2 handouts: slides, assignment 2
730W entries were due
Introduction to Knowledge Representation and Reasoning
What is Knowledge Representation?

- Representing facts
- Reasoning with facts

Can computers be meaningful?
Philosophy of Logic

- History of Logic
- Advice Taker
- The PSSH
- Prop. Logic
- Reasoning

- Philo of Megara (5C BC): truth tables
- Aristotle (322BC): tautologies of proper arguments
- Leibniz (1646-1716): inference as math-like logic (but bogus system)
- George Boole (1854): *The Laws of Thought* (almost propositional logic)
- Gottlob Frege (1879): Conceptual Notation (propositional and first-order logic)
- Dartmouth Conference (1956): modern AI movement
- CYC (1984–, www.cyc.com): slightly more complicated than first-order logic
John McCarthy: “AI”, Lisp, time-sharing
The Physical Symbol System Hypothesis: A physical symbol system has the necessary and sufficient means for general intelligent action. (Newell and Simon)

where a

Symbol is a designating pattern that can be combined with others to form another designating pattern

and

Designation means standing in for something in the world
Propositional Logic
Propositional Logic

What is KR?

Prop. Logic

An Example

Break

Reasoning

It is raining

I am wet

It is raining → I am wet

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<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
<th>$x \land y$</th>
<th>$x$</th>
<th>$y$</th>
<th>$x \rightarrow y$</th>
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$x \rightarrow y$

modus ponens

$\land, \lor, \neg, \rightarrow (\supset, \Rightarrow), \leftrightarrow$
A logic is a formal system:

- syntax: defines sentences
- semantics: relation to world
- inference rules: reaching new conclusions

three layers: proof, models, reality

flexible, general, principled
If the unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.
Break

- asst 1:
- asst 2: first-order logic
- office hours
- third exam: 10:30-11:50 May 11, N133
Reasoning
Conversion to Conjunctive Normal Form

Syntax: $\land, \lor, \neg, \rightarrow (\supset, \Rightarrow), \leftrightarrow$

1. eliminate $\leftrightarrow$
2. eliminate $\rightarrow$
3. move $\neg$ inward: $\neg\neg x, \neg(x \land y), \neg(x \lor y)$
4. distribute $\lor$: $x \lor (y \land z)$
modes ponens
resolution (do unicorn proof)
Please write down the most pressing question you have about the course material covered so far and put it in the box on your way out.

Thanks!