Artificial Intelligence (is no match for natural stupidity :)

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Thinking with Electricity

- The inventors of ENIAC, 1st computer, said it “thinks with electricity”
  - Do calculators “think”? 
  - Does performing arithmetic, which is entirely algorithmic, require thinking? 
  - Once, performing arithmetic, was thought to be divinely or magically conferred ability
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The Problem: Many human activities look like thinking until they are understood (to be algorithmic)
Turing’s Test

- A.M. Turing, computer pioneer, worried about intelligence in humans & machines; proposed a test (1950)
  - Aware that it is intelligence until it’s understood, Turing devised an experiment:
  - A computer (A) and a person (B) are connected to an examiner, who can ask questions using text to determine which is which
**Turing’s Idea of Interrogation**

**Interrogator** In the first line of your sonnet which reads 'Shall I compare thee to a summer's day', would not 'a spring day' do as well or better?

**Computer** It wouldn't scan.

**Interrogator** How about 'a winter's day'? That would scan all right.

**Computer** Yes, but nobody wants to be compared to a winter's day.

**Interrogator** Would you say Mr. Pickwick reminded you of Christmas?

**Computer** In a way.

**Interrogator** Yet Christmas is a winter's day, and I do not think Mr Pickwick would mind the comparison.

**Computer** I don't think you're serious. By a winter's day one means a typical winter's day, rather than a special one like Christmas.
Captcha

- Completely Automated Public Turing Test To Tell Computers and Humans Apart
  - Developed at CMU by Luis Van Ahn and his team
Joel Weizenbaum’s “Doctor” [a\k\a “Eliza”] was a program that appeared intelligent

*User:* I’m depressed.

*Doctor:* Why are you depressed?

*User:* My mother is not speaking to me.

*Doctor:* Tell me about your mother.

*User:* She doesn’t want me to major in CS.

*Doctor:* No?

*User:* No, she wants me to go into medicine.

**Doctor was basically scripted**
Artificial Intelligence

- The study of making computers act intelligently
  - They already act intelligently ... e.g. they can correct your spelling mistakes
  - Is this intelligent behavior? Most AI researchers would say “no” ... algorithmic
  - Playing grandmaster level chess in a tournament became an AI goal (1952)
    - Minimizes real world knowledge
    - Clear goal, formal system
Playing Chess

- Chess is a game, so it uses a game tree
  - At each node is a ‘board’ -- easily digitized
  - Below it are all boards created in 1 move; below those, all boards needing another move

An objective function evaluates “goodness” of the position: go for highest ... opponent goes for lowest
Deep Blue vs Kasparov

- An IBM system, Deep Blue, played world champion Gary Kasparov
  - In 1996 Kasparov won, but Deep Blue played 1 game well!!! This was a first.
  - In May 11, 1997 Deep Blue won 3.5-2.5
Deep Blue is a 32 processor parallel computer with 256 “chess processors” that can consider 200,000,000 chess positions per second + openings.

Does Deep Blue’s performance show that a computer can be intelligent?

- No -- it repeats its designers intelligence (weak rebuttal)
- Yes – it’s better than anyone in the world at something people find interesting and fun
- Maybe -- it shows intelligence in chess, but can it apply its intelligence elsewhere?

What do you think?
And Now Watson plays Jeopardy
Category: US Cities

"Its largest airport is named for a World War II hero, its second largest for a World War II battle."

What’s the answer?
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"Its largest airport is named for a World War II hero, its second largest for a World War II battle."

What’s the answer?
Watson said, “Toronto”
A Problem: What *Type* of Answer?

- Figuring out what is needed as an answer is tough: Who’s on first?  <baseball player>
Watson: More Sophisticated

- Compared to Deep Blue, Watson is much more sophisticated in design, organization
  - runs on ~2,500 parallel CPUs, each capable of up to 33 billion operations a second; size of small RV
  - crawled and organized 200 million pages of data
  - “expert” analyzers — more than 100 different techniques running concurrently to analyze natural language, appraise sources, propose hypotheses, merge results and rank top guesses.
Compare Watson, Deep Blue

- Chess seems harder, but it’s not
  - Chess has fixed rules, little real world data needed
  - Jeopardy, more free form using only real data
- Other differences
  - In chess the “problem” is known beforehand, but in Jeopardy, someone else sets up the problem
  - In chess, decisions are based on a formula, but in Jeopardy many forms of evaluation are needed (a problem solved by probabilities)
  - In chess there is very little pre-planning, but in Jeopardy, organizing the data is the key
Computers do things deemed creative in past

- Create designs in the style of Piet Mondrian, Jackson Pollack or Josef Albers ...

Is it Art?
Is it Creative?
Definition of Creativity

- Creativity has two forms: “flash out of the blue” and “incremental revision”
  - “Flash,” i.e. inspiration, is rare; is it just luck?
  - “Revision”, i.e. hard work, is common and to a large degree algorithmic

Advertising agencies are famous for creativity, but in a recent study, 89% of all award-winning ads were an application of one of six templates -- design algorithm
Composing Music

- An experiment at the U. of Oregon ...
  compose music in the style of Bach
- Three participants: Bach, U of O Professor (Larson), EPI program
- And the winner is ...

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<tr>
<th>Audience Guess</th>
<th>True Composer</th>
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<tr>
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<td>EMI</td>
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<td>Composition 2</td>
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Watson looks to be a major advance in AI and a big step towards answering Turing’s Test.

What is AI?

The capacity of a computer to perform operations analogous to learning and decision making in humans.