


The background of the slide is a complex, abstract composition. It features a central white banner with a subtle, light gray geometric pattern. To the left of the banner, there is a small, square inset image showing a dense cluster of orange and red dots on a light background. The main background is a mix of muted colors, including shades of brown, beige, and light gray, with a network of thin, intersecting lines and small, scattered dots in various colors (green, blue, orange) that create a sense of depth and complexity.

The Downward Closure Property of Frequent Patterns

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- ❑ Observation: From $TDB_1: T_1: \{a_1, \dots, a_{50}\}; T_2: \{a_1, \dots, a_{100}\}$
 - ❑ We get a frequent itemset: $\{a_1, \dots, a_{50}\}$
 - ❑ Also, its subsets are all frequent: $\{a_1\}, \{a_2\}, \dots, \{a_{50}\}, \{a_1, a_2\}, \dots, \{a_1, \dots, a_{49}\}, \dots$
 - ❑ There must be some hidden relationships among frequent patterns!
- ❑ The **downward closure (also called “Apriori”)** property of frequent patterns
 - ❑ If **$\{\text{beer, diaper, nuts}\}$** is frequent, so is **$\{\text{beer, diaper}\}$**
 - ❑ Every transaction containing $\{\text{beer, diaper, nuts}\}$ also contains $\{\text{beer, diaper}\}$
 - ❑ Apriori: Any subset of a frequent itemset must be frequent
- ❑ Efficient mining methodology
 - ❑ If any subset of an itemset S is infrequent, then there is no chance for S to be frequent—why do we even have to consider S !?  A sharp knife for pruning!

Apriori Pruning and Scalable Mining Methods

- Apriori pruning principle: If there is any itemset which is infrequent, its superset should not even be generated! (Agrawal & Srikant @VLDB'94, Mannila, et al. @ KDD' 94)
- Scalable mining Methods: Three major approaches
 - Level-wise, join-based approach: Apriori (Agrawal & Srikant@VLDB'94)
 - Vertical data format approach: Eclat (Zaki, Parthasarathy, Ogihara, Li @KDD'97)
 - Frequent pattern projection and growth: FPgrowth (Han, Pei, Yin @SIGMOD'00)