

Progress has been tremendous

**Artificial Intelligence (is no match  
for natural stupidity :)**

*Lawrence Snyder  
University of Washington, Seattle*

# Thinking with Electricity

- The inventors of ENIAC, 1<sup>st</sup> 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

# Thinking with Electricity

- The inventors of ENIAC, 1<sup>st</sup> 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

The Problem: Many human activities look like thinking until they are understood (to be algorithmic)

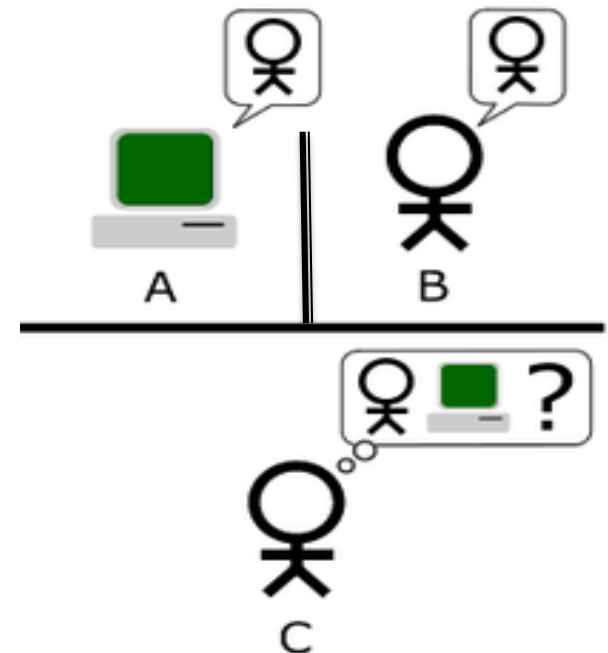
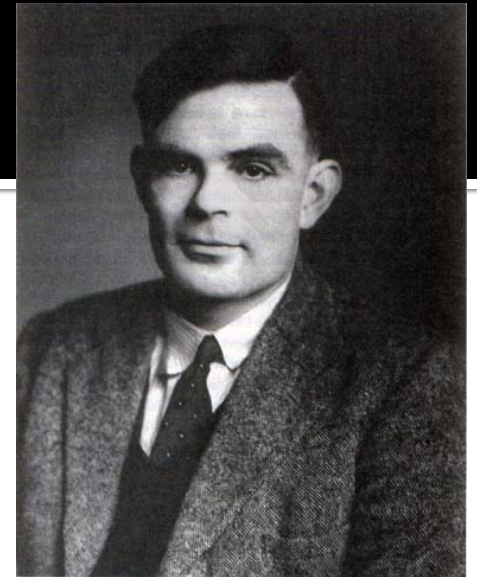
# Turing's Test

- 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



# Seeming To Be Intelligent

- 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

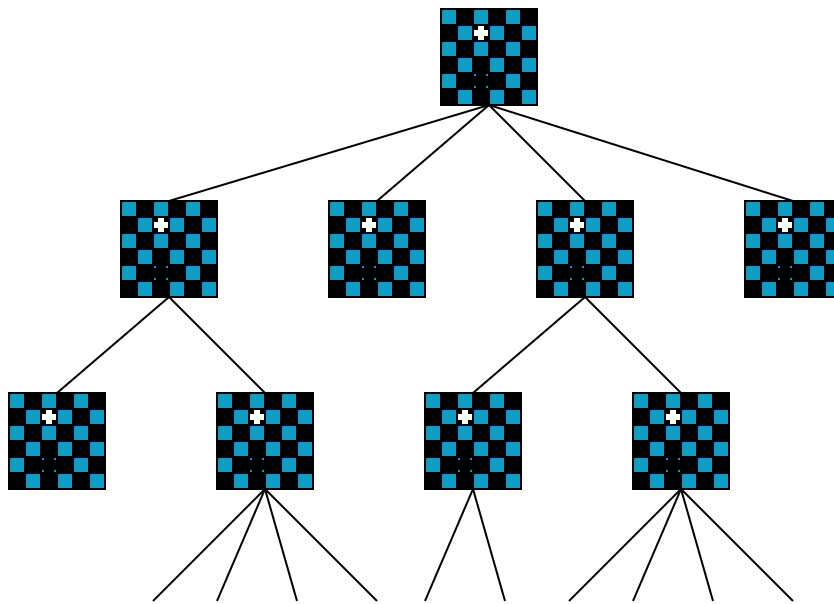
# Artificial Intelligence

- The study of making computers act intelligently
  - They already act intelligent ... 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 + opens + ends

# Intelligent?

- 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!



# Day 1, Final Jeopardy

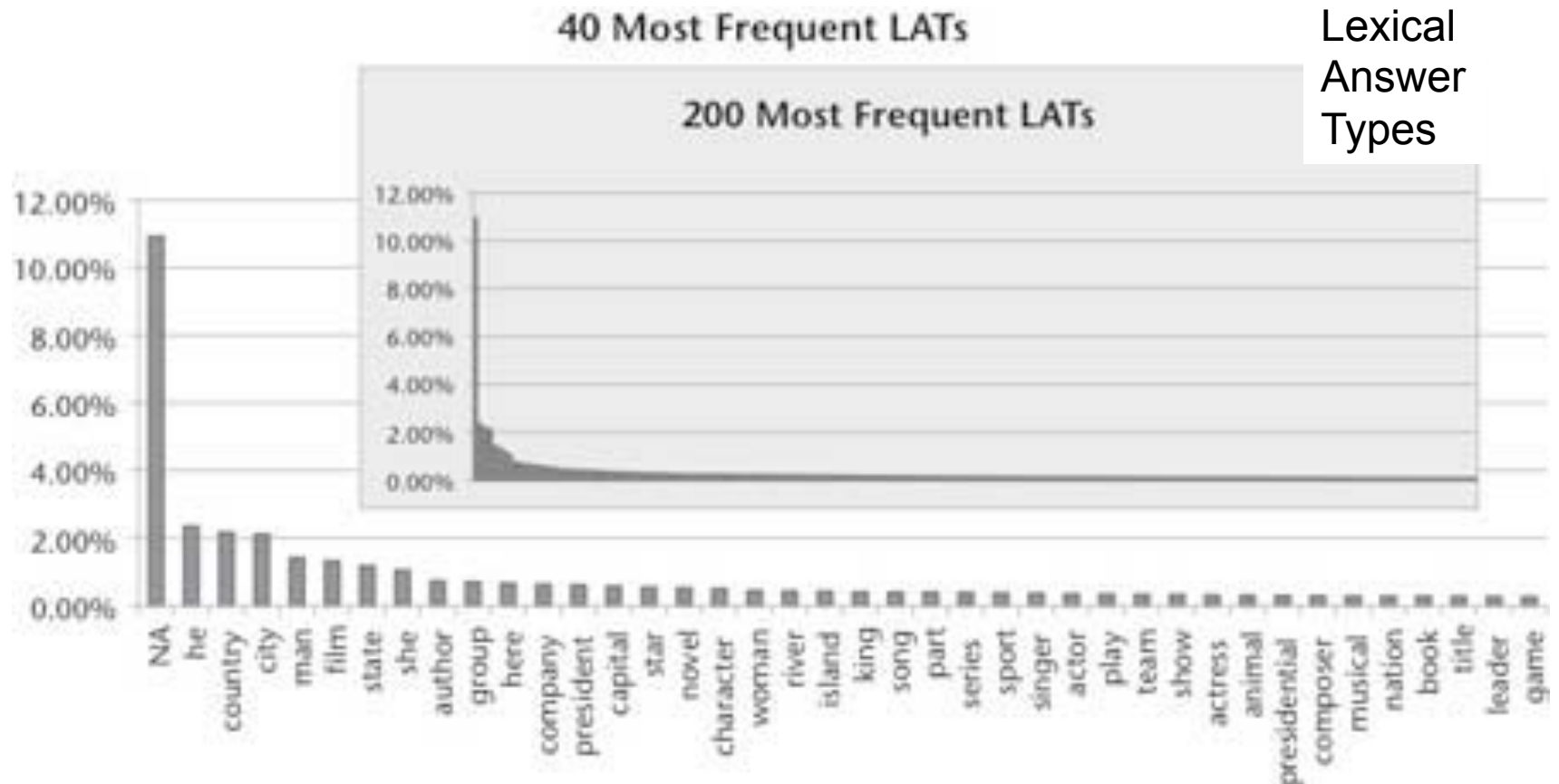
- Category: US Cities
- "Its largest airport is named for a World War II hero, its second largest for a World War II battle."
- What's the answer?

# Day 1, Final 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?
- 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.

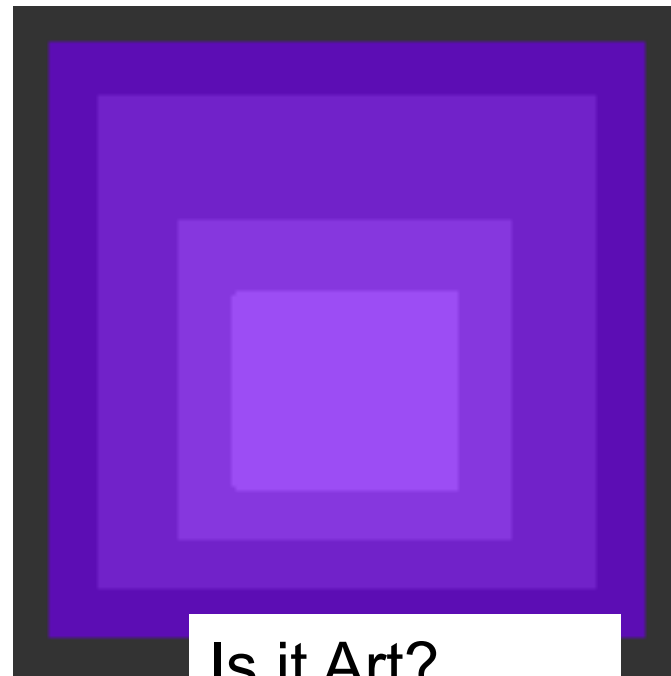
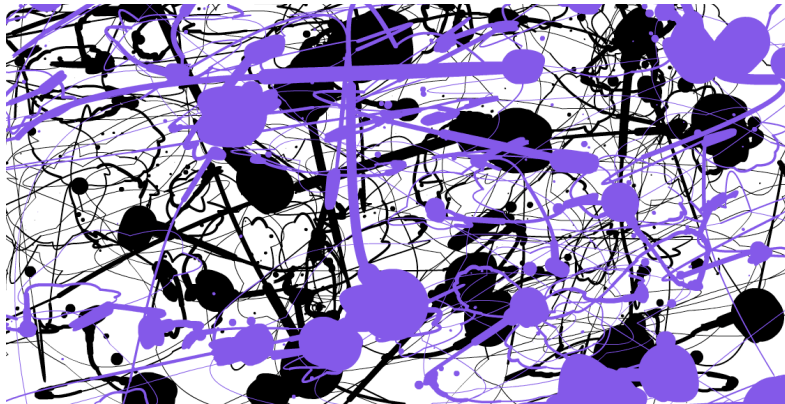
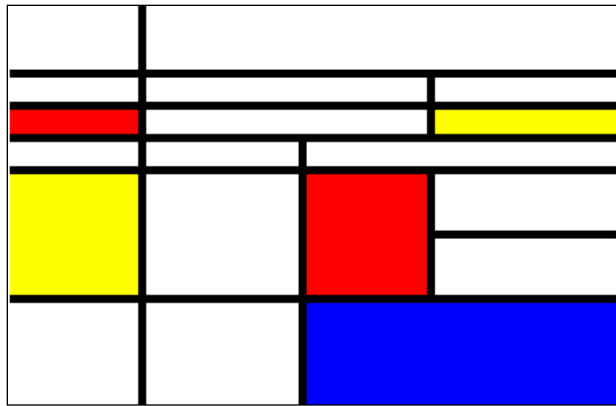


# Compare Watson, Deep Blue

- 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

# Being Creative

- 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,  
EPI program
- And the winner is ...

	<b>Audience Guess</b>	<b>True Composer</b>
Composition 1	EMI	Larson
Composition 2	Larson	Bach
Composition 3	Bach	EMI

# Summary

- Watson looks to be a major advance in AI and a big step towards answering Turing's Test

THE CAPACITY OF  
A COMPUTER TO  
PERFORM OPERATIONS  
ANALOGOUS TO  
LEARNING AND  
DECISION MAKING  
IN HUMANS

What is AI?