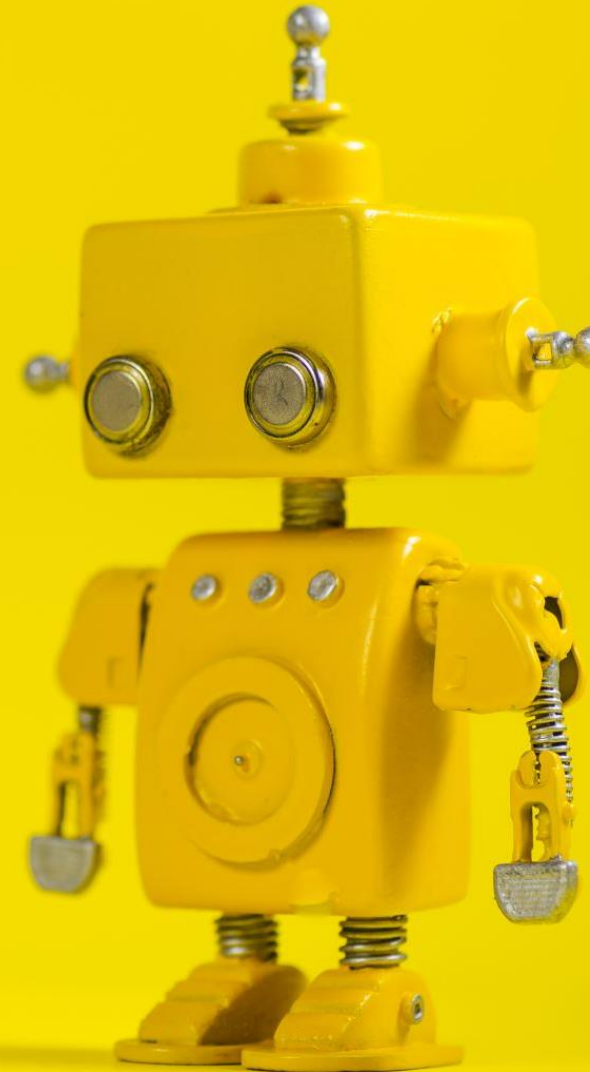

ARTIFICIAL INTELLIGENCE

OMKAR BASNET

MSC CSIT , CDCSIT, TU KIRTIPUR

HOD , CSIT/BCA

TEXAS INTERNATIONAL COLLEGE



ARTIFICIAL INTELLIGENCE



Introduction



AI Perspectives



History of AI



Foundations of AI

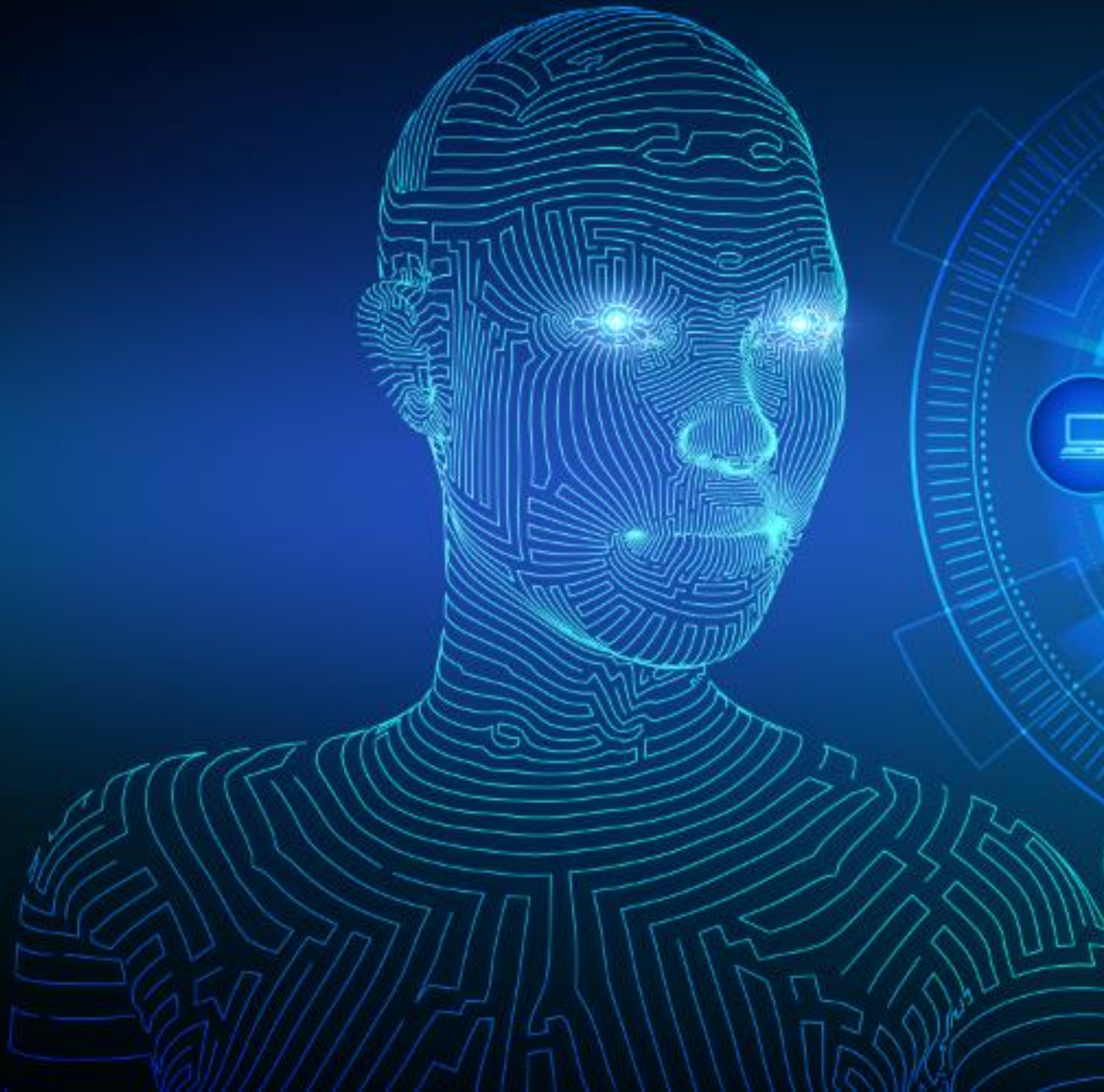


Applications of AI

ARTIFICIAL INTELLIGENCE(AI)

- Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence.
- AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry.





ARTIFICIAL INTELLIGENCE (AI)

- **"Giving machines ability to perform tasks normally associated with *human* intelligence."**
- AI consists of design of intelligent agents, which is a program that perceives its environment and takes action that maximizes its chance of success.
- With Ai it comes issues like deduction, reasoning, problem solving, knowledge representation, planning, learning, natural language processing, perception, etc.

ARTIFICIAL INTELLIGENCE (AI)

- AI is "the study of agents that receive percepts from the environment and perform actions."
(Russel and Norvig viii)
- AI is concerned with ***thought processes and reasoning***, where as bottom dimension addresses the ***behavior***.
- The defination of AI Describe in two major dimensions (human and rationally).
- Human-centered approaches must be an empirical science, involving hypothesis and experimental confirmation. A rationalist approach involves a combination of mathematics and engineering.

AI PERSPECTIVES

There are four different approaches that have historically defined the field of AI:

Thinking humanly

Thinking rationally

Acting humanly

Acting rationally

The first two ideas concern thought processes and reasoning, while the others deal with behavior.

AGAIN THE BROAD DEFINATION OF AI

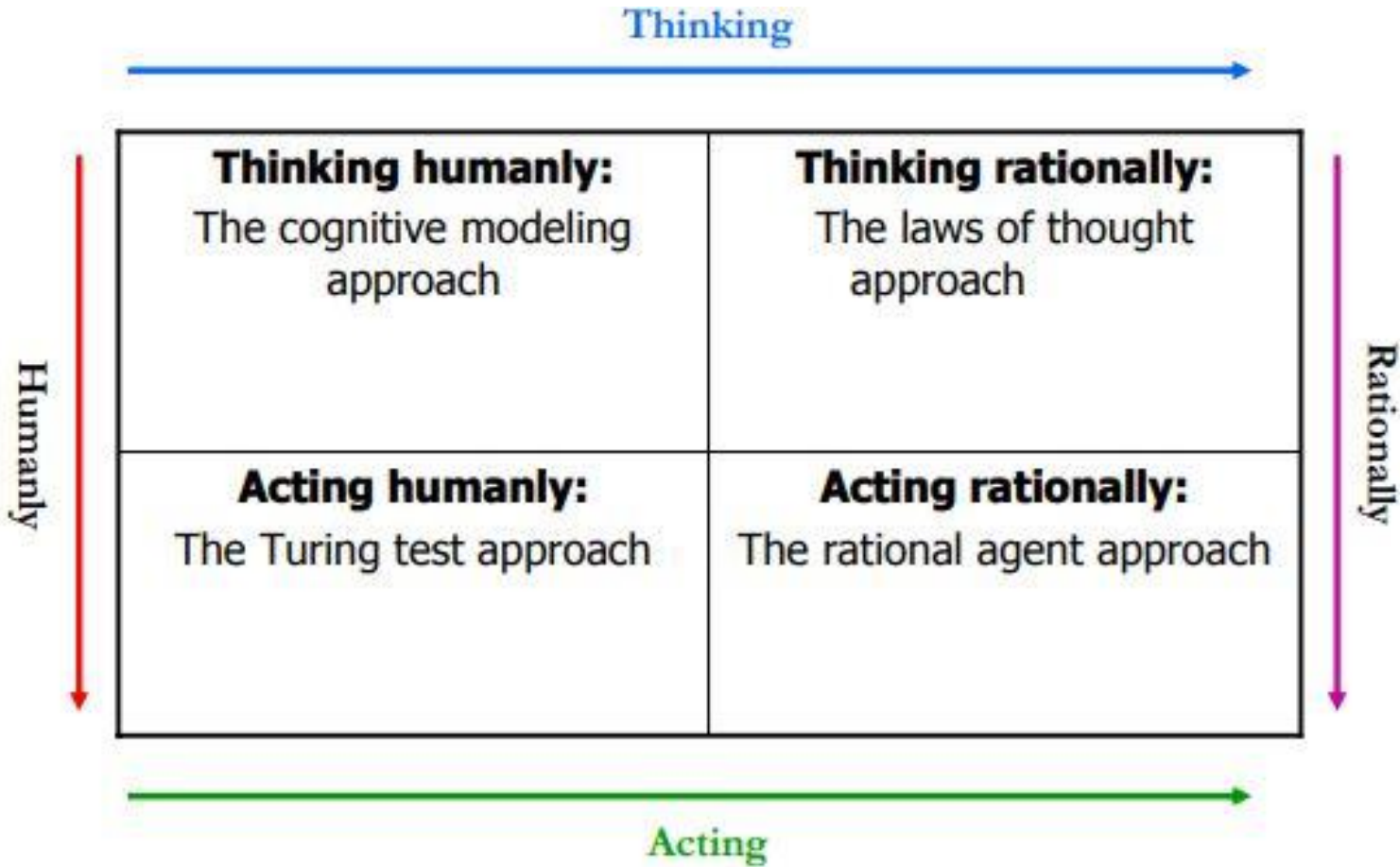
- While addressing a crowd at the Japan AI Experience in 2017, DataRobot CEO Jeremy Achin began his speech by offering the following definition of how AI is used today:
- "AI is a computer system able to perform tasks that ordinarily require human intelligence... Many of these artificial intelligence systems are powered by machine learning, some of them are powered by deep learning and some of them are powered by very boring things like rules."

HOW IS AI USED?

- Artificial intelligence generally falls under two broad categories:
- **Narrow AI:** Sometimes referred to as "Weak AI," this kind of artificial intelligence operates within a limited context and is a simulation of human intelligence. Sometimes used to perform single task for eg:
 - Google search
 - Image recognition software
 - Siri, Alexa and other personal assistants
 - Self-driving cars

HOW AI IS USED?

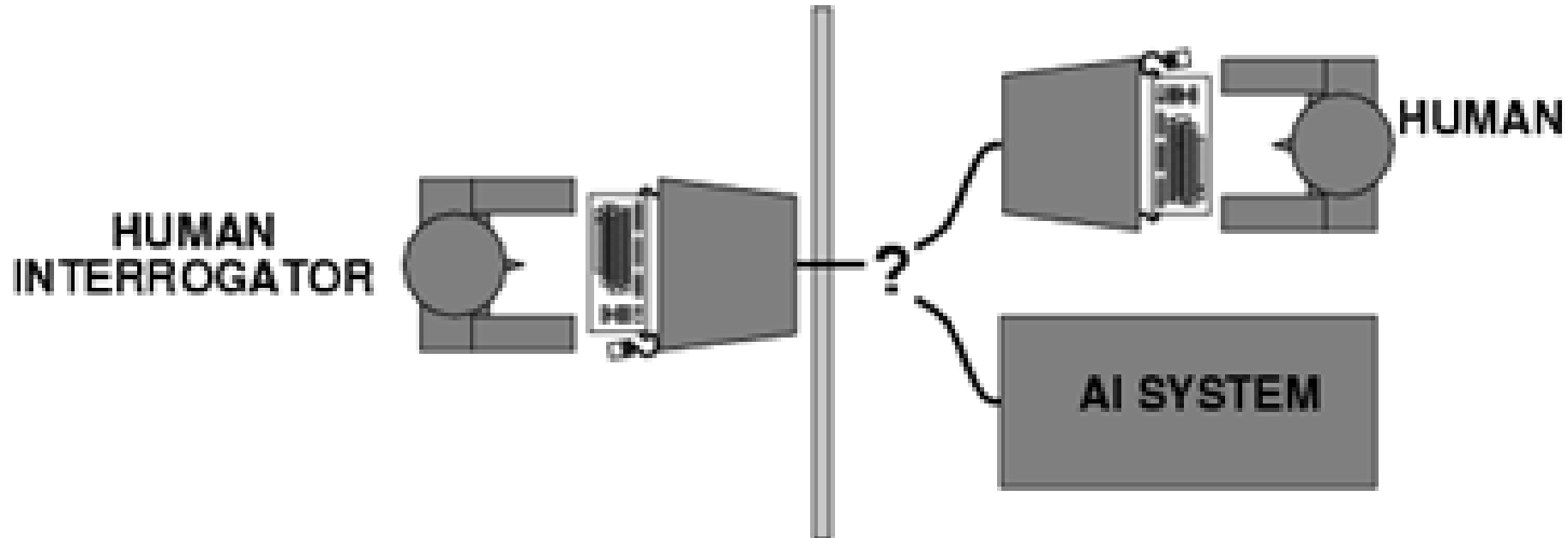
- **Artificial General Intelligence (AGI):**
AGI, sometimes referred to as "Strong AI," is the kind of artificial intelligence we see in the movies, like the robots. AGI is a machine with general intelligence and, much like a human being, it can apply that intelligence to solve any problem. For eg:
 - Disease mapping and prediction tools
 - Optimized, personalized healthcare treatment recommendations
 - Spam filters on email
 - Recommendation in social media and youtube.



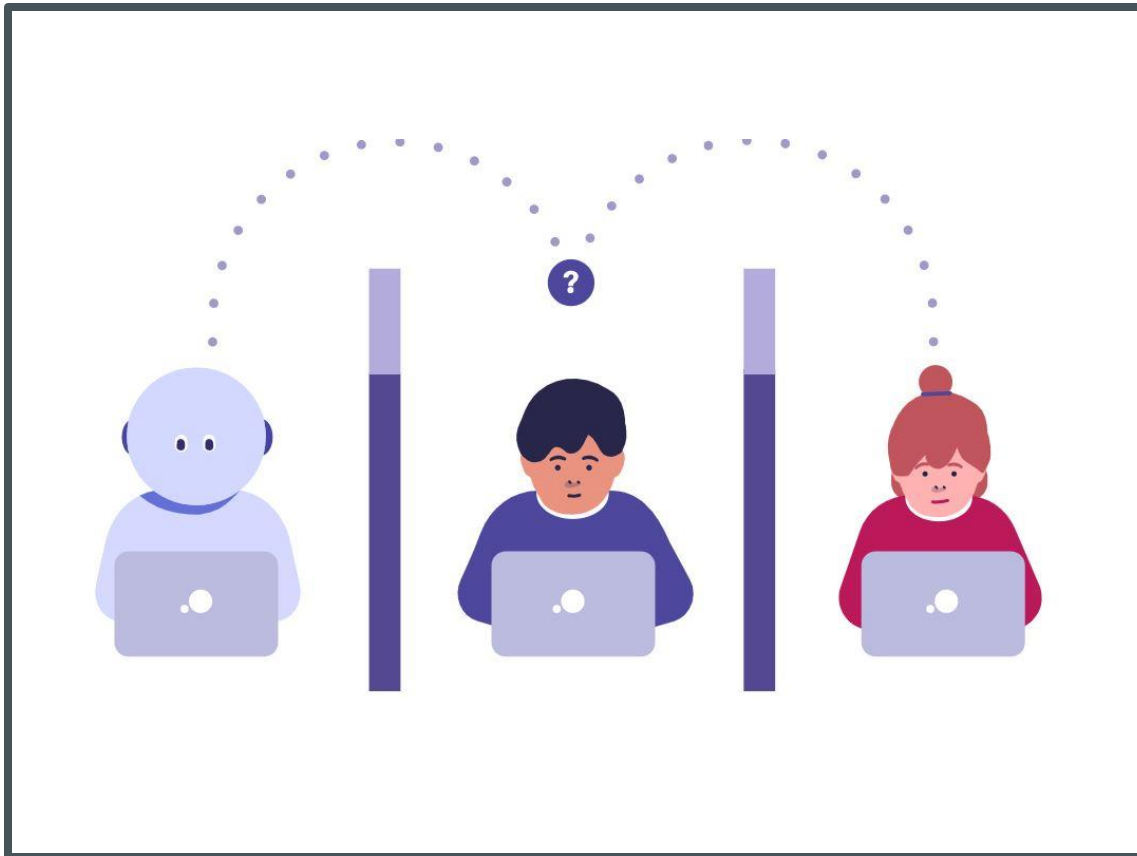
AI PERSPECTIVES

ACTING HUMANLY:THE TURING TEST APPROACH

- The **Turing test**, proposed by Alan Turing (1950) was designed to convince the people that whether a particular machine can think or not. He suggested a test based on indistinguishability from undeniably intelligent entities- human beings.



ACTING HUMANLY: THE TURING TEST APPROACH



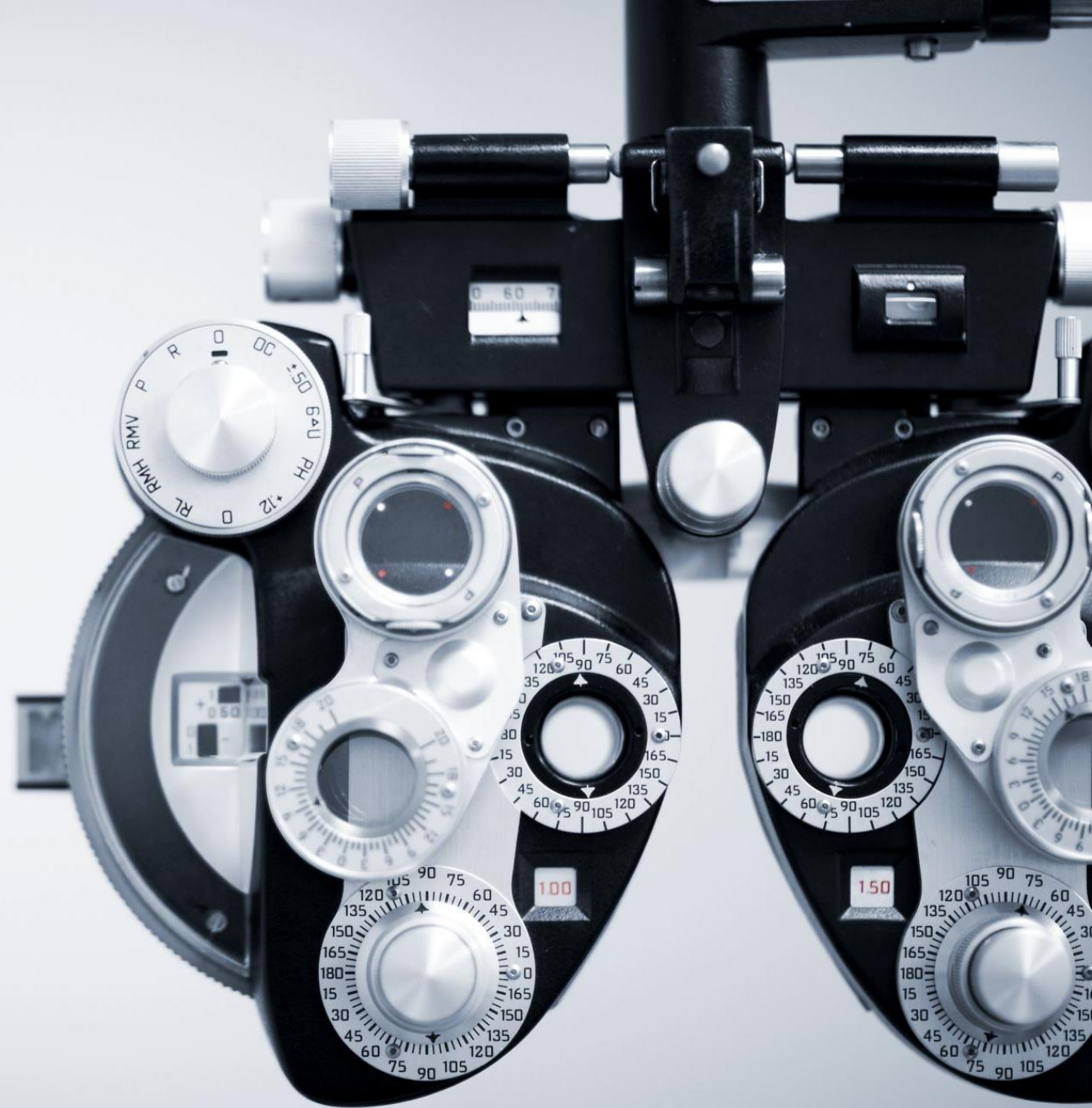
- The test involves an interrogator who interacts with one human and one machine. Within a given time the interrogator has to find out which of the two the human is, and which one the machine.

ACTING HUMANLY:THE TURING TEST APPROACH

- The computer passes the test if a human interrogator after posing some written questions, cannot tell whether the written response come from human or not.
- To pass a Turing test, a computer must have following capabilities:
 - Natural Language Processing: Must be able to communicate successfully in English
 - Knowledge representation: To store what it knows and hears.
 - Automated reasoning: Answer the Questions based on the stored information.
 - Machine learning: Must be able to adapt in new circumstances.
 - Turing test avoid the physical interaction with human interrogator. Physical simulation of human beings is not necessary for testing the intelligence.

THE TOTAL TURING TEST

- **The total Turing test** includes video signals and manipulation capability so that the interrogator can test the subject's perceptual abilities and object manipulation ability. To pass the total Turing test computer must have following additional capabilities:
- **Computer Vision:** To perceive objects
- **Robotics:** To manipulate objects and move



THINKING HUMANLY: COGNITIVE MODELLING APPROACH

- In this philosophy we are going to say that AI must be able to think like human while giving the output.
- If we are going to say that a given program thinks like a human, we must have some way of determining how humans think. We need to get inside the actual workings of human minds. There are two ways to do this:
 - **through introspection:** catch our thoughts while they go by
 - **through psychological experiments.**
- If system think on the basis to above points then we can say that system is intelligent

THINK RATIONALLY: THE LAWS OF THOUGHT APPROACH

- The Greek philosopher Aristotle was one of the first to attempt to codify ``right thinking," that is, irrefutable reasoning processes.
- His famous **syllogisms** provided patterns for argument structures that always gave correct conclusions given correct premises. For example, ``Socrates is a man; all men are mortal; therefore Socrates is mortal." These laws of thought were supposed to govern the operation of the mind, and initiated the field of **logic**.
- These law of thought were supposed to govern the operation of mind: This study initiated the field of logic. The logicist tradition in AI hopes to create intelligent systems using logic programming.
- However there are two obstacles to this approach :
 - It is not easy to take informal knowledge and state in the formal terms required by logical notation, particularly when knowledge is not 100% certain.
 - solving problem principally is different from doing it in practice.

ACTING RATIONALLY: THE RATIONAL AGENT APPROACH:

- **Rational behaviour** :
doing the right thing.
- **The Right Thing** : that
which is expected to
maximize the goal
achievement from the
given information.



ACTING RATIONALLY:THE RATIONAL AGENT APPROACH:

- If system is called rational agent then it is expected to have following attributes:
 - Autonomous control
 - Perceiving their environment
 - Persisting over a prolonged period of time
 - Adapting to change
 - And capable of taking on another's goal



- intelligent robots and artificial beings first appeared in the ancient Greek myths of Antiquity. Aristotle's development of the syllogism and its use of deductive reasoning was a key moment in mankind's quest to understand its own intelligence. While the roots are long and deep, the history of artificial intelligence as we think of it today spans less than a century.

HISTORY OF AI

HISTORY OF AI

- The following is a quick look at some of the most important events in AI :
- **1943** :Warren McCullough and Walter Pitts publish "A Logical Calculus of Ideas Immanent in Nervous Activity." The paper proposed the first mathematic model for building a neural network.
- **1949** :In his book *The Organization of Behavior:A Neuropsychological Theory*, Donald Hebb proposes the theory that neural pathways are created from experiences and that connections between neurons become stronger the more frequently they're used. Hebbian learning continues to be an important model in AI.
- **1950** :Alan Turing publishes "Computing Machinery and Intelligence, proposing what is now known as the Turing Test, a method for determining if a machine is intelligent.
- Harvard undergraduates Marvin Minsky and Dean Edmonds build SNARC, the first neural network computer.
- Claude Shannon publishes the paper "Programming a Computer for Playing Chess."
- Isaac Asimov publishes the "Three Laws of Robotics."

HISTORY OF AI

- **1952** : Arthur Samuel develops a self-learning program to play checkers.
- **1954** :The Georgetown-IBM machine translation experiment automatically translates 60 carefully selected Russian sentences into English.
- **1963** :John McCarthy starts the AI Lab at Stanford.
- **1969** :The first successful expert systems are developed in DENDRAL, a XX program, and MYCIN, designed to diagnose blood infections, are created at Stanford.
- **1972** : The logic programming language PROLOG is created.
- **1973** :The "Lighthill Report," detailing the disappointments in AI research, is released by the British government and leads to severe cuts in funding for artificial intelligence projects.

HISTORY OF AI

- **1974-1980** :Frustration with the progress of AI development leads to major DARPA cutbacks in academic grants.This period is known as the "First AI Winter."
- **1980** :Digital Equipment Corporations develops R1 (also known as XCON), the first successful commercial expert system. Designed to configure orders for new computer systems, R1 kicks off an investment boom in expert systems that will last for much of the decade, effectively ending the first "AI Winter."
- **1982** :Japan's Ministry of International Trade and Industry launches the ambitious Fifth Generation Computer Systems project.
- **1985** :Companies are spending more than a billion dollars a year on expert systems and an entire industry known as the Lisp machine market springs up to support them.

HISTORY OF AI

- **1987-1993** :As computing technology improved, cheaper alternatives emerged and the Lisp machine market collapsed in 1987, ushering in the "Second AI Winter." During this period, expert systems proved too expensive to maintain and update, eventually falling out of favor. Japan terminates the FGCS project in 1992, citing failure in meeting the ambitious goals outlined a decade earlier.
- **1997** :IBM's Deep Blue beats world chess champion Gary Kasparov
- **2005** :STANLEY, a self-driving car, wins the DARPA Grand Challenge.
- The U.S. military begins investing in autonomous robots like Boston Dynamic's "Big Dog" and iRobot's "PackBot."
- **2008** :Google makes breakthroughs in speech recognition and introduces the feature in its iPhone app.

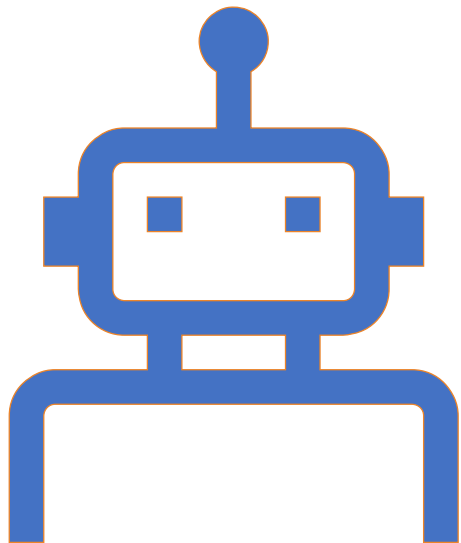
HISTORY OF AI

- **2012** :Andrew Ng, founder of the Google Brain Deep Learning project, feeds a neural network using deep learning algorithms 10 million YouTube videos as a training set. The neural network learned to recognize a cat without being told what a cat is, ushering in breakthrough era for neural networks and deep learning funding.
- **2014** :Google makes first self-driving car to pass a state driving test.
- **2016** :Google DeepMind's AlphaGo defeats world champion Go player Lee Sedol. The complexity of the ancient Chinese game was seen as a major hurdle to clear in AI.

FOUNDATIONS OF AI

- ***Philosophy:***
- Logic, reasoning, mind as a physical system, foundations of learning, language and rationality.
 - Where does knowledge come from?
 - How does knowledge lead to action?
 - How does mental mind arise from physical brain?
 - Can formal rules be used to draw valid conclusions?





FOUNDATIONS OF AI

- ***Mathematics:***

Formal representation and proof algorithms, computation, undecidability, intractability, probability.

- What are the formal rules to draw the valid conclusions?
- What can be computed?
- How do we reason with uncertain information?

- **Psychology:**

Adaptation, phenomena of perception and motor control.

- How humans and animals think and act?

FOUNDATIONS OF AI

- **Economics:** *Formal theory of rational decisions, game theory, operation research.*
 - How should we make decisions so as to maximize payoff? How should we do this when others may not go along?
 - How should we do this when the payoff may be far in future?
- **Linguistics:** *Knowledge representation, grammar*
 - How does language relate to thought?
- **Neuroscience:** *Physical substrate for mental activities*
 - How do brains process information?
- **Control theory:** Homeostatic systems, stability, optimal agent design
 - How can artifacts operate under their own control?

APPLICATIONS OF AI

- Autonomous planning and scheduling
- Game playing
- Autonomous Control
- Expert Systems
- Logistics Planning
- Robotics
- Language understanding and problem solving
- Speech Recognition
- Computer Vision



THANK YOU

