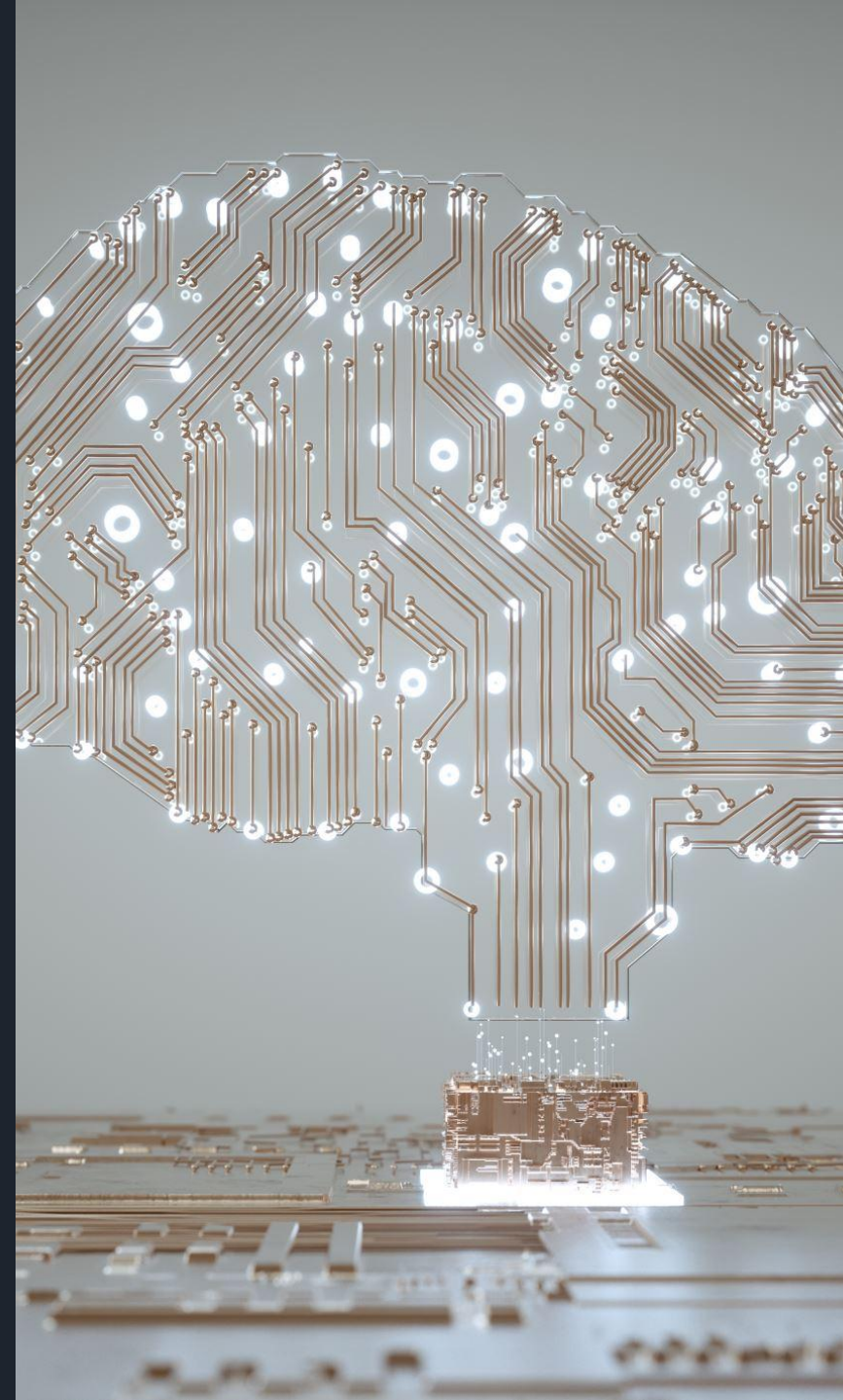

ARTIFICIAL INTELLIGENCE

BS(AI-III)

ABDUL HASEEB



WHY STUDY AI?

AI makes computers more useful

Intelligent computer would have huge impact on civilization

AI cited as “field I would most like to be in” by scientists in all fields

Computer is a good metaphor for talking and thinking about intelligence

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



WHAT IS THE DEFINITION OF AI?

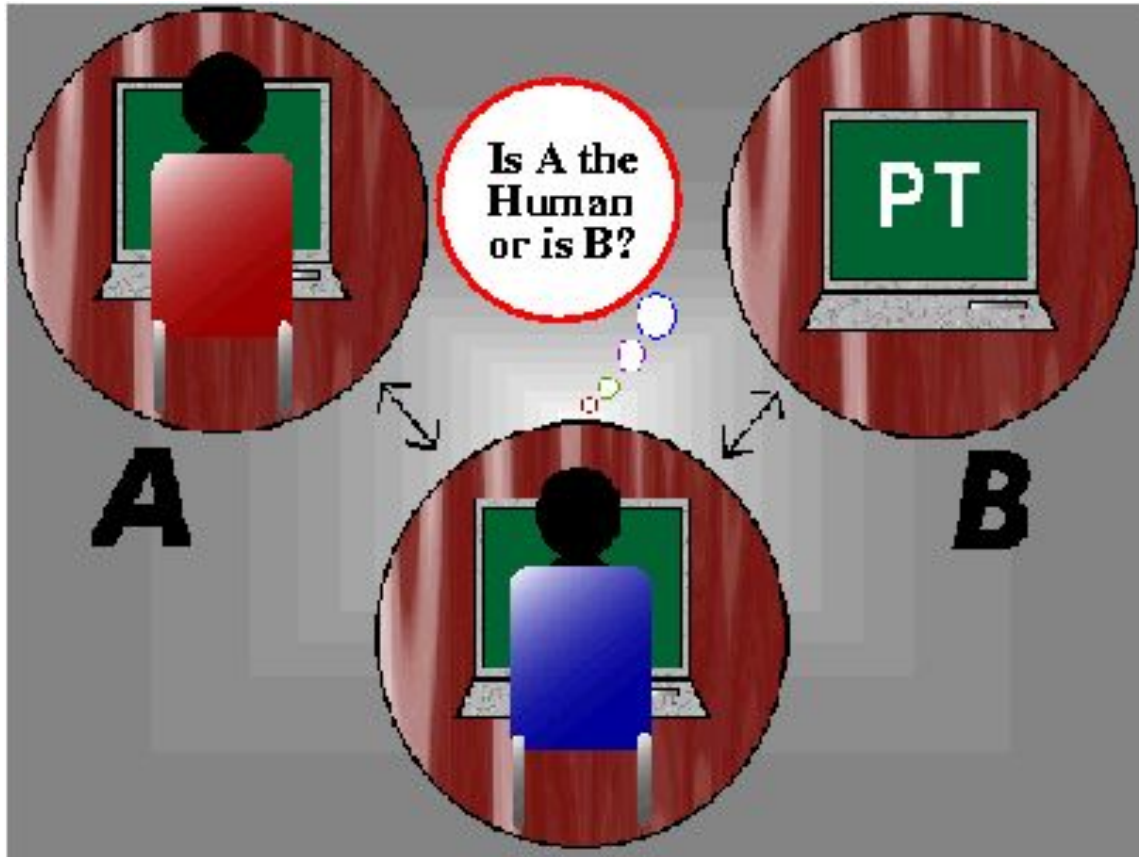
What do you think?

WHAT IS THE DEFINITION OF AI?

| Systems that think like humans | Systems that think rationally |
|---------------------------------------|--------------------------------------|
| Systems that act like humans | Systems that act rationally |

DEFINITIONS OF AI

| | |
|---|--|
| Thinking Humanly “The exciting new effort to make computers think . . . <i>machines with minds</i> , in the full and literal sense.” (Haugeland, 1985) “[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . .” (Bellman, 1978) | Thinking Rationally “The study of mental faculties through the use of computational models.” (Charniak and McDermott, 1985) “The study of the computations that make it possible to perceive, reason, and act.” (Winston, 1992) |
| Acting Humanly “The art of creating machines that perform functions that require intelligence when performed by people.” (Kurzweil, 1990) “The study of how to make computers do things at which, at the moment, people are better.” (Rich and Knight, 1991) | Acting Rationally “Computational Intelligence is the study of the design of intelligent agents.” (Poole <i>et al.</i> , 1998) “AI . . . is concerned with intelligent behavior in artifacts.” (Nilsson, 1998) |
| Figure 1.1 Some definitions of artificial intelligence, organized into four categories. | |



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

HOW EFFECTIVE IS THIS TEST?

- Agent must have:
 - Natural Language processing
 - Knowledge Representation:
 - Store what it knows or hears
 - Demonstrate human traits (humor, emotion)
 - Be able to reason:
 - Answer Questions
 - Draw Conclusions
 - Be able to learn:
 - Adapt to new Circumstances



LOBNER PRIZE



- [Loebner prize](#) competition is modern version of Turing Test
- Example: [Alice](#), Loebner prize winner for 2000 and 2001

CHINESE ROOM ARGUMENT (SEARLE ARGUMENT)



Imagine you are sitting in a room with a library of rule books, a bunch of blank exercise books, and a lot of writing utensils. Your only contact with the external world is through two slots in the wall labeled "input" and "output". Occasionally, pieces of paper with Chinese characters come into your room through the "input" slot. Each time a piece of paper comes in through the input slot your task is to find the section in the rule books that matches the pattern of Chinese characters on the piece of paper. The rule book will tell you which pattern of characters to inscribe the appropriate pattern on a blank piece of paper. Once you have inscribed the appropriate pattern according to the rule book your task is simply to push it out the output slot.

By the way, you don't understand Chinese, nor are you aware that the symbols that you are manipulating are Chinese symbols.

In fact, the Chinese characters which you have been receiving as input have been questions about a story and the output you have been producing has been the appropriate, perhaps even "insightful," responses to the questions asked. Indeed, to the outside questioners your output has been so good that they are convinced that whoever (or whatever) has been producing the responses to their queries must be a native speaker of, or at least extremely fluent in, Chinese.

DO YOU UNDERSTAND CHINESE?



Searle says NO



What do you think?



Is this a refutation of the possibility of AI?



The Systems Reply

The individual is just part of the overall system, which does understand Chinese



The Robot Reply

Put same capabilities in a robot along with perceiving, talking, etc. This agent would seem to have genuine understanding and mental states.

THINKING HUMANLY: COGNITIVE MODELING APPROACH

- **Machine Thinks like humans:**

- How do humans think?
- We can find the working of brain via:
 - Introspection
 - Psychological experiments

- **Once we have working theory of human brain**

- Incorporate it in computer program and observe the input-output behavior of computer program and machine match or not

- **This is the focus of cognitive science**

THINKING RATIONALLY: THE “LAWS OF THOUGHT” APPROACH

- Aristotle was one of the first to attempt to “Right Thinking”
- Syllogism:
 - When given the correct premises always yield to correct conclusions
 - Socrates is a man; All men are mortal; therefore, Socrates is mortal
- Laws of thought govern the operation of mind
 - Study of these initiated the field of logic

ACTING RATIONALLY

- Rational Agent shows Rational Behavior
- Rational behavior is doing the “right thing”
 - Thing which expects to maximize goal achievement



FOUNDATIONS OF AI

- Provides the disciplines that contributed, ideas, viewpoints and Techniques to AI.
 - Philosophy
 - Mathematics and Statistics
 - Economics
 - Neuroscience
 - Psychology
 - Computer Science and Engineering
 - Control Theory and Cybernetics
 - Linguistics

PHILOSOPHY

- Fundamental nature of knowledge, reality and existence are considered for solving a specific problem
- It also defines that how formal rules can be used to draw conclusions
- Aristotle developed laws for reasoning
- Without Philosophy it is difficult to answer following questions:
 - How does mind arise from a physical brain?
 - Where does knowledge come from?
 - How does knowledge leads to actions?



MATHEMATICS AND STATISTICS

- IN AI MATHEMATICS AND STATISTICS ARE IMPORTANT FOR:
 - Proving Theorems
 - Writing Algorithms
 - Computation
 - Decidability
 - Tractability
 - Modeling and Uncertainty
 - Learning from data



ECONOMICS

- Investing amount of money and maximization of utility with minimum investment
- When Developing AI Products we should make decisions for:
 - When to invest
 - How to invest
 - How much to invest?
 - Where to invest



NEUROSCIENCE

- Study of nervous system, particularly the brain
- How does the brain process information?

PSYCHOLOGY/COGNITIVE SCIENCE

- Scientific Study of Mind:
 - Problem solving skills
 - How do people behave
 - How do people perceive
 - Process information
 - How do humans think and act?

COMPUTER SCIENCE AND ENGINEERING

- Computer hardware gradually changed for AI Applications, such as Graphic processing unit, Tensor Processing Unit, and Wafer Scale Engine (WSE)
- The super computers and Quantum Computers can solve very complex AI Problems
- Software side provided OS, Programming languages and tools needed to write modern programs

HISTORY OF AI

■ **Gestation of AI:**

- First work, now generally recognized as AI was done by Warren McCulloch and Walter Pitts (1943).
 - They proposed a model of artificial neurons

HISTORY OF AI

■ **Gestation of AI:**

- Two undergraduate students at Harvard, Marvin Minsky and Dean Edmonds,
- Built the first neural network computer in 1950.
- The SNARC, as it was called, used 3000 vacuum tubes

HISTORY OF AI

■ Gestation of AI:

- Alan Turing's vision was perhaps the most influential
- Proposed Turing Test
- Introduced the machine learning, genetic algorithms, and reinforcement learning.

HISTORY OF AI

■ 1956: Birth of AI:

- Different Researchers (10) including John McCarthy, gathered at Darmouth for two-month workshop
- An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.
- **AI was considered as a separate field now**

HISTORY OF AI

■ 1966: First Chat Bot

- Joseph Weizenbaum introduced first chat bot “ELIZA”
- Research focus in these years was to develop models which can solve mathematical problems like Geometry Theorems



HISTORY OF AI

- **1980: AI Comes Back**
 - Expert Systems
 - Programmed with Human Decision Making Capabilities



HISTORY OF AI

- **1997:**

- IBM Deep Blue beat world chess champion (Gary Kasparov)

- **2002:**

- AI entered in homes
- ROOMBA a form of vacuum cleaner

HISTORY OF AI

■ 2006:

- AI in Business
- FB, Twitter started testing AI

■ 2011:

- IBM Watson won Jeopardy(a quiz show)
- It can solve complex questions and riddles
- ROOMBA a form of vacuum cleaner



HISTORY OF AI

- **2012 On wards:**

- Advances in Deep Learning, Big Data, Generative AI, Transformers, LLMs etc

SOME TRENDING AI TOOLS IN 2024

- [Anyword](#) for writing support
- [Jasper](#) for AI-powered marketing content
- [Shortwave](#) for email writing and management
- [Runway](#) for freeform and creative videos
- [Wondershare Filmora](#) for polishing video
- [Midjourney](#) for the best AI image results
- [Adobe Photoshop](#) for AI-generated image enhancement
- [DALL-E 3](#) for easy-to-use AI image generation
- [ElevenLabs](#) for a comprehensive AI voice library
- [Suno](#) for easy-to-use AI music generation
- [Beautiful.ai](#) for automated presentation design elements
- [Tome](#) for applying data to your presentations
- [Wix](#) for intuitive website-building
- [Framer](#) for AI-centric website-building
- [Microsoft Power Apps](#) for in-depth app development
- [Pico](#) for fully automated app-building
- [ChatGPT](#) for versatility
- [Claude](#) for great writing skills

APPLICATIONS OF AI

- AI in Gaming: Chess, Poker, Tic Tac Toe
 - Machine can think large number of moves
- AI in NLP: Chatbots, Alex, Siri etc
 - Machine can understand human language
- AI in Healthcare: Fast Diagnosis
 - Robotic Surgery
- AI in Finance: Adaptive Intelligence
 - Trading Algorithm etc
- AI in Data Security: AEG BOT, AI2
 - Helps in making applications more secure

APPLICATIONS OF AI

- Expert Systems:
 - Integration of software, machine and special information to provide reasoning and advice
- Computer Vision:
 - Machine can understand the visuals
- Speech Recognition:
 - Extract the meaning of sentence by human talk (Slang Removal, Noise Removal etc)
- Robotics:
 - Erica, Sophia, Ameca is the most modern humanoid robot
- E-Commerce:
 - Automatic Recommendation of products etc



CLASSIFICATION OF AI

- Weak AI
- Strong AI
- Evolutionary AI



WEAK AI (NARROW AI)

- Able to perform dedicated task with intelligence
- Can't perform beyond it's field
- Not concerned with how Task is performed, but is concerned with efficiency of tasks
- Exp:
 - Chatbots (Siri)



STRONG AI

- Study and Design of machines that simulate human mind to perform intelligent task
- Operating through deep learning, neural networks, and machine learning, strong AI aims to replicate human cognitive abilities and problem-solving skills.
 - Exp: Deep Blue



EVOLUTIONARY AI

- It is the study and design of machines that simulate simple creatures and attempt to evolve
- Exp:
 - Ants, Bees etc



SUPER AI

- Hypothetical
- Machines that can be more intelligent than humans