INTELLIGENCE ARTIFICIELLE : début de l'histoire et applications

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What is AI?

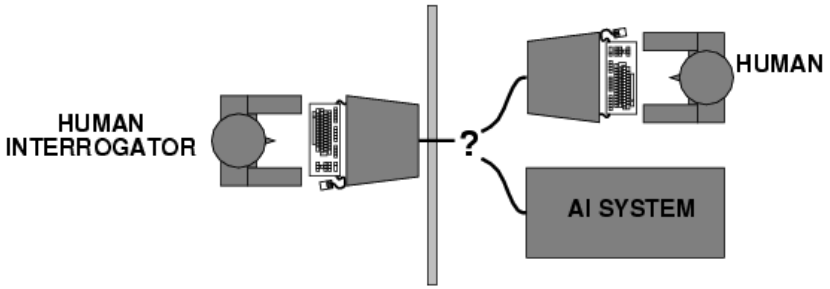
Views of AI fall into four categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

The textbook advocates "acting rationally"

Acting humanly: Turing Test

- Turing (1950) "Computing machinery and intelligence":
- "Can machines think?" → "Can machines behave intelligently?"
- Operational test for intelligent behavior: the Imitation Game



- Predicted that by 2000, a machine might have a 30% chance of fooling a lay person for 5 minutes
- Anticipated all major arguments against AI in following 50 years
- Suggested major components of AI: knowledge, reasoning, language understanding, learning

Thinking humanly: cognitive modeling

- 1960s "cognitive revolution": information-processing psychology
- Requires scientific theories of internal activities of the brain
- -- How to validate? Requires

  1) Predicting and testing behavior of human subjects (top-down)

  or 2) Direct identification from neurological data (bottom-up)

- Both approaches (roughly, Cognitive Science and Cognitive Neuroscience) are now distinct from AI

Thinking rationally: "laws of thought"

- Aristotle: what are correct arguments/thought processes?
- Several Greek schools developed various forms of *logic*: *notation* and *rules of derivation* for thoughts; may or may not have proceeded to the idea of mechanization
- Direct line through mathematics and philosophy to modern AI
- Problems:
  1. Not all intelligent behavior is mediated by logical deliberation
  2. What is the purpose of thinking? What thoughts should I have?

Acting rationally: rational agent

- Rational behavior: doing the right thing
- The right thing: that which is expected to maximize goal achievement, given the available information
- Doesn't necessarily involve thinking – e.g., blinking reflex – but thinking should be in the service of rational action

Rational agents

- An agent is an entity that perceives and acts
- This course is about designing rational agents
- Abstractly, an agent is a function from percept histories to actions:

$$[f: \mathcal{P}^{\star} \rightarrow \mathcal{A}]$$

- For any given class of environments and tasks, we seek the agent (or class of agents) with the best performance
- Caveat: computational limitations make perfect rationality unachievable

  → design best program for given machine resources

Intelligence Artificielle | Définitions

- *"Ensemble de théories et de techniques mises en œuvre en vue de réaliser des machines capables de simuler l'intelligence"*

  Source : Larousse

  "le terme « intelligence artificielle » caractérise l'élaboration de programmes informatiques capables de prendre en charge des tâches habituellement effectuées par des humains car demandant un ***apprentissage****, une* ***organisation*** *de la* ***mémoire*** *et un* ***raisonnement****.* ***L'objectif est de parvenir à transmettre à une machine des fonctions propres au vivant : rationalité, raisonnement, mémoire et perception.****"*

  John McCarthy

Intelligence Artificielle | Définitions

- *"la construction de programmes informatiques qui s'adonnent à des tâches qui sont, pour l'instant, accomplies de façon plus satisfaisante par des êtres humains car elles demandent des processus mentaux de haut niveau tels que : l'apprentissage perceptuel, l'organisation de la mémoire et le raisonnement critique "*

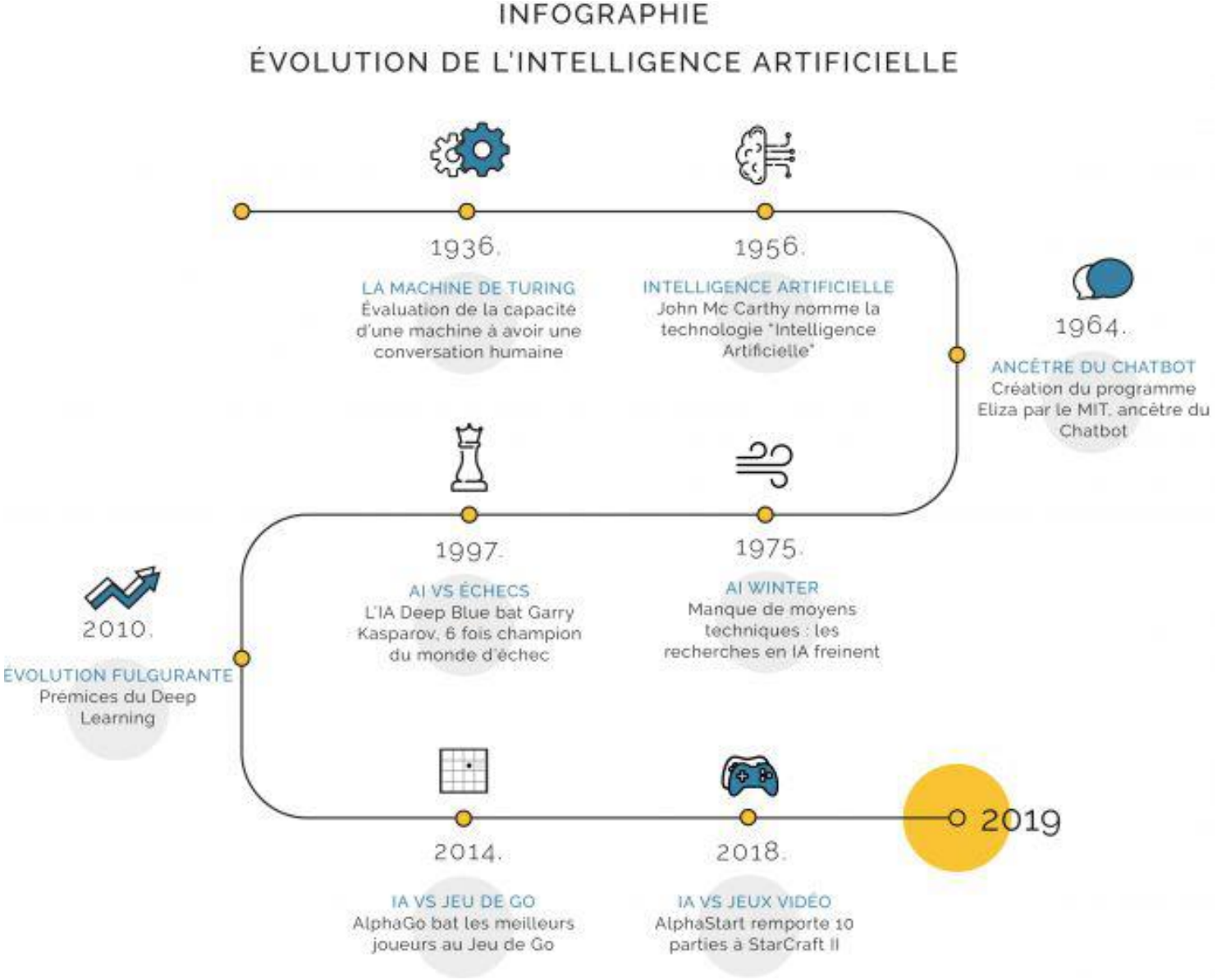
Marvin Lee Minsky

AI prehistory

• Philosophy	Logic, methods of reasoning, mind as physical system foundations of learning, language, rationality
• Mathematics	Formal representation and proof algorithms, computation, (un)decidability, (in)tractability, probability
• Economics	utility, decision theory
• Neuroscience	physical substrate for mental activity
• Psychology	phenomena of perception and motor control, experimental techniques
• Computer engineering	building fast computers
• Control theory	design systems that maximize an objective function over time
• Linguistics	knowledge representation, grammar

Abridged history of AI

- 1943 McCulloch & Pitts: Boolean circuit model of brain
- 1950 Turing's "Computing Machinery and Intelligence"
- 1956 Dartmouth meeting: "Artificial Intelligence" adopted
- 1950s Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
- 1965 Robinson's complete algorithm for logical reasoning
- 1966—73 AI discovers computational complexity
  Neural network research almost disappears
- 1969—79 Early development of knowledge-based systems
- 1980-- AI becomes an industry
- 1986-- Neural networks return to popularity
- 1987-- AI becomes a science
- 1995-- The emergence of intelligent agents



Source Robank Hood 2019

Accélérer l'innovation dans l'IA

State of the art

- Deep Blue defeated the reigning world chess champion Garry Kasparov in 1997
- Proved a mathematical conjecture (Robbins conjecture) unsolved for decades
- No hands across America (driving autonomously 98% of the time from Pittsburgh to San Diego)
- During the 1991 Gulf War, US forces deployed an AI logistics planning and scheduling program that involved up to 50,000 vehicles, cargo, and people
- NASA's on-board autonomous planning program controlled the scheduling of operations for a spacecraft
- `Proverb` solves crossword puzzles better than most humans

Important Research and Application Areas

1.2.1 Game Playing

1.2.2 Automated Reasoning and Theorem Proving

1.2.3 Expert Systems

1.2.4 Natural Language Understanding and Semantic Modeling

1.2.5 Modeling Human Performance

1.2.6 Planning and Robotics

1.2.7 Languages and Environments for AI

1.2.8 Machine Learning

1.2.9 Alternative Representations: Neural Nets and Genetic Algorithms

1.2.10 AI and Philosophy

IA & cas d’usage

Analyse prédictive

PILOTAGE DE LA PERFORMANCE FINANCIERE

MAINTENANCE PREDICTIVE EN USINE

OPTIMISATION DE LA GESTION DES STOCKS

OPTIMISATION ET PERSONNALISATION DE L'EXPERIENCE CLIENT

Computer Vision

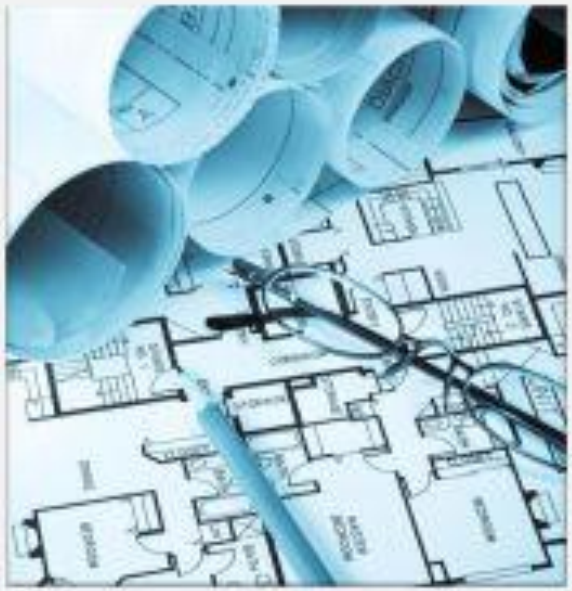
DETECTION/RECONNAISSANCE DE DOCUMENTS
ex. Traitement de la documentation administrative

DETECTION/RECONNAISSANCE DE PERSONNES
ex. Authentification des chauffeurs UBER

DETECTION/RECONNAISSANCE D'OBJETS
ex. Détection du port d'uniforme ou accessoires de protection

Knowledge Mining

ANALYSE DE DOCUMENTS CONTRACTUELS



COMPREHENSION DE PLANS (Ingénierie, architecture, ..)

EXTRACTION D'INFORMATIONS DE FORMULAIRES OFFICIELS

Conversationnel

SUPPORT CLIENT: DESENGORGEMENT DES CALL CENTERS

SUPPORT EMPLOYE: DESENGORGEMENT DES FONCTIONS SUPPORTS (RH, IT...)

ACCOMPAGNEMENT EMPLOYE: GESTION BESOINS LOGISTIQUES, OPERATEUR AUGMENTE

PARCOURS CLIENT: ACCOMPAGNEMENT DE LA TRANSACTION EN LIGNE

Important Features of Artificial Intelligence

1. The use of computers to do reasoning, pattern recognition, learning, or some other form of inference.
2. A focus on problems that do not respond to algorithmic solutions. This underlies the reliance on heuristic search as an AI problem-solving technique.
3. A concern with problem-solving using inexact, missing, or poorly defined information and the use of representational formalisms that enable the programmer to compensate for these problems.
4. An attempt to deal with issues of semantic meaning as well as syntactic form.
5. Answers that are neither exact nor optimal, but are in some sense "sufficient". This is a result of the essential reliance on heuristic problem-solving methods in situations where optimal or exact results are either too expensive or not possible.
6. The use of large amounts of domain-specific knowledge in solving problems. This is the basis of expert systems.
7. The use of meta-level knowledge to effect more sophisticated control of problem-solving strategies. Although this is a very difficult problem, addressed in relatively few current systems, it is emerging as an essential are of research.

Enjeux éthiques de l’IA

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Equité

Les systèmes IA doivent traiter tous les individus de manière équitable et éviter que des groupes de situation similaire soient traités de différentes manières.
Exemple : Inégalité des sexes au niveau des prêts

Responsabilité

Les individus doivent rester responsables et conserver le contrôle des systèmes IA.
Exemple : Réglementation relative à la reconnaissance faciale.

This App Removed A Filter After People Complained It Was Racist

FaceApp changed the name of its "Hot" filter to "Spark" after people complained that it whitewashed them. Then it removed the option entirely.

Blake Montgomery
BuzzFeed News Reporter

Last updated on April 25, 2017, at 1:10 p.m. ET
Posted on April 24, 2017, at 9:59 p.m. ET

Tweet Share Copy

UPDATE

April 25, 2017, at 9:58 p.m.

Wireless Lab OOO removed the "Spark" filter entirely after the publication of this article.

But people have noticed something off about it...

The app's "Spark" filter, which was formerly called the "Hot" filter, lightens your face.

khary @ ECCC K-1
@kharyrandolph

So this app is apparently racist as hell. But at least I'm sassy.
#faceapp ift.tt/2pvtFG4

♡22 2:50 PM - Apr 18, 2017

Enjeux éthiques de l’IA

Vie privée et sécurité

De même qu'avec les autres technologies, les systèmes IA doivent être en mesure de préserver la confidentialité des informations et de résister aux attaques.

Transparence

Les individus doivent être en mesure de comprendre comment les systèmes IA prennent des décisions, surtout lorsque ces dernières ont un impact sur leur quotidien.