Language and Learning

Introduction to
Artificial Intelligence

COS302

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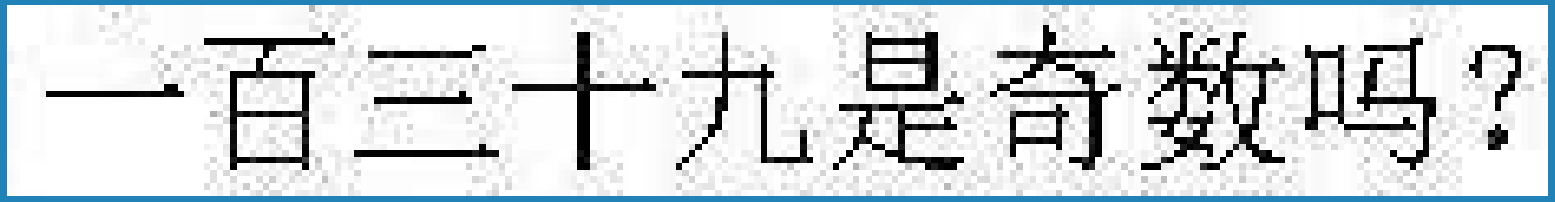
Administration

- Break ok?

Search and AI

Powerful techniques. Do they solve the whole AI problem?

Let's do a thought experiment.



Chinese Room Argument

- Searle: There is a fundamental difference between symbol manipulation and understanding meaning.

- Syntax vs. semantics

Was Searle Right?

- Yes/no: The richness of corpora.
- What is judgment? Can it be automated?

Famous Quotes

"The difference between chess and crossword puzzles is that, in chess, you know when you've won." --- Michael L. Littman

"Trying is the first stem toward failure." --- Homer Simpson via my cryptogram program

Cryptogram Example

- Is this wrong?
- Can you write a program that would agree with you on this?
- What would your program be like?

Language Resources

Three major resources:

- Dictionaries
- Labeled corpora
- Unlabeled corpora

Each useful for different purposes.

Examples to follow...

Google

- Word matching on large corpus
- Hubs and authorities (unlabeled corpus, statistical processing)
- Hand tuned ranking function
- http://www.google.com
- Also machine translation...

Ionaut

- Question answering: www.ionaut.com
- Hand-built question categorization
- Named-entity tagger trained from tagged corpus
- Large unlabeled text corpus
- Hand-tuned ranking rules

Ask Jeeves

- Hand-selected web pages and corresponding questions
- Proprietary mapping from query to question in database

www.ask.com

NL for DB

- Hand constructed rules turn sentences into DB queries
- START
- http://www.ai.mit.edu/projects/infolab/ailab.html

Eliza

- Chatterbots very popular. Some believe they can replace "customer care specialists".
- Generally a large collection of rules and example text.
- http://www.uwec.edu/Academic/Curric/jerzdg/if/WebHelp/eliza.htm

Wordnet

- Hand built
- Rich interconnections
- Showing up as a resource in many systems.
- http://www.cogsci.princeton.edu/cgi-bin/webwn

Spelling Correction

- Semi-automated selection of confusable pairs.
- System trained on large corpus, giving positive and negative examples (WSJ)

http://l2r.cs.uiuc.edu/~cogcomp/eoh/spelldemo.html

OneAcross

- Large corpus of crossword answers: www.oneacross.com
- IR-style techniques to find relevant clues
- Ranking function trained from held-out clues
- Learns from users

Essay Grading

- Unsupervised learning to discover word representations
- Labeled graded essays
- http://www.knowledge-technologies.com/IEAdemo.html

More Applications

- Word-sense disambiguation
- Part of speech tagging
- Parsing
- Reading comprehension
- Summarization
- Cobot
- Cross-language IR
- Text categorization

Synonyms

Carp = quit, argue, painful, scratch, complain

Latent Semantic Indexing

- Corpus, deep statistical analysis

Pointwise Mutual Information

- *Huge* corpus, shallow analysis

WordNet...

Analogies

Overcoat:warmth::

- Glove:hand
- Jewelry:wealth
- Slicker:moisture
- Disguise:identification
- Helmet:protection

Dictionary not sufficient

Labeled corpus probably wouldn't help

Unlabeled corpus, not obvious...

What to Learn

- Difference between straight search problems and language
- Why learning might help
- Three types of resources (hand-created, labeled, unlabeled)

A Rule

Follow this carefully.

____ 是奇数吗？

Rule: If the last character filling in the blank is 一，三，五，七 and 九, say “是”. Otherwise, say “不是”

Explanation

Note:

一，三，五，七 and 九 mean one, three, five, seven and nine, respectively.

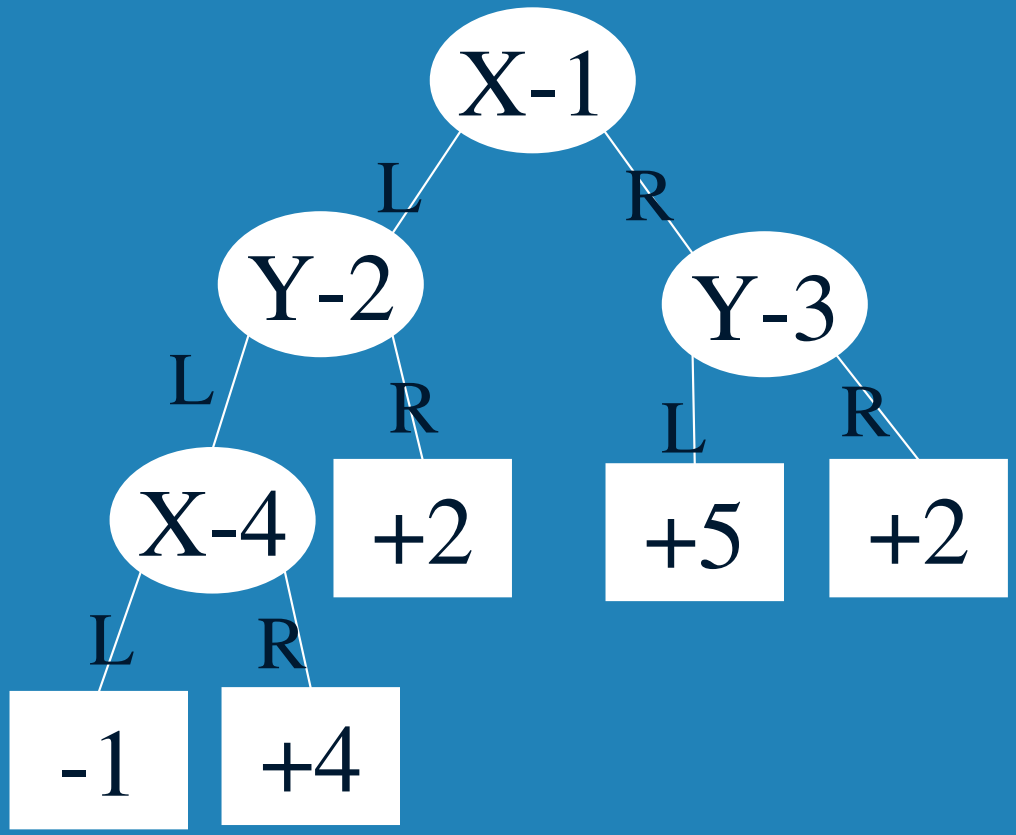
Example:

1) 二十五是奇数吗？	是
Q:Is 25 an odd number?	Yes
2) 五万是奇数吗？	不是
Q:Is 50,000 an odd number?	No
3) 一百三十九是奇数吗？	是
Q:Is 139 an odd number?	Yes

Homework 5 (due 11/7)

1. The value iteration algorithm from the *Games of Chance* lecture can be applied to deterministic games with loops. Argue that it produces the same answer as the "Loopy" algorithm from the *Game Tree* lecture.
2. Write the matrix form of the game tree below.

Game Tree



Continued

3. How many times (on average) do you need to flip a coin before you flip 3 heads in a row? (a) Set this up as a Markov chain, and (b) solve it.

Homework 6 (due 11/14)

1. Use the web to find sentences to support the analogy traffic:street::water:riverbed. Give the sentences and their sources.
2. More soon...