Artificial Intelligence

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- “Artificial Intelligence is whatever hasn't been done yet.” (common variation on Tesler’s Theorem: “Intelligence is whatever machines haven't done yet.”)

Artificial Intelligence

- "The study and design of intelligent agents"[1] where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. (Russell & Norvig)
- "The science and engineering of making intelligent machines." (John McCarthy)
- “The science of knowing what to do when you don’t know what to do.” (Peter Norvig)

Early Optimism

- Dartmouth conference in 1956
- Early AI focused on reasoning, calculations, games, and puzzles
  - Checkers, chess
  - Calculus
- Significant progress was made quickly. Researchers started predicting we'd soon have intelligent machines.

Stumbling Blocks

- Image recognition
  - Foreground, background, extraneous features, differences of position, lighting, etc
- Robotics with independent movement
- Natural language understanding
  - Parsing varying sentence structures
  - Dealing with ambiguity (“it”, double meanings)
  - Dealing with what is left unsaid
  - Common sense knowledge

Next Generation

- Machine Learning
- Microworlds
- Game Theory (rational decision making)
- Expert Systems
- Neural Networks (an area of Machine Learning)
- Huge database (“knowledge base”) of facts & rules making up common knowledge and common sense

Modern AI

- Spurred by
  - Parallel Computing
  - New Techniques (e.g., statistical techniques)
  - Big Data ("learning from data" – Dr. Eric Horvitz, MS Research)
- AI is everywhere, even when not called that
  - Spam filters
  - Movie and music recommendations
  - Face recognition (e.g., in Picasso or iPhoto)
  - Traffic routing
  - Data mining (e.g., credit card fraud detection)
  - Natural language translation

Modern AI

- Publicly recognized AI
  - Deep Blue – beat Garry Kasparov in 1997
  - Watson – won big at Jeopardy in Feb. 2011

Why is AI Difficult?

- Deduction
- Knowledge Representation, including Common Sense
- Planning
- Learning
- Natural Language Processing
- Social Intelligence (emotion)
- Creativity
- General Intelligence

AI Topics

- Affective computing (recognize, process, display human affect (emotions))
- Automated Planning and Scheduling
- Evolutionary Algorithms
- Fuzzy Logic
- AI, Game Theory, and Games
- HAL's Legacy (science fiction vs current science)
- Machine Learning
- Neural Networks
- Speech Recognition, Facial Recognition
- Turing Test and Loebner Prize
- AI in popular media (Hitchhiker's Guide to the Galaxy; I, Robot; Skynet; Star Wars; The Matrix)