Partner–Product Recommendation System

# 1. Methodology

## A. Custom Product Recommendation System

Goal: Recommend relevant electrical product categories to channel partners based on historical purchasing behavior and partner profiles.  
Method:  
- Binary product adoption matrix: Created using past purchase records (1 if a partner has bought a product, 0 otherwise).  
- Cosine similarity: Used to measure similarity between partners to identify close neighbors.  
- Top-N recommendation: Products frequently bought by similar partners but not yet purchased by the target partner are shortlisted as recommendations.

## B. Contextual Feature Integration

Merged with synthetic metadata containing:  
- Stockist characteristics: Geography, Stockist\_Type, New\_Stockist, Bulk\_Purchase\_Tendency  
- Sales insights: Sales\_Value\_Last\_Period, Discount\_Applied, Growth\_Percentage  
- Scheme behavior: Preference for schemes like Bulk Purchase, Discount, or custom scheme1, scheme2, etc.

# 2. Key Findings & Business Insights

Targeted Product Rollout:  
- Enables partner-specific product targeting. E.g., Wholesalers in West with high past MRP purchases are good candidates for advanced units like VCU and PSS.  
  
Scheme Alignment:  
- Partners with high bulk purchase tendencies and growth responded better to “Bulk Purchase” or “Discount” schemes.  
- New stockists favored simpler packages like AIS and VCB, potentially requiring introductory or loyalty-based schemes.  
  
Segment Behavior:  
- Retailers in Central and South show higher diversity in product adoption but are more sensitive to price changes.  
  
Feature Influence:  
- High MRP + low growth implies mismatch in scheme or saturation — calls for scheme rotation or bundling strategies.

# 3. Assumptions, Limitations & Edge Cases

Assumptions:  
- Past purchase behavior and partner similarity reflect future buying intent.  
- Scheme preferences are indirectly tied to product purchase patterns.  
- The similarity metric is sufficient to capture nuanced behavior.  
  
Limitations:  
- No real-time data: Based on historical/synthetic data.  
- No modeling of time-based drift or seasonality.  
- Scheme impact not causally validated — only inferred from sales outcomes.  
  
Edge Cases:  
- New Stockists: Cold-start problem; few or no transactions make recommendations less reliable.  
- Overlapping product categories (e.g., VCU vs VCB) may confuse the model.  
- Contradictory partner behavior (e.g., high value, low volume) might need multi-objective recommendations.

# 4. Reference Links

- https://scikit-learn.org/stable/modules/generated/sklearn.metrics.pairwise.cosine\_similarity.html  
- https://towardsdatascience.com/recommendation-system-basics-types-and-evaluation-5b470ad71e85  
- https://www.analyticsvidhya.com/blog/2021/06/cold-start-problem-in-recommender-systems/