

# Introduction to AIML

# What is Artificial Intelligence?

- Artificial Intelligence is composed of two words **Artificial** and **Intelligence**, where
  - Artificial defines "*man-made*," and
  - intelligence defines "*thinking power*",
  - hence AI means "*a man-made thinking power*."
- "It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions."

# What is Artificial Intelligence?

- Artificial Intelligence is the study of systems that act in a way that to any observer would appear to be intelligent.
- Artificial Intelligence exists when a machine can have human based skills such as learning, reasoning, language understanding, and solving problems.

# Why Artificial Intelligence?

- With the help of AI,
  - you can create such software or devices which can solve real-world problems very easily and with accuracy such as health issues, marketing, traffic issues, etc.
  - you can create your personal virtual Assistant, such as Cortana, Google Assistant, Siri, etc.
  - you can build such Robots which can work in an environment where survival of humans can be at risk.
- AI opens a path for other new technologies, new devices, and new Opportunities.

# Advantages of AI

- **High Accuracy with less errors:** As AI machines or systems take decisions as per pre-experience or information.
- **High-Speed and Reliability:** AI systems can be of very high-speed and fast-decision making.
- **Useful for risky areas:** AI machines can be helpful in situations such as defusing a bomb, exploring the ocean floor, where to employ a human can be risky.
- **Digital Assistant:** AI technology is currently used by various E-commerce websites to show the products as per customer requirement.
- **Useful as a public utility:** AI can be very useful for public utilities such as a self-driving car which can make our journey safer and hassle-free, facial recognition for security purpose, Natural language processing to communicate with the human in human-language, etc.

# Disadvantages of AI

- **High Cost:** Hardware & software requirement of AI is very costly as it requires lots of maintenance to meet current world requirements.
- **Can't think out of the box:** Even we are making smarter machines with AI, but still they cannot work out of the box, as the robot will only do that work for which they are trained, or programmed.
- **No feelings and emotions:** AI machines still do not have the feeling so it cannot make any kind of emotional attachment with human, and may sometime be harmful for users if the proper care is not taken.
- **Increase dependency on machines:** With the increment of technology, people are getting more dependent on devices and hence they are losing their mental capabilities.
- **No Original Creativity:** As humans are so creative and can imagine some new ideas but still AI machines cannot beat this power of human intelligence and cannot be creative and imaginative.

# Applications of AI

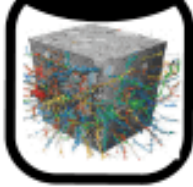
- **Astronomy**
- **Healthcare**
- **Gaming**
- **Finance**
- **Agriculture**
- **Travel and Transport**
- **Data Security**
- **Social Media**
- **Automation Industry**
- **Robotics**
- **Entertainment**
- **E-commerce**
- **Education**

# History of AI



# History of AI

1943



Evolution of Artificial neurons

1950



Turing Machine

1956



Birth of AI: Dartmouth Conference

1966



First Chatbot: ELIZA

1972



First Intelligence Robot: WABOT-1

1974-1980



First AI winner

1980



Expert System

1987-1993



Second AI Winner

1997



IBM Deep blue: first computer to beat a world chess champion

2002



AI in Home: Roomba

2011



IBM's Watson: Wins a quiz show

2012



Google now

2014



Chatbot Eugene Goostman: Wins a "Turing test"

2015



Amazon Echo

# Birth of AI (1943-56)

- **Year 1943:** The first work which is now recognized as AI was done by Warren McCulloch and Walter Pitts in 1943. They proposed a model of artificial neurons.
- **Year 1949:** Donald Hebb demonstrated an updating rule for modifying the connection strength between neurons. His rule is now called Hebbian learning.
- **Year 1950:** Alan Turing publishes "Computing Machinery and Intelligence" in which he proposed a test. The test can check the machine's ability to exhibit intelligent behavior equivalent to human intelligence, called a Turing test.

# Birth of AI...

- *Logic Theorist*: a program for proving mathematics theorems in 1955 by Alan Newell & Herbert Simon
- Dartmouth 1956 conference for 2 months
  - Term “artificial intelligence”
  - Fathers of the field introduced

# Early enthusiasm (1956-69)

- *General Problem Solver*, Newell & Simon
  - Intentionally solved puzzles in a similar way as humans do (order of subgoals, etc)
- *Geometry Theorem Prover*, Herbert Gelernter, 1959
- Arthur Samuel's learning checkers program 1952
- LISP, time sharing, Advice taker: McCarthy 1958
- Integration, IQ geometry problems, algebra stories
- Blocks world: vision, learning, NLP, planning
- Adalines [Widrow & Hoff 1960], perceptron convergence theorem [Rosenblatt 1962]

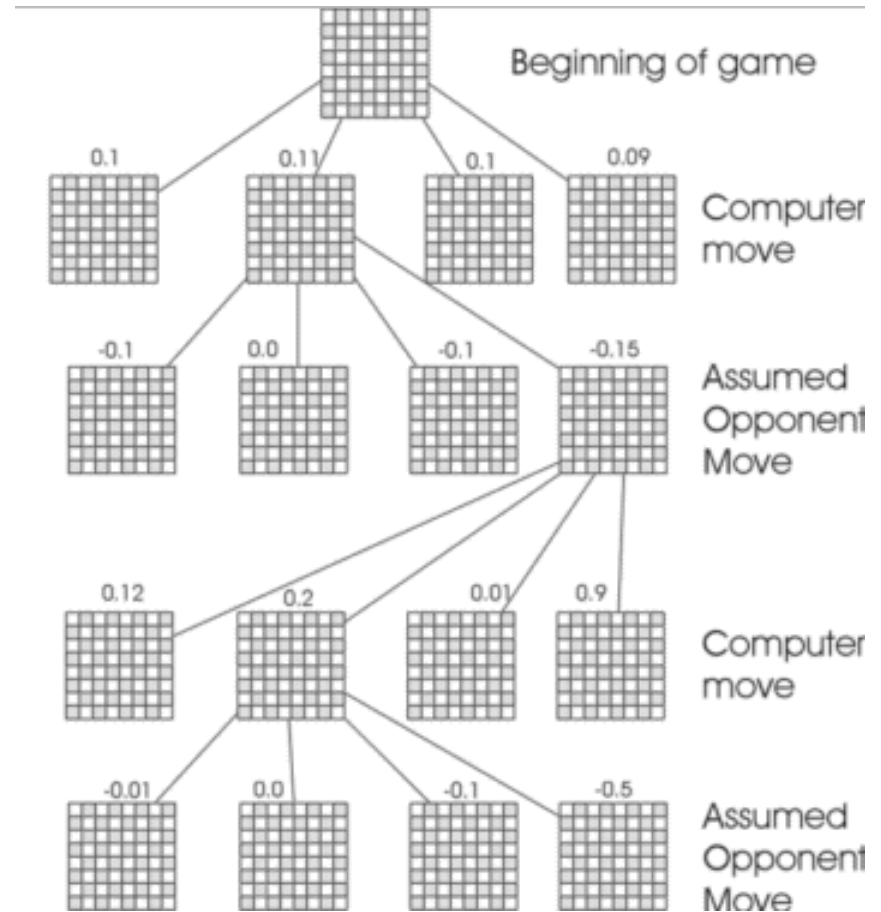
# The first AI winter (1974-1980)

- Scalability and Intractability Issue
- *Perceptrons* book with negative result on representation capability of 1-layer ANNs [Minsky & Papert]
- **AI winter** refers to the time period for dormant AI research and development. It is here computer scientist dealt with a severe shortage of funding from government for AI researches.
- During AI winters, an interest of publicity on artificial intelligence was decreased.

# Scalability

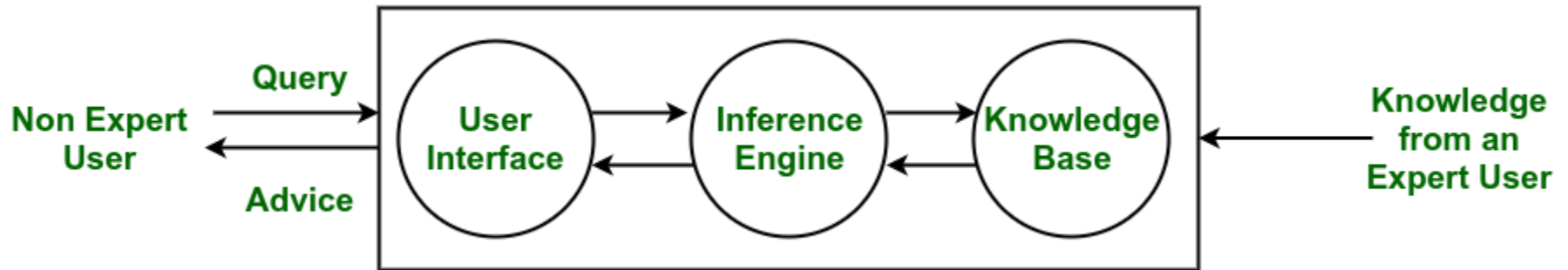
Solving hard problems requires search in a large space.

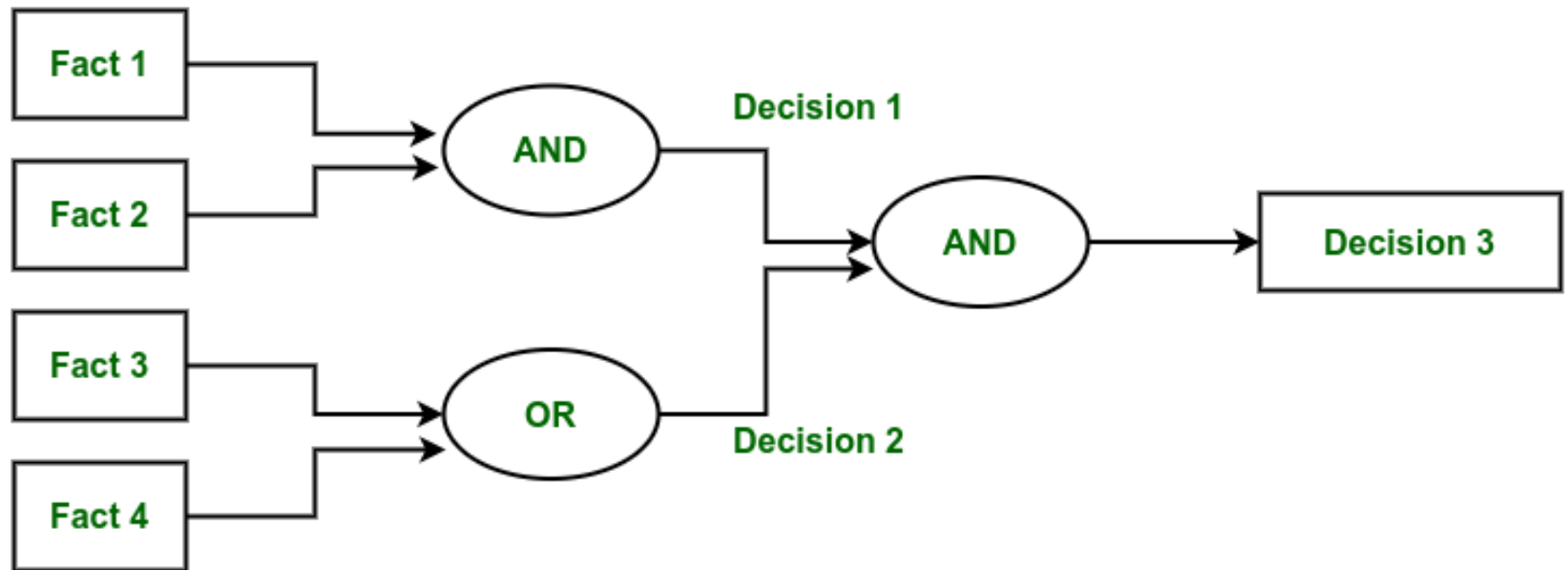
To play master-level chess requires searching about 8 ply deep. So about  $35^8$  or  $2 \cdot 10^{12}$  nodes must be examined.



# AI becomes an industry (1980-88)

- **1980:** first successful commercial expert system. Expert systems were programmed that emulate the decision-making ability of a human expert.
- **1988:** 40 expert systems were made
- Industry: few M\$ in 1980 -> 2B\$ in 1988







# Second AI Winters (1989-1993)

- Again, Investors and government stopped in funding for AI research as due to high cost but not efficient result.
- Expert Systems were too costly to maintain.
- DARPA (Defense Advanced Research Projects Agency) cuts AI funding.

# Recent events (1994-)

- Rigorous theorems and experimental work rather than intuition
- Real-world applications rather than toy domains
- Building on existing work
  - E.g. speech recognition
    - Ad hoc, fragile methods
    - Hidden Markov models
  - E.g. planning (unified framework helped progress)
- Normative system design
  - Belief networks & probabilistic reasoning
  - Reinforcement learning
  - Multiagent systems
  - Resource-bounded reasoning
- Deep learning

# AI winters freeze progress

1956-1974

## First wave of excitement

First neural networks and perceptrons written, first attempts at machine translation.

The U.S. Defense Advanced Research Projects Agency (DARPA) funds AI research with few requirements for delivering functioning products throughout the 1960s.

1980-1987

## Renewed AI excitement

Expert systems emerge representing human decisions in if-then form. Funding picks up.

1994-present

## Slow but steady progress

Computation power increases, big data provides training data, algorithms improve.

1950

1960

1970

1980

1990

2000

2010

2020

1974-1980

## First AI winter

Limited applicability of AI leads to funding pullback in the U.S. and abroad.

**1969:** Researchers Marvin Minsky and Seymour Papert published *Perceptrons*, an influential book pointing out the ways early neural networks failed to live up to expectations.

**1970-1974:** DARPA cut its funding as enthusiasm wore thin.

**1974:** The Lighthill report, compiled by researcher James Lighthill for the British Science Research Council, stated: "In no part of the field [of AI] have the discoveries made so far produced the major impact that was then promised."

1987-1994

## Second AI winter

Limitations of if-then reasoning become more apparent.

**1987:** Market for Lisp machines (specialty hardware for running AI applications) collapses.

**1987:** DARPA again cuts funding for AI research.

**1990:** Expert systems, an attempt to replicate human reasoning through a series of if-then rules, failed. The software proved hard to maintain and couldn't handle novel information, resulting in a cutback in AI development.

**1991:** Japanese Ministry of International Trade and Industry's Fifth Generation Computer project failed to deliver on goals of holding conversations, interpreting images and achieving humanlike reasoning.