EECS 4401/5326 Winter 2021
Week 6 — Additional Examples — 25/21/2021

Yves Lespérance

Dept. of Electrical Engineering and Computer Science
York University

Example 1

Suppose that we have the default logic theory $\langle \mathcal{D}, \mathcal{F} \rangle$, where

$$\mathcal{D} = \{\langle\ OperaFan(x) \Rightarrow WineDrinker(x)\rangle\} \text{ and}$$

$$\mathcal{F} = \{OperaFan(john), JazzFan(bob)\}?$$

What are the extension(s) of this default logic theory?

Example 1

Suppose that we have the default logic theory $\langle \mathcal{D}, \mathcal{F} \rangle$, where

$$\mathcal{D} = \{\langle\ \mathit{OperaFan}(x) \Rightarrow \mathit{WineDrinker}(x)\rangle\} \text{ and}$$

$$\mathcal{F} = \{\mathit{OperaFan}(\mathit{john}), \mathit{JazzFan}(\mathit{bob})\}?$$

What are the extension(s) of this default logic theory?

Only one extension

$$\{\phi | \mathcal{F} \cup \{\mathit{WineDrinker}(\mathit{john})\} \models \phi\}$$

Example 2

Suppose that we have the default logic theory $\langle \mathcal{D}, \mathcal{F} \rangle$, where

$$\mathcal{D} = \{\langle\ \mathit{OperaFan}(x) \Rightarrow \mathit{WineDrinker}(x)\rangle, \langle\ \mathit{RockFan}(x) \Rightarrow \neg \mathit{WineDrinker}(x)\rangle\}$$

$$\text{and } \mathcal{F} = \{\mathit{OperaFan}(john), \mathit{RockFan}(john), \mathit{RockFan}(bob)\}?$$

What are the extension(s) of this default logic theory?

Example 2

Suppose that we have the default logic theory $\langle \mathcal{D}, \mathcal{F} \rangle$, where

$$\mathcal{D} = \{\langle\ OperaFan(x) \Rightarrow WineDrinker(x)\rangle, \langle\ RockFan(x) \Rightarrow \neg WineDrinker(x)\rangle\}$$

$$\text{and } \mathcal{F} = \{OperaFan(john), RockFan(john), RockFan(bob)\}?$$

What are the extension(s) of this default logic theory?

Two extensions:

$$\{\phi | \mathcal{F} \cup \{WineDrinker(john), \neg WineDrinker(bob)\} \models \phi\}$$

and

$$\{\phi | \mathcal{F} \cup \{\neg WineDrinker(john), \neg WineDrinker(bob)\} \models \phi\}$$

KB = {p}
KB also entails all tautologies and sentences such as p v q,
{ phi l KB l= phi} No …

Example 3

Let $KB = \{Student(john), Student(mary)\}$

Does $KB \models \neg Student(paul)$?

No it is not entailed

Does $KB \models_{CWA} \neg Student(paul)$?

Yes

KB U Negs |= ~Student(paul)

Example 4

Let $KB = \{Student(john), (Student(mary) \lor Student(paul))\}$.

Does $KB \models_{CWA} \neg Student(paul)$?

Yes,
KB does not entail Student(paul), so Negs will include ~Student(paul)
so KB U Negs entails ~Student(paul)

Does $KB \models_{CWA} \neg Student(mary)$?

Yes, for the same reason as above

$KB \cup Negs$ consistent?

No
these two negative atoms in Negs are inconsistent with the disjunction in the KB

Example 5

Let $KB = \{OperaFan(john), \forall x. OperaFan(x) \land \neg Ab(x) \supset WineDrinker(x)\}$

Does $KB \models WineDrinker(john)$?

No
because there is an interpretation that satisfies the KB where
Ab(jiohn) holds

Does $KB \models_{\leq} WineDrinker(john)$?

Yes
because in the most normal models of KB, Ab is empty
and WineDrinker(john) holds

Example 6

Let $KB = \{OperaFan(john) \vee OperaFan(mary), \forall x. OperaFan(x) \wedge \neg Ab(x) \supset WineDrinker(x)\}$

Does $KB \models_{\leq} WineDrinker(john)$?

No
there is a most norrmal interpretation where mary is an opera fan but john is not,
she must be a wine drinker but john is not

Does $KB \models_{\leq} WineDrinker(john) \vee WineDrinker(mary)$?

Yes
in all the most normal models of KB, Ab is empty and either john or mary is a wine drinker