Data Mining

SPSS Clementine 12.0

6. Apriori Algorithm

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Outline

- Overview
- Apriori Node
- Example of Apriori Node: Market Basket Analysis
- References

Overview

Overview

- Association rules associate a particular conclusion (the purchase of a particular product) with a set of conditions (the purchase of several other products).
- For example, the rule

  beer <= cannedveg & frozenmeal (173, 17.0%, 0.84)

  - states that *beer* often occurs when *cannedveg* and *frozenmeal* occur together.
  - The rule is 84% reliable and applies to 17% of the data, or 173 records.

Overview

- Association rule algorithms are supported:
- Generalized Rule Induction (GRI)
  - discovers association rules in the data.
  - For example, customers who purchase razors and aftershave lotion are also likely to purchase shaving cream.
  - GRI extracts rules with the highest information content based on an index that takes both the generality (support) and accuracy (confidence) of rules into account.
  - GRI can handle numeric and categorical inputs, but the target must be categorical.
- Apriori model
  - extracts a set of rules from the data, pulling out the rules with the highest information content.
  - Apriori requires that input and output fields all be categorical.

Overview

- CARMA model
  - The CARMA model offers build settings for rule support (support for both antecedent and consequent) rather than just antecedent support.
- Sequence model
  - discovers association rules in sequential or time-oriented data.
  - A sequence is a list of item sets that tends to occur in a predictable order. For example, a customer who purchases a razor and aftershave lotion may purchase shaving cream the next time he shops.

Overview

- Data used by association rule models may be in
  - Transactional format
  - Tabular format

Overview

- Transactional Format
  - Transactional data have a separate record for each transaction or item.
  - If a customer makes multiple purchases, for example, each would be a separate record, with associated items linked by a customer ID.
  - This is also sometimes known as till-roll format.

Customer	Purchase
1	jam
2	milk
3	jam
3	bread
4	jam
4	bread
4	milk

  - The Apriori, CARMA, and Sequence nodes can all use transactional data.

Overview

- Tabular Data
  - Tabular data (also known as basket or truth-table data) have items represented by separate flags, where each flag field represents the presence or absence of a specific item.
  - Each record represents a complete set of associated items.
  - Flag fields can be categorical or numeric, although certain models may have more specific requirements.

Customer	Jam	Bread	Milk
1	T	F	F
2	F	F	T
3	T	T	F
4	T	T	T

  - The Apriori, CARMA, GRI, and Sequence nodes can all use tabular data.

Apriori Node

Apriori Node

- The Apriori node is available with the Association module.
- This node discovers association rules in the data.
- Apriori offers five different methods of selecting rules and uses a sophisticated indexing scheme to efficiently process large datasets.

Apriori Node

- Requirements
  - To create an Apriori ruleset, you need one or more *In* fields and one or more *Out* fields.
  - Input and output fields (those with direction *In*, *Out*, *or* *Both*) must be symbolic.
  - Fields with direction *None* are ignored.
  - Fields types must be fully instantiated before executing the node.
  - Data can be in tabular or transactional format.

Example of Apriori Node: Market Basket Analysis

Market Basket Analysis

- Using a Variable File node, connect to the dataset BASKETS1n, selecting to read field names from the file.
- Connect a Type node to the data source, and then connect the node to a Table node.
- Set the type of the field *cardid* to *Typeless* (because each loyalty card ID occurs only once in the dataset and can therefore be of no use in modeling).
- Select Set as the type for the field sex
  - this is to ensure that the Apriori algorithm will not treat *sex* as a flag

Market Basket Analysis

- Now execute the stream to instantiate the Type node and display the table.
- The dataset contains 18 fields, with each record representing a basket.
- **The 18 fields are presented in the following headings:**
  - **Basket summary:**
    - *cardid*. Loyalty card identifier for customer purchasing this basket.
    - *value*. Total purchase price of basket.
    - *pmethod*. Method of payment for basket.

Market Basket Analysis

- **The 18 fields are presented in the following headings (cont.):**
  - **Personal details of cardholder:**
    - *sex*
    - *homeown. Whether or not cardholder is a homeowner.*
    - *income*
    - *age*
  - **Basket contents—flags for presence of product categories:**
    - *fruitveg , freshmeat, dairy, cannedveg, cannedmeat, frozenmeal, beer, wine, softdrink, fish, confectionery*

Market Basket Analysis

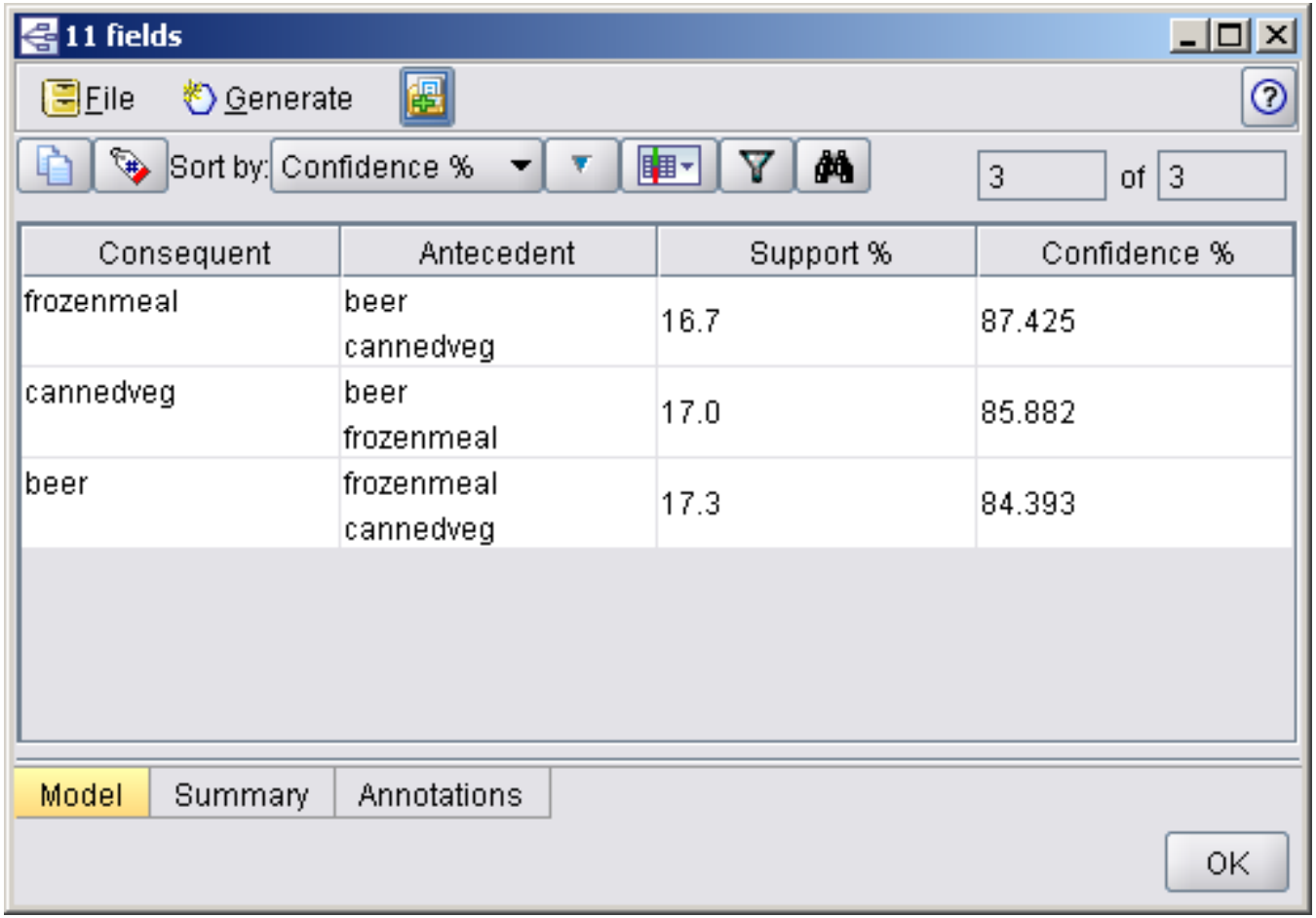
- **Discovering associations in Basket Contents:**
- Select the fields to be used in this modeling process by editing the Type node and setting the directions of all of the product categories to Both and all other directions to None.
  - You can set options for multiple fields using Shift-click to select the fields before specifying an option from the columns.

Market Basket Analysis

- Once you have specified fields for modeling, attach a Apriori node to the Type node
- Select the options, and execute the Apriori node.
- The result, an unrefined model on the Models tab at the upper right of the managers window, contains association rules that you can view by using the context menu and selecting Browse.

Market Basket Analysis

- These rules show a variety of associations between products



Clementine

References

References

- Integral Solutions Limited., **Clementine® 12.0 Source, Process, and Output Nodes,** 2007. (Chapter 2)

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