Artificial Intelligence & Knowledge Management

Gajendra Nayal

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ARTIFICIAL INTELLIGENCE AND KNOWLEDGE MANAGEMENT

INTRODUCTION TO A.I.

Introduction to Intelligence and Artificial Intelligence

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INTRODUCTION

Artificial Intelligence (AI) technology provides techniques for developing computer programs for carrying out a variety of tasks, simulating the intelligent way of problem solving by humans. The problems that humans solve in their day-to-day life are of a wide variety in different domains. Though the domains and methods are different, AI technology provide a set of formalisms to represent the problems and also the techniques for solving them. Different people working in this topic for many years have proposed different definitions. According to Rich, AI is the study of how to make computers do things at which, at the moment, people are better. It is observed that it is equally difficult to define human intelligence. Some of the essential activities associated with intelligence are given below:

(a) To respond to situations flexibly.

(b) To make sense out of ambiguous or contradictory messages.

(c) To recognize the relative importance of different elements of a situation.

(d) To find similarities between situations despite differences which may separate them.

(e) To draw distinctions between situations despite similarities which may link them.

Simulation of the above activities in a computer is difficult. Also, most of the above actions are used by engineers in carrying out tasks such as planning, design, diagnosis, classification, monitoring, etc. Hence, it is essential to look at them more closely in order to understand how they can be formally represented and used.

CHAPTER AT A GLANCE

Artificial Intelligence, otherwise known as AI, is the study and development of intelligent machines capable of performing complex tasks that require thought and behaviour normally associated with human intelligence. Computer programs are a common area of specialization in this branch of science. Artificial Intelligence adapts characteristics of human problem-solving skills and then applies them as algorithms easily comprehended by computer systems. Such systems are routinely and widely used today by hospitals, corporations, militaries and homes around the world.

Artificial Intelligence is the search for a way to map intelligence into mechanical hardware and enable a

structure into that system to formalize thought. No formal definition, as yet, is available for us to know what artificial intelligence actually is. Over the course of this section, we will try to formulate a working definition, reasoning and articulating facts and preferences of various other authors and practitioners of the field. To start with, we would think of the word artificial and intelligence as main sources of inspiration and come up with a brief description of the same as follows:

"Artificial Intelligence is the study of human intelligence such that it can be replicated artificially".

The demarcation of concepts true to the clauses for systems that:

- Think and act like humans
- Think and act rationally.

So, one would be tempted to improve upon the definition given above to include these facts into perspective such that the definition that we end up with says that:

"Artificial Intelligence is the study of human intelligence and actions replicated artificially, such that the resultant bears to its design a reasonable level of rationality".

SOME SIMPLE DEFINITIONS OF A.I.

There are numerous definitions of what artificial intelligence is:

"**Artificial Intelligence** is the study of how to make computers do things which, at the moment, people do better".

"**Artificial Intelligence** (AI) is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable".

In sight of the reflections on the decision-making processes, the following is a proposed **definition of artificial intelligence**.

"A machine's system of decision-making, created or not by human beings, that demonstrates certain intelligence, at least apparently, and has the characteristics of a vital impulse system."

We end up with four possible goals:

1. Systems that think like humans (focus on reasoning and human framework).
2. Systems that think rationally (focus on reasoning and a general concept of intelligence).
3. Systems that act like humans (focus on behaviour and human framework).
4. Systems that acts rationally (focus on behaviour and a general concept of intelligence).

We learn about the different definitions in the detail below:

1. "The art of creating machines that performs functions that require intelligence when performed by humans". Involves cognitive modeling – We have to determine how humans think in a literal sense (explain the inner workings of the human mind, which requires experimental inspection or psychological testing).
2. "GPS – General Problem Solver" (Newell and Simon). Deals with "right thinking" and dives into the field of logic. Uses logic to represent the world and relationships between objects in it and come to the conclusions about it.
3. Turing defined intelligent behaviour as the ability to achieve human-level performance in all cognitive tasks, sufficient to fool a human person (Turing Test). Physical contact to the machine has to be avoided, because physical appearance is not relevant to exhibit intelligence. However, the "Total Turing Test" includes appearance by encompassing visual input and robotics as well.
4. The rational agent – Achieving ones goals given one's beliefs. Instead of focusing on humans, this approach is more general, focusing on agents (which perceive and act). More general than strict logical approach (i.e. thinking rationally).

DEFINITION BY ELAINE RICH

According to Elaine Rich – "Artificial Intelligence is the study of how to make computers do things, at which, at the moment, people are better."

According to the definition: The computer does better things as compare to human and *vice-versa*. Thus, the basic factor of the computer is better than human as follows:

- To save the time and given a better computational result according to the condition which is define in a machine.
- To store the information in an infinitive time.
- Computer can easily done repetitive tasks as compare to human.
- Multitasking is a possible way to calculate multiple operations in the same time.

On the other hand, the basic factor to show the ability of human better than computer as follows:

- To understand the real world problem and given a solution.
- To analysis the behaviour of the system.
- To give the answer in common reasoning.
- To get the result when available information is inconsistent or in a incomplete manner.

Artificial Intelligence is already used to automate and replace some human functions with computer-driven machines. These machines can see and hear, respond to questions, learn, draw inferences and solve problems. A.I. refers to machines that will be both self-aware and superhuman in their intelligence, and capable of designing better computers and robots faster than humans can today. Such a shift, they say, would lead to a vast acceleration in technological improvements of various kinds.

AI has produced many significant and impressive products even at the early stage of development. Although no one can predict the future in detail, it is clear that computers with human-level intelligence (or better) would have a huge impact on our everyday lives and on the future course of civilization.

DEFINITION BY BUCHANIN AND SHORTLIFFE

According to Buchanan and Shortliffe – "AI is the branch of computer science that deals with symbolic rather than numeric processing and non-algorithmic methods including the rule of thumb or heuristics instead of algorithms as techniques for solving problems".

AI research follows two distinct and to some extent competing, methods, the symbolic (or "top-down") approach, and the connectionist (or "bottom-up") approach. The top-down approach seeks to replicate intelligence by analyzing cognition independent of the biological structure of the brain, in terms of the processing of symbols-whence the symbolic label. The bottom-up approach, on the other hand, involves creating artificial neural networks in imitation of the brain's structure-whence the connectionist label.

Symbolic processing *vs*. Numeric processing: We generally know and use 125 as a number which has a definite relation with the number 75 (than of greater than like as 125>75). However, if the numbers mentioned the number 125 denote the roll no. of the student or house number of residential colony than none of the relations or operations mentioned above, may held.

On the other hand, Hexadecimal number system represents digital number into the non-digital character sequence (like as A-10, B-11... F-15).

The basic difference between symbolic processing and numeric processing : Numeric processing done by a small number of well defined relations and operation having universally truly. On the other hand, Symbolic processing totally depends upon the problem.

For example, we show the relationship of two persons through age. So we can use the symbolic processing like as less than, more than operator. On the other hand, if we solve any mathematical calculation, we can use the numeric processing like as +,-... so on.

The weakness of numeric processing: It can only perform numeric computation i.e. a number of floating point computation to be made and the resulting numbers displayed.

A formula or set of steps for solving a particular problem. To be an algorithm, a set of rules must be unambiguous and have a clear stopping point. Algorithms can be expressed in any language, from natural languages like English or French to programming languages like FORTRAN.

We use algorithms regularly. For example, a recipe for baking a cake is an algorithm. Most programs, with

the exception of some artificial intelligence applications, consist of algorithms. Inventing elegant algorithms - algorithms that are simple and require the fewest steps possible – is one of the principal challenges in programming.

A solution of problem which can be defined as an algorithmic is called an algorithmic solution. Thus, algorithmic solution to use in numeric or symbolic processing as per as the condition of the problem. To solve that mathematical problem like as in algebra [set, relation function] we need to solve the problem to algorithmic solution. A problem that has at least one algorithmic solution is called a solvable problem.

Algorithmic *vs*. Non-algorithmic Method: The algorithmic approach to planning and scheduling requires that all possible permutations of the problem be thought out in advance, impossibility with problems which change with time as the environment around them changes. The algorithm is a crystallized and fixed way of doing things perhaps perfectly valid on the day it was conceived for the problem as then envisaged.

An algorithm often seems to be an easy way to automate a process, in that the algorithm "keys into" and appears to fit the problem. The outline of the algorithm can be quickly knocked up. Fleshing it out is usually not so easy. Putting the finishing touches on a scheduling algorithm may take hours of running and months of tweaking and tuning, while the process is slowly changing because of better techniques or different resources becoming available. The end result is either that changes to the process can't be permitted because the algorithm can't handle them, or the algorithm is constantly being worked on and revised to keep it up to date, or junked in favour of restarting from scratch.

The Non-Algorithmic approach embeds the logic of the application in the scheduling machine, not in an algorithm where it can only be changed with difficulty. The logic arises naturally from the way that elements are linked together, the elements themselves containing their own logic.

It is a well known as **alternative to algorithmic methods**. The site is divided into three sections: The first one contains technical information about the neural networks architectures known, this section is merely theoretical, the second is set of topics related to neural networks as: artificial intellignec genetic algorithms, DSP's, among others.

Heuristic: Refers to experience-based techniques for problem solving, learning and discovery. Heuristic methods are used to speed up the process of finding a satisfactory solution, where an exhaustive search is impractical. Examples of this method are using a "rule of thumb", an educated guess, an intuitive judgment, or common sense.

Here are a few other commonly used heuristics:

- If you are having difficulty understanding a problem, try drawing a picture.
- If you can't find a solution, try assuming that you have a solution and seeing what you can derive from that ("working backward").
- If the problem is abstract, try examining a concrete example.
- Try solving a more general problem first (the "inventor's paradox": The more ambitious plan may have more chances of success).

Currently, the most well known area of AI research is expert systems. Concepts from AI when applied to solve specialized problems came to be known as expert systems. These contain both declarative knowledge and procedural knowledge to emulate the reasoning process of human experts.

Buchanan and Shortliffe [1984] suggest that a good expert system must be useful, usable, educational when appropriate and able to explain its advice, respond to simple questions, learn new knowledge and easily modified tasks.

Therefore, we infer that a good expert system should provide the following:

(a) Expertise when a human expert is not available.

(b) Expertise more uniformly and rapidly.

(c) Perform the duties of the assistance to the expert in making decisions that involve many interacting complex factors.

(d) A repository for currently undocumented expert knowledge and procedure, and