



A T M E
College of Engineering



Principles of Artificial Intelligence and Machine Learning

Subject Code : 21CS54

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Module 1

The Foundations of Artificial Intelligence

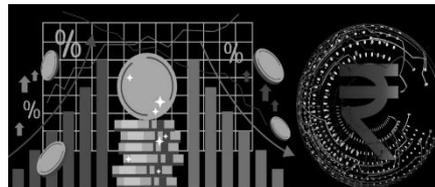
Philosophy



Mathematics



Economics

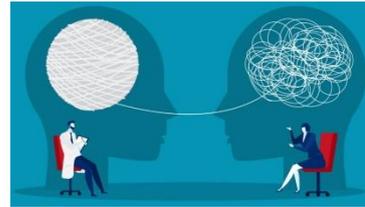


Neuro Science



The Foundations of Artificial Intelligence

Psychology



Computer Engineering



Control Theory and Cybernetics

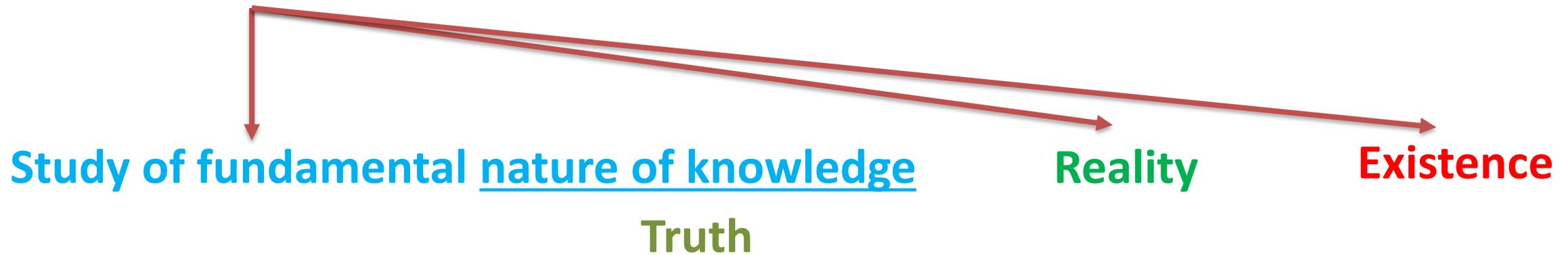


Linguistics



The Foundations of Artificial Intelligence

Philosophy



These are considered for solving a specific problem is a basic thing in AI

The Foundations of Artificial Intelligence

Philosophy

- Philosophy defines how can **formal rules** be used to draw valid **conclusions**.
- Philosophy is needed to answer the following questions:

How does the mind arise from a physical brain?

Where does the knowledge come from?

How does knowledge lead to actions?

The Foundations of Artificial Intelligence

Mathematics and Statistics

- AI programming requires **formal logic** and **probability** for planning and learning.
- **Computation** required for **analysing relation** and **implementation**.

In AI, mathematics and statistics are most important for

Proving theorems

Writing Algorithms

Computations



The Foundations of Artificial Intelligence

Mathematics and Statistics

Decidability

Tractability

Modelling Uncertainty

Learning from data

The Foundations of Artificial Intelligence

Mathematics and Statistics

Using these topics we can answer the following questions:

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

The Foundations of Artificial Intelligence

Economics

Deals with **investing the amount of money**, and **maximization of utility** with **minimal investment**

While developing an AI product, we should make decisions for:

- 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 the future?

To answer these questions one should have knowledge about **Decision Theory, Game Theory, Operation Research** etc.

The Foundations of Artificial Intelligence

Neuroscience

Neuroscience is the study of the **nervous system**, particularly the human brain,

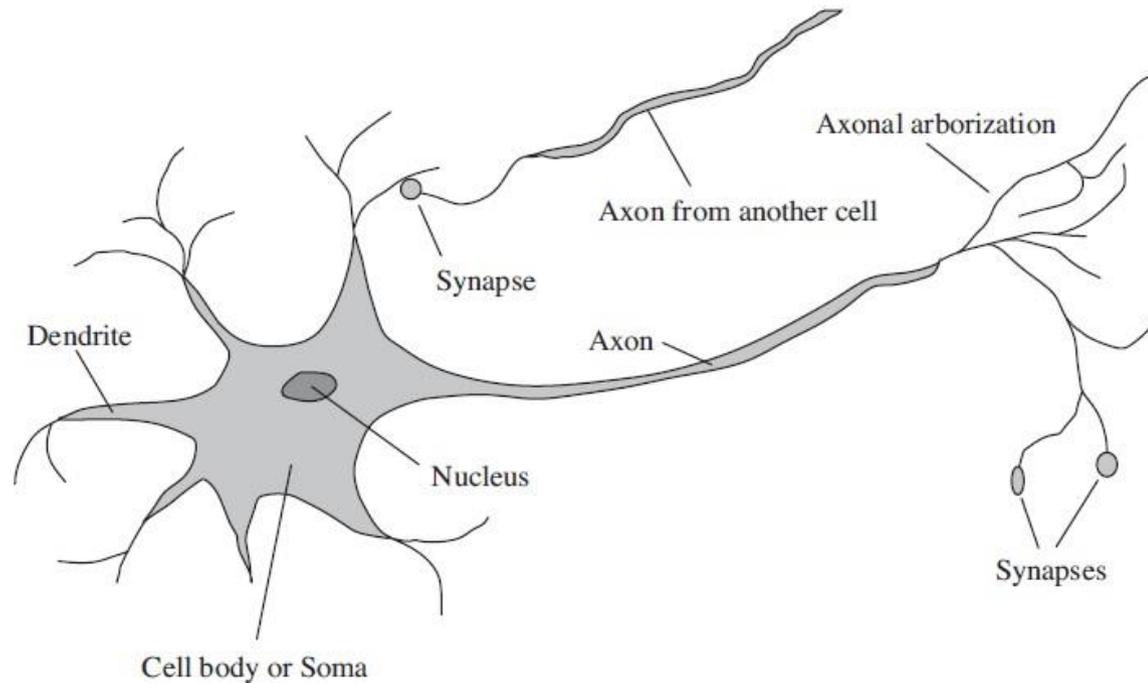
Human brains are somehow different, when compared to other creatures, **man has the largest brain in proportion to the size.**

The brain consisted largely of **nerve cells**, or **neurons** and the **observation of individual neurons** can lead to thought, action and **consciousness of one's brain.**

How do **brain** process information?

The Foundations of Artificial Intelligence

Neuroscience



The Foundations of Artificial Intelligence

Psychology/Cognitive Science

- The scientific method to study of human **mental ability** and **thinking**.
- Problem solving skills
- How do people behave?
- Perceive
- Process cognitive information
- Represent Knowledge

How do humans and animals think and act?



The Foundations of Artificial Intelligence

Computer Science and Engineering

Logic and inference theory

Algorithms

Programming languages

System building

Are important parts of Computer Science



The Foundations of Artificial Intelligence

Computer Science and Engineering

- Computer hardware gradually changed for AI applications, such as **graphic processing unit (GPU)**, **tensor processing unit(TPU)**, and **wafer scale engine(WSE)**.
- The amount of **computing power** used to train top machine learning applications and the utilization **doubled every 100 days**.
- The super **computer and quantum** computers can solve very complicated AI problems.
- The software side of computer science, supplied the **operating system, programming languages, and tools needed to write modern programs**.



The Foundations of Artificial Intelligence

Computer Science and Engineering

- AI has founded many ideas in modern and mainstream computer science including
 - Time sharing
 - Interactive interpreters
 - Personal Computers
 - Rapid Development Environments
 - The linked-list datatype
 - Automatic storage management



The Foundations of Artificial Intelligence

Computer Science and Engineering

Key concepts of **symbolic programming, functional programming, declarative programming, object-oriented programming.**

How can we build fast and efficient computer?

The Foundations of Artificial Intelligence

Control Theory

Control Theory helps the system to **analyse define, debug and fix errors by itself.**

Developing **self-controlling machine, self regulating feedback control systems and submarines** are some examples of control theory

Calculus and matrix algebra, and the tools of control theory, provide themselves to systems that are desirable by fixed sets of continuous variables.



The Foundations of Artificial Intelligence

Control Theory

Knowledge Representation, Grammars, Computational Linguistics or Natural Language Processing(NLP) are significant to developing AI applications.

How can artifacts operate under their own control?

The Foundations of Artificial Intelligence

Control Theory



The Foundations of Artificial Intelligence

Linguistics

Speech Recognition is a technology which enables a machine to understand the spoken language and translate into a machine readable format.

It is a way to talk with a computer, and on the basis of that command, a computer can perform a specific task.

It includes Speech to Text, Text to Speech

How does language relate to thought?