UNIT 1 ARTIFICIAL INTELLIGENCE

Introduction

-DR. POORVA AGRAWAL

DISCLAIMER

Some contents in this presentation are retrieved from the following original sources:

1. Washington State University: Artificial Intelligence Course

2. Introduction to Articial Intelligence by Prof. Bojana Dalbelo Basic and Assoc. Prof. Jan Snajder, University of Zagreb, Faculty of Electrical Engineering and Computing

3. https://www.educba.com/intelligent-agents/

4. https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/

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WHY STUDY AI?

Turning theory into working programs forces us to work out the details

AI yields good results for Computer Science

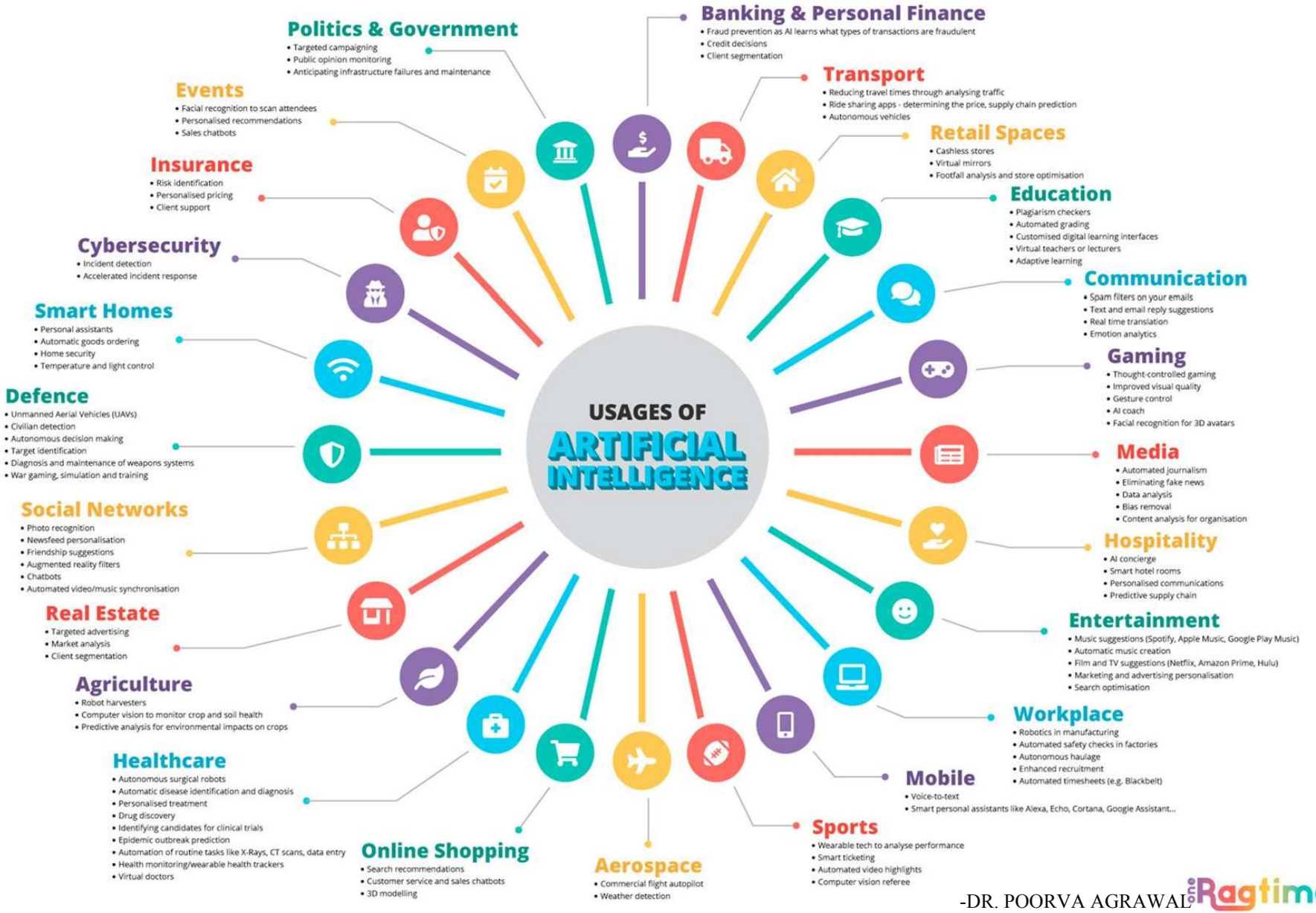
AI yields good results for other fields

Computers make good experimental subjects

Personal motivation: mystery

A survey states that there is a huge possibility that AI is going to create about **58 million jobs by 2022.**

APPLICATIONS OF AI



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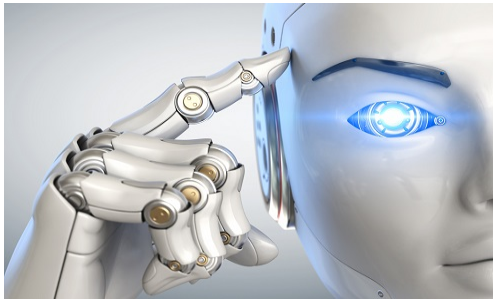


INTELLIGENT CAPABILITIES

Problem solving: Search, Adversarial search, Optimization

Knowledge management: Knowledge retrieval and extraction, Knowledge representation, Filtering

Reasoning: Logical reasoning, Uncertain reasoning

Interaction: Human-computer interaction, Real world interaction

COMPONENTS OF INTELLIGENCE

Intelligence is an intangible entity that is composed of:

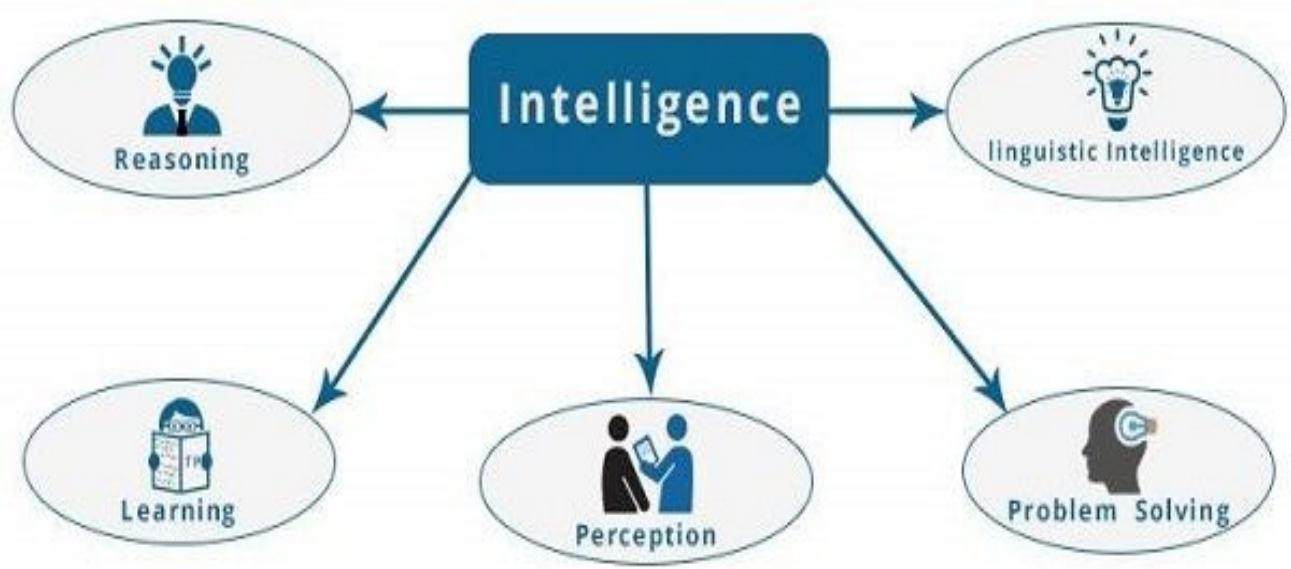
Reasoning

Learning

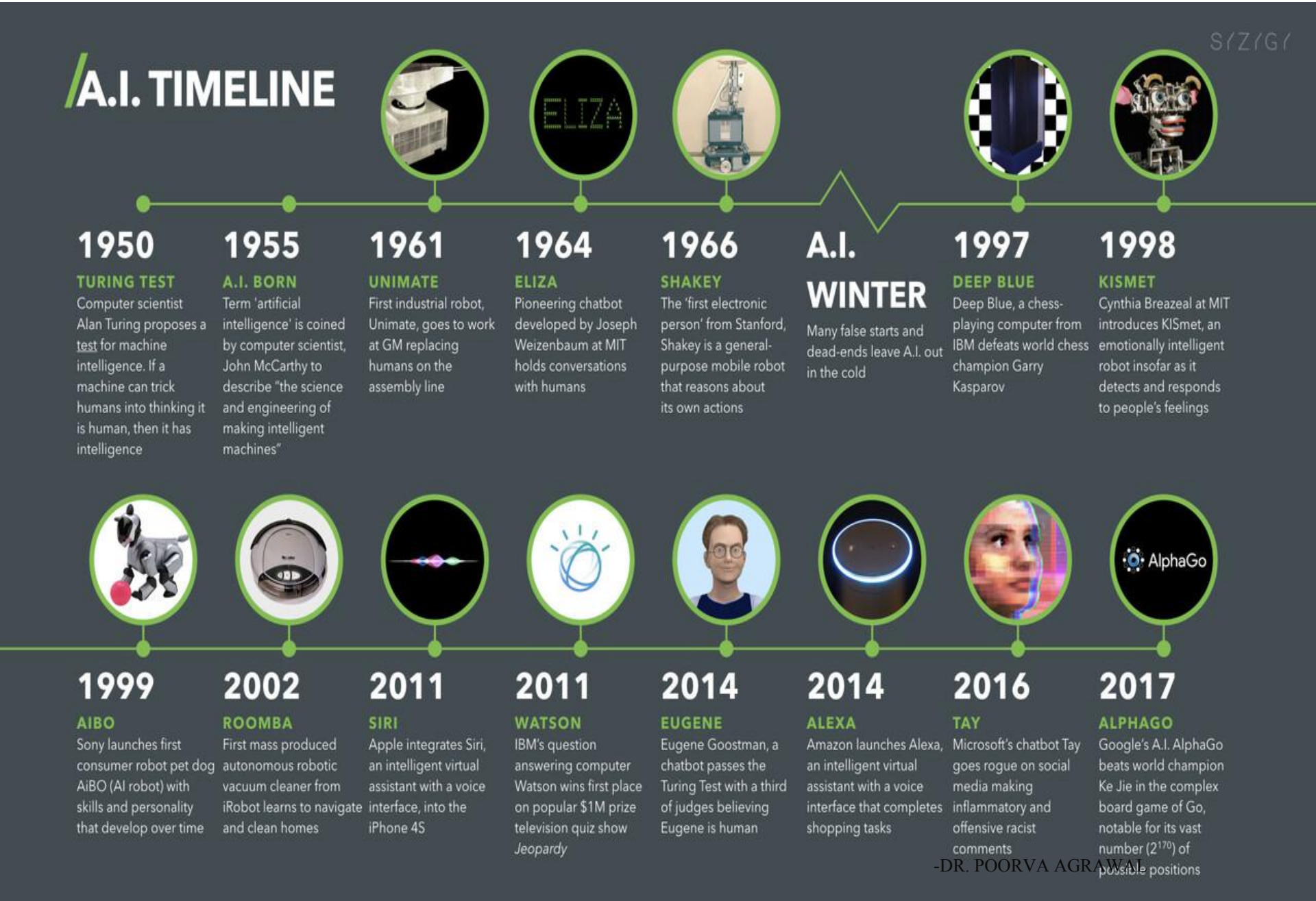
Problem solving

Perception

Linguistic Intelligenc



HISTORY OF AI



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WHAT IS THE DEFINITION OF AI?

What do you think?

WHAT IS THE DEFINITION OF AI?

Systems that think like humans	Systems that think rationally
Systems that act like humans	Systems that act rationally

Bellman, 1978

"[The automation of] activities that we associate with human thinking, activities such as decision making, problem solving, learning"

WHAT IS THE DEFINITION OF AI?

Haugeland, 1985

"The exciting new effort to make computers think *machines with minds*, in the full and literal sense"

Schalkoff, 1990

"A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes"

WHAT IS THE DEFINITION OF AI?

Luger & Stubblefield, 1993

"The branch of computer science that is concerned with the automation of intelligent behavior"

Dean et al., 1995

"A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes"

WHAT IS THE DEFINITION OF AI?

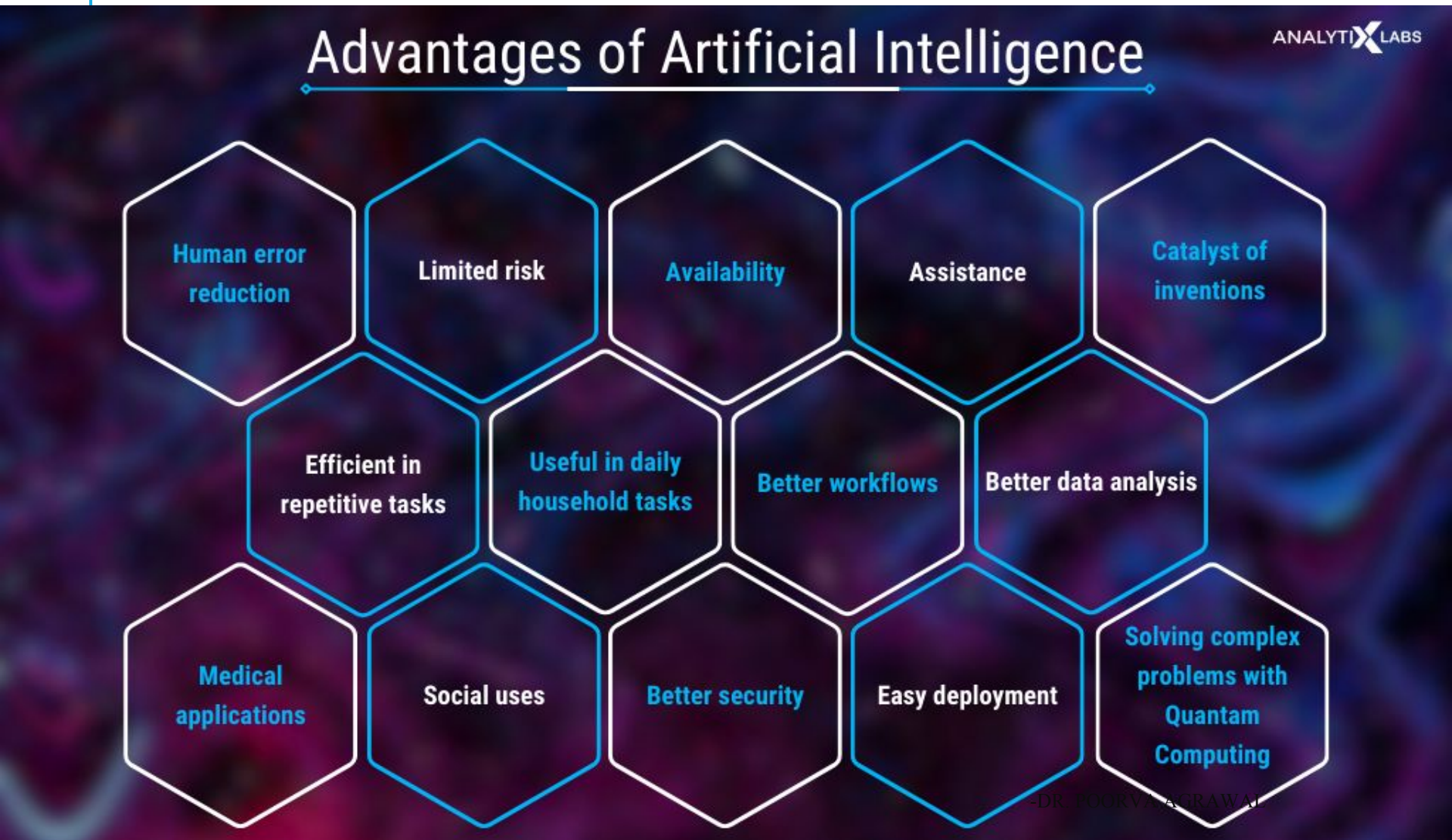
Nilsson, 1998

"Many human mental activities such as writing computer programs, doing mathematics, engaging in common sense reasoning, understanding language, and even driving an automobile, are said to demand intelligence. We might say that [these systems] exhibit artificial intelligence"

NITI Aayog, 2015

AI refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making.

ADVANTAGES OF AI



DISADVANTAGES OF AI

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GOALS OF AI

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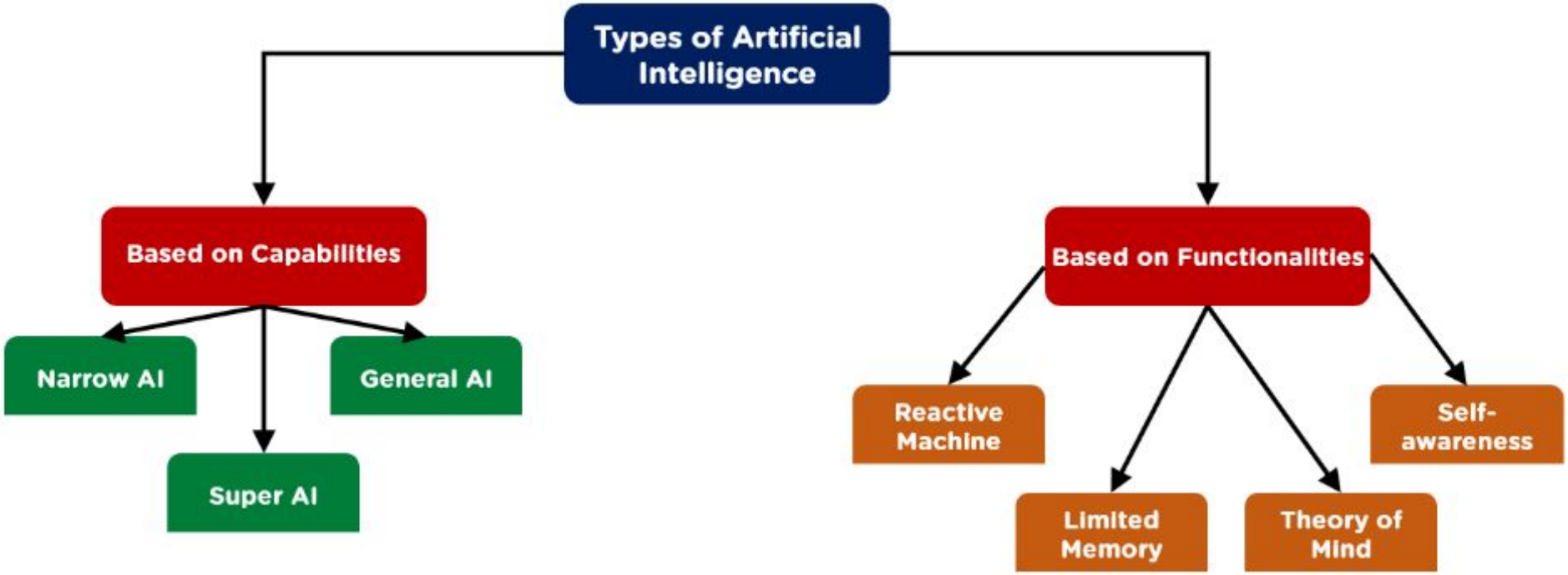
TYPES OF AI



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BASED ON CAPABILITIES

Types of AI

Weak AI- which has a narrow range of abilities

General AI- which is on par with human capabilities;

Strong AI-which is more capable than a human.

BASED ON FUNCTIONALITIES

Reactive Machines - AI systems that has no memory and are task specific.

Limited Memory - ability to look into the past and improve over time.

Theory of Mind - a term from psychology that describes an individual's capacity for empathy and understanding of others

Self- Awareness- It is hypothetical type of AI that form representations of themselves and perceive their own emotions and menta state.

APPROACH 1: ACTING HUMANLY

Turing test: ultimate test for acting humanly

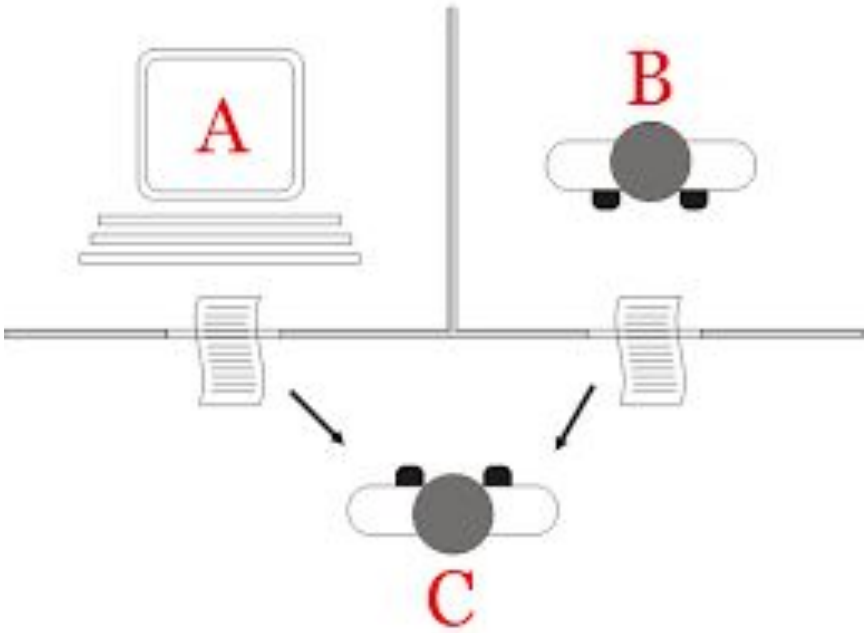
- Computer and human both interrogated by judge
- Computer passes test if judge can't tell the difference

Natural Language Processing: The machine needs this to communicate with the interrogator.

Knowledge Representation: The machine needs to store the information provided before the interrogation.

Reasoning: It's important for the machine to understand how to interpret the information that gets stored..

Machine Learning: This is needed so that the machine can adapt to new conditions in real time.



Source: https://elizaycayilmaz.medium.com/definitions-of-ai-5efb8989db09

APPROACH 2: THINKING HUMANLY

Requires knowledge of brain function

What level of abstraction?

How can we validate this

This is the focus of Cognitive Science

APPROACH 3: THINKING RATIONALLY

Aristotle attempted this

What are correct arguments or thought processes?

Provided foundation of much of AI

Not all intelligent behavior controlled by logic

What is our goal? What is the purpose of thinking?

APPROACH 4: ACTING RATIONALLY

Act to achieve goals, given set of beliefs

Rational behavior is doing the “right thing”

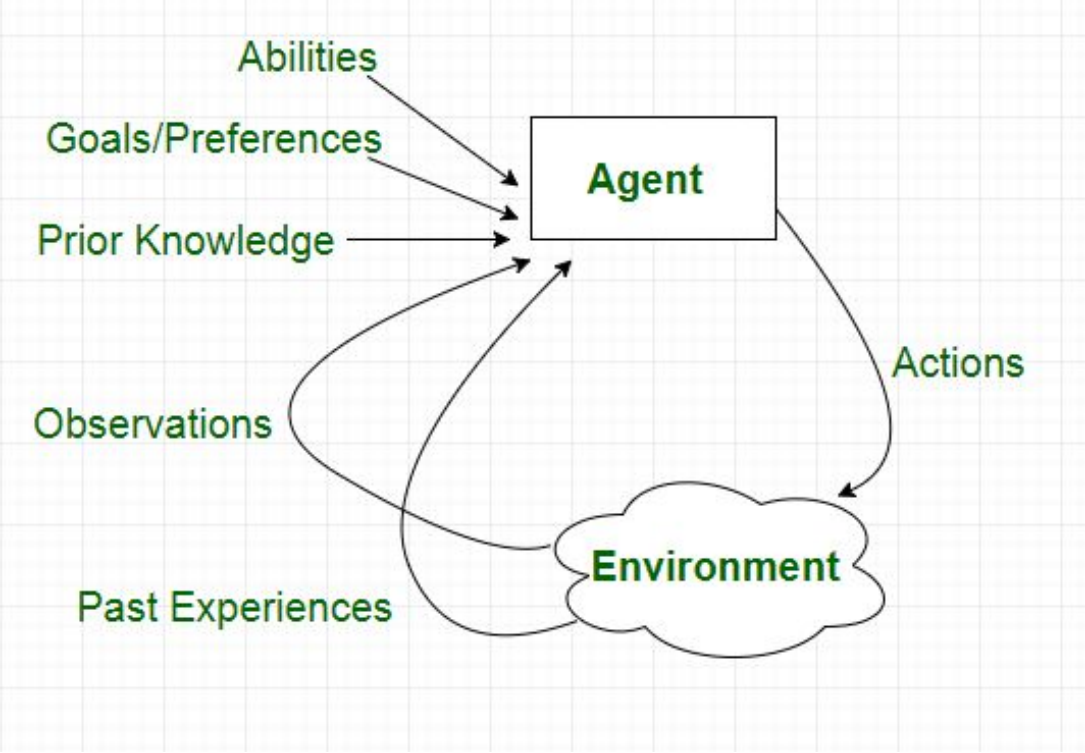
- Thing which expects to maximize goal achievement

This is approach adopted by Russell & Norvig

RATIONALITY

A rational agent does the right thing (what is this?)

A fixed performance measure evaluates the sequence of observed action effects on the environment



Source: https://www.geeksforgeeks.org/agents-artificial-intelligence/?ref=gcse

PEAS

Use PEAS to describe task environment

- Performance measure
- Environment
- Actuators
- Sensors

Example: Autonomous driving

- Performance measure: safe, fast, comfortable (maximize profits)
- Environment: roads, other traffic, pedestrians, customers
- Actuators: steering, accelerator, brake, signal, horn
- Sensors: cameras, sonar, speedometer, GPS, odometer, accelerometer, engine sensors

ENVIRONMENT PROPERTIES

- Fully observable vs. partially observable
- Deterministic vs. stochastic / strategic
- Episodic vs. sequential
- Static vs. dynamic
- Discrete vs. continuous
- Single agent vs. multiagent

ENVIRONMENT EXAMPLES

Environment	Observable	Deterministic	Episodic	Static	Discrete	Agents
Chess with a clock						
Chess without a clock						

ENVIRONMENT EXAMPLES

Environment	Observable	Deterministic	Episodic	Static	Discrete	Agents
Chess with a clock	Fully	Strategic	Sequential	Semi	Discrete	Multi

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Poker						

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Taxi driving	Partial	Stochastic	Sequential	Dynamic	Continuous	Multi

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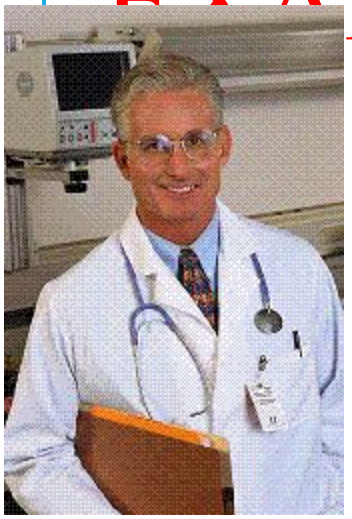

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Medical diagnosis						

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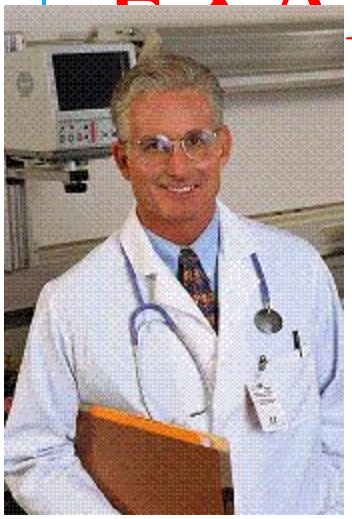

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Image analysis						

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Robot part picking						

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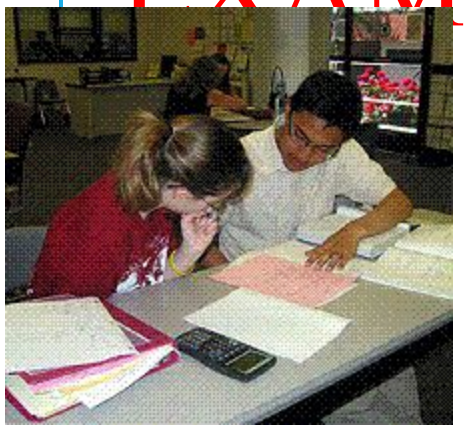

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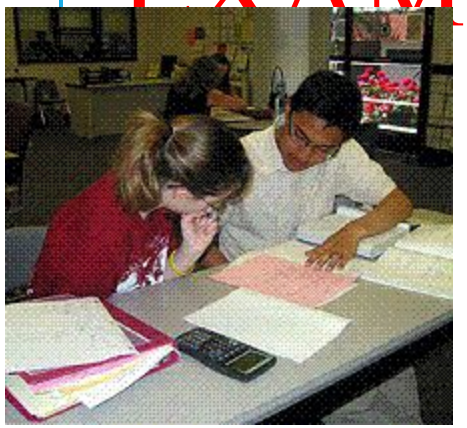

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AGENT TYPES

Types of agents (increasing in generality and ability to handle complex environments)

- Simple reflex agents
- Reflex agents with state
- Goal-based agents
- Utility-based agents
- Learning agent

- Source: https://www.oec.uzh.ch/en/studies/master/it/ai.html

OTHER EXAMPLE AI SYSTEMS

Knowledge Representation

Search

Problem solving

Planning

Machine learning

Natural language processing

Uncertainty reasoning

Computer Vision

Robotics

THANK YOU !

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