

Artificial Intelligence

Unit-1

Artificial Intelligence 01CE0702



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In this unit you will be able to understand the following concepts:

- Introduction to AI.
- The AI Problems.
- AI techniques.
- Task Domains of AI.
- Level of AI Model.
- Criteria of Success.
- Applications of AI.

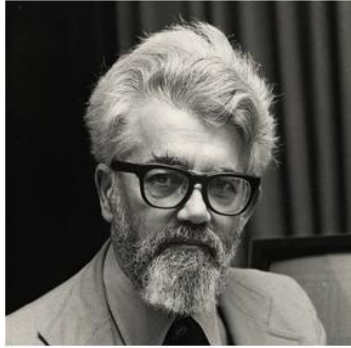
Some questions

- What is intelligence?
- What is Artificial Intelligence?

Intelligence has been defined in many ways: the ability/capacity for

- Logic,
- Communicate,
- Understanding,
- Self-awareness,
- Learning,
- Emotional-knowledge,
- Reasoning,
- Planning,
- Creativity,
- Critical thinking,
- and problem-solving.

What is Artificial Intelligence?(AI)

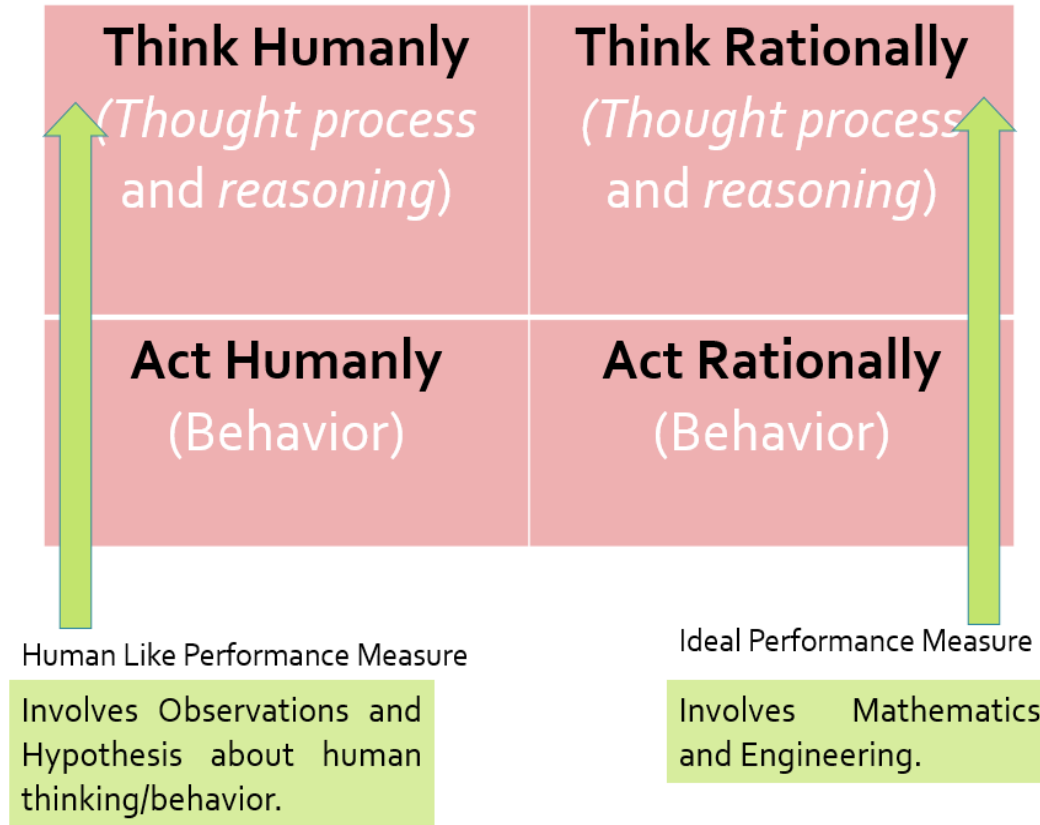


John McCarthy
(the father of Artificial Intelligence)

AI is the science and engineering of making intelligent machines, especially intelligent computer programs (1956).

- ▶ AI is a branch of computer science dealing with the simulation of intelligent behavior in computers.
- ▶ AI is the study of how to make computers do things which, at the moment, people do better.
- ▶ AI is, the study and design of intelligent agents where an intelligent agent is a system that perceives its environment and takes actions.

What is Artificial Intelligence ?



1. Thinking Humanly

- **Thinking Humanly : The Cognitive Modeling Approach**

1. Introspection
2. Psychological experiment
3. Brain imaging

**Cognitive Science Field = Computer Model from AI +
Experimental techniques from psychology = Output (Testable
theories of human mind)**

2. Acting Humanly

Acting Humanly : The Turing Test approach

1. Turing test

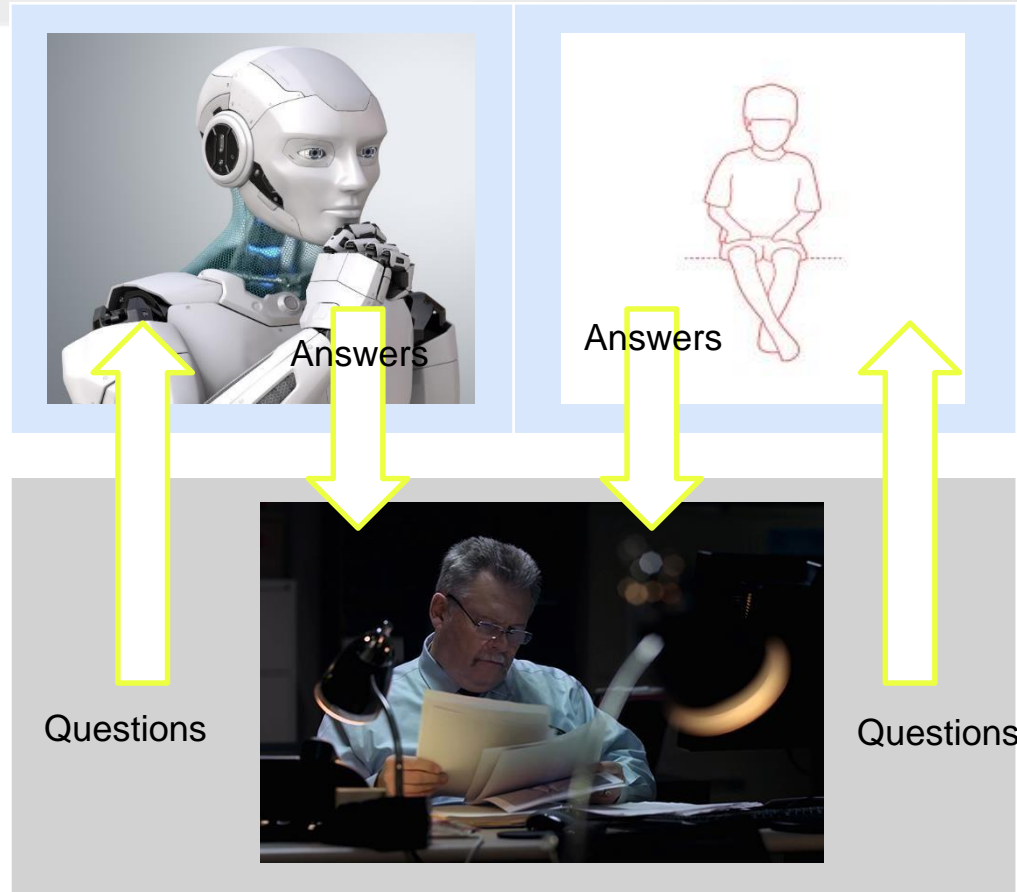
- NLP
- Knowledge representation
- Automated reasoning
- Machine learning

2. Total Turing Test

- Computer Vision (to perceive objects)
- Robotics (to manipulate objects and moves)

Turing Test

(A satisfactory test to know a person and a computer posses Intelligence or not)



Acting Humanly: The Turing Test proposed by Alan Turing (1950)

- A Turing Test is a method of inquiry for determining whether or not a computer is capable of thinking like a human being.
- The interrogator job is to try and figure out which one is human and which one is computer by asking questions to both of them.
- The computer would try to remain indistinguishable from human as much as possible.

3. Thinking Rationally

- **Thinking Rationally : The Law of Thought approach**
- So – called logical approach.
 1. Informal knowledge (input) \rightarrow formal (output – as per logical notation).
 2. Problem solving \rightarrow “in principle” and “in practice”.

4. Acting Rationally

- **Acting Rationally : The Rational Agent Approach**
- Agent → something that acts.
- Rational Agent → something act rationally.

A **Rational Agent** or **Rational** being is a person or entity that always aims to perform optimal actions based on given premises and information.

Advantages over human thought and human behavior:

1. More general.
2. More prominent.

Artificial Intelligence Problems can be solved.

- 1. Perception(Vision & Speech)**
- 2. Game Playing**
- 3. Theorem Proving**
- 4. Natural Language Processing(NLP)**
- 5. Common sense knowledge and Reasoning**

An AI technique is a method that exploits knowledge that is represented so that:

- The knowledge captures generalizations that share properties, are grouped together, rather than being allowed separate representation.
- It can be understood by people who must provide it—even though for many programs bulk of the data comes automatically from readings.
- In many AI domains, how the people understand the same people must supply the knowledge to a program.
- It can be easily modified to correct errors and reflect changes in real conditions.
- It can be widely used even if it is incomplete or inaccurate.
- It can be used to help overcome its own sheer bulk by helping to narrow the range of possibilities that must be usually considered.

There are three important AI techniques:

1.Search –

- Provides a way of solving problems for which no direct approach is available.
- It also provides a framework into which any direct techniques that are available can be embedded.

2.Use of knowledge –

Provides a way of solving complex problems by exploiting the structure of the objects that are involved.

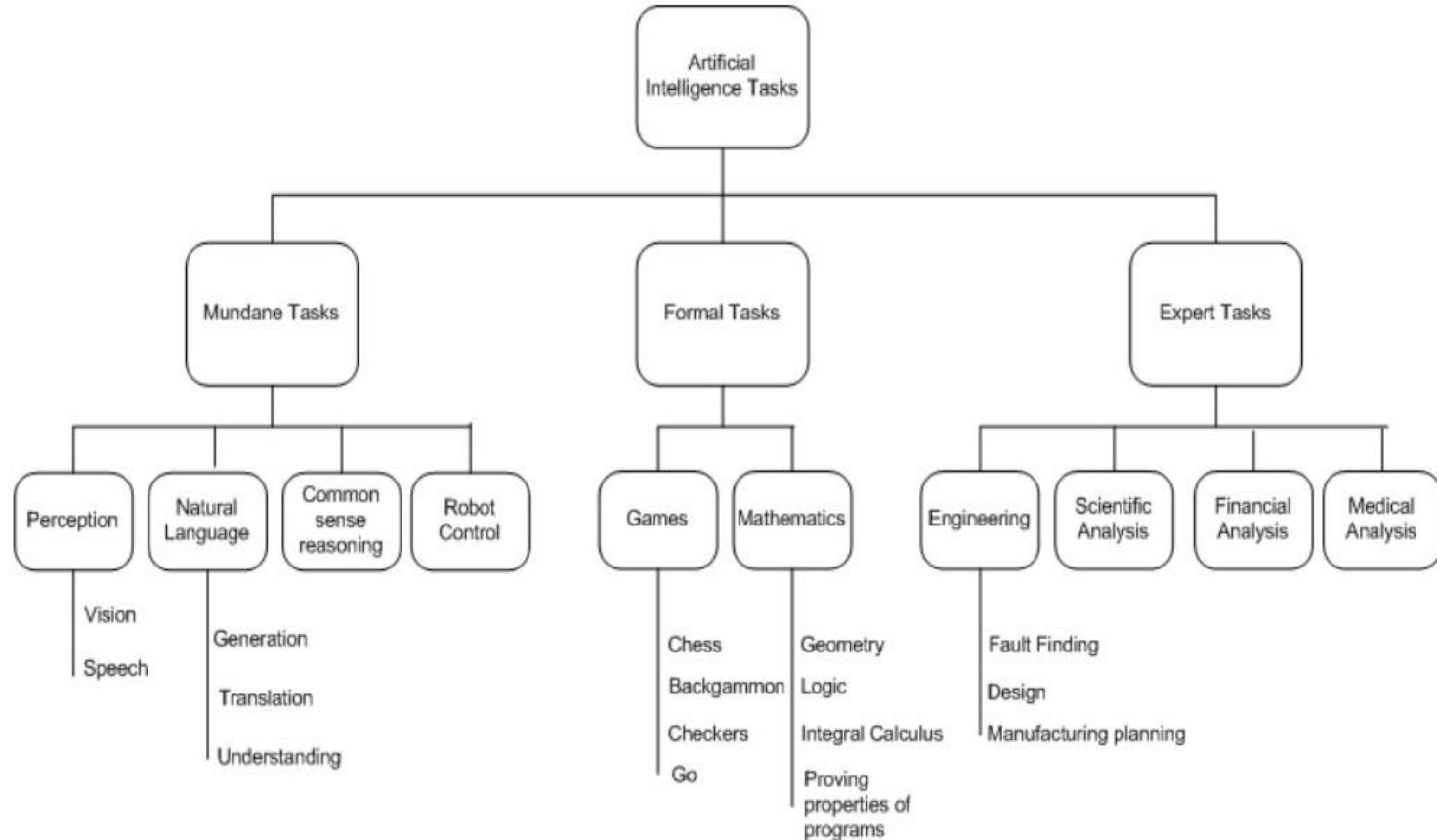
3.Abstraction –

Provides a way of separating important features and variations from many unimportant ones that would otherwise overwhelm any process.

Tasks Domain of AI

- **Mundane tasks** are the ones that we(the humans) do on regular basis without any special training
- **Formal tasks** - are the ones where there is an application of formal logic, some learning etc.
- **Expert tasks**- are the ones that needs expert knowledge without common sense, which can be easier to represent and handle such as engineering, fault finding, manufacturing planning, medical diagnosis etc.

Tasks Domain of AI



AI Problems and Solution Techniques require

The following questions are to be considered and required to solve any AI problem:

1. What are the underlying assumptions about intelligence?
2. What kinds of techniques will be useful for solving AI problems?
3. At what level human intelligence can be modelled?
4. When will it be realized when an intelligent program has been built?

Types of AI

1. Weak AI

Machines/programs are sensing for things similar to what they know, and classifying them accordingly.

Example: If you ask Alexa to turn on the TV, the programming understands key words like On and TV. The algorithm will respond by turning on the TV, it is only responding to its programming. In other words, it does not focus on meaning of what you said.

Weak AI applications:

- Alexa
- Chess
- AlphaGo

2. Strong AI

It does not classify, but uses clustering and association to process data.

Example: Featured in many movies, strong AI acts more like a brain.

Strong AI application:

- Robot.
- Suggestion for correction.

It signifies the importance what we are trying to achieve through AI

- **Is our goal trying to produce programs that do the intelligent things that people do ?**
- **Or we want programs to do the task easiest way?**

Efforts to perform the task same as human can be divided into two classes:

- **Programs in the first class** attempt to solve problems that a computer can easily solve and do not usually use AI techniques. Solve the problem that do not fit our definition of AI task.
- AI techniques usually include a search, as no direct method is available, the use of knowledge about the objects involved in the problem area and abstraction on which allows an element of pruning to occur, and to enable a solution to be found in real time; otherwise, the data could explode in size.
- Examples of these trivial problems in the first class, which are now of interest only to psychologists are EPAM (Elementary Perceiver and Memorizer) which memorized garbage syllables.

- **The second class** of problems attempts to solve problems that are non-trivial for a computer and use AI techniques. We wish to model human performance on these:
 1. To test psychological theories of human performance. Ex. PARRY [Colby, 1975] – a program to simulate the conversational behavior of a paranoid person.
 2. To enable computers to understand human reasoning – for example, programs that answer questions based upon newspaper articles indicating human behavior.
 3. To enable people to understand computer reasoning. Some people are reluctant to accept computer results unless they understand the mechanisms involved in arriving at the results.
 4. To exploit the knowledge gained by people who are best at gathering information. This persuaded the earlier workers to simulate human behavior in the SB part of AISB simulated behavior. Examples of this type of approach led to GPS (General Problem Solver).

- How to Know if the machine has become Intelligence or not ?
- It can be as tough as defining intelligence
- Alan Turing proposed a test which later became famous by the name of turing test
- It requires 2 person and machine all three in separate room
- 1 person interrogates machine and person without knowing who/what is inside room
- Small [Video](#) to understand what exactly happens in Turing test
- We may device more such standards in future which can help us to identify that if machine has been truly made intelligent or not.

Application Domains of AI

Natural Language Processing

Email Spam Filter in Gmail

Neural Network

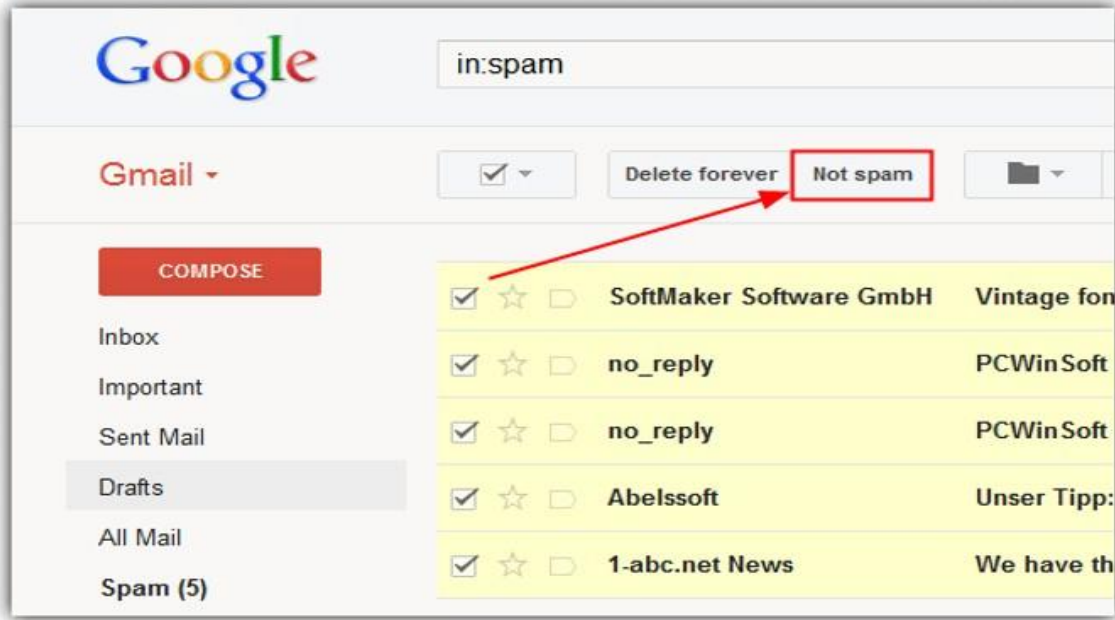
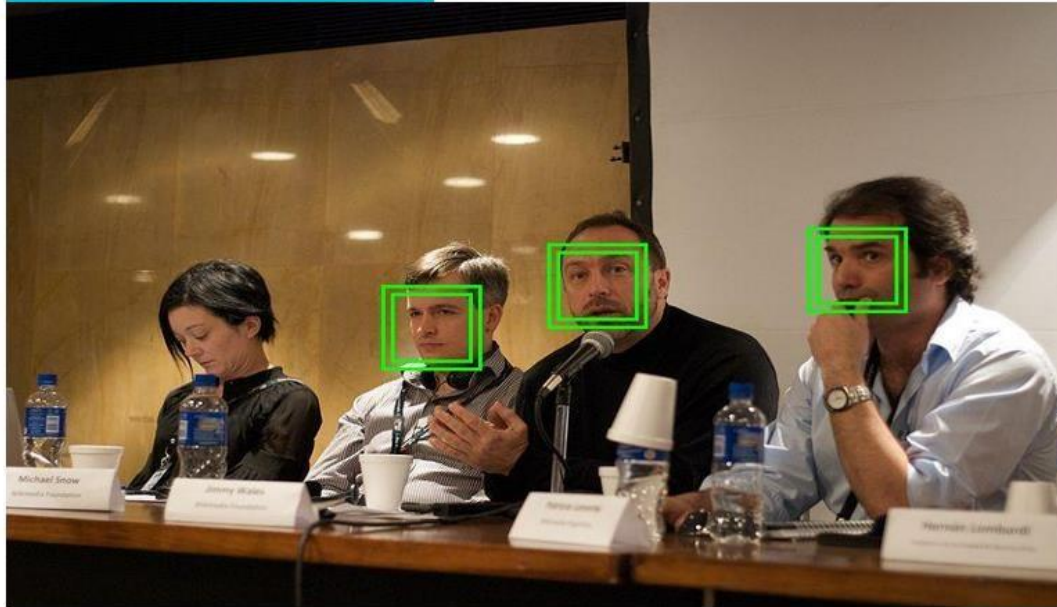


Image Processing

Face Detection in Camera

Deep Learning



Speech Recognition

Voice Technology in Virtual Agents

Deep Learning



Market Basket Analysis

Product recommendation





Home Automation



Deep Learning



Resource Scheduling

Aurora - Advanced Intelligent Planning and Scheduling Solution

NASA Space Launch System

NASA is implementing Aurora to schedule the ground-based activities that are preparing the Space Launch System (SLS) before its maiden flight. Similarly, Aurora/AMP generated short- and long-term schedules of ground-based activities that prepared and refurbished the Space Shuttles before and after each flight. Aurora's intelligent and rapid scheduling enables NASA to analyze numerous what-if scenarios efficiently.



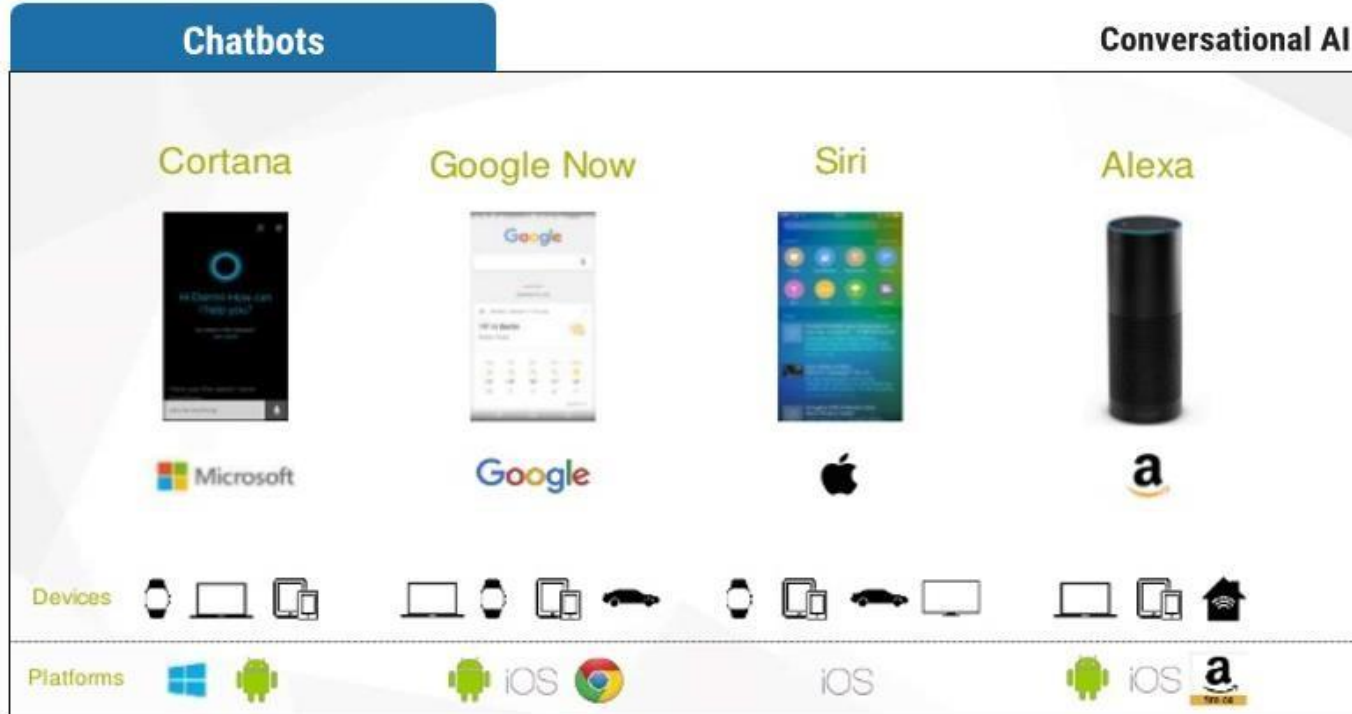
Optimization



Game Playing



Virtual Agents



Personalized Recommender System

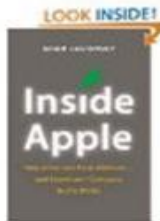
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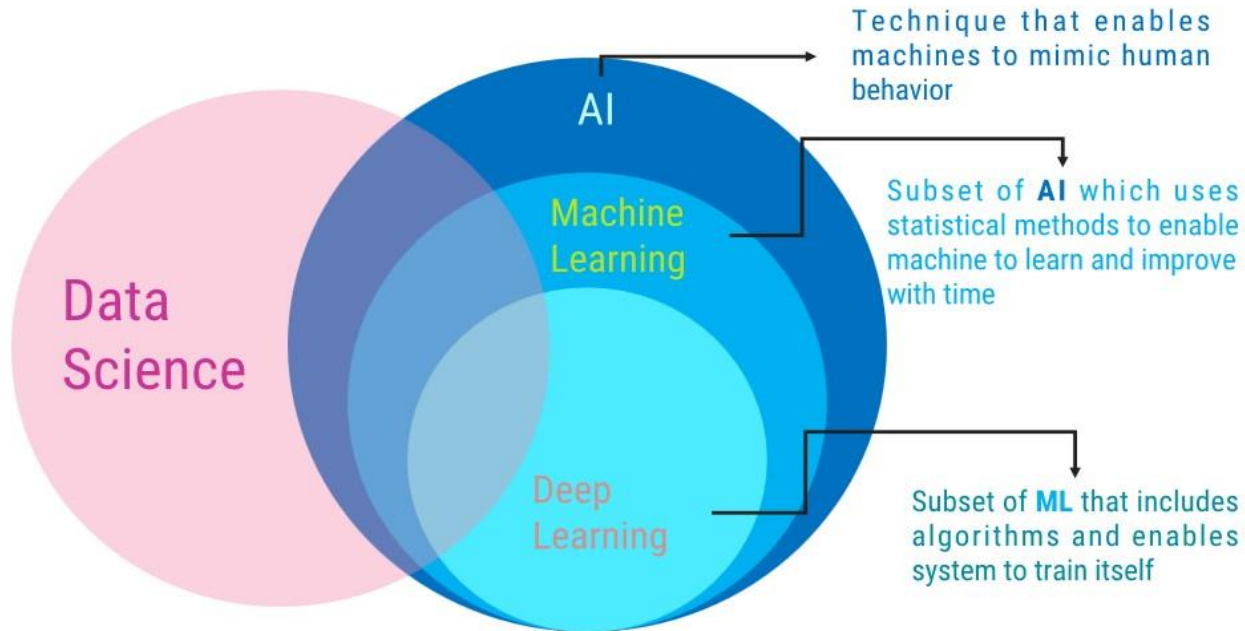
Fuzzy Logic



NVIDIA Metropolis

Machine Learning





THANK YOU