

Present and Future of AI

Where's the AI?



The image is a screenshot of a CNN Tech article. The top navigation bar is red with the CNN Tech logo on the left and a search bar on the right. Below the navigation bar, the article title "AI set to exceed human brain power" is displayed in a large, bold font. The date "July 24, 2006" is shown to the left of the title. To the right of the title are social sharing buttons for "Share", "Twitter", and "Email". Below these buttons is a "Recommend" button with a small icon and a Facebook logo, followed by the text "Be the first of your friends to recommend this." The main text of the article begins with "Mention Artificial Intelligence and most people are immediately transported into a distant future inspired by popular science fiction." and continues with "Humankind either co-exists in blissful peace with subservient robots and conscious computers or faces a battle for survival against ultra-smart psychotic machines set on its destruction." and "Yet Artificial Intelligence (AI) has already been with us for half a century. The phrase was first coined by Professor John McCarthy for a conference on the subject at Dartmouth College in 1956." and "And while the AI fantasies imagined by science fiction writers such as Isaac Asimov, author of 'I, Robot,' may not have materialized, AI is already in more common usage than many of us might imagine."

AI in the Real World



Information retrieval
 Natural Language Understanding
 Image retrieval
 AdWords
 Spam Filtering
 Speech recognition



Natural Language Understanding
 Hierarchies of semantic knowledge



Voice recognition
 Natural language understanding
 Personal Assistant
 Chat bot

Wolfram Alpha

The screenshot shows the Wolfram Alpha interface for the query "anchorage". At the top is the WolframAlpha logo with the tagline "computational knowledge engine". Below the logo is a search bar containing the text "anchorage". To the right of the search bar are links for "Examples" and "Random". Below the search bar, there are two lines of text: "Assuming 'anchorage' is a city | Use as a word instead" and "Assuming Anchorage (Kentucky, USA) | Use Anchorage (Alaska, USA) instead". Below this is a section titled "Input interpretation:" which shows "anchorage (English word)". Underneath is a "Definitions:" section with a "Show examples" button. The definitions are listed as follows:

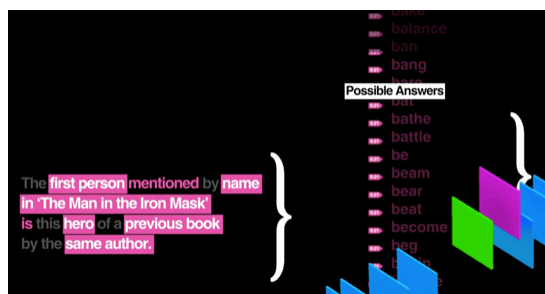
- 1 noun the condition of being secured to a base
- 2 noun a fee for anchoring
- 3 noun place for vessels to anchor
- 4 noun the act of anchoring

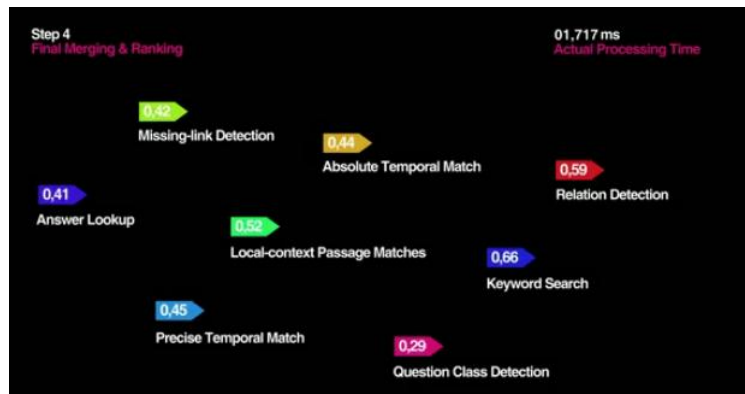
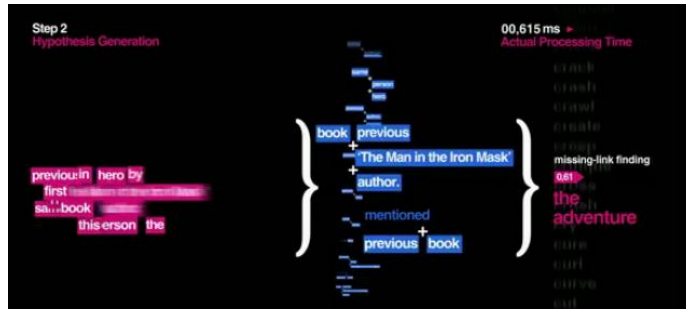
Grand Vision

- Useful, but what about the HAL 9000 or Terminators?

IBM Watson

- Beat Jeopardy! champions in 2011
- <http://www-03.ibm.com/innovation/us/watson/>







Stanley

- Won 2005 DARPA Grand Challenge
 - Driverless car to win 132 mile off-road course
 - LIDAR to build 3D map along with GPS, other sensor data
 - Six Pentiums running Linux
 - Architecture: sensor layer to perception layer to planning & control
 - Lots of complex algorithms; learning algorithm to map driveable terrain. Over 100K lines of code.



Boss

- CMU vehicle, won 2007 DARPA Urban Challenge
- More code and tech
 - Over 12 lasers, cameras, radars
 - Route planning, perception of lane and road boundaries, stop lines, speed limits, etc.
 - Over 300K lines of code

Robotics

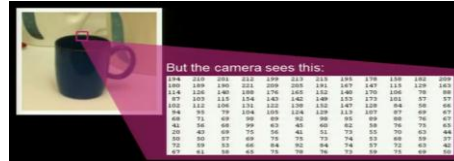
- Where are our robotic servants?
- Steady advances in control systems
 - Stanford Shakey
 - <http://www.youtube.com/watch?v=qXdn6ynwpil>
 - MIT Leg robots
 - <http://www.youtube.com/watch?v=vHjVV7AWaGM>
 - Asimo
 - <http://www.youtube.com/watch?v=NZngYDDDFW4>

Perception

- The robot shortcomings are primarily in perception
 - Visual
 - Auditory
 - Tactile

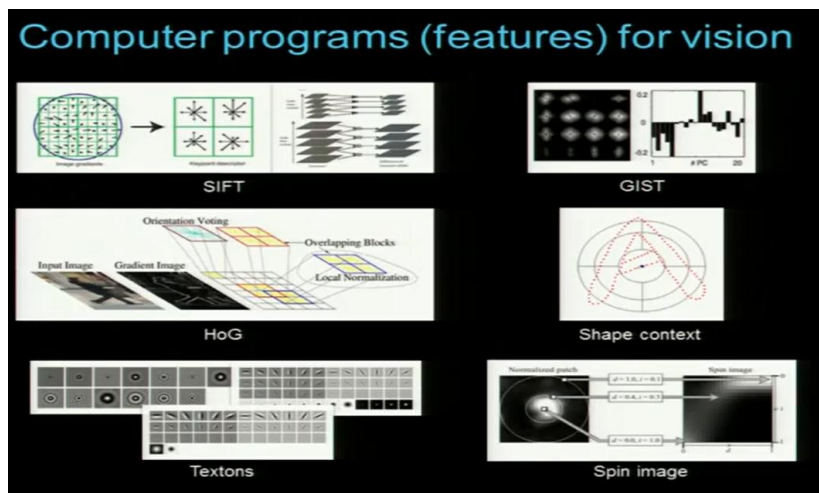
Computer Vision

- Hard problem



- Also have to consider invariance
 - Scale, illumination, rotation, deformation, occlusion, viewing angle

Complex Solutions



Better AI → More Lines of Code?

- Depressingly complex solutions
- Do an OK job but not great

- More general approach?
 - Mounting evidence of a single learning algorithm in the brains
 - Numenta
 - <http://www.numenta.com/>

Bow to your future robot overlords?

- Advances in machine intelligence the last 60 years compared to human intelligence?
- Kurzweil
 - 2020: Computer passes Turing Test
 - 2029: Robot Rights movement, robots claim consciousness
 - 2045: Technological singularity
 - 2099: Humans and machines merge physically and mentally