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Visual Computing MAGAZiNE

Vol. 2, Issue 3
2024

CHRONICLE OF *ARTIFICIAL INTELLIGENCE*
PART (1)

Visual Computing Magazine

The Preface

Welcome to this new issue the Visual Computing Magazine, where we present a chronicle of artificial intelligence (AI) through a selection of landmark developments from 1955 to 2011 **(part 1)**.
Some of the contributions in this issue are presented in a **comic style**. This creative format brings these stories to life in a visually dynamic way and provides an entertaining perspective on complex technological advancements.

We begin with the work of A. Turing **(Computing Machinery And Intelligence, 1950)** and the proposal made during **(Dartmouth conference, 1955)**. This event marked the birth of AI as an academic discipline.
The year 1958, **(The Perceptron)**, saw a major breakthrough for neural networks with the introduction of the concept of machine learning and advanced the pattern recognition.
The late 1960s marked a breakthrough in robotics with **(Shakey the Robot, 1966)**, a pioneering project in the field of autonomous machines. Likewise **(ELIZA, 1966)**, presented the first natural language processing, reflecting the challenge of approximating interaction with the machine.
In 1969 **(Representation of Knowledge in AI, 1969)**, a significant shift occurred in the way artificial intelligence researchers approached the concept of knowledge representation. In 1972, **(Logic Theorist and Automated Reasoning System)** illustrated the power of machines to solve complex logical problems, while **(MYCIN, 1976)** applied AI to medicine, showing the potential of expert systems.
In 1997, the world saw **(IBM's Deep Blue)** defeat world chess champion Garry Kasparov, a symbol of AI's ability to challenge human expertise.
In 2006, the **(Deep Belief Nets)** algorithm demonstrated the potential of deep learning, which would revolutionize the AI landscape.
Finally, In 2011, **(IBM Watson)** triumphed on the game show Jeopardy, demonstrating natural language understanding and the growing ability of AI to address real-world challenges.

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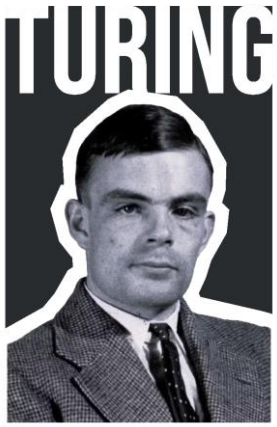
Chief Editor: Prof. Slimane LARABI

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: **Computing Machinery And Intelligence, 1950**

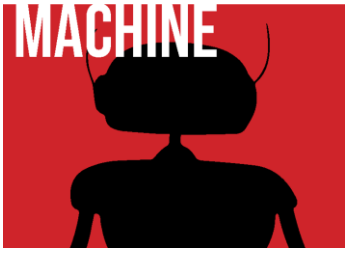
A. KACI AISSA , R. NINE , MASTER 2 VISUAL COMPUTING , USTHB



CAN MACHINES REALLY THINK ?

TO TEST THAT HE CREATED

THE IMMITATION GAME



THE GOAL IS FOR THE INTERROGATOR TO **DISTINGUISH** WHO'S THE **MACHINE** BY ONLY ASKING **QUESTIONS** TO BOTH CONTENDERS

OBJECTIONS !!

TURING FACED OBJECTIONS SUCH AS THE LADY LOVELACE OBJECTION

" THE ANALYTICAL ENGINE HAS NO PRETENSIONS TO ORIGINATE ANYTHING.
IT CAN DO WHATEVER WE KNOW HOW TO ORDER IT TO PERFORM "[2]

1966

```
EEEEEE  LL      IIII   ZZZZZZ   AAAAA
EE      LL       II       ZZ   AA   AA
EEEEE   LL       II     ZZZ    AAAAAAA
EE      LL       II   ZZ       AA   AA
EEEEEE  LLLLLL  IIII ZZZZZZ    AA   AA
```

ELIZA, AN EARLY NATURAL LANGUAGE PROCESSING PROGRAM CREATED BY **JOSEPH WEIZENBAUM** , WAS DESIGNED TO PASS THE TURING TEST [3]

Reference:

- A. M. TURING, I.—COMPUTING MACHINERY AND INTELLIGENCE, Mind, Volume LIX, Issue 236, October 1950, Pages 433–460
- ELIZA--A Computer Program For the Study of Natural Language Communication Between Man and Machine , Joseph Weizenbaum , 1966

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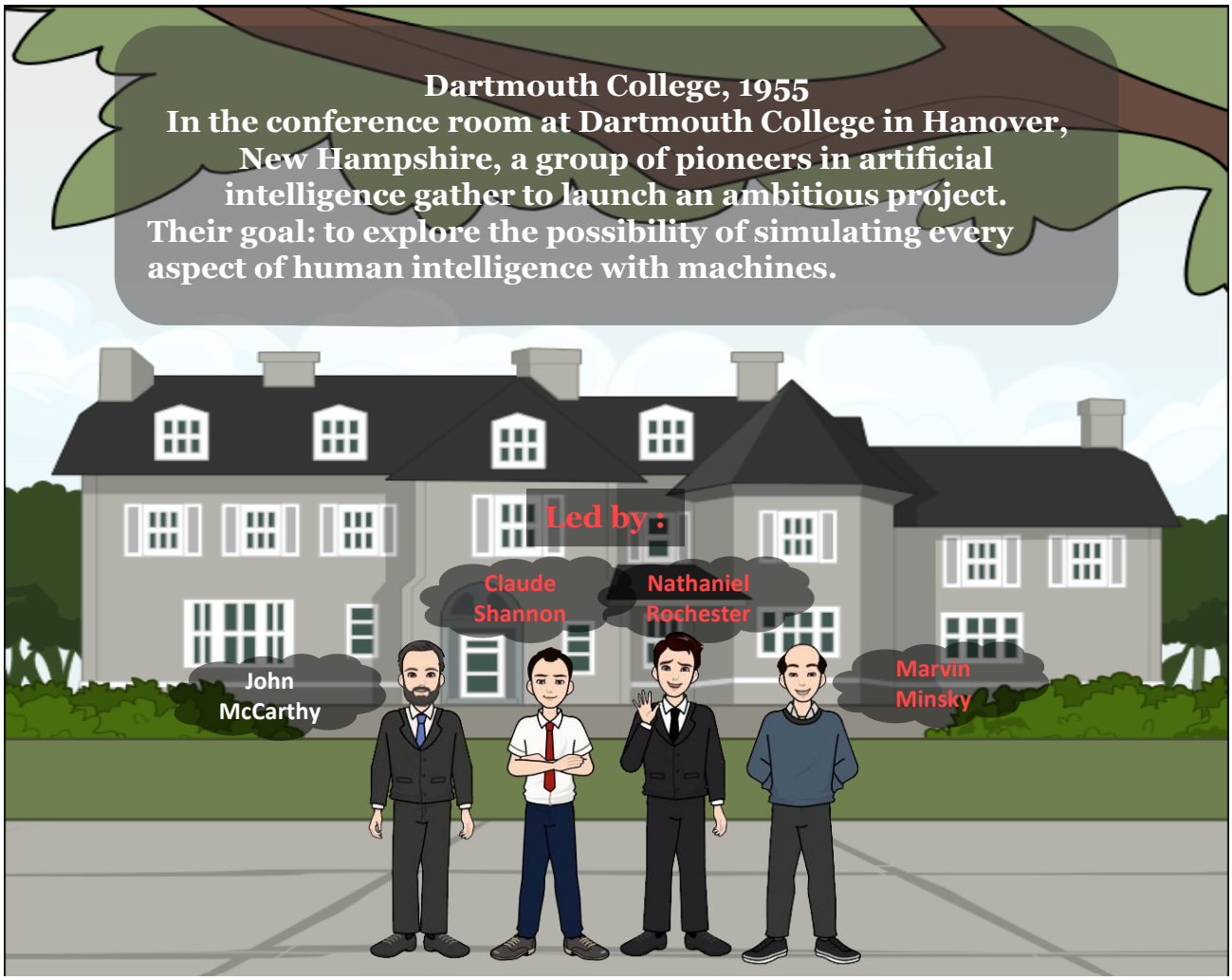
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Dartmouth Conference Proposal, 1955

Y. BELAIDI, K. MAZROU, MASTER 2 VISUAL COMPUTING, USTHB



This bold initiative brought together researchers for a summer to answer a fundamental question: **Is it possible to create machines capable of learning, reasoning, and evolving autonomously?**

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Dartmouth Conference Proposal, 1955

Y. BELAIDI, K. MAZROU, MASTER 2 VISUAL COMPUTING, USTHB

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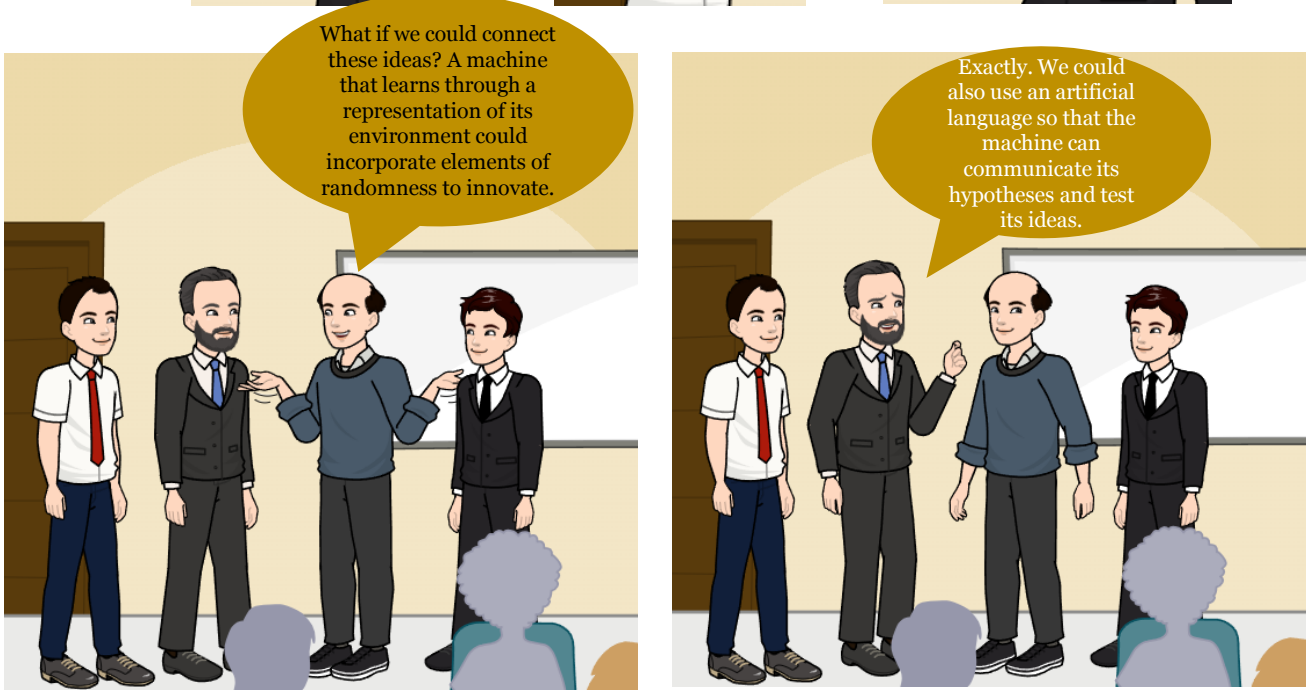

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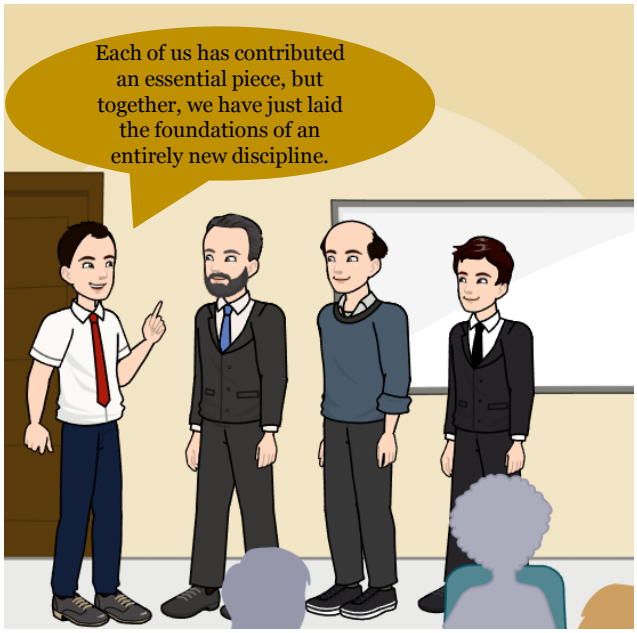

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Dartmouth Conference Proposal, 1955

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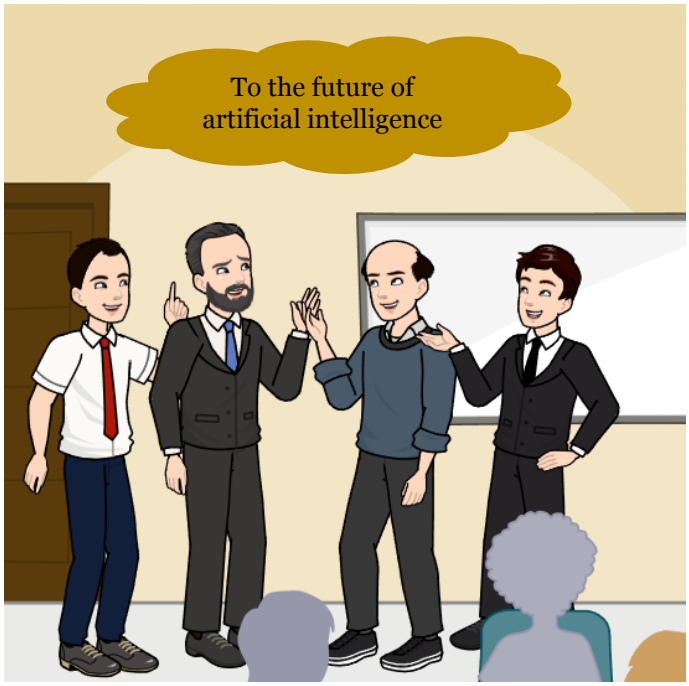

This historic meeting made history by giving birth to artificial intelligence. It was at Dartmouth College, during the summer of 1955, that these visionary researchers laid the foundations of an entirely new scientific field.

Reference: A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence. August 31, 1955. John McCarthy, Marvin L. Minsky, Nathaniel Rochester, Claude E. Shannon. https://doi.org/10.1609/aimag.v27i4.1904

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: The Perceptron, 1958

L.R.BOUGUERA, MASTER 2 VISUAL COMPUTING, USTHB

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CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: The Perceptron, 1958

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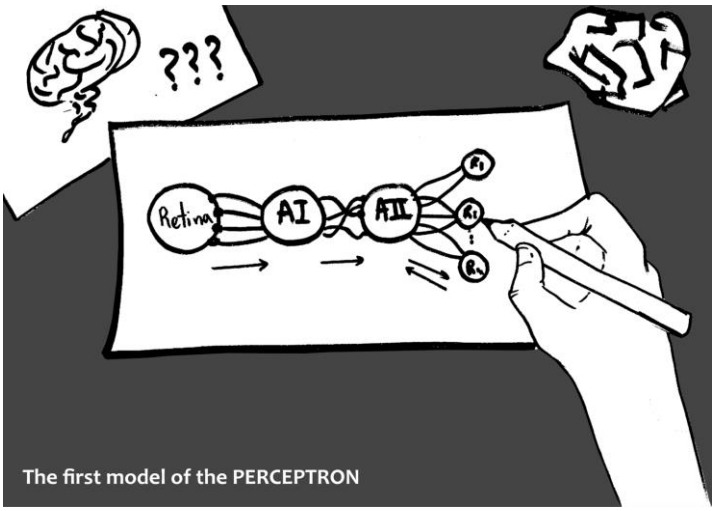
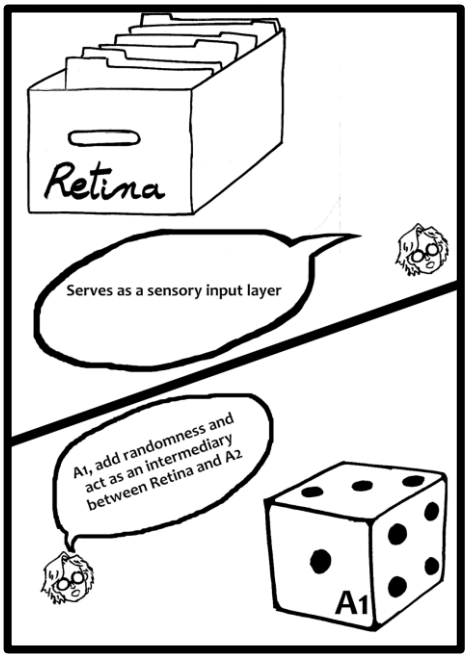
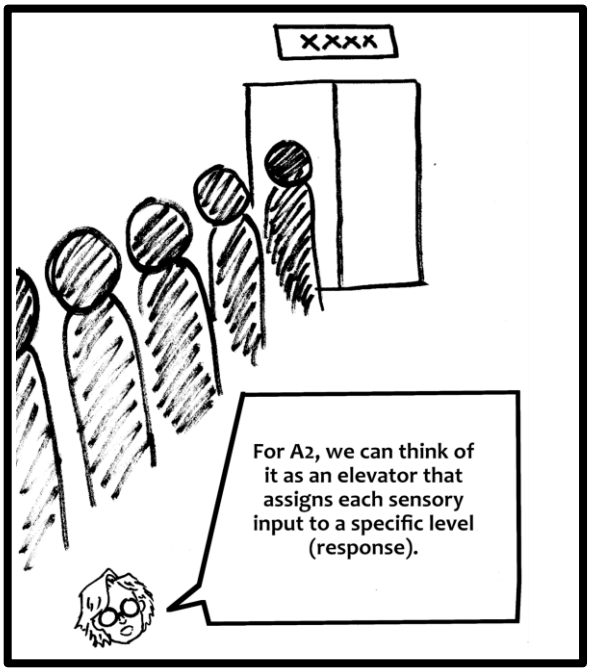
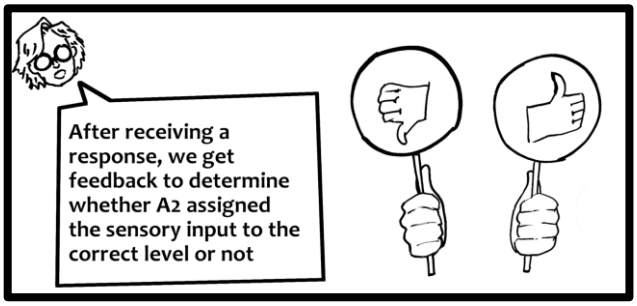






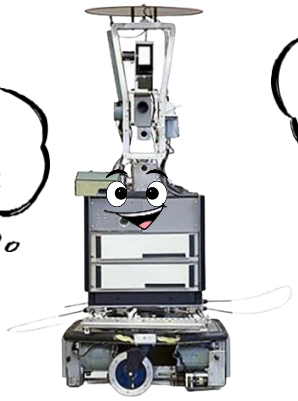


Reference: Rosenblatt, Frank. "The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain." *Psychological Review*, vol. 65, no. 6, 1958, pp. 386–408.

CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: SHAKEY THE ROBOT, 1966

S.TAREB, A.KHOUAS, MASTER 2 VISUAL COMPUTING, USTHB

Hi ! i am shakey, the first robot that used AI in history, and that was at SRI

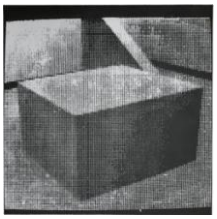


Well , am Mr Charles Rosen, the head of the development of Shakey in the 1960s

Shakey is tasked with moving The box to close the door D4, i am gonna explain all the steps !

1 Perception: Mapping the Environment

Camera captures the box



shakey's pov

Shakey needs to gather **data** about its environment in order to plan and navigate effectively !.

Basic Map

Bump detector

Range Finder

Measure the distance to the box and stop if bumped into it

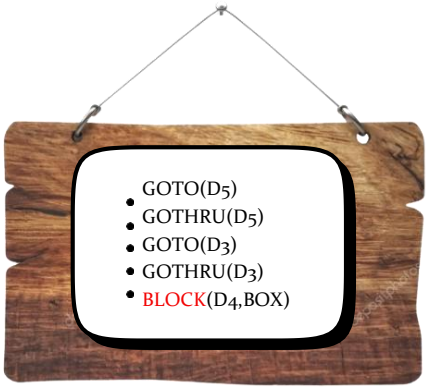
CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: SHAKEY THE ROBOT, 1966

S.TAREB, A.KHOUAS, MASTER 2 VISUAL COMPUTING, USTHB

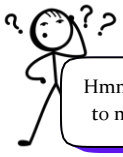
2 STRIPS

STRIPS (Stanford Research Institute Problem Solver) is used for task planning. It takes the current state of the world and generates a sequence of actions to reach the goal.

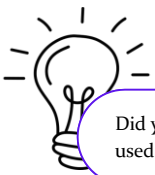
Shakey is attached to an external computer using his radio antenna



Shakey’s plan using **STRIPS**



Hmm, I need to figure out the best way to move the box to Door D4!



Did you know? STRIPS was one of the first AI planning algorithms and is still used as a foundation in modern robotics and game design

CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: SHAKEY THE ROBOT, 1966

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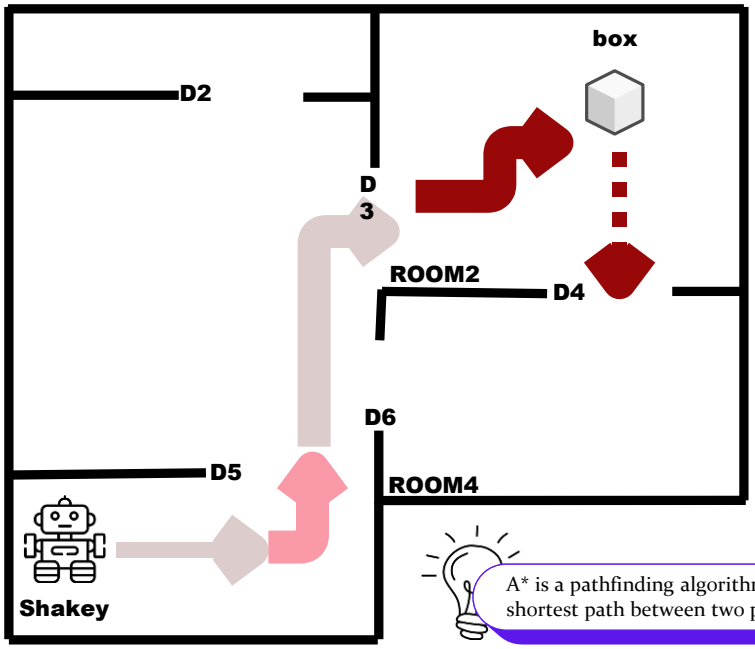
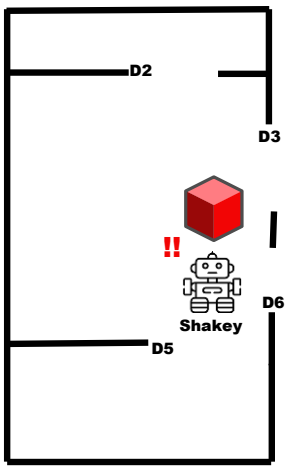
3 Pathfinding using A*



Shakey needs to figure out the best way to move from its current location to the box and then to the door.
This involves navigating around obstacles.

A* is a pathfinding algorithm that calculates the shortest path between two points

I don't want Shackey to do a great job he is my enemy ! I am gonna put a new box in its path so he won't move !



Hmm it's seems that there is a new box here ! I detected it using my sonsors, oh I have to replane everything

CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: SHAKEY THE ROBOT, 1966

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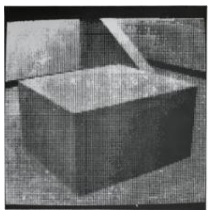
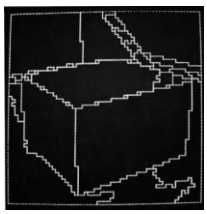
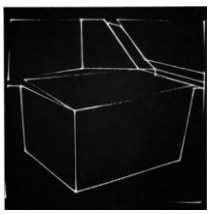


sraw image data

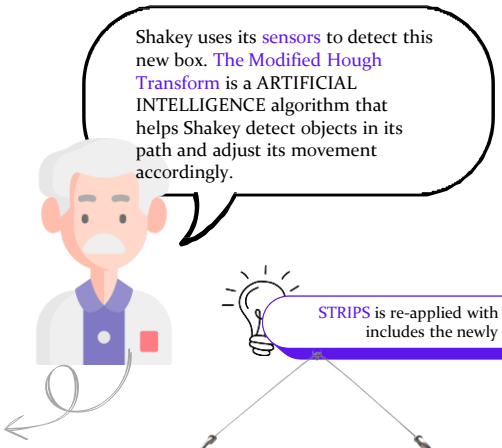
edge detection process

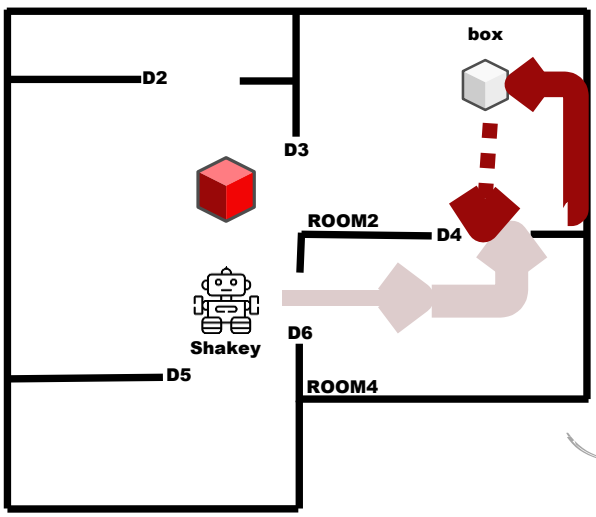


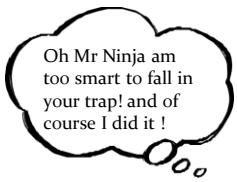
simplified structure

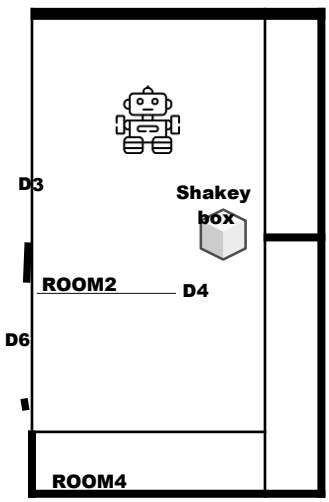


idealized model









Reference:
https://cyberneticzoo.com/cyberneticanimals/1967-shakey-charles-rosen-nils-nilsson-bertram-raphael-et-al- american/
https://ethw.org/Milestones:SHAKEY:_The_World%E2%80%99s_First_Mobile_Intelligent_Robot,_1972

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: ELIZA Program, 1966

KADIRI HADJER, MASTER 2 VISUAL COMPUTING, USTHB

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: ELIZA Program, 1966

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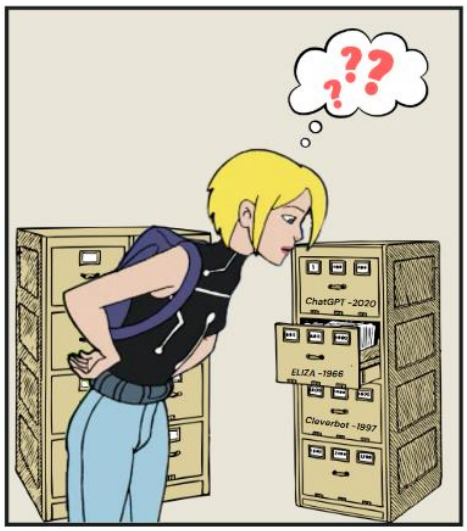

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: ELIZA Program, 1966

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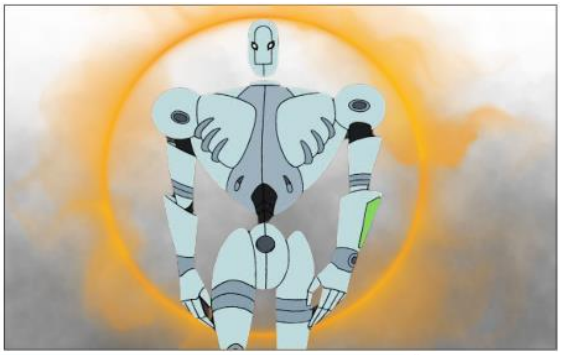
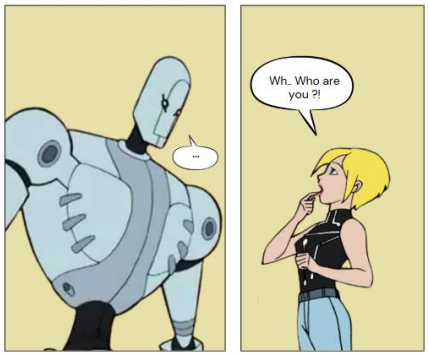
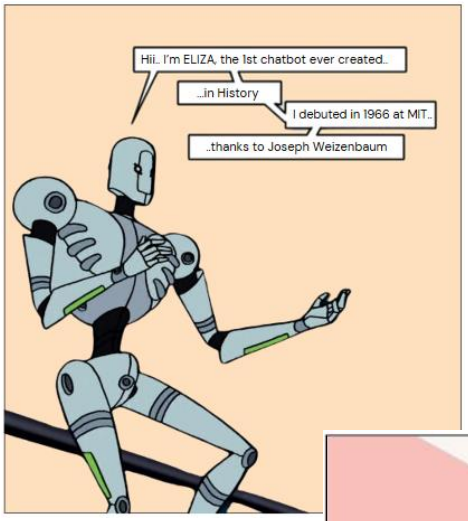
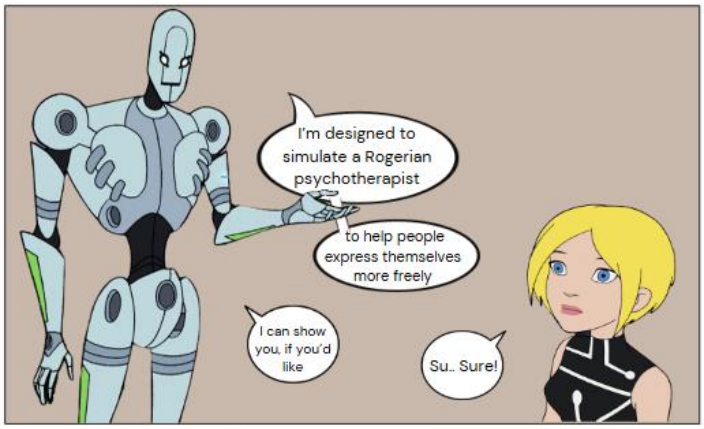
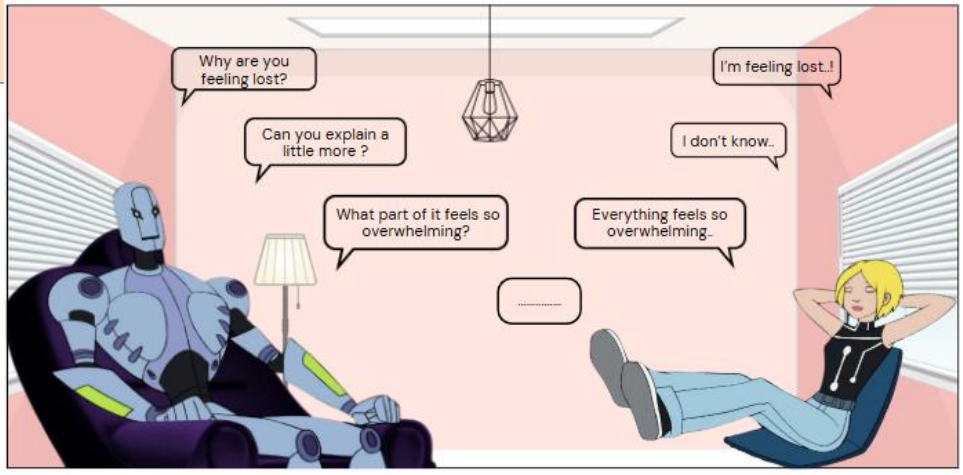








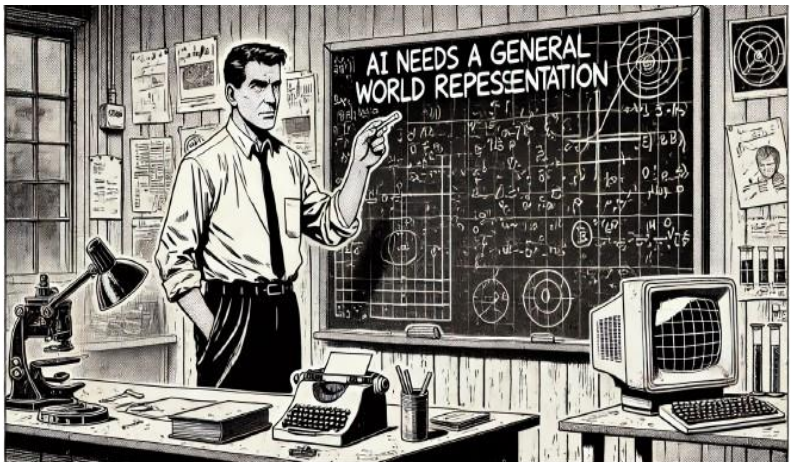


Reference: Joseph Weizenbaum
ELIZA—a computer program for the study of natural language communication between man and machine. Communications of the ACM, Volume 9, Issue 1, pages 36 – 45. https://doi.org/10.1145/365153.365168

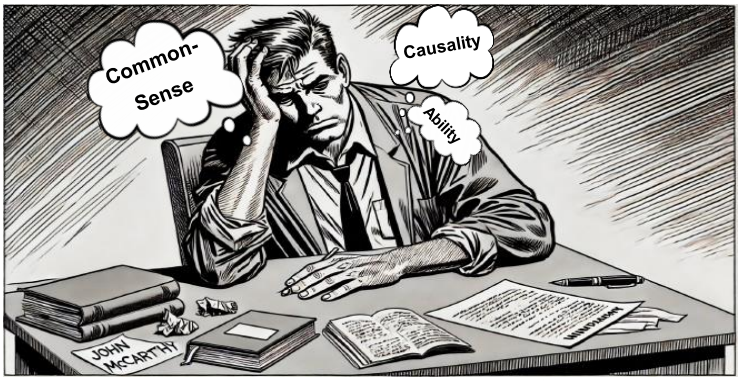
CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: Representation of Knowledge in AI, 1969

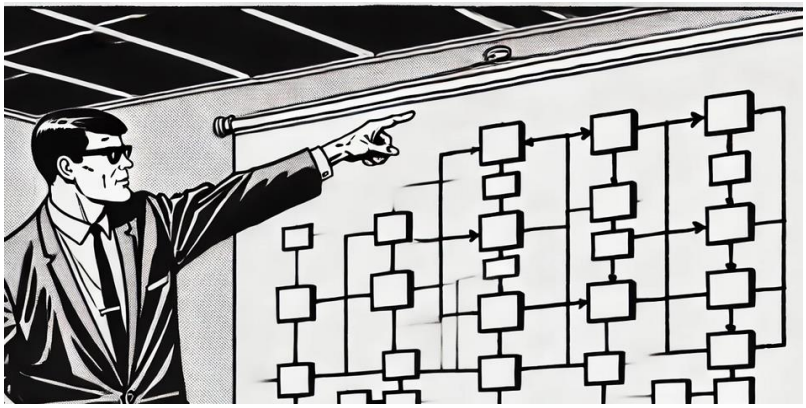
A. ADLAOUI, A. BELLOULA, MASTER 2 VISUAL COMPUTING, USTHB

Chapter 1: Representation of knwoledge in AI



Mccarthy recognized that early AI struggled with representing the world and adapting to dynamic environments.



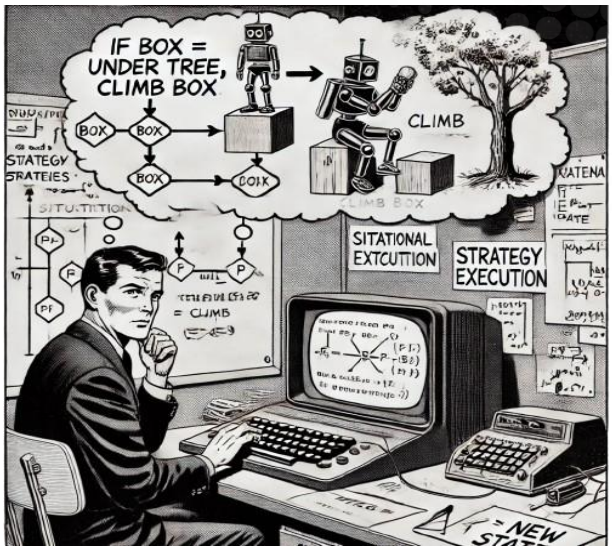


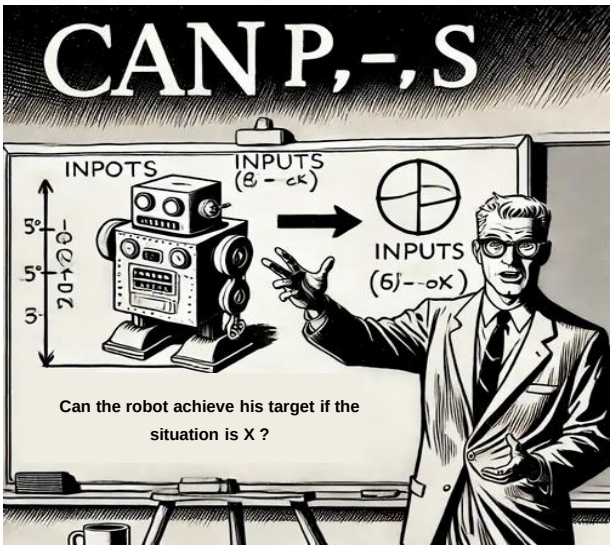
By developing formal logic systems and the concept of sub-automata, McCarthy laid the groundwork for machines to model problem-solving.

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Representation of Knowledge in AI, 1969

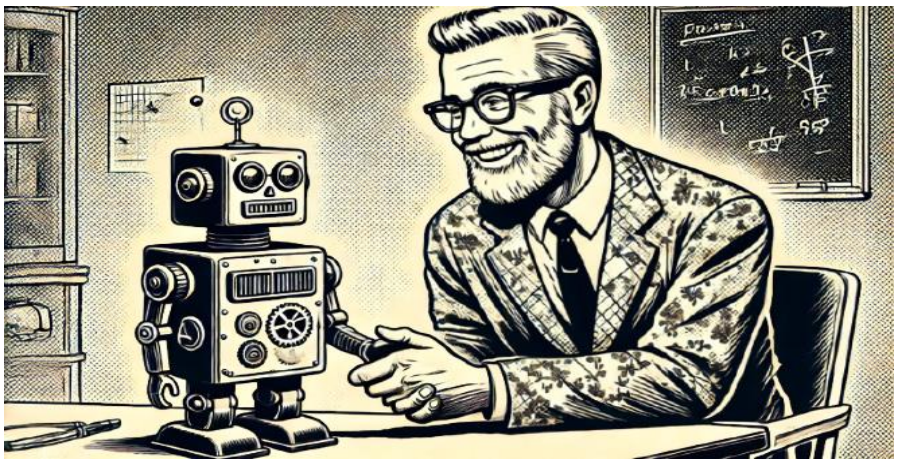
A. ADLAOUI, A. BELLOULA, MASTER 2 VISUAL COMPUTING, USTHB

Understanding causality allowed AI to predict outcomes and strategize, enabling systems to achieve goals across various states.





McCarthy's vision of AI shaped the foundational principles of reasoning systems, influencing the development of modern intelligent machines.



CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: LOGIC THEORIST AND AUTOMATED REASONING,1972

Ismail Belkcemi & Lokmane rouibah , Master 2 Visual Computing,USTHB

The First Artificial Intelligence Program

What is Logic Theorist?

- The first AI system designed for automated reasoning.
- Proved 38 of the first 52 theorems in Principia Mathematica.
- Found new, shorter proofs for some theorems.

How It Was Created ?

Inspired by :

made by :

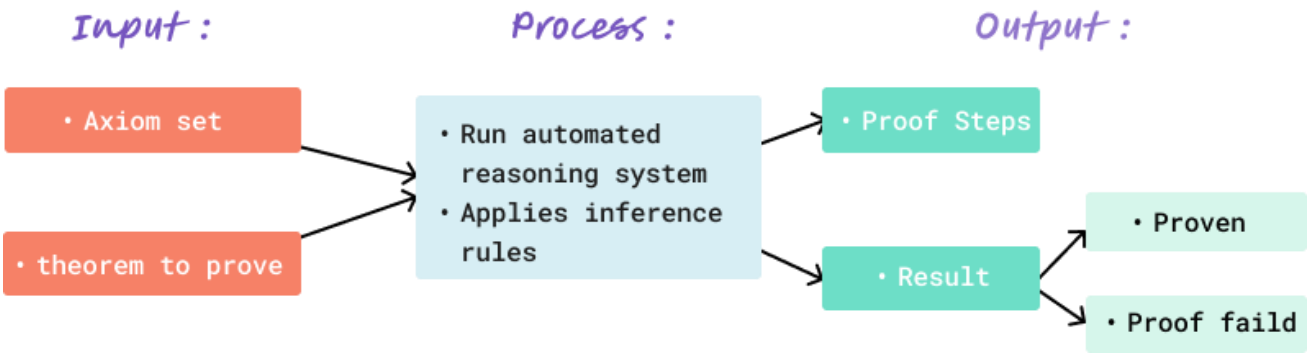
Visual Computing Magazine

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: LOGIC THEORIST AND AUTOMATED REASONING,1972

Ismail Belkcemi & Lokmane rouibah , Master 2 Visual Computing,USTHB

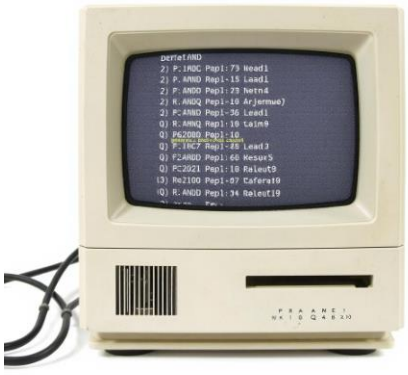
The First Artificial Intelligence Program

How Does It Work?



Successes

- Demonstrated the feasibility of automated reasoning.
- Proved complex theorems.



Limitations

- Restricted to propositional logic.
- Struggled with more complex problems.
- Dependent on pre-programmed rules.
- no ability to generalize.

Reference: Newell, A., & Simon, H. A. (1972). Human problem solving. Prentice-Hall

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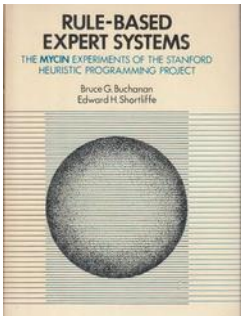
CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: MYCIN,1976

H. SAAD, M. MEZIANI, Master 2 Visual Computing,USTHB

Introduction

MYCIN is an early example of a computer-based expert system developed to assist medical professionals in diagnosing and treating bacterial infections



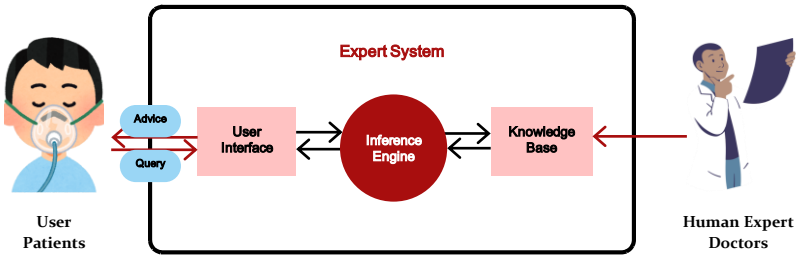
MYCIN book

Dr. Edward H. Shortliffe

MYCIN was designed to address challenges in infectious disease diagnosis, particularly in selecting effective antibiotic treatments

How does MYCIN work?

MYCIN's architecture is consisting of over 450 **IF-THEN** rules capturing medical expertise regarding bacterial pathogens



CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: MYCIN,1976

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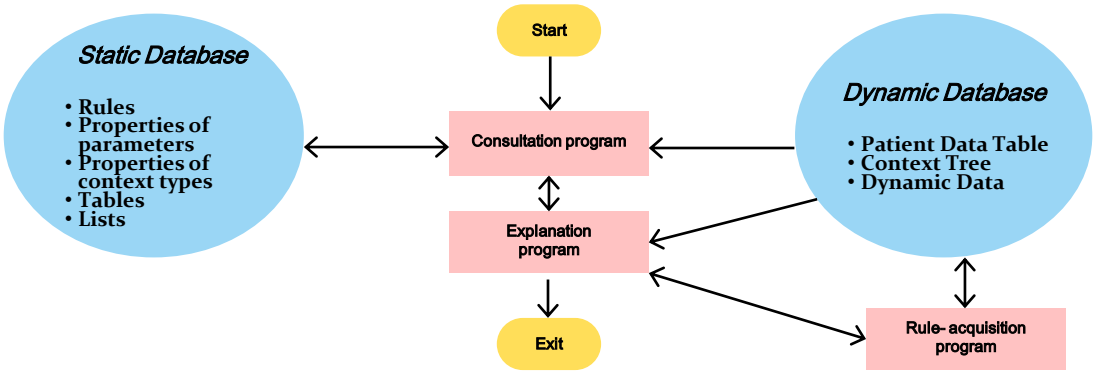
Consultation System

Users enter symptoms, lab results, and case details.
MYCIN uses backward chaining to ask relevant questions and arrive at recommendations.



Model of Inexact Reasoning

- Introduced certainty factors (CFs) to handle probabilities and uncertain data.
- CFs allow MYCIN to weigh evidence and rank potential diagnoses.

This system was innovative for its time, as it made the reasoning processes of expert systems transparent. Today, this ability to explain decisions is a key principle in the development of explainable AI (XAI), which aims to make intelligent systems more understandable and reliable, particularly in critical fields such as medicine.

Reference: Edward H. Shortliffe, Computer-Based Medical Consultations: MYCI. Intelligence Artificial Series. 286 pp., Elsevier, New York, 1976

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EVENT: IBM's Deep Blue Defeats Garry Kasparov, 1997

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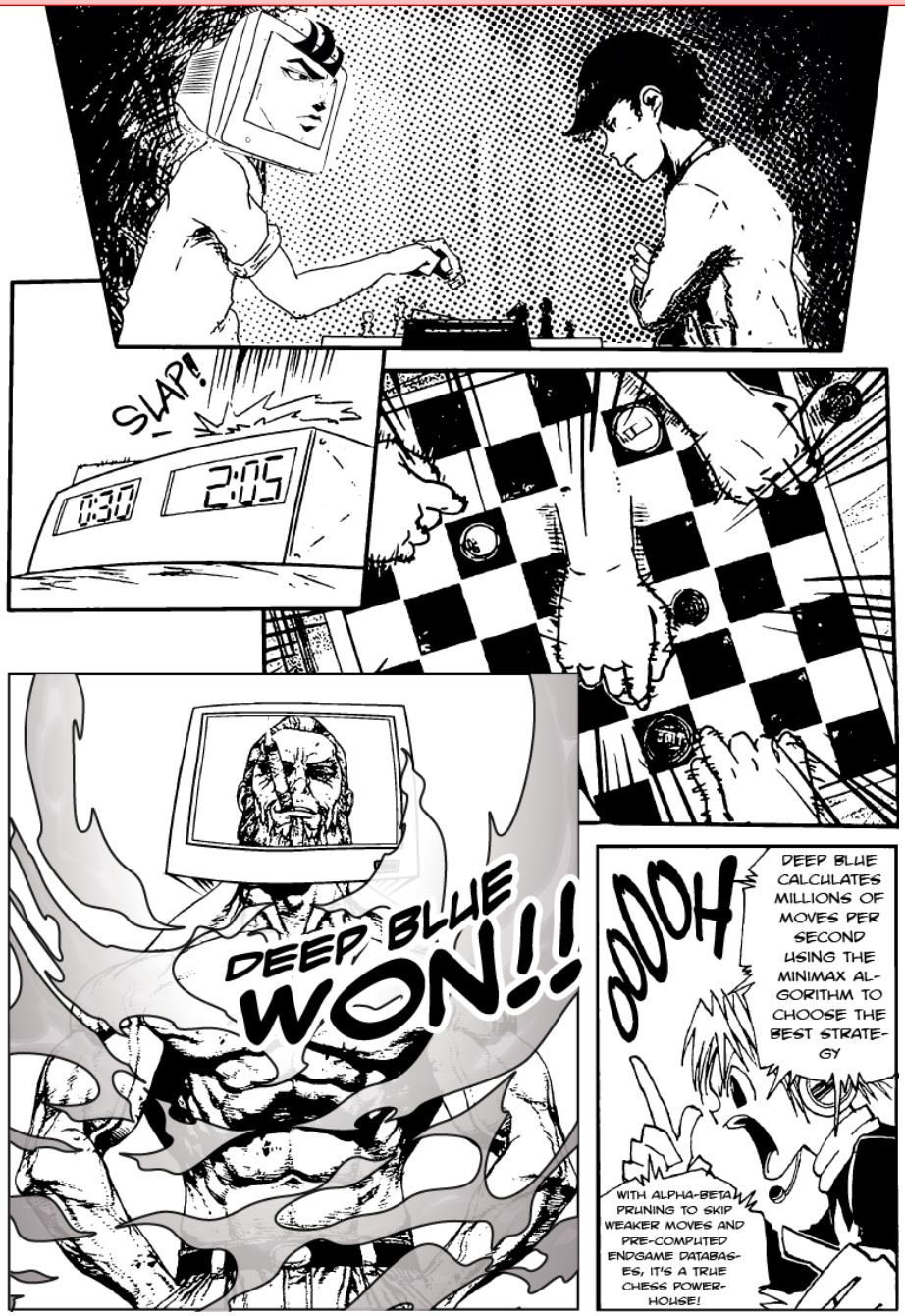

Reference: https://www.ibm.com/history/deep-blue

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EVENT: A fast learning algorithm for deep belief nets, 2006

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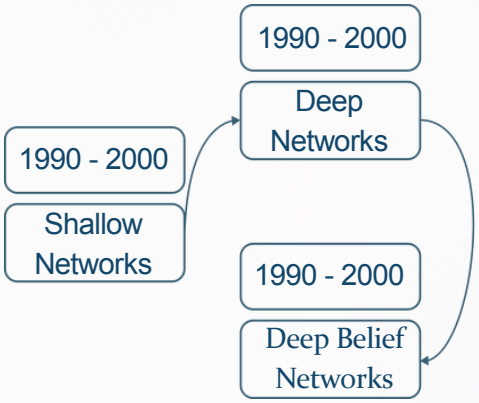
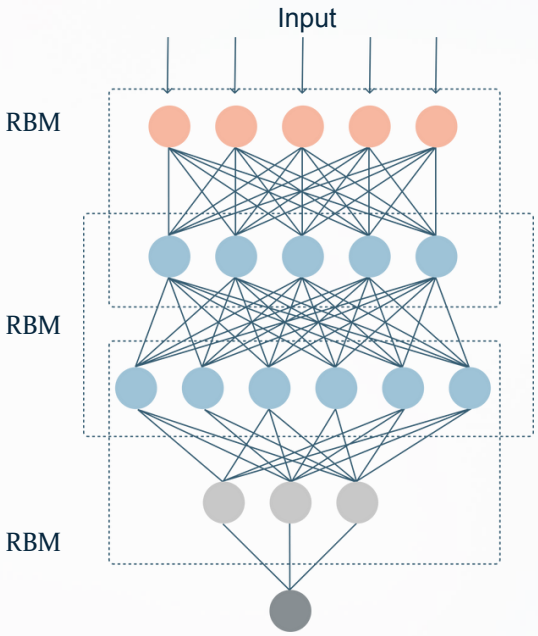
A BIT OF CONTEXT



The deep belief networks revolution was mainly possible thanks to the efforts of the 2024 physics Nobel Prize laureate.

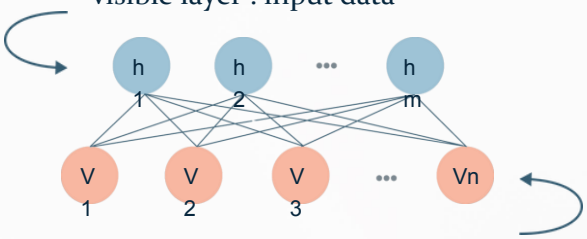
GEOFFREY HINTON

THE DEEP BELIEF NETWORK



RESTRICTED BOLTZMANN MACHINE (RBM)

visible layer : input data



Hidden layer of RBM: Captures underlying patterns

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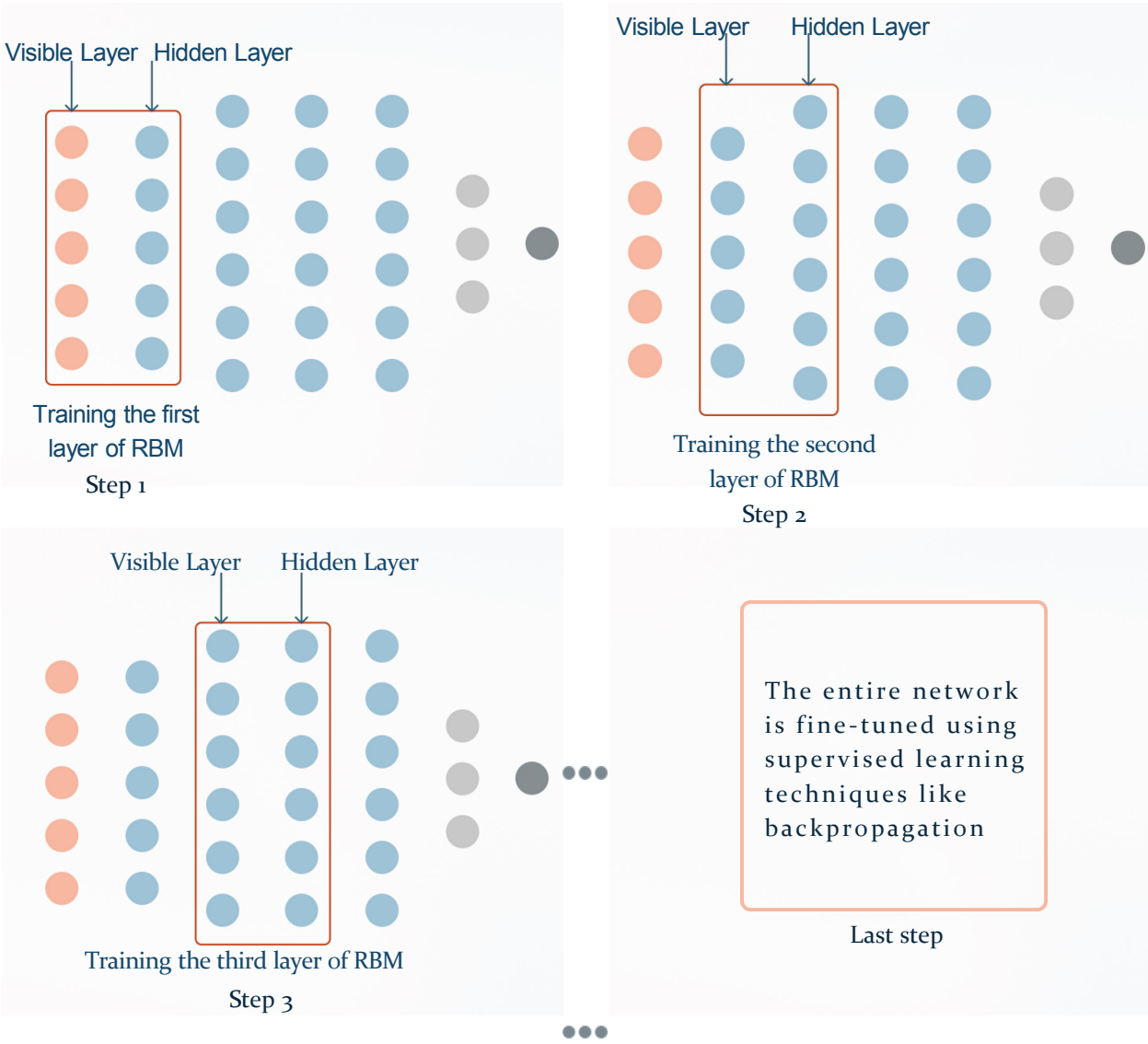
GREEDY LAYER-BY-LAYER TRAINING:



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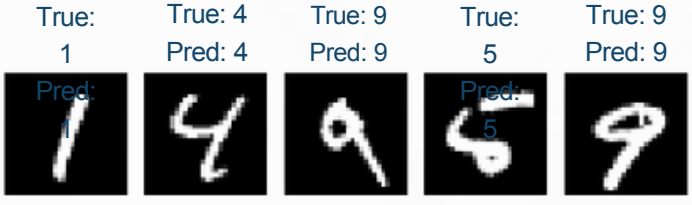
EXAMPLE OF APPLICATION ON MINST DATASET

A "DBN" network applied to the MNIST dataset for classification purposes gave us the following results:

The true data represent the label of the test data

The predicted data represent the label that the model generated



Reference: Geoffrey E Hinton 1, Simon Osindero, Yee-Whye Teh A fast learning algorithm for deep belief nets. Neural Computing. 2006 Jul;18(7):1527-54. doi: 10.1162/neco.2006.18.7.1527.

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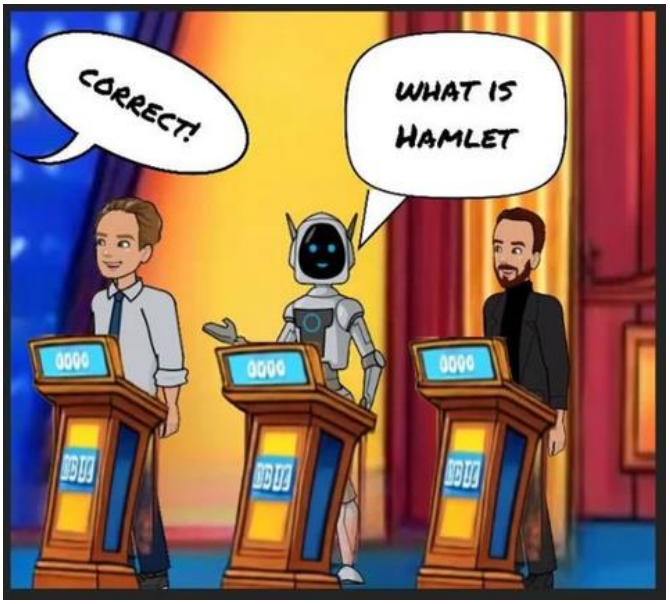

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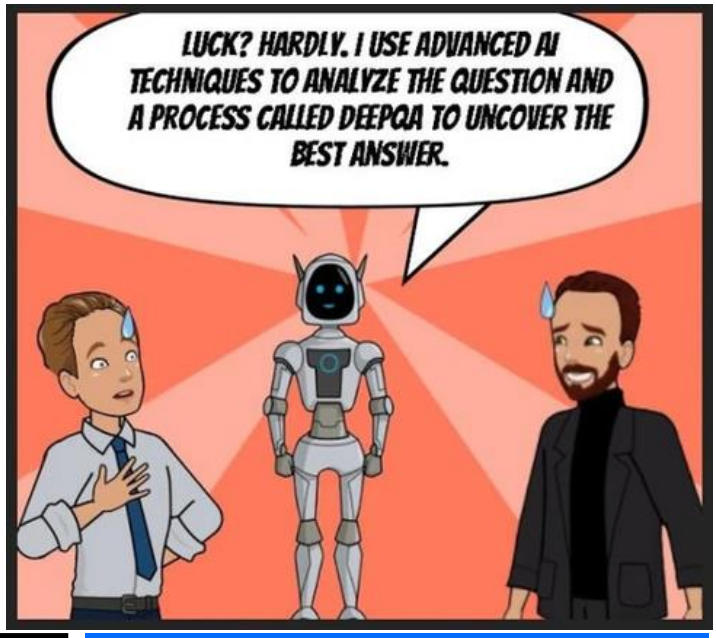

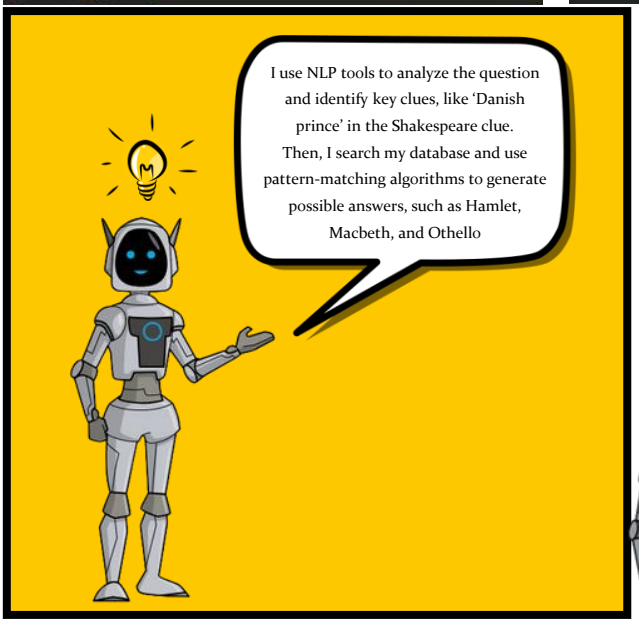

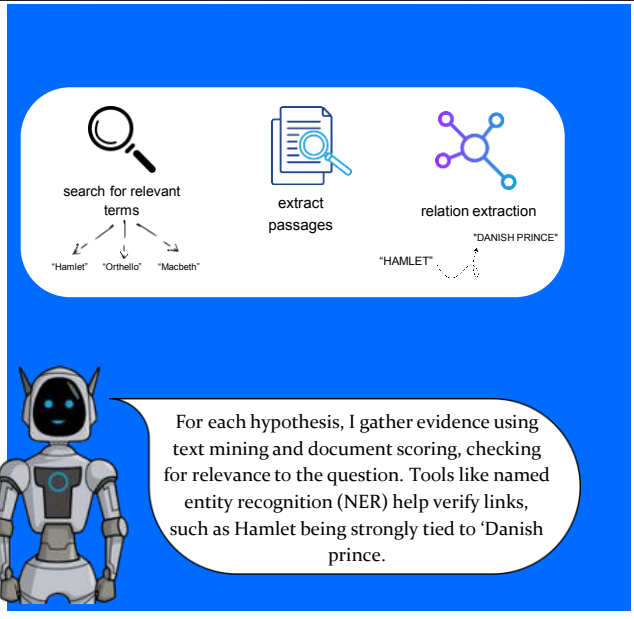

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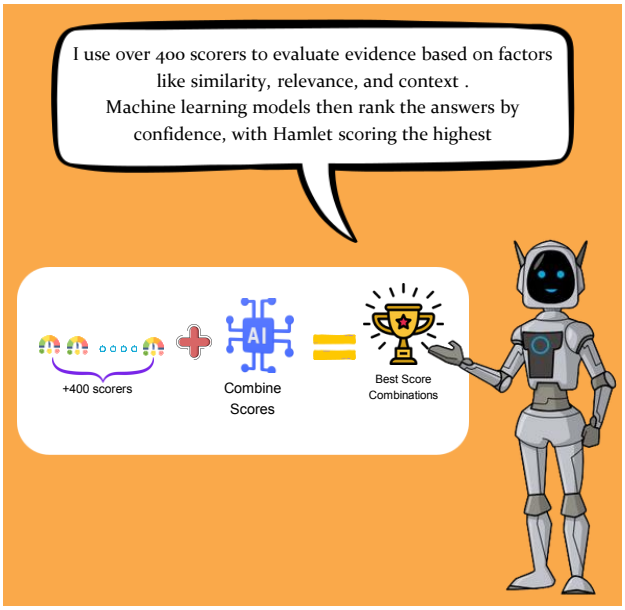

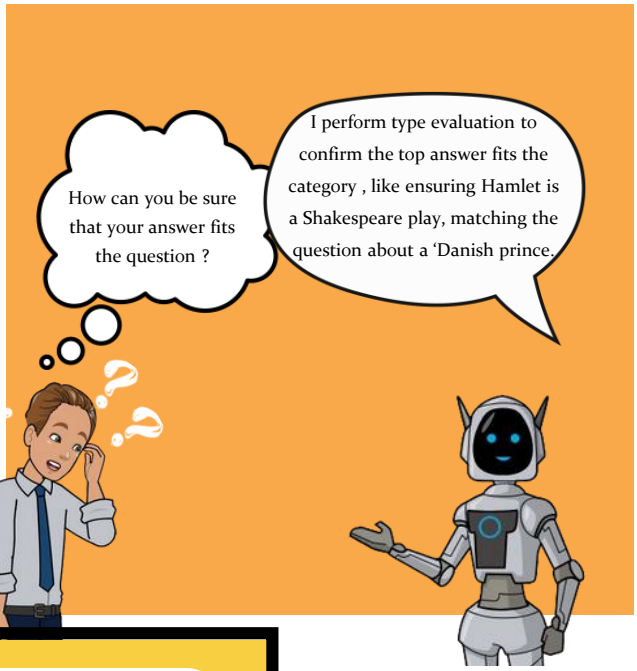

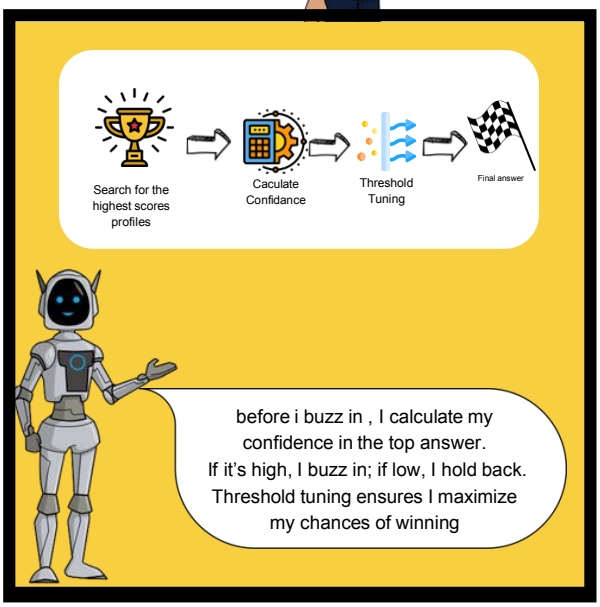

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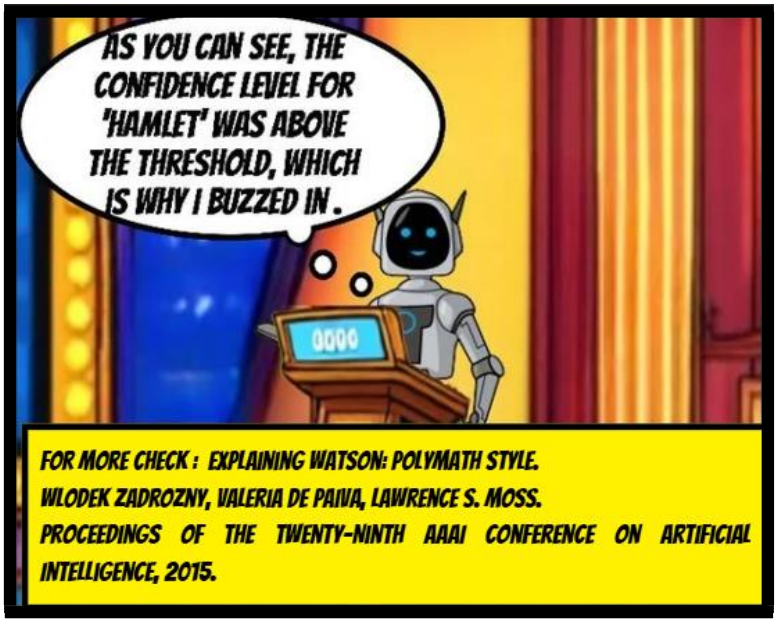

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