

The background of the slide is a complex, abstract composition. It features a network of thin, reddish-brown lines connecting various points, creating a web-like structure. Interspersed among these lines are numerous small, colored dots in shades of green, blue, and orange. The overall color palette is muted, with a lot of grey and white space, punctuated by the network lines and colored dots. In the top left corner, there is a small, semi-transparent inset image showing a different pattern of dots and lines. The title text is centered in a large, bold, black font.

# Session 8. Handling Multiple Constraints

# How to Handle Multiple Constraints?

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- It is beneficial to use multiple constraints in pattern mining
- But different constraints may require potentially conflicting item-ordering
  - If there exists an order  $R$  making both  $c_1$  and  $c_2$  convertible, try to sort items in the order that benefits pruning most
  - If there exists conflict ordering between  $c_1$  and  $c_2$ 
    - Try to sort data and enforce *one constraint* first (which one?)
    - Then enforce the other when mining the projected databases
- Ex.  $c_1$ :  $\text{avg}(S.\text{profit}) > 20$ , and  $c_2$ :  $\text{avg}(S.\text{price}) < 50$ 
  - Sorted in profit descending order and use  $c_1$  first (assuming  $c_1$  has more pruning power)
  - For each project DB, sort trans. in price ascending order and use  $c_2$  at mining

# Summary

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- ❑ Different kinds of constraints lead to different pruning strategies
- ❑ Pattern space pruning with
  - ❑ Pattern anti-monotonic constraints vs. pattern monotonic constraints
- ❑ Data space pruning with
  - ❑ Data anti-monotonic constraints
- ❑ Data and pattern space pruning with succinct constraints
- ❑ Pattern space pruning with convertible constraints
- ❑ Handling multiple constraints

# Recommended Readings

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- ❑ R. Srikant, Q. Vu, and R. Agrawal, “Mining association rules with item constraints”, KDD'97
- ❑ R. Ng, L.V.S. Lakshmanan, J. Han & A. Pang, “Exploratory mining and pruning optimizations of constrained association rules”, SIGMOD'98
- ❑ G. Grahne, L. Lakshmanan, and X. Wang, “Efficient mining of constrained correlated sets”, ICDE'00
- ❑ J. Pei, J. Han, and L. V. S. Lakshmanan, “Mining Frequent Itemsets with Convertible Constraints”, ICDE'01
- ❑ J. Pei, J. Han, and W. Wang, “Mining Sequential Patterns with Constraints in Large Databases”, CIKM'02
- ❑ F. Bonchi, F. Giannotti, A. Mazzanti, and D. Pedreschi, “ExAnte: Anticipated Data Reduction in Constrained Pattern Mining”, PKDD'03
- ❑ F. Zhu, X. Yan, J. Han, and P. S. Yu, “gPrune: A Constraint Pushing Framework for Graph Pattern Mining”, PAKDD'07