Definition of a set of relevant cedents
Table of content

- Association rules
- Cedents and partial cedents
- Literals
- Coefficient type
Association rule, cedents and literals

\[
\text{Antecedent} \approx \text{Succedent / Condition}
\]

cedent: partial cedent $\land$ partial cedent $\land$ ... $\land$ partial cedent

partial cedent: literal $\land$ literal $\land$ ... $\land$ literal

partial cedent: literal $\lor$ literal $\lor$ ... $\lor$ literal

literal: \text{Attribute (coefficient)} \text{ or } \neg \text{Attribute (coefficient)}
Set of relevant association rules

Is given by:
- Set of relevant antecedents
- Set of relevant succedents
- Set of relevant conditions
- 4ft-quantifier
Example of 4ft-Miner input

<table>
<thead>
<tr>
<th>ANTECEDENT</th>
<th>QUANTIFIERS</th>
<th>SUCCEDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antecedent</td>
<td>BASE p = 5.000</td>
<td>Succeedent</td>
</tr>
<tr>
<td>District (subset), 1 - 1</td>
<td>B, pos</td>
<td>Status (subset), 1 - 1</td>
</tr>
<tr>
<td>Salary</td>
<td>FUI p = 0.900</td>
<td></td>
</tr>
<tr>
<td>Salary (subset), 1 - 1</td>
<td>B, pos</td>
<td></td>
</tr>
<tr>
<td>Salary by 500 (subset), 1 - 1</td>
<td>B, pos</td>
<td></td>
</tr>
</tbody>
</table>

Partial antecedent

The set of relevant antecedents

The set of relevant succedents

The set of relevant conditions

4ft-quantifier
Table of content

- Asociation rules
- Cedents and partial cedents
- Literals
- Coefficient type
Antecedent and partial antecedents

Antecedent

\[ \varphi \approx \psi / \chi \]

Partial antecedent

\[ \varphi = \varphi_1 \land \varphi_2 \land \ldots \land \varphi_k \]

Partial antecedent

\[ \varphi_i = \lambda_{i,1} \land \ldots \land \lambda_{i,k_i} \]

Conjunction of literals

Literal
Antecedent and partial antecedents

Antecedent

\[ \varphi \approx \psi / \chi \]

Partial antecedent

\[ \varphi = \varphi_1 \land \varphi_2 \land \ldots \land \varphi_k \]

Partial antecedent

\[ \varphi_i = \lambda_{i,1} \lor \ldots \lor \lambda_{i,k_i} \]

Disjunction of literals

Literal
Antecedent and partial antecedents – example

Partial antecedent
The set of relevant partial cedents

Is given by:

- The set of attributes $A_1, \ldots, A_p$ which creates literals.
- Boolean operation type conjunction/disjunction.
- Minimal and maximal length.
- Some of the attributes are marked as Basic – partial antecedents must contain at least one Basic attribute.
- Classes of equivalence – from each class there must be maximum of one attribute in one partial antecedent.
- Simple definition of the set of relevant literals for each attribute.
Partial cedents - example

- Minimal and maximal length
- Conjunction / disjunction

Relevant cedent contains at least one Basic attribute
Table of content

- Association rules
- Cedents and partial cedents
- Literals
- Coefficient type
The set of relevant literals

Is given by:

- One of the seven types of literals
- Minimal and maximal length
- One of the positive/negative literal option
  - To generate only positive literals
  - To generate only negative literals
  - To generate positive and negative literals
Definition of the literal - example

- Just $A(\alpha)$
- Just $\neg A(\alpha)$
- Both $A(\alpha)$ and $\neg A(\alpha)$
- Type $\alpha$

At least one Basic attribute

Min. and max. length $\alpha$
Table of content

- Association rules
- Cedents and partial cedents
- Literals
- Coefficient type
Coefficient type

- Subset
- One category
- Interval
- Cyclical intervals
- Cut
- Left cut
- Right cut
Subset – example

Attribute A with possible values (categories) 1, 2, 3, 4, 5.

Literals with coefficient Subset (1 – 3).

A(1), A(2), A(3), A(4), A(5)
A(1, 2), A(1, 3), A(1, 4), A(1, 5)
A(2, 3), A(2, 4), A(2, 5)
A(3, 4), A(3, 5)
A(4, 5)
A(1, 2, 3), A(1, 2, 4), A(1, 2, 5)
A(2, 3, 4), A(2, 3, 5)
A(3, 4, 5)
Subset – another example

![Subset Example](image)

**Literal**
- **Attribute:** District
- **Literal type:** Basic
- **Gace type:** Positive
- **Coefficient type:** Subset
- **Coefficient length:**
  - Min. length: 1
  - Max. length: 2

**Comment:**

**Category:**

**Contingency table**
- **Antecedent**
  - Age: 27
  - Sex: F
  - District: Beroun
- **Succedent**
  - Loan: bad

**Hypothesis ID:** 2

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>DATA</th>
<th>Graph</th>
<th>AR2NL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Succedent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Succedent**
- NOT Succedent
  - Antecedent: 700
    - NOT Succedent: 5454
    - Succedent: 6154
  - Antecedent: 727
    - NOT Succedent: 5454
    - Succedent: 6181
One category – example
Interval – example

(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
Interval – example output

Antecedent: Age(<40;50), <50;60) & Salary by 500((8500;9000)…(9500;10000))
Succedent: Status(Bad)
Condition: (empty)

Contingency table

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Succedent</th>
<th>NOT Succedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antecedent</td>
<td>1071</td>
<td>477</td>
</tr>
<tr>
<td>NOT Antecedent</td>
<td>2994</td>
<td>1639</td>
</tr>
<tr>
<td></td>
<td>4065</td>
<td>2116</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1548</td>
</tr>
</tbody>
</table>
Cyclical interval – example

Attribute:  *Day of the week with values* mo, tu, we, thu, fri, sa, su

Generated literals:

*Day of the week* (mo, tu, we)
*Day of the week* (tu, we, thu)
*Day of the week* (we, thu, fri)
*Day of the week* (thu, fri, sa)
*Day of the week* (fri, sa, su)
*Day of the week* (sa, su, mo)
*Day of the week* (su, mo, tu)
Left cut – example

(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>

(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>

(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
Right cut – example

(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
(8000;8500>, (8500;9000>, (9000;9500>, (9500;10000>, (10000;12500>, (12500;13000>
Another coefficients

Cut – generates
Left cut and Right cut

For Boolean attributes