Technische Universität Dresden

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Formal Concept Analysis

Exercise Sheet 6, Winter Semester 2015/16

Exercise 1 (multi-valued context)

a) Write down the derived contexts for the given multi-valued context about winter tyres using the

- nominal scale
- ordinal scale
- interordinal scale
- biordinale scale

(++ very good, + good, o satisfactory, − unsatisfactory)

b) Draw the line diagrams of the corresponding concept lattices.

c) Which tyre would you buy for your car? Why?

	Dry	Wet	Snow
Conti	+	+	++
Firestone	+	o	+
Fulda	+	+	+
Gislaved	+	o	++
Goodyear 2	+	+	+
Goodyear 3	+	o	++
Michelin	o	o	++
Pirelli	+	+	+
Semperit	o	+	+
Uniroyal	+	o	+
Vredestein	+	−	+

Solution:

(a) Conceptual Scaling

- Nominal Scales: $N_n := (n, n, =)$ Used for scaling attributes whose values exclude each other.

	−	o	+	++
−	x			
o		x		
+			x	
++				x

	Dry		Wet			Snow	
	o	+	−	o	+	+	++
Conti		x			x		x
Firestone		x		x		x	
Fulda		x			x	x	
Gislaved		x		x			x
Goodyear 2		x			x	x	
Goodyear 3		x		x			x
Michelin	x			x			x
Pirelli		x			x	x	
Semperit	x				x	x	
Uniroyal		x		x		x	
Vredestein		x	x			x	

- Ordinal Scales: $O_n := (n, n, \leq)$ Used with attributes with ordered values, where each value implies the smaller value.

	-	o	+	++
-	x			
o	x	x		
+	x	x	x	
++	x	x	x	x

	Dry		Wet			Snow	
	o	+	−	o	+	+	++
Conti	x	x	x	x	x	x	x
Firestone	x	x	x	x		x	
Fulda	x	x	x	x	x	x	
Gislaved	x	x	x	x		x	x
Goodyear 2	x	x	x	x	x	x	
Goodyear 3	x	x	x	x		x	x
Michelin	x		x	x		x	x
Pirelli	x	x	x	x	x	x	
Semperit	x		x	x	x	x	
Uniroyal	x	x	x	x		x	
Vredestein	x	x	x			x	

- Inter-ordinal Scales: $I_n := (n, n, \leq) \mid (n, n, \geq)$ Used in questionnaires for example. The concept intents are exactly the intervals of scale.

	≤ -	≤ o	≤ +	≤ ++	≥ -	≥ o	≥ +	≥ ++
-	x	x	x	x	x			
o		x	x	x	x	x		
+			x	x	x	x	x	
++				x	x	x	x	x

	Dry				Wet					Snow			
	≤ o	≤ +	≥ o	≥ +	≤ -	≤ o	≤ +	≥ -	≥ o	≥ +	≤ +	≤ ++	≥ +	≥ ++
Conti		x	x	x			x	x	x	x		x	x	x
Firestone		x	x	x		x	x	x	x		x	x	x	
Fulda		x	x	x			x	x	x	x	x	x	x	
Gislaved		x	x	x		x	x	x	x			x	x	x
Goodyear 2		x	x	x			x	x	x	x	x	x	x	
Goodyear 3		x	x	x		x	x	x	x			x	x	x
Michelin	x	x	x			x	x	x	x			x	x	x
Pirelli		x	x	x			x	x	x	x	x	x	x	
Semperit	x	x	x				x	x	x	x	x	x	x	
Uniroyal		x	x	x		x	x	x	x		x	x	x	
Vredestein		x	x	x	x	x	x	x			x	x	x	

- Bi-ordinal Scales: $B_{n,m} := (n, n, \leq) \mid (m, m, \geq)$ Used when objects are assigned to one of two groups, and in each group with a different degree. The result is a partition with ranking.

	-	o	+	++
-	x			
o		x		
+		x	x	
++		x	x	x

	Dry		Wet			Snow	
	o	+	−	o	+	+	++
Conti	x	x		x	x	x	x
Firestone	x	x		x		x	
Fulda	x	x		x	x	x	
Gislaved	x	x		x		x	x
Goodyear 2	x	x		x	x	x	
Goodyear 3	x	x		x		x	x
Michelin	x			x		x	x
Pirelli	x	x		x	x	x	
Semperit	x			x	x	x	
Uniroyal	x	x		x		x	
Vredestein	x	x	x			x	

(b) To simplify the line diagrams, the following abbreviations for attributes and objects are used:

Conti	C	Dry 0	D0
Firestone	F1	Dry +	D+
Fulda	F2	Wet -	W-
Gislaved	G1	Wet +	W0
Goodyear 2	G2	Wet ++	W+
Goodyear 3	G3	Snow +	S+
Michelin	M	Snow ++	S++
Pirelli	P		
Semperit	S		
Uniroyal	U		
Vredestein	V		

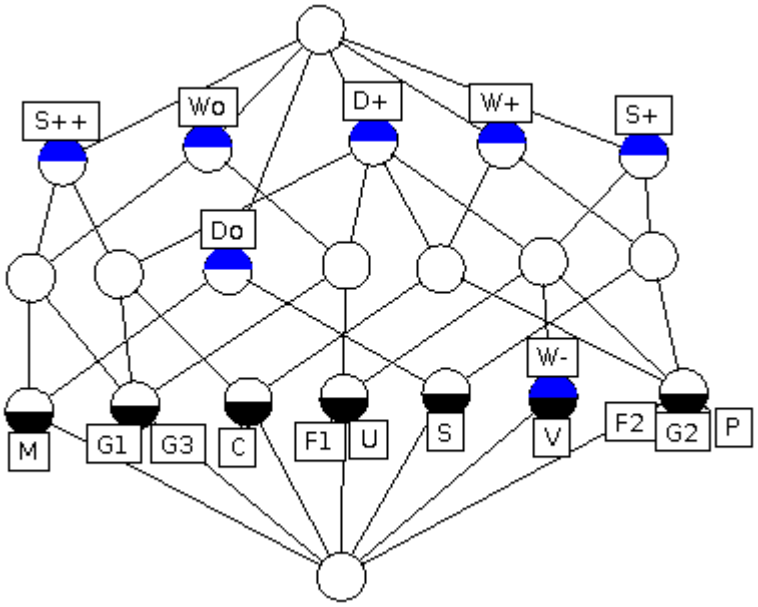
- 

Abbildung 1: Applying nominal scaling

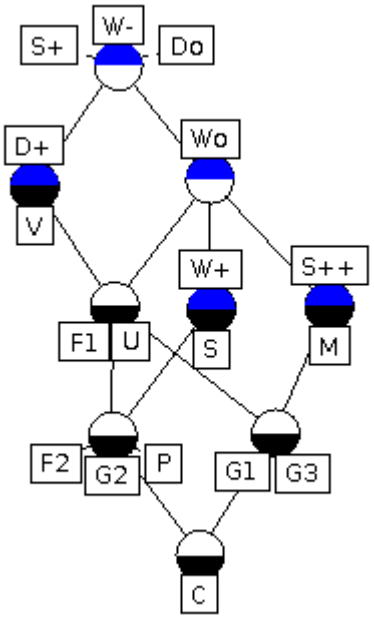
- 

Abbildung 2: Applying ordinal scaling

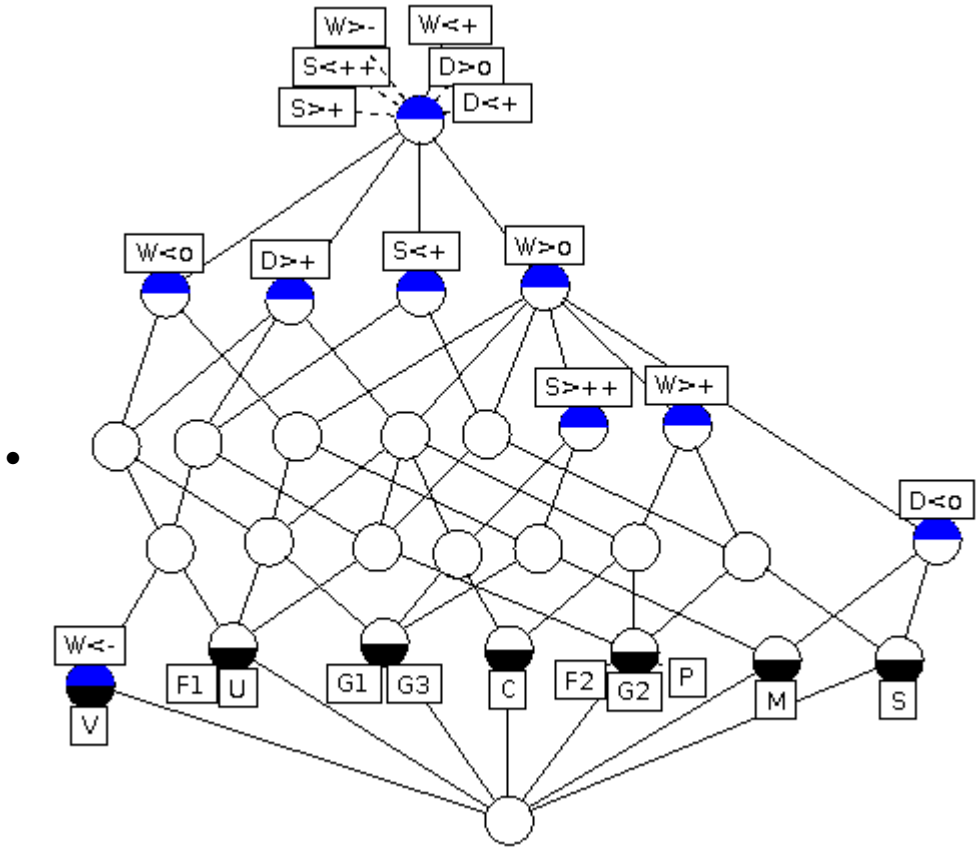


Abbildung 3: Applying interordinal scaling

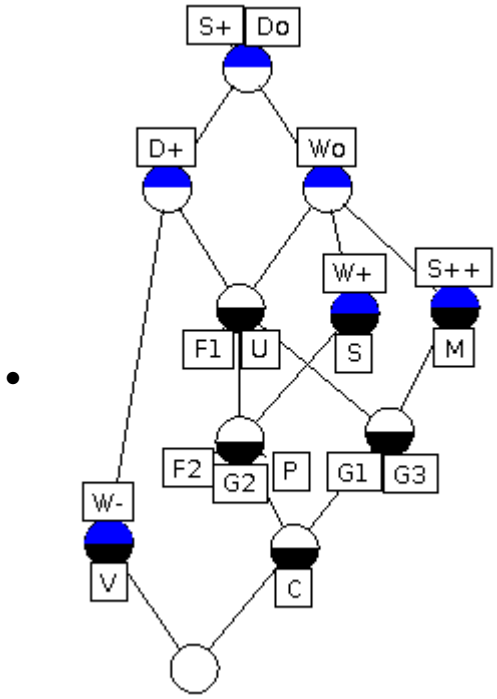


Abbildung 4: Applying biordinal scaling

(c) Which tire would you buy? Ordinal scaling seems most natural in this situation (the "deeper" the object concept in the lattice, the "better" the object). Conti has the best characteristics for all weather types.