ENTAILMENT

CSE 511A: Introduction to Artificial Intelligence

ENTAILMENT

Computer

Sentences ——entail——→ Sentences

represents ↓   ↓ represents

Facts ——entail——→ Facts

World

ENTAILMENT

Facts	Sentences
If the head comes up in a coin toss, I win	H⇒IW
If the tail comes up in a coin toss, you lose	T⇒UL
Either the head or the tail must come up in a coin toss	H⇔¬T
You losing is equivalent to me winning	IW⇔UL

entail

I win	IW

ENTAILMENT

- Knowledge base (KB) containing the following facts:
    - H⇒IW
    - IW⇔UL
    - H⇔¬T
    - T⇒UL

- KB ⊨ IW
    - ⊨ is the symbol for entailment
    - Means that IW is true for every model or "world" where KB is true
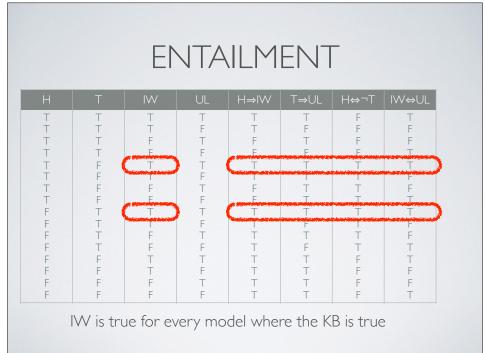
H	T	IW	UL	H⇒IW	T⇒UL	H⇔¬T	IW⇔UL
T	T	T	T	T	T	F	T
T	T	T	F	T	F	F	F
T	T	F	T	F	T	F	F
T	T	F	F	F	F	F	T
T	F	T	T	T	T	T	T
T	F	T	F	T	T	T	F
T	F	F	T	F	T	T	F
T	F	F	F	F	T	T	T
F	T	T	T	T	T	T	T
F	T	T	F	T	F	T	F
F	T	F	T	T	T	T	F
F	T	F	F	T	F	T	T
F	F	T	T	T	T	F	T
F	F	T	F	T	T	F	F
F	F	F	T	T	T	F	F
F	F	F	F	T	T	F	T

H	T	IW	UL	H⇒IW	T⇒UL	H⇔¬T	IW⇔UL
T	T	T	T	T	T	F	T
T	T	T	F	T	F	F	F
T	T	F	T	F	T	F	F
T	T	F	F	F	F	F	T
T	F	T	T	T	T	T	T
T	F	T	F	T	T	T	F
T	F	F	T	F	T	T	F
T	F	F	F	F	T	T	T
F	T	T	T	T	T	T	T
F	T	T	F	T	F	T	F
F	T	F	T	T	T	T	F
F	T	F	F	T	F	T	T
F	F	T	T	T	T	F	T
F	F	T	F	T	T	F	F
F	F	F	T	T	T	F	F
F	F	F	F	T	T	F	T

IW is true for every model where the KB is true

INFERENCE ALGORITHMS

Generally, four ways to check for entailment:

- Brute-force model checking
- Resolution
- Forward chaining
- Backward chaining