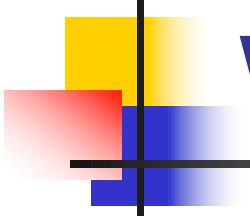


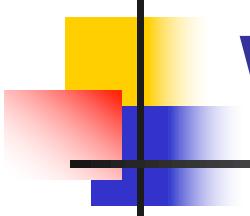
Introduction to AI

Russell chap. 1
Luger chap. 1, chap. 16



What is Intelligence?

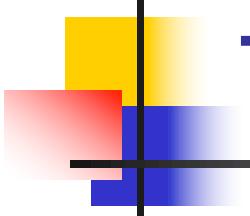
- Perception
 - Sensing - image, sound, touch ...
 - Understanding - vision, language ...
- Reasoning
 - Given facts → new facts
 - Problem solving based on knowledge
- Learning
 - Improving performance as it repeats
 - Predicting future based on past experiences (data)
- Adaptiveness, creativity, etc.



What is Artificial Intelligence?

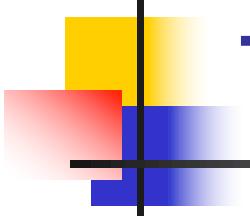
- Study on how to make machines perform intelligent behavior
 - To find how people think/act intelligently
 - To develop systems that perform intelligent task (perception, reasoning, learning, ...)





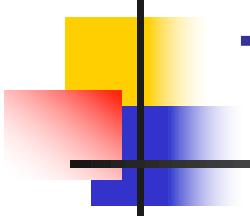
The History of AI

- Foundation
 - What is mind and how it operates? – Philosophy
 - How to automate the reasoning process? – Mathematics
 - How do brains process information? – Neuroscience
 - How do humans think and act? – Psychology
 - How can we build efficient computer? - Computer Science
 - How does language relate to thought? – Linguistics
- Gestation (40s, 50s)
 - Artificial neuron (McCulloch & Pitts, MIT)
 - Perceptron: a computational model of neuron
 - Logic Theorist (Newell & Simon, CMU)
 - Non-numerical problem solving - theorem proving
 - Dartmouth workshop → “**Artificial Intelligence**” (1956)



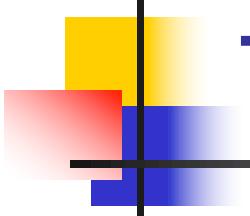
The History of AI

- Early enthusiasm (50s, 60s)
 - Various successful systems in limited domains
 - Checker program (Samuel, IBM), GPS (Newell & Simon, CMU), ELIZA (Weizenbaum, MIT), SHRDLU (Winograd, MIT), ...
 - LISP (McCarthy, MIT)
 - Physical symbol system hypothesis
 - “a physical symbol system has the necessary and sufficient means for general intelligent action”
- Difficulties in reality (60s)
 - Lack of knowledge
 - Machine Translation Project (NRC) failed
 - Ex> “The spirit is willing but the flesh is weak” (in Russian)
→ “The vodka is good but the meat is rotten” (in English)
 - Intractability of problems
 - As complexity increase, the program failed to find solutions
 - Ex> in search for theorem proving
 - Limitation on structure
 - Ex> Minsky and Papert proved that a simple perceptron can not learn certain tasks



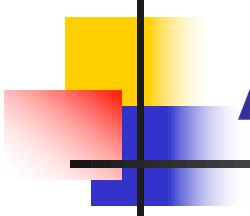
The History of AI

- Knowledge-based systems (70s)
 - Expert systems
 - DENDRAL (Stanford) - Identify molecule structure by using mass spectrum data
 - MYCIN (Stanford) - Medical diagnosis
 - Knowledge representation for language understanding
- AI becomes an industry (80s)
 - Commercial expert systems, AI companies
 - DEC's R1(computer configuration expert system), DuPont, ...
 - 5th generation computer project (Japan), MCC project (USA)
 - Many companies failed
- Return of neural networks (80s)
 - PDP(Parallel and Distributed Processing)
 - Connectionist models, backpropagation learning



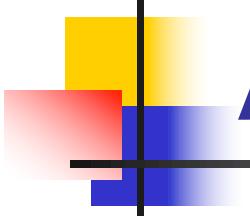
The History of AI

- Statistical approaches (80s - present)
 - Working on mathematical analysis of large data
 - Probabilistic reasoning, Speech recognition, Machine translation
 - Data mining
- Intelligent agents (90s – present)
 - A software that is intelligent, autonomous, and social
 - AGI (Artificial General Intelligence)
- Big data, deep learning (00s – present)
 - Data driven machine learning applications
 - Image recognition, Self-driving car, Speech translation, Natural language processing, Stock trading, Game playing, ...



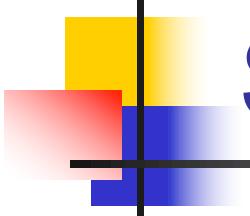
Areas/Applications of AI

- Logical/probabilistic reasoning
 - Expert systems (financial, design, ...)
- Speech recognition
 - Voice recognition, speech translation
- Natural language processing
 - Text mining, Machine translation
- Vision
 - Character recognition, Object recognition, autonomous vehicle



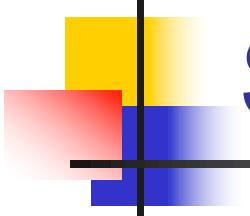
Areas/Applications of AI

- Machine learning
 - Data mining, Big data analysis, Deep learning
- Robotics
 - Motion planning, Assembly planning
- Game playing
 - Chess/Baduk, NPC control
- Intelligent agents
 - Search agent, Recommender systems



Symbolic vs. Connectionist

- Symbolic AI
 - *Physical symbol system hypothesis*
 - Intelligence is achieved through
 - Symbol patterns to represent problems
 - Operations on the patterns to generate potential solutions
 - Search to select a solution
 - ➡ Logical inference
 - ➡ Knowledge-based systems



Symbolic vs. Connectionist

- Connectionist AI

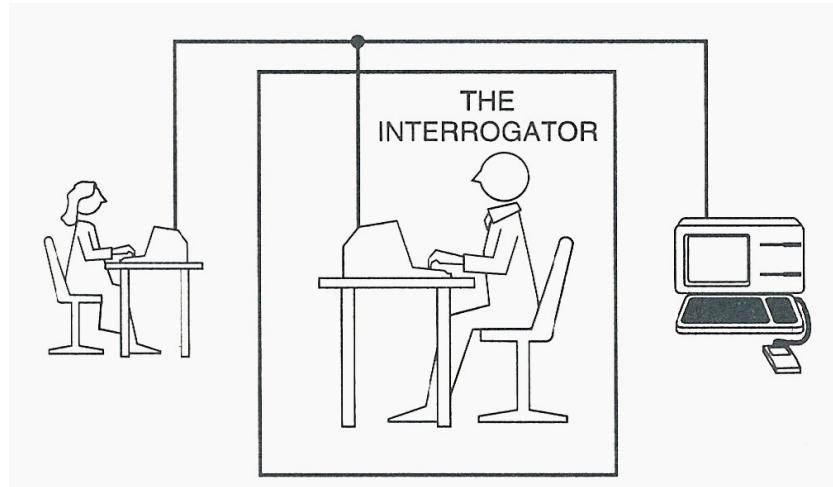
- *Modeling human brain*
 - Intelligent behavior is achieved by
 - Large number of connected processing element
 - Learning of the network

→ Neural Networks

Can Machines Think?

■ Turing Test

- Alan Turing (1950) - Can machine be intelligent?



jabberwacky.com

A screenshot of the Jabberwacky AI interface. It features a 3D rendering of a bald man with yellow sunglasses and a white t-shirt with the "jabberwacky" logo. Below him is a text input field containing the message "No, you are not.". Further down, there are several blue horizontal bars with white text:

- "It is true that I am human and using a computer."
- "Can you prove it?"
- "Can you prove Anything?"

A small input field with the placeholder "Say" is located above a row of buttons labeled "Pass", "Log", and "New".

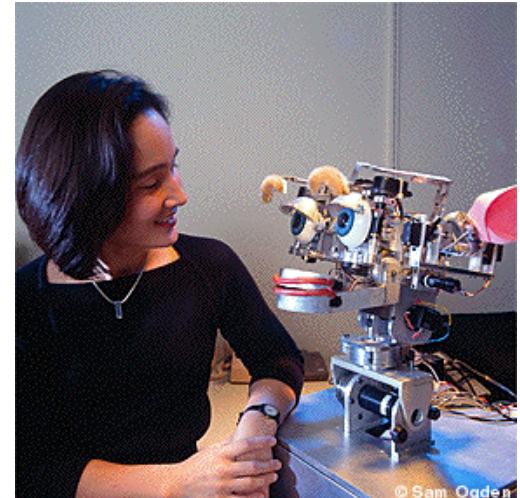
■ Loebner Prize

- <http://www.loebner.net/Prizef/loebner-prize.html>
- <http://www.jabberwacky.com>

Conversation with Robots

■ KISMET

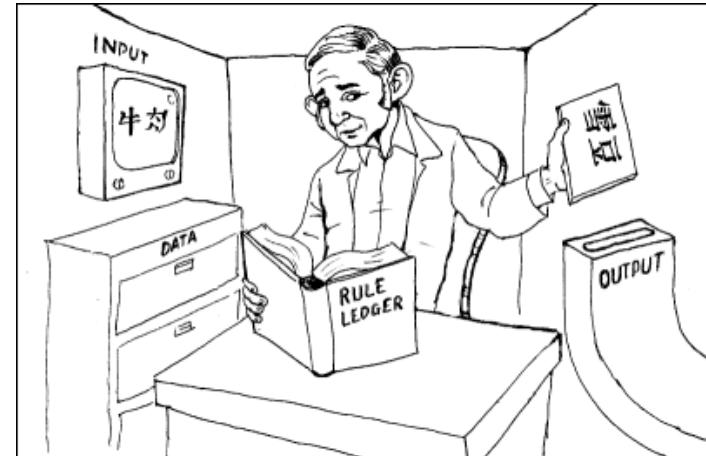
- A robot made in MIT AI lab
 - Vision – object recognition, movement detection
 - Speech recognition
 - Attention/Behavior control
 - Speech generation
 - Introducing emotions, belief, desire
- [Expression examples](#) 
- [Focusing](#) 
- [Dialog with humans](#) 
- [Hanson Robotics](#) 



© Sam Ogden

The Chinese Room Experiment

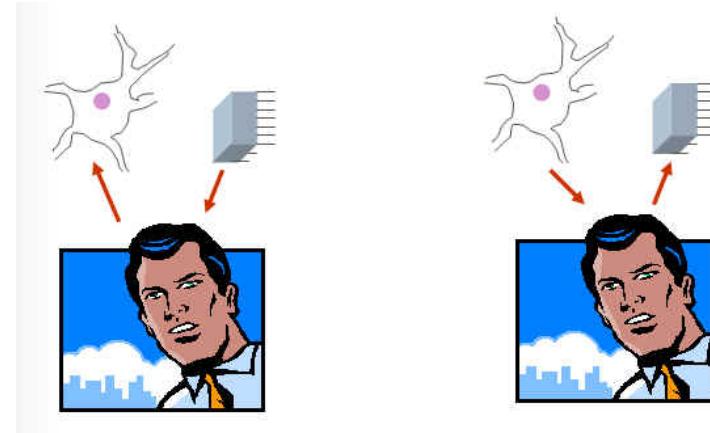
- John Searle (1980)
- Thought experiment



- Searl's argument
 - The man in the room does not have any understanding
 - No matter how intelligent-seeming a computer behaves and no matter what programming makes it behave that way, since the **symbols it processes are meaningless to it**, it's not really intelligent. It's not actually thinking.

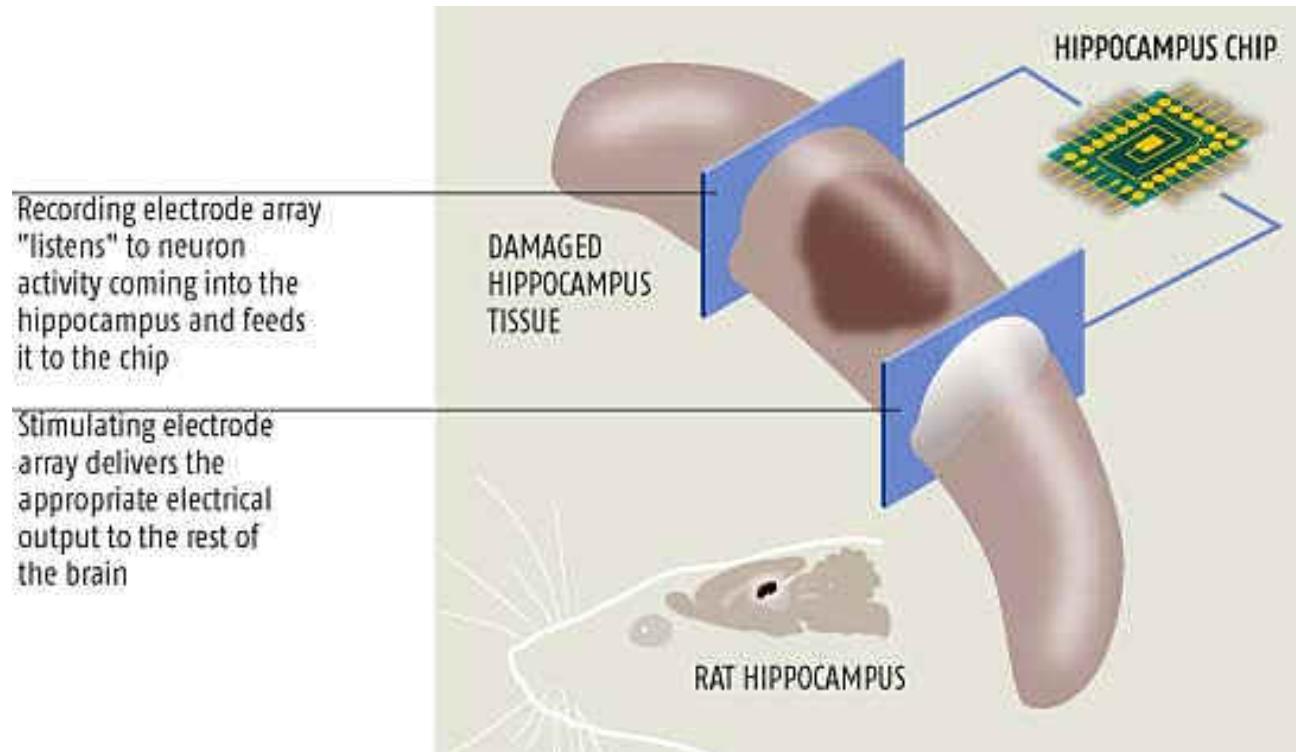
The Brain Prosthesis Experiment

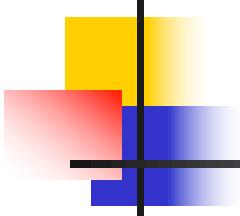
- John Searle (1980),
Hans Moravec (1988)
- Thought experiment



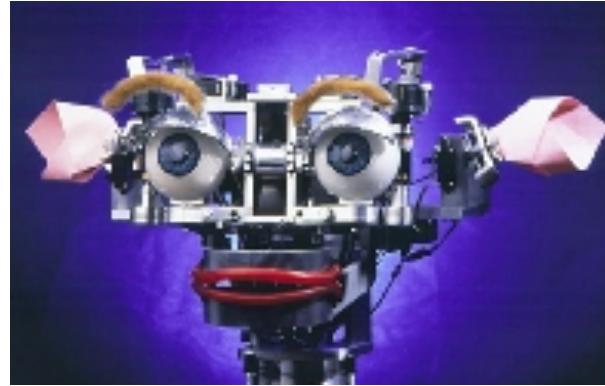
- Will you remain conscious?
 - Hans Moravec: Yes. It will show exactly same behavior with real brain. **The mechanism involved in consciousness are still operating in the electronic brain**, which is therefore “conscious”
 - John Searle: No. You would end up loosing your control over your behavior. (Problem: The consciousness cannot be removed instantaneously)

The World's First Brain Prosthesis: Artificial Hippocampus





Can Machines Think?



Am I thinking or what?

- Intelligence? (weak AI)
 - yes, in narrow sense.
- Consciousness? (strong AI)
 - debate unsolved.

Expert Systems



Osteoporosis Questions

Your answers to these questions are confidential and are not linked to your user name or password or other identifiable data such as those obtained for credit card payment. See our [Privacy Policy](#).

Required:

Age Sex

1. Have you had the recent onset of back pain?
 Yes
 No
 Unknown/not applicable

2. Have you been on long-term treatment (more than 6 months) with any of the following medications?
 A. Steroids (more than the equivalent of 7.5 mg. Prednisone daily)
 B. Thyroid hormone (Synthroid, Cytomel, etc.)
 C. Anticoagulants, dilantin, immunosuppressives, or Depo Provera?
 D. None of the above
 E. Unknown/not applicable

Expert Systems



Osteoporosis Results

Condition/Disease	Estimated probability
Normal Bone Density	55%
Osteoporosis	34%
Reduced Bone Mass (Osteopenia)	11%

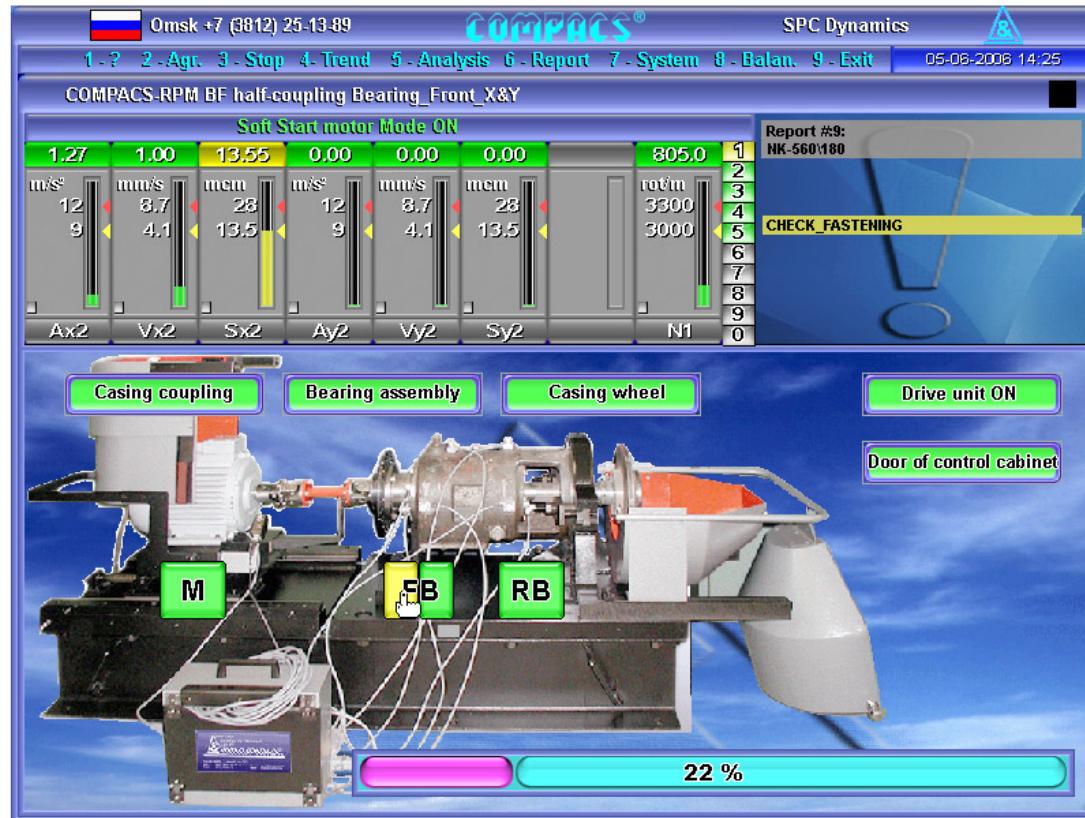
Millions of people visit the Internet daily in search of information about their complaints and conditions. *EasyDiagnosis* offers a novel interactive resource to assist health site visitors **bypass vast amounts of irrelevant medical news and information** offered by traditional medical web sites.

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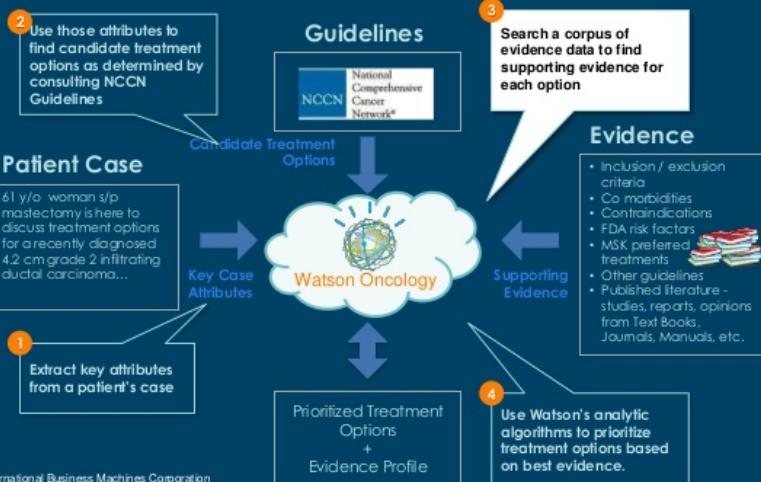
The COMPACS®-RPM system for diagnostics and dynamic balancing of cradle-mounted pump rotors

IBM Watson



In 2011, the IBM's Watson competed on Jeopardy! against former winners Brad Rutter and Ken Jennings, and received the first place prize of \$1 million.

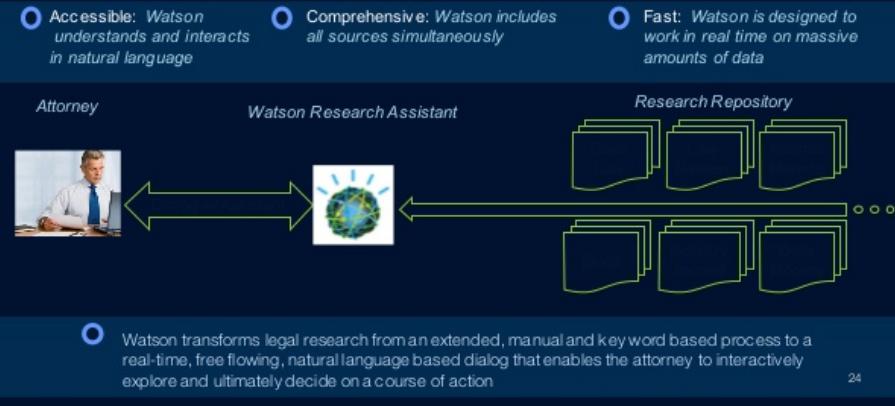
Watson Oncology helps medical oncologists and their care teams address these challenges



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15

Watson can perform comprehensive legal research – faster



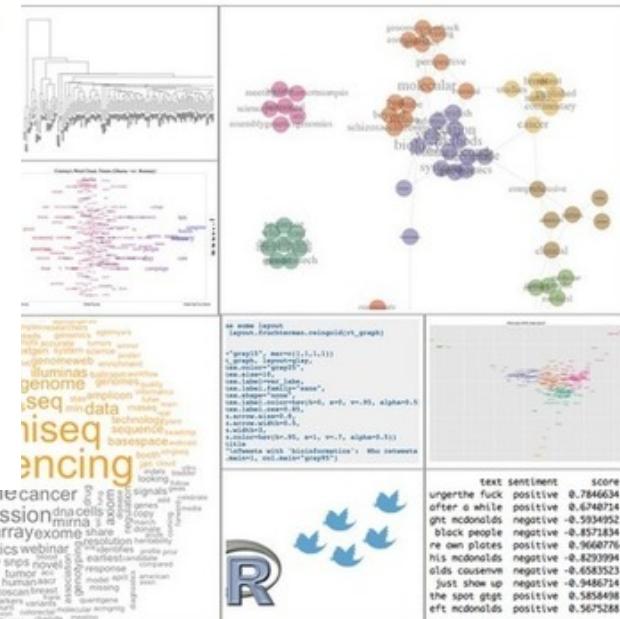
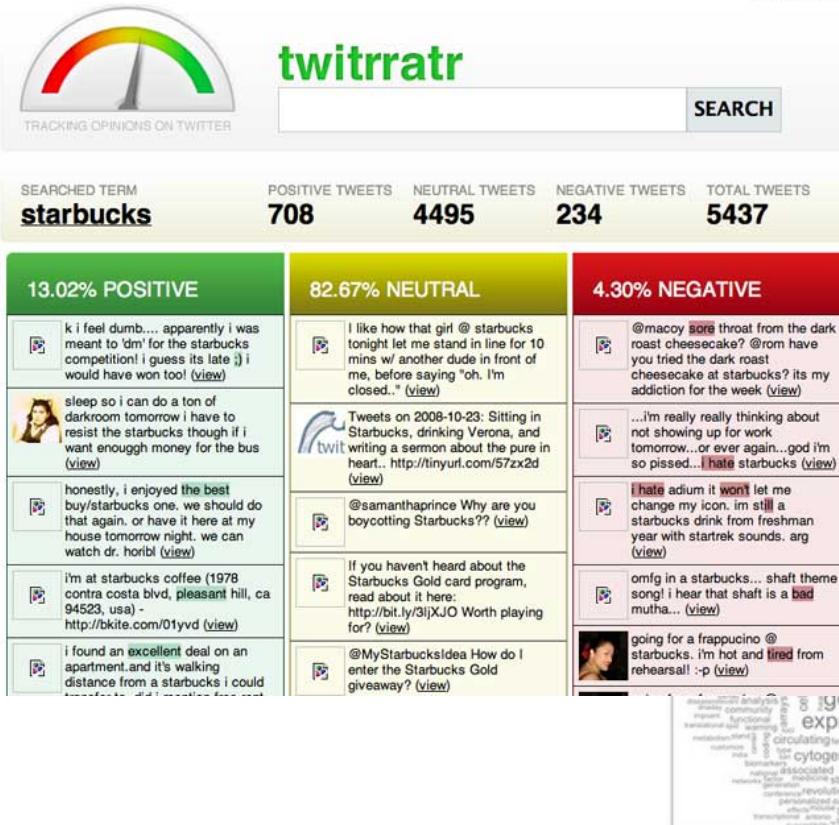
24

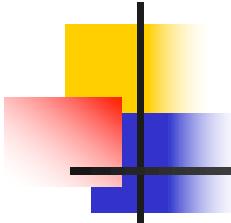


Speech Recognition



Text mining





Machine Translation

Google

번역

출발어: 영어 ▾

도착어: 한국어 ▾

번역하기

Artificial intelligence (AI) is a branch of computer science that aims to create the intelligence of machines. AI textbooks define the field as "the study and design of intelligent agents".

인공 지능 (AI)는 기계의 지능을 만드는 것을 목표로 컴퓨터 과학의 한 분과입니다. AI 교과서는 "지능형 에이전트에 대한 연구 및 설계"로 필드를 정의합니다.

◀ A ✓

New! 대체 번역을 보려면 위 단어를 클릭합니다. 무시



Character Recognition



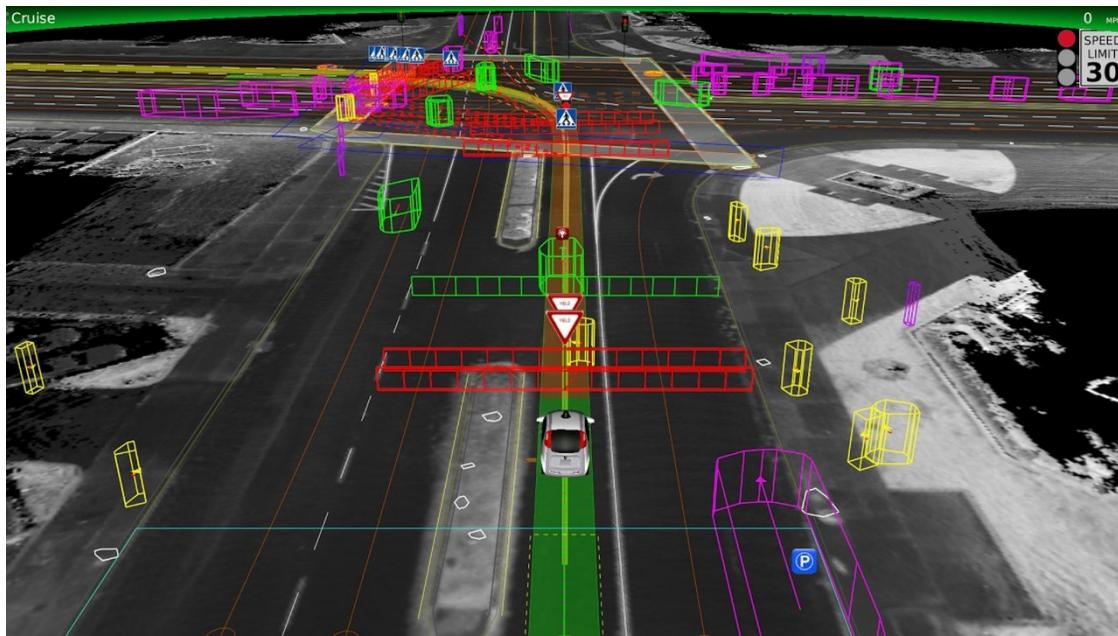
Recognition + Translation



The "Word Lens" feature in action, instantly translating a sign in view. Google



Object recognition



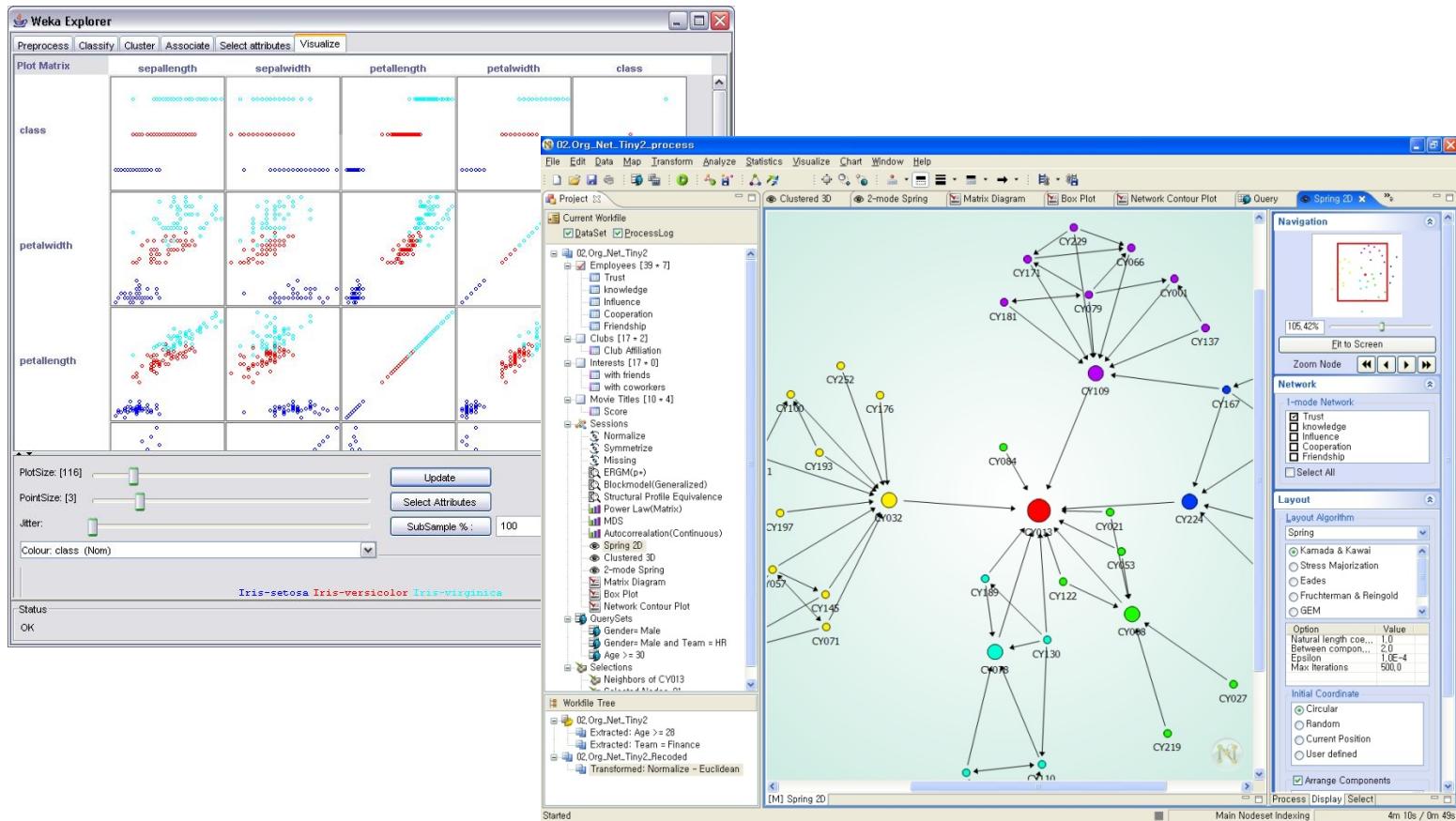
Autonomous Vehicles



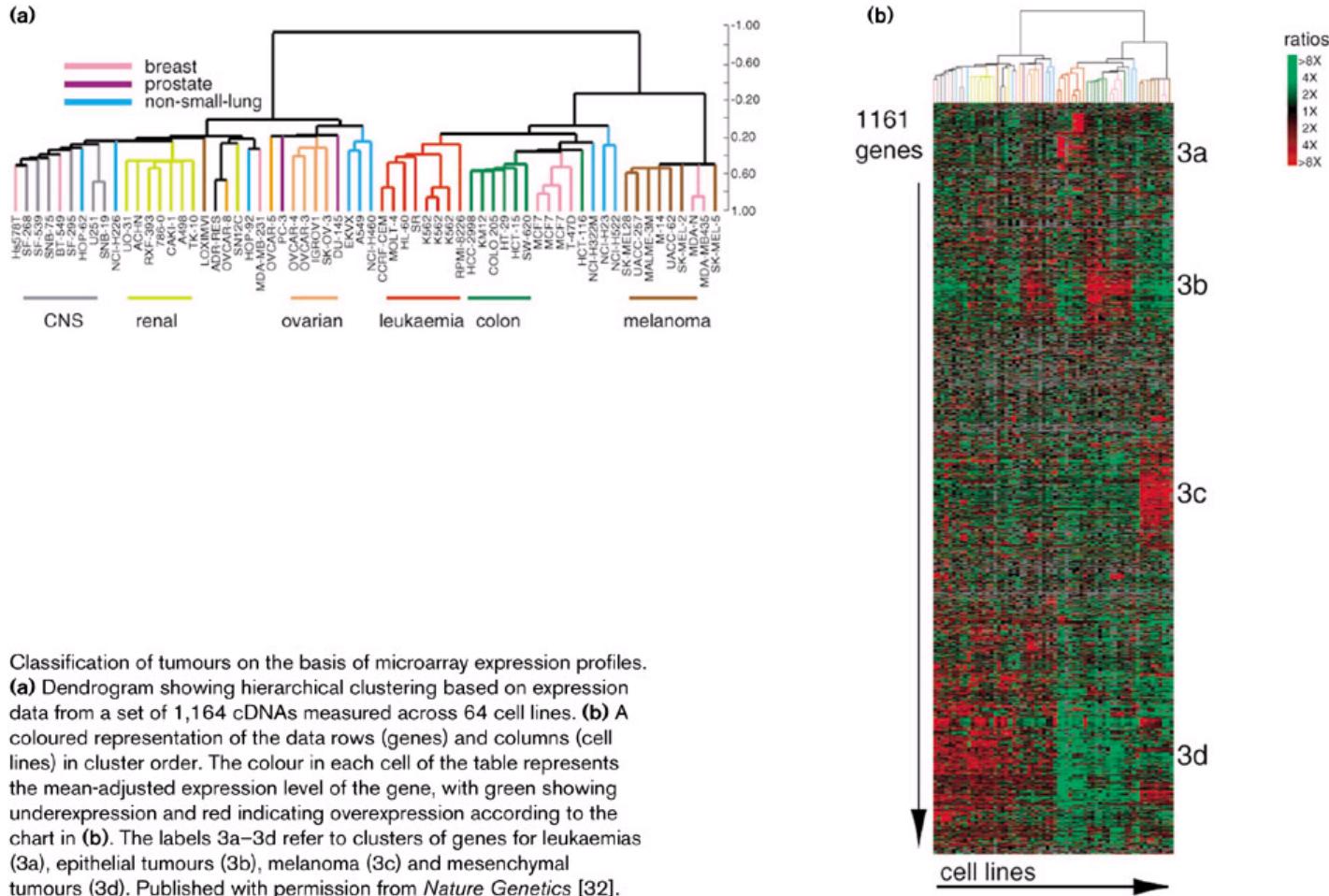
- Mars Autonomy
- Google's prototype self driving car



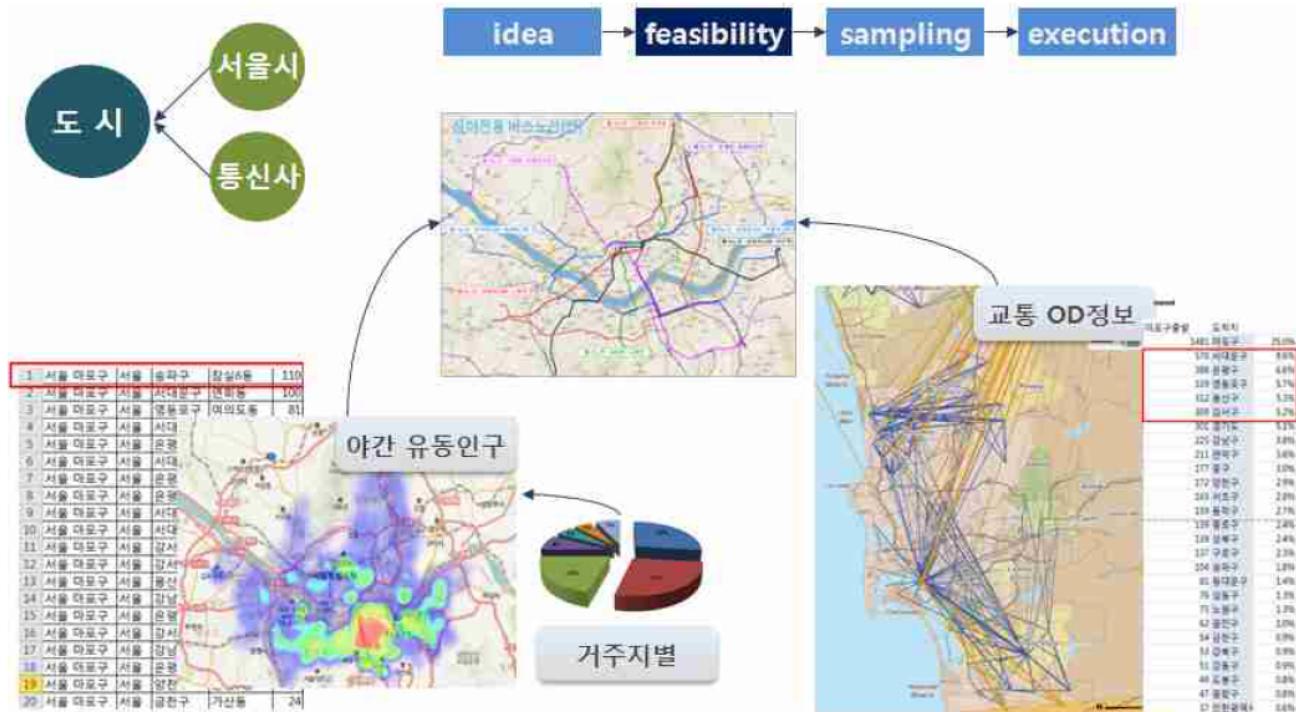
Data Mining



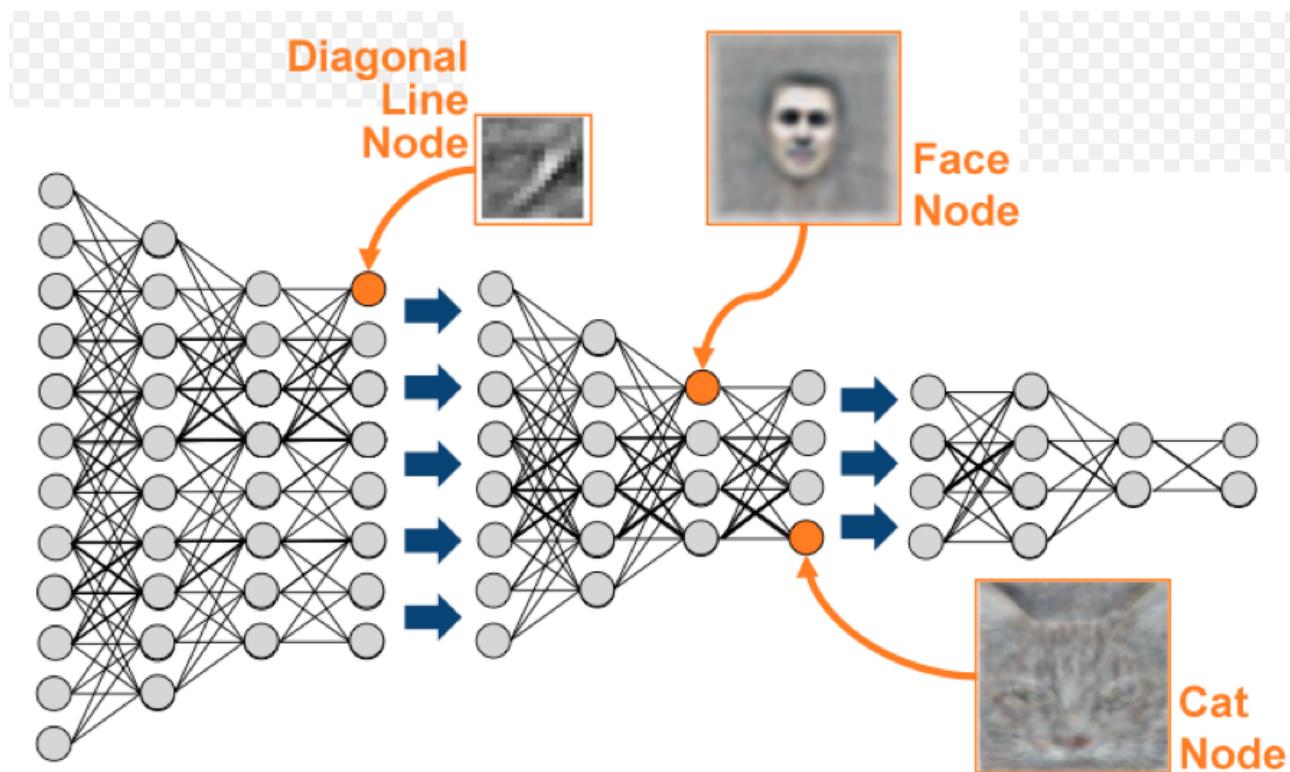
Data Mining



Big Data Analysis



Deep Learning



Deep Learning



lens cap

reflex camera
Polaroid camera
pencil sharpener
switch
combination lock



abacus

typewriter keyboard
space bar
computer keyboard
accordion



slug

zucchini
ground beetle
common newt
water snake



hen

cock
cocker spaniel
partridge
English setter



tiger

tiger
tiger cat
tabby
boxer
Saint Bernard



chambered nautilus

lampshade
throne
goblet
table lamp
hamper



tape player

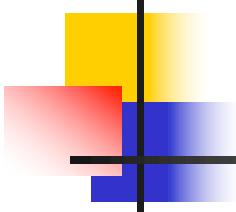
cellular telephone
slot
reflex camera
dial telephone
iPod



planetarium

planetarium
dome
mosque
radio telescope
steel arch bridge





IBM Deep Blue

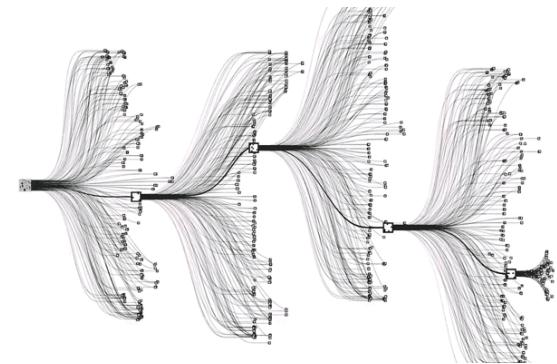


Man vs. machine:
Kasparov and Deep Blue

(CNN)



Google AlphaGo



NPC Control



Recommender Systems

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