

Seeking Relevant Information Sources

Using FCA

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- 1 **Introduction**
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- 3 **Formal Conceptual Analysis**
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- Selection of relevant sources
- TIL + Machine learning
- Formal Conceptual Analysis to obtain additional information

- Carnapian explication
- concept = closed TIL construction
- explicandum = atomic concept
- explicatum = molecular concept

$${}^0\textit{Dog} =_{df} \lambda w \lambda t \lambda x [[{}^0\textit{Domesticated} {}^0\textit{Carnivore}]_{wt} x]$$

Types: $\textit{Domesticated} / ((o\iota)_{wt}(o\iota)_{wt}); \textit{Dog}, \textit{Carnivore} / (o\iota)_{wt}; x \rightarrow \iota$

- Formal context (G, M, I)
 - G = set of objects
 - M = set of attributes
 - $I \subseteq G \times M$ = binary relation between G and M
- Set of all formal concepts
$$\beta(G, M, I) = \{(O, A) \mid O \subseteq G, A \subseteq M, A^\downarrow = O, O^\uparrow = A\}$$
 - $O^\uparrow = \{a \mid \forall o \in O, (o, a) \in I\}$
 - $A^\downarrow = \{o \mid \forall a \in A, (o, a) \in I\}$

O/A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
e_1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
e_2	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
e_3	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
e_4	1	1	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0
e_5	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0
e_6	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0
e_7	1	1	1	0	0	0	0	0	1	0	1	0	0	1	1	0	0
e_8	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0

Table: Formal context of explications

- e_i is an explication obtained from textual source s_i

Formal concepts

0. ($\{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8\}, \emptyset$)
1. ($\{e_1, e_4, e_7\}, \{1, 2\}$)
2. ($\{e_1, e_4\}, \{1, 2, 7\}$)
3. ($\{e_1, e_5, e_6, e_8\}, \{5\}$)
4. ($\{e_1, e_7\}, \{1, 2, 3\}$)
5. ($\{e_1\}, \{1, 2, 3, 4, 5, 6, 7, 8\}$)
6. ($\{e_2, e_4, e_5, e_6, e_7\}, \{11\}$)
7. ($\{e_2, e_7\}, \{9, 11\}$)
8. ($\{e_2, e_8\}, \{10\}$)
9. ($\{e_2\}, \{9, 10, 11\}$)
10. ($\{e_3, e_4, e_5, e_6, e_8\}, \{16\}$)
11. ($\{e_3, e_4, e_5, e_7\}, \{15\}$)
12. ($\{e_3, e_4, e_5\}, \{15, 16\}$)
13. ($\{e_3, e_6, e_7\}, \{14\}$)
14. ($\{e_3, e_6\}, \{14, 16\}$)
15. ($\{e_3, e_7\}, \{14, 15\}$)
16. ($\{e_3\}, \{12, 13, 14, 15, 16, 17\}$)
17. ($\{e_4, e_5, e_6\}, \{11, 16\}$)
18. ($\{e_4, e_5, e_7\}, \{11, 15\}$)
19. ($\{e_4, e_5\}, \{11, 15, 16\}$)
20. ($\{e_4, e_7\}, \{1, 2, 11, 15\}$)
21. ($\{e_4\}, \{1, 2, 7, 11, 15, 16\}$)
22. ($\{e_5, e_6, e_8\}, \{5, 16\}$)
23. ($\{e_5, e_6\}, \{5, 11, 16\}$)
24. ($\{e_5\}, \{5, 11, 15, 16\}$)
25. ($\{e_6, e_7\}, \{11, 14\}$)
26. ($\{e_6\}, \{5, 11, 14, 16\}$)
27. ($\{e_7\}, \{1, 2, 3, 9, 11, 14, 15\}$)
28. ($\{e_8\}, \{5, 10, 16\}$)
29. ($\emptyset, \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17\}$)

Relevat ordering

- Significant objects of explication

$SO(e) = \bigcup_{i=1}^n O_i^e$, where O^e is the extent of a concept
 $(O, A) \neq (G, B), e \in O, B \subseteq M$

- Relevant ordering

$a \sqsubseteq b$ is in relevant ordering iff

$\max(|(O^a)^\uparrow|) \leq \max(|(O^b)^\uparrow|), a, b, \in SO(e), (O^a, (O^a)^\uparrow), (O^b, (O^b)^\uparrow) \in \gamma(e)$

- $\gamma(e)$ is a set of concepts (O, A) where $e \in O$

Exp.	Intent	DF	RT
e_1	{1,2,3,4,5,6,7,8}	{}	{ s_1 }
e_4	{1,2,7}	{3,4,5,6,8}	{ s_4 }
e_7	{1,2,3}	{4,5,6,7,8}	{ s_7 }
e_5	{5}	{1,2,3,4,6,7,8}	{ s_5 }
e_6	{5}	{1,2,3,4,6,7,8}	{ s_6 }
e_8	{5}	{1,2,3,4,6,7,8}	{ s_8 }

Table: Final text sources' ordering

- $e_8(s_8) \sqsubseteq e_6(s_6) \sqsubseteq e_5(s_5) \sqsubseteq e_7(s_7) \sqsubseteq e_4(s_4) \sqsubseteq e_1(s_1)$
- DF is the difference of e_i and the chosen explication e_1
- RT is a recommended textual source

- Optimisation of FCA by using Iceberg lattices

Thank you for your attention.

Questions?