Probabilistic Graphical Models

Tutorial

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Inductive Logic Programming

Exercise 1

We consider the following data, where a user gave his preferences on some movies. Based on this data, can we infer one rule that would give some relation between the genre of the movie and the preferences of the user ? You do not have to extract a complete list of rules, just find the most interesting one.

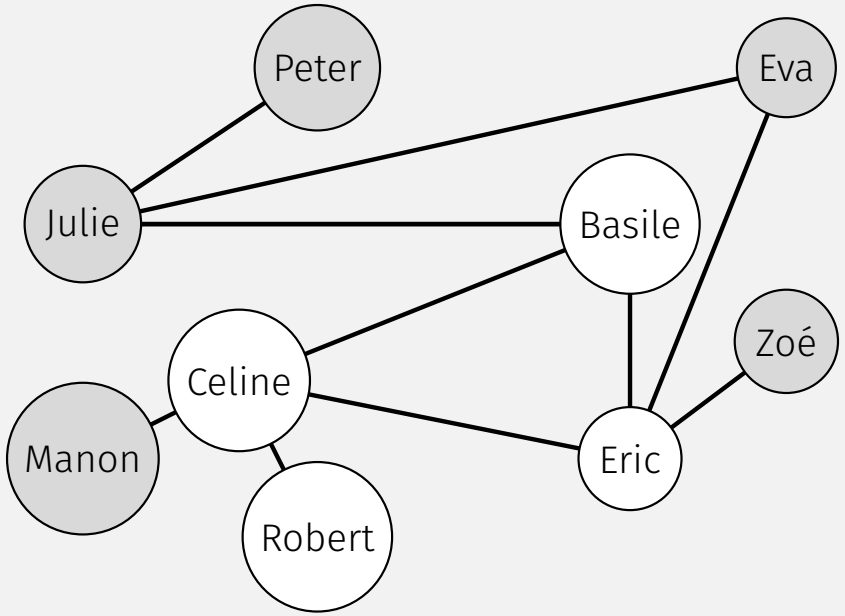
Movie	Drama	Sci-Fi	Crime	Action	Thriller	Aventure	Western	Likes
Batman: The Dark Knight	1	0	1	1	1	0	0	0
Interstellar	1	1	0	0	0	1	0	1
The Godfather	1	0	1	0	0	0	0	0
Pulp Fiction	0	0	1	0	1	0	0	0
The Revenant	1	0	0	0	1	1	1	1
The Hateful Eight	1	0	0	0	1	0	1	1
Spectre	0	0	1	1	0	1	0	0

Exercise 2

Apply inverse resolution in propositional form to the clauses $C = A \vee B$, $C_1 = A \vee B \vee G$. Give at least two possible results for C_2.
Apply inverse resolution to the clauses $C = R(B, x) \vee P(x, A)$ and $C_1 = S(B, y) \vee R(z, x)$. Give at least four possible results for C_2. Here A and B are constants, x and y are variables.

Exercise 3

We consider the following social network, where two nodes are connected if the corresponding persons know each other.



- Determine the number of positive and negative examples in this network. Give at least 3 of each.
- Using this network, inverse resolution and known predicates, try to learn this concept.

Markov Logic Networks

Exercise 4

We consider the following formula $\neg c \wedge (\neg a \vee \neg b \vee c) \wedge (\neg a \vee d \vee e) \wedge (\neg b \vee \neg c)$. With the help of the WalkSAT algorithm, find, if it exists, a solution to this problem.
Same question with the formula $(a \vee b) \wedge (\neg b \vee c \vee d) \wedge (d \vee \neg a) \wedge (e \vee \neg c) \wedge (\neg d \vee c) \wedge \neg e$. Can we find a compromise, considering uniform weight for every clause ?

Exercise 5

In a knowledge base, we consider the two following first order formulas

- $\forall x(Bird(x) \rightarrow Fly(x))$
- $\forall x \forall y(Predator(x, y) \wedge Bird(y) \rightarrow Bird(x))$

and the constants `eagle` and `sparrow`.

1. What is the corresponding Markov Logic Network ? Draw its grounding.
2. Let us suppose that we know Bird(eagle) and Bird(sparrow). How can we determine the probability of Predator(eagle,sparrow) to be true ?