CSC 103: How Computers Work

Spring 2016
Smith College
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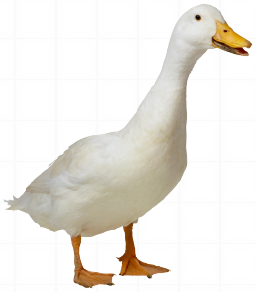
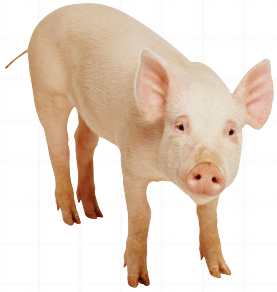
Class 8: April 18
Outline

- Discussion of Artificial Intelligence (AI)
- Overview and branches of AI & demos
- A first AI algorithm: Decision Trees

Discussion Questions:


1) What are attributes that make us consider humans more intelligent than other animals?

2) What attributes would make a computer intelligent?

3) How do we know that we are not also computers at some level?

Artificial Intelligence

- Thinking
- Perception
- Action

- Need: a representation or language

Example: identify a leaf

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One way: go through a nature guide until we see a match

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One way: go through a nature guide until we see a match

Another way: use hierarchical features (i.e. deciduous vs. coniferous)

Decision Trees

- Used for classification (assign a data point to one of several outcome classes)

- Example: medical decision making
  - Data point = symptoms of patient (cough, fever, etc)
  - Class = clinical diagnosis (cold, flu, etc)

Classification

- Normal/Disease based on genome, scan, other info
- Topic modeling (what a document is about, useful for search)
- Image classification (faces, forensics)

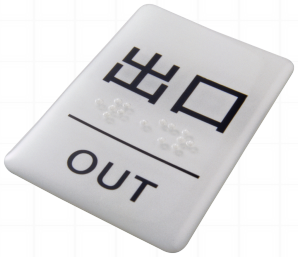
Turing Test

- Can a human tell the difference between a computer chat bot and a human?

ELIZA http://nlp-addiction.com/eliza/

ALICE http://alice.pandorabots.com/

Automatic Language Translation



- Translate from one natural language to another (Chinese, Spanish, English, Arabic, etc)
- Requires a lot of expert knowledge
- Very active research area, considered unsolved
- Right now automatic ("machine") translation can only get the "gist" of the meaning
- Sometimes that's enough because human translators are very expensive

Search (maps)

- “Best” path from point A to point B
- Best could mean shortest distance, shortest time, paved roads, cheapest, non-highway, etc

Robotics

- Computer may be able to solve a complex problem, but not walk across the room
- Classical robotics: motion and physical tasks
- Modern robotics: integrate perception and action

ATM check recognition

ATM check recognition

- Uses training data and handwriting recognition
- Can turn check upside down
- Eliminates need for some human bankers
  - Good or bad?

Written/oral/text communication

Written/oral/text communication

- Handwriting/text to speech
  - Useful for the blind
- Speech to text
  - Useful for the deaf, or those less able to type
- Phone typing
- Idea of representation

http://detexify.kirelabs.org/classify.html

First two AI algorithms

- Binary search for 99 number
- Decision Tree for housing prices

Big Takeaway

Most modern AI is based on data, not expert rules