transactions
- eg: "Bread is bought in 20% of all transactions."

Confidence

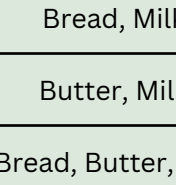
- Likelihood of B given A
- eg: "If bread is bought, butter is bought 75% of the time."

Lift

- Strength of association compared to random chance
- eg: "Bread and butter are much more likely to be bought together than by chance."

APRIORI ALGORITHM

A method used to discover frequent itemsets and generate association rules from large datasets



1. Set thresholds for Support and Confidence
2. Scan transactions to find frequent itemsets
3. Generate rules from frequent itemsets
4. Prune the rules below threshold

REAL-WORLD APPLICATION

- **Financial Services**: Analyzes spending habits to suggest personalised offers such as credit card deals based on frequent purchases.
- **E-commerce**: Used to recommend products that are often bought together like laptop + laptop bag, increasing sales.

SAMPLE DATASET & RULES

Transaction ID	Items Bought
T1	Bread, Butter, Milk
T2	Bread, Butter
T3	Bread, Milk
T4	Butter, Milk
T5	Bread, Milk

Frequent Itemsets

Item	Support Count	Support %
Bread	4	80% ✓
Butter	3	60% ✓
Milk	4	80% ✓
Bread, Butter	2	40% ✗
Bread, Milk	3	60% ✓
Butter, Milk	2	40% ✗
Bread, Butter, Milk	1	40% ✗

Association Rules

Minimum Support Threshold: 50%
Minimum Confidence Threshold: 70%

Rule 1: Bread → Butter
- Support of {Bread, Butter} = 2
- Support of {Bread} = 4
- Confidence = 2/4 = 50%

(Failed threshold)

Rule 2: Butter → Bread
- Support of {Bread, Butter} = 2
- Support of {Butter} = 3
- Confidence = 2/3 = 66.67%

(Failed threshold)

Rule 3: Bread → Milk
- Support of {Bread, Milk} = 3
- Support of {Bread} = 4
- Confidence = 3/4 = 75%

(Passes threshold)