

# Logical Foundation Of Artificial Intelligence Systems

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## Abstract:

The current time is described as the time of technology by excellence, due to its rapid and unlimited spread in various fields, based on the manifestations of technology that prevail and y on dominate all aspects of our life in general, to present artificial intelligence as an alternative that humans rel in many of their actions. Which was produced by contemporary technological sciences to provide us with computer theory "according to what is called computer science, whose goal is to create intelligent systems that require logical symbolic formulas that are used as programming languages, through which problems and dilemmas can be solved that require a simple and complete algorithm equivalent to the logical conclusion that can be used by artificial intelligence as a representative In digital computers, how far has his research advanced and how has logic formed the basic tools and methods for its applications?

**Keywords:** artificial intelligence, logic, programming languages, digital computers

## Introduction:

The world is living in an era guided by digital technologies in a way that has changed the nature of our lives, our human relationships, our commercial transactions, and the way get information and the speed of sharing it with others. From the standpoint of the general climate of this present time and the acceleration of its sciences in order to provide the means of success and well-being to the person of this age, and to relieve his suffering by providing what benefits him and raises his Likewise, artificial intelligence show us as one of the most important of knowledge that demonstrates the proof of the logical, and even philosophical, role of technological fields development, represented by the construction and development of computers with the ability to perform intelligent tasks in various fields, as it is considered an attempt by William Stanley Jevons W.S. Jevons (1835.1882) is one of the important steps in the history of logic machines,

This English logician and economist presented the first practical model of his logical machine [represented by something resembling a piano in a vertical

position, not horizontal, and containing wooden pieces on which are fixed the letters of the alphabet and symbols for the logical association and the separator, all of which are in a specific order in a way that is easy to move by hand. Thanks to this machine, you can reach to the possible combinations of terms that constitute any number of premises,

Jevons developed his design for his machine in 1869, and spoke about it in a lecture he gave before the Royal Society. He presented the machine to the members of this society on January 20, 1870<sup>(1)</sup>

If we know that the beginning of the work was in this way and that the first argument about computers was presented in 1948, we will know that what Jevons presented was at the top of the designs. Many scientists presented and developed Jevons' work.

Alain Marquand designed an electrically operated machine in 1885

T.A.Kalin and W.Burkhard from Harvard presented the first design for an electric computer brain, *Electric computers* 1937, to solve Boole algebra equations that have up to twelve variables. These designs are considered the first nucleus in designing and building the computer that we use now in various aspects of life.

1-Mahmoud Fahmy (Zidan): 1989, *Symbolic Logic, Its Origins and Development*, University Youth Foundation, Alexandria, Egypt.

Therefore, the mechanism of logic and its having of many symbolic languages, as well as many inference mechanisms, is one of the things that most attracts the attention of computer scientists in general and artificial intelligence scientists in particular, considering logic to be the best way to achieve the desired goals of these sciences.

While defining the epistemological problems in artificial intelligence, J. McCarthy<sup>(1)</sup> stated that the most difficult problem is how we can express rules that give the effects of actions and events when they occur simultaneously ?

That is, in common sense reasoning, the individual often decides what he does through the results of his various actions that he can do at the same time, and therefore he should use the same practical smart programs.

But how can this constantly changing knowledge and results be expressed within a system that is both monotonous and precise at the same time ?

That is, within a deductive system ?

To address this proposition, we adopted the critical analytical approach based primarily on the mechanisms of logical analysis in discussing this problem,

according to the logic of reason, analysis, and criticism, and on inference, conclusion, and comparison between multiple logical systems. Therefore, this does not prevent us from using the comparative and historical approach in some parts of the research.

What do we mean by the term artificial intelligence (AI):

It is one of the prevailing concepts of our time,

Artificial thinking simulates human mental processes. It is considered one of the basic branches of computer science, characterized by computer programs that work to simulate human mental abilities and their work patterns.

The term can also be considered controversial due to the lack of a specific definition of intelligence.

In general, its origins go back to 1956 with John McCarthy

The term Artificial Intelligence is based on the engineering and manufacture of smart machines.

That is, systems or devices that speaks by human intelligence to perform tasks

1- John McCarthy (1927-2011), professor of computer science at Stanford, has been interested in developing systems that demonstrate the level of artificial intelligence since 1948. He coined the term artificial intelligence in 1955 and called him the father of artificial intelligence. He invented the first programming language for symbolic computing, "LISP." He is credited with He established the two main centers for artificial intelligence research in the United States, namely "MIT" and "Stanford." His main contributions to the field of artificial intelligence were through common sense reasoning, and he was a pioneer in that, especially non-monotone reasoning. He won many awards, such as the Turing Award and the Excellent Research Award. He holds honorary doctorates from several universities, such as Sweden, Madrid, and Canada.

Which can improve itself based on the information it collects, and in building models of programs that translate human thinking into solving its problems and is considered an attempt to understand human intelligence and cognition.<sup>(1)</sup>

In recent years, artificial intelligence has witnessed amazing progress that has produced inventions that we never imagined would be possible

Computers and robots have become able to learn how to improve their performance and even make decisions.

This is done according to pre-programmed algorithms and without any individual conscience emanating from a knowing self.

This leads us to ask some questions, including:

Can a machine think ?

Is it possible to formulate knowledge formally?

What are the capabilities of artificial intelligence at the current stage of its development and how independent is it?

What about human control in all of this?

Artificial intelligence is more related to the ability to think superiorly and analyze data than to a specific form or function

Although it presents images of high-performance, human-like robots taking over the world, it does not aim to replace humans.

Rather, it aims to significantly enhance human capabilities and contributions

Which makes it a very valuable business asset?

For the knowledge industry in it to be a product of technical development that is catching up and accelerating in electronic computers and their uses,

Even if computers were designed to process and operate data very quickly or with high accuracy and for a long period of time and efficiently in managing data and transforming abstract formal theories into applied images represented in realistic, practical models (artificial intelligence models)

1- Saad Abdel-Wahhab (Al-Shaabani): 2008, Electronic Devices and Systems in Smart Computers, Dar Ghaida for Publishing and Distribution, Jordan.

It is the one who taught us how symbols can work through machines and it also deals with pictorial symbols.

This is all through embodying languages and multiple logical tools in the form of real machines that humans use in their daily lives.

The relationship of logic by artificial intelligence:

The relationship between them is part of a broader and more general relationship that brings together mathematical-symbolic logic and computer science, and this relationship dates back to the year 1869, the year in which Jevons presented his logical machine, which was the nucleus for the innovation of the computer later.

[ It represents the practical aspect of regionalization]

As for computer scientists, they turned to logic to use it and its theories in 1937

This is the year in which engineer Claude Shanwron presented a master's thesis on the possibility of applying ideas from mathematical-symbolic logic in the field of electronics.

Where he explained that electronic circuits must be analyzed into logical procedures

Such as connection (and), separation (or), negation (no), inclusion, and true and false (the duality of one and zero) .

In order to determine the general features of the relationship between logic and the computer, we can highlight the features of this relationship through two main components of the computer:

A - Hardware or physical components

B- Software

The first component is "hardware".

In its physical design, the computer is based on the use of logical constants revealed by symbolic logic

Such as linking, separating, plundering, and conditioning<sup>(1)</sup>

.1Mahmoud Fahmy (Zidan): 1989, Symbolic Logic, Its Origins and Development, University Youth Foundation, Alexandria, Egypt.

Logical constants are only one aspect of the logical creativity left behind by the founders of symbolic logic

Among them is George Boole, who classified symbols according to their function.

So that these functions can be expressed with symbols similar to algebraic symbols, and thus subjected to calculation,

He achieved the creation of a special type of algebra, which is a formal calculation and is not linked to any specific interpretation.

With this revelation, which served as a clear opening for electronic scientists in general and logic circuit scientists in particular ?

If the cell is the building unit of a living organism, then logic circuits can be considered as pictorial symbols that are the building unit of any electronic device.

Based on logical circuits, computer scientists were able to build computer hardware starting from the first generation in 1948 at the beginning of its

appearance, whose development took a path of several qualitative shifts symbolized by the four generations.

The decisive factor was the change that occurred in the physical component and the logical circuits specifically - used in building the CP4 central processing unit<sup>(1)</sup>.

This is the case with computer hardware with logic,

As for the software side, he was no less fortunate.

Its many fields, starting from data base management, through organizing programming languages, all the way to artificial intelligence, all of which are derived from symbolic logic as formal knowledge.

Bonnet made this clear when he stated:

1- Ali (Nabil): 1994, Arabs and the Information Age, World of Knowledge Series Magazine, April Kuwait Issue

When an artificial intelligence researcher begins to build databases, he stores data by classifying it on the basis of logical and intellectual relationships and the similarity that exists between them.<sup>(1)</sup>

Although computer technology is the product of centuries of scientific progress,

The emergence of calculating machines, I think, requires a kind of cognitive break with the machines of ancient times, in the words of Gaston Bachelard,

The emergence of calculating machines is not a cumulative continuation of the path of machines or a modification of it.

Rather, it is a leap of the human mind

The more he understands a stage and looks forward to more challenges.

Although it is difficult to determine an exact date linking logic to artificial intelligence, it is possible to make the date 1959 the date of this connection.

This is the year in which John McCarthy published an article entitled "Programme Withe Common Sense".

He explained the necessity of using logic to represent knowledge within artificial intelligence programs

And also learning how we should think<sup>(2)</sup>

By closely following the above, logic can be considered to have proven in practice to be the ideal tool for implementing complex tasks in artificial intelligence.

Perhaps this is what pushed artificial intelligence scientists towards logic itself

Because of their awareness of the close proximity between the subject of the two fields

It is the human mind and how to find mechanisms that will make this mind work properly.

1- Alain (Bonnet): 1993, *Artificial Intelligence: Its Reality and Future*, translated by Ali Sabri Farghali, World of Knowledge, Kuwait.

2- Maccarthy.J.1988.Mathematial Logic in Artificial Intelligence In Graubad S,R (ed) the Artificial Intelligence Dabcte the Mit Press. Cambridge

Especially if it is embodied in computers, which are nothing but symbolic systems embodied in a formal theory of mental performance.

This brings us to talking about the nature of the relationship between logic and artificial intelligence.

### **The nature of the relationship between logic and artificial intelligence:**

It shows the relationship between variables in influence and being affected.

The dependent variable is subject to multiple influences, including when controlling the variable, whether it is independent or dependent, and when conducting experiments on it.

The points of similarity and commonality in goal and approach are established and undeniable.

What should be focused on is the foundational role that logic plays in various artificial intelligence systems.

This relationship can be considered fairly stable.

The history of artificial intelligence did not marginalize or dispense with the role of logic, considering it one of its basic pillars

It is the most appropriate tool for dealing with various issues.

His scientists and theorists, such as: John McCarthy J. McCartty, Patrick Hans P. Hayes, N. Nelson, and Shapiro S., viewed logic as the heart of artificial intelligence.

With it, intelligent computer programs are designed to think

it solves any problems presented to her

According to the use of logic languages without reference to consideration

Whether or not this is how humans actually think,

These languages depend on and include many formal systems

Which makes the process of logical deduction the pivotal process in artificial intelligence?

Kowalski and Partridge also make a number of strong statements about the role of reason

Among them is his saying: There is only one language valid for expressing information, which is the language of predicate logic.

He does not know the problems that artificial intelligence researchers must find a solution to, as much as he knows the optimal solution to these problems, which is "logic".

Therefore, there are multiple roles that logic plays in artificial intelligence, according to the multiplicity of intelligent systems.

Hardly any intelligent system is devoid of a logical fingerprint that proves its value and strong presence. Artificial intelligence scientists relied on two basic elements while applying logic in their field.

They are: - symbolic logical language and - inference mechanisms,

In order to investigate the value and role of these two elements, we find that logic has provided a great service to artificial intelligence by inventing logical systems.

Which contains within it multiple logical languages and reasoning mechanisms?

So it is according to mathematicians and logicians such as: Alan Newell, Herbert Simon...

They emphasize the hypothesis that digital minds and computers are nothing but logical symbolic systems

In 1955, they discovered that a group of small units called bits or bytes is a group of contiguous binary numbers that electronic computers consider as a unit.

It is usually shorter than a word

The digital computer processes them, which can replace numbers, elements or attributes from the real world. In addition,

Programs can be used as rules to represent relationships of these symbols,

Therefore, the system can infer other facts about the represented subjects and their relationships .

If we look at intelligent programs, we will find that they represent information related to the limits and nature of the problem to be solved through logic languages.

It also uses logical reasoning to decide what actions are most appropriate to achieve its goals.

In addition, these programs need an accurate language to represent knowledge

At the same time, it must rely on an accurate idea

About "How we think"

How can new formulas be simplified from old ones in a way that resembles and approaches the human way of thinking?

In addition, to the participation of logic in the representation of knowledge

This is called the "preparation phase" of smart programs.

With the participation of logic in the operation of these programs through multiple reasoning mechanisms and ways of thinking

This is what we can call the "implementation phase".

There is also an intermediate stage between them in which logic plays an important role, which is the programming stage

In which logically represented knowledge is introduced,

As well as all the inference commands of the intelligent program to the computer,

So that the program can accomplish the task required of it

This is done through programming languages

Based on the above, the logical roles in artificial intelligence can be divided into three roles:

The first: It consists of using logic as a direct and effective technique for representing knowledge

This is despite the fact that there are other methods used for the same purpose,  
The second is to consider logic as a source of multiple types of thinking.

In addition to the common pattern of logical thinking in the past,

As well as the use of multiple logical reasoning mechanisms in different programs,

Third: Logic contributes to the design and construction of many programming languages

The most important of which is the logic programming language “Prolog.”

If we return to the first stage, we find that symbolic logic did not realize its subject in the precise sense for the first time clearly and precisely define its program except with Leibniz (1646-1716).

He felt the need for a general scientific language for scientists to use as a means of understanding among themselves, which he called the universal language.

He uses symbols instead of words

In addition to alerting the need for a mental calculation through which we can think mathematically<sup>(1)</sup>

1. -Abdel Rahman (Badawi): 1968, Formal and Mathematical Logic, 2nd edition, Egyptian Nahda Library.

With the emergence of artificial intelligence and its scientists realizing an important fact that a person deals with a problem “intelligently” as a result of the information he has about it.

And information about the surrounding environment

To understand the circumstances associated with this problem

And also the experiences that he acquired before to use in his dealings with her,

With this information collection, in addition to using his mental abilities

This information turns into knowledge-

It may be complete or it may be incomplete.

With this problem, through which he arrives at the “smart solution”

“As long as the goal is to simulate the human mind to achieve artificial intelligence”.

Computers must be provided with a huge wealth of knowledge, which by its nature is contained in free linguistic forms

It also enables her to deal intelligently with the problems she faces,

This is what makes us stop at what artificial intelligence scientists stopped at when they became aware - as Leibniz did - of ambiguity and ambiguity.

And even redundants found in natural language

Which makes its use in the knowledge representation process impossible?

Based on the above, artificial intelligence scientists began searching for an alternative language

More transparent artificial language

It is characterized by extreme accuracy and brevity

They only found the language of logic, which in their view is a formal language

They are languages that can be recognized using regular rules based on precision and rigor (Partridge.1991.P46).

This is what was actually done by rereading the logic

Or regions, in the expression of the late Mahmoud Yaqoubi, and his concepts, with a new contemporary outlook that is in line with the development taking place in all sciences.

Logic now does not have a single language, but rather a number of languages.

Each of his theories has its own language.

However, the most famous logical languages used to represent knowledge are Propositional Logic and Predical Logic.

Together they form what is called “computational logic”.

Or computer processing of logical thinking,

Certainly, propositional logic and predicate logic were not the only ones applied in artificial intelligence as languages for representing knowledge

This is despite the precedence and privacy that these two languages enjoy

However, there are many other languages that are considered an extension of it and mobile logic in particular

The most prominent languages are:

Model Logic,

TemsLogic

Many-Valued Logic.

This does not mean that using logic to represent knowledge is the only way to do so.

Just as no one has succeeded in giving a single programming language design for all computer applications,

Also, no one has been able to design a typical form to represent knowledge in artificial intelligence programs.

The strength and effectiveness of the way in which knowledge is represented is measured in its ability to accurately express complex and thorny situations.

And the extent of its ability to represent the interconnection between issues and things <sup>(1)</sup>

1- Alain (Bonnet): 1993, Artificial Intelligence: Its Reality and Future, translated by Ali Sabri Farghali, World of Knowledge, Kuwait.

### **Logical thinking styles:**

The interest of artificial intelligence scientists in studying logic and its applications came as a result of its enormous potential and capabilities in solving complex and difficult problems.

In an abstract rational way,

They use its languages and tools to represent knowledge that addresses these problems

This is on the one hand, and on the other hand, finding logical solutions to these problems

This approach came from the premise that artificial intelligence and logic study the same subject, which is “thinking.”

This is what Boden presented when he considered logic to be the standard model for both human and mechanical thinking (Boden.1990.p488).

Therefore, thinking is the foundation and first foundation of artificial intelligence.

As the daily action of the human race,

In order for artificial intelligence researchers to develop computer thinking, they must know how humans think?

But the flexibility and constant change of everyday thinking is not understood consistently and correctly, except for one pattern, which is logical deduction.

So that logic is the perfect alternative to compensate for the lack of tools that help understand thinking patterns,

Despite all that he presented, with the passage of time, new problems related to thinking began to unfold before artificial intelligence researchers, which showed that logic with the familiar and traditional style of thinking cannot deal with such problems.

### **The traditional logical thinking style has its limitations, including:**

1-It is a strict and categorical logic that only deals with ones and zeros

It is binary value logic

It does not deal with flexible (non-monotonic) thought, i.e. [truth and falsehood, right and wrong].2-Logic only deals with the act of being in the present state.

This is implicit in our Arabic language

It is not possible to express the phenomenon of time in language except in terms of the connection with the tense of the verb

Its past and present tense include the event tense, past, present and future.

Or in terms of the internal temporal structure of the action itself, such as starting the action, finishing it, repeating it, continuing it, and so on <sup>(1)</sup>

Despite these obstacles and limits

(Limitations)Imitations

However, artificial intelligence scientists did not stop there, but rather took the initiative to invent new logical thinking patterns that could represent such phenomena in order to find solutions to them.

They also served as incentives and warning signals for the regions themselves.

There are multiple logical thinking patterns within artificial intelligence

The most prominent ones were:

Fuzzy Logic

As well as Common Sense Reasoning

And the logic is not monotonous....

**Flexible logic thinking style:**

It is a stage of processing that deals with approximate inferences, modeled by Multiple-Valued Logic

It is a research paper presented by Lotfi Zadeh, an American engineer of Azerbaijani origins, in 1965.

About mysterious groups,

- 1- Ali (Nabil): 1994, Arabs and the Information Age, World of Knowledge Series Magazine, April Kuwait Issue

It is worth noting that the creator of this type of thinking is neither logical nor linguistic

Research into flexible logic at its beginning had a geometric-mathematical tendency.

While its philosophical foundations are still under research and study

The creators of this logic claim its ability to represent ambiguous meanings in natural language, and research is being conducted in artificial intelligence on its use in representing knowledge as it is in nature.<sup>(1)</sup>

Therefore, it is a logic that deals with approximate, not precise, thinking.

The latter studies the extent to which elements belong to a group

The results are expressed as a membership degree function that has real values within the domain  $[0,1]$

The traditional values of honesty are no longer sufficient to deal with issues and situations that involve varying degrees of judgment, such as medical diagnosis, lengths, sizes, etc.

Therefore, there was a need for a flexible logic that overcomes this logical rigor

In addition, there is a lot of research in artificial intelligence related to the use of flexible logic in representing knowledge related to the real or external world

Essentially simplifying our lives through its systems that help us save time and take on difficult and tedious tasks.

1-Elkan.C.1996 Fuzzy Logic In.D.M.Borchert (Ed) the Encyclopedia Of Philosophy. Supplement.Macmillon Reference Newyork VOL3

### **Common sense thinking style:**

“Common sense is a set of principles common to all minds.

It is a way to judge people's behavior as right or wrong without awareness of the logical premises that require training <sup>(1)</sup>

An example of common sense is our awareness that real objects that fall do not make a sound

The eye is in the front of the head

And the tears fall in drops

While rain falls, showers or torrents

The redness of a hot iron differs in meaning from the redness of the cheek <sup>(2)</sup>

Common sense thinking is another type of thinking

This is in addition to the previous modes that the machine should be equipped with in order to increase its efficiency in dealing with different situations.

Common sense thinking stems from logical thinking

So it benefits from logic

His knowledge cannot be complete unless it is placed within its logical framework.

Therefore, logical systems will remain an important and necessary element in artificial intelligence

But the question remains and is urgently raised

How can a machine understand and deal with these patterns of thinking ?

Is there a mechanism to program artificial intelligence systems according to such patterns?

This question makes us to talk about another dimension of logic in artificial intelligence

It is called an "inference engine."

1. Murad (Wahba): 1979, The Philosophical Dictionary, 3rd edition, New Culture House, Cairo

2. Ali (Nabil): 1994, Arabs and the Information Age, World of Knowledge Series Magazine, April Kuwait Issue

Once you have built a knowledge base by representing the knowledge needed to solve a problem,

It begins with the stage of building control programs to help process the knowledge within the base, which represents the basic part of any intelligent system for the purpose of reasoning and making the appropriate decision to solve problems.

This program is a logarithm that controls some logical deduction processes

It is called the "reasoning machine".<sup>(1)</sup>

The search mechanism is based on sorting, arranging, and selecting appropriate rules and facts stored in the knowledge base

This is all within the machine program

In order to achieve a solution to the problem using information and data related to the problem presented to the smart system<sup>(2)</sup>

In addition, there are many laws, rules, and logical deductive principles that artificial intelligence uses in building the reasoning mechanism

Among them is the following law of proof, Modus Ponens, as a mechanism that helps in the process of proving or denying hypotheses

Thus it helps to conclude,

Let us conclude that knowledge representation is the field of artificial intelligence

Its mission is to study and build languages and tools to express knowledge of intelligent programs and infer representational knowledge

In practice, logic plays an important role in the history of artificial intelligence from its beginnings to the present day.

1. Mahmoud Fahmy (Zidan): 1989, Symbolic Logic, Its Origins and Development, University Youth Foundation, Alexandria, Egypt.

2- Abdel Hamid (Basiouni): 1994, Introduction to Artificial Intelligence for Computers and Introduction to Prologue, 1st edition, Alexandria Egyptian Universities Publishing House.

## **Logic and programming languages:**

Programming Languages represent the link between the human programmer and the internal details of the computer system.

At the beginning of the advent of the computer, programs were written in machine language

It is a complex task that only specialists can perform

It is necessary to have a precise knowledge of the internal details of the equipment.

In order for the machine to become easier to use, programming languages continued to move away from the machine towards the human user until they almost mimicked his natural language.<sup>(1)</sup>

Therefore, logic, through its symbolic language, is an essential component of many programming languages, whether classical ones or artificial intelligence languages.

We can understand Logico Programmai more clearly as the use of logic to represent problems.

As an approach to solving the problem together

With the use of appropriate evidentiary procedures for the effective and effective solution of these problems,

Innovative attempts to use logic as a declarative language for computers began at the end of the sixties of the last century

As there was a prevailing view at the time in the AI complex

Its content is that logic is declarative and very general, which makes its use in practical applications useful <sup>(2)</sup>

1- Abdel Hamid (Basiouni): 1994, Introduction to Artificial Intelligence for Computers and Introduction to Prolog, 1st edition, Alexandria Egyptian Universities Publishing House.

2-Hogger .C.J& Kowalski R.A1992. Logic Programming In Shapiro S,C (ed)Encyclopegia Of Artifical Intelligence Vol 1 john wiley & sons New York

### **-Prolog programming language**

The Prolog programming language is a basic model of logical programming languages

Prolog is an abbreviation for the term Programming in Logic, or programming with logic.

The basic idea of logical programming (with logic) arose-

Or programming a partial class of mobile logic at the beginning of the seventies of the last century, and many logicians and scientists, such as Huger and Kowalski, contributed to this through cooperation between Kowalski from the University of Edinburgh in Britain and Colmerauer from the University Of Aix Marseilles France.

By the end of the summer of 1972, the first version of the Prolog language was designed <sup>(1)</sup>

### **Logic gates as an implementation element:**

It is an element that implements a logical function

It means that with regard to basic logical operations and the logical functions that represent them, and in the presence of basic elements that represent them, which are logic gates.

Illustrative example:

For one integrated circuit divided by the number of logic gates, the following is given:

The theoretical representation of the logic voltage level indicates that 5 volts (5v) represents the state of logic 1,

Zero volt (v 0) represents logic state 0,

However, in practical applications, it is not possible to achieve voltage levels with such accuracy.

Logic circuits are designed so that voltages greater than 2.5 volts (v 2.5) represent the logical variable 1 and voltages less than 0.8 volts (v0.8) represent the logical variable 0.

1-Hogger .C.J& Kowalski R.A1992. Logic Programming In Shapiro S, C (ed) Encyclopegia Of Artifical Intelligence Vol 1 john wiley & sons New York

### **-Logic gate representation:**

I decided to represent the logic gate in electrical circuits through the electrical circuit in its analogue world

Where the logical gates in electrical circuits are represented by an electrical plug and a lamp, to be more clear and present in our reality,

Where the electrical switches symbolize the regional inputs and the light bulb symbolizes the logical output

Closing the switch means that the value of the logical variable at the input of the logic gate is 1

The opposite is true, meaning that opening the switch or plug means that the value of the logical variable at the gate is 0

As for the light bulb in the circuit, if it lights up, the logical output will be 1 at the output

If this lamp does not work, the logical value will be 0 at the output of the logic gate, as in the table below:

Electrical element	Physical condition	Logical condition
The condition of the switch or plug	1	closed
	0	open
Lamp status (outlet)	1	It shines
	0	It doesn't light up

So artificial intelligence includes two aspects:

One is cognitive

The other is exploratory

The cognitive aspect expresses the representation of the world through an image in which the solution to problems follows from the facts expressed in the representation

While the exploratory aspect expresses a mechanism that is established based on the fact that the information solves the problem and decides what should be done?

That is, when inference processes are actually carried out by solving the problem<sup>(1)</sup>

Maccarthy.J.1988.Mathematial Logic in Artificial Intelligence In Graubad -1 S,R (ed) the Artificial Intelligence Dabcte the Mit Press. Cambridge

## **Human creativity dominates artificial intelligence:**

The achievements and technologies that man offers resulting from his intelligence and creativity make him unique and distinguished with an exceptional specificity, given that creativity in itself is a breakthrough that dazzles everything around it.

We may encounter extraordinary, creative and exceptional people in any of the arts, such as music, drawing, poetry, prose, or even sports...

They leave their mark and permanent presence in their field of specialization.

According to Professor of Philosophy at the University of Constantine, Mohamed Jadidi, artificial intelligence, with all its developments and achievements, lacks uniqueness, unlike human intelligence and creativity.

Because it is a technology that relies on algorithms that process data in an automated manner, this puts us in a state of generalization

Meaning that the idea or product is available to everyone and everyone who controls the technology can create and access it or produce any of it based on the available applications.

But without the individual, subjective or personal touch that has always characterized the products of human creativity and been a condition for it.

Despite all the achievements and progress that artificial intelligence has presented and achieved in many, complex and precise fields, it has become a huge project funded by the giants of global companies, “the web”, for example, to replace human intelligence as a first step to be followed after that.

Making the digital entity replace the biological human entity,

Thus making artificial intelligence dominant and superior to humans,

However, with careful scrutiny and focus on the natural intelligence of man, we find that he is more superior and dominant due to his ability to renew and transform.

On the other hand, we note that artificial intelligence remains limited due to its absolute dependence on programming and the data placed in it.

Let's get to the idea that technology does not outperform human faculties

But he is the one who submits to it voluntarily due to the increasing reliance on the “technical” machine as it is considered the convenient and quick solution for accomplishing all his tasks as a reality we live in at the moment.

Fear from artificial intelligence has become an inevitability dictated by the circumstances in which we live, of tremendous speed and great development witnessed in all aspects of life.

This led to the disappearance of professions in the labor market in general, including the arts market and creative jobs.

### **Conclusion:**

The study proves the extent of relationship between logic and artificial intelligence.

It also demonstrates the multiple logical contributions that exist in artificial intelligence

The presentation shows the sequence of the logical role that began from the design stage of the smart system through the use of logical languages with high expressive efficiency.

This is followed by another stage, which is programming, in which logic, through its use as a programming language, introduces the required knowledge in order to build this system.

To conclude his role by building a reasoning machine through which thinking patterns and a number of laws and principles of reasoning are used to reach the desired goal.

One of the most important results revealed by this study

The truth is that computer scientists and artificial intelligence have dealt with the field of logic in order to invent and discover logical visions and theories

Enables them to confront and deal with the obstacles they encounter,

Flexible logic and common-sense, even non-monotonic logic, are the best proof of this.

To make it clear to us that logic is not limited to logicians alone

It would not have matured and developed unless it was linked to other research fields

The best example is linking logic to mathematics and the resulting studies and theories in mathematical-symbolic logic.

The examples are many and varied

Then comes relation between logic and artificial intelligence, and the resulting studies and theories that can be included in what is called “Logic of AI”.

The study also showed that logic is both the goal and the means for artificial intelligence.

The goal of artificial intelligence is to build intelligent mechanisms

Or, more precisely, building machines that think correctly

Considering that “the intelligent one is the one who thinks correctly”

If we know that the first definition of logic is “the science of correct thinking”

The first goal of artificial intelligence is to make the machine logical,

The means is its multiple symbolic languages

Its various inference mechanisms make it the main player in the process of building any intelligent system

Which confirms that logic was and still is the best means to achieve the goals of artificial intelligence?

Let us reach the conclusion that logic is the heart and foundation of artificial intelligence

When we review its fields, we will find that any intelligent system is divided into two parts:

Knowledge base

And the reasoning mechanism,

The first section: gives the logical representation of knowledge, which is the representation adopted in building the knowledge base in artificial intelligence systems.

As for the second section: Any intelligent system works through various rules and different inference mechanisms.

Finally, the various logical theories applied in artificial intelligence, especially in our present time, provide the greatest evidence of their effectiveness and their great role in them and in the rest of the other sciences.

It also warded off all the criticism and rejection that befell it, considering it to be dry, rigid, and useless science.

Without forgetting the necessity of returning intelligence to morality, as expressed by “applied intelligent morality”.

Ethical behavior becomes a competitive advantage in it,

It is an ethics that cares and deals primarily with results that are beneficial to humans

It is a horizon that could be the subject of discussion.

### **List of approved sources and references**

.1Mahmoud Fahmy (Zidan): 1989, Symbolic Logic, Its Origins and Development, University Youth Foundation, Alexandria, Egypt.

.2Saad Abdel-Wahhab (Al-Shaabani): 2008, Electronic Devices and Systems in Smart Computers, Dar Ghaida for Publishing and Distribution, Jordan.

.3Abdel Hamid (Basiouni): 1994, Introduction to Artificial Intelligence for Computers and Introduction to Prologue, 1st edition, Alexandria Egyptian Universities Publishing House.

- .4Abdul Rahman (Badawi): 1968, Formal and Mathematical Logic, 2nd edition, Egyptian Nahda Library, Cairo.

.5Alain (Bonnet): 1993, Artificial Intelligence: Its Reality and Future, translated by Ali Sabri Farghali, World of Knowledge, Kuwait.

### **List of approved magazines, periodicals and dictionaries:**

.1Murad (Wahba): 1979, The Philosophical Dictionary, 3rd edition, New Culture House, Cairo

.2Ali (Nabil): 1994, Arabs and the Information Age, World of Knowledge Series Magazine, April Kuwait Issue

.3Website: <http://jmc.Stanford.edu/general/index.html>

### **Authorized references in foreign languages:**

1-Edmund Husserl.1977La Crise europeennestradiation par

Ricoeur-ED Abien-paris

2- Maccarthy.J.1988.Mathematial Logic in Artificial Intelligence in Graubad S, R (ed) the Artificial Intelligence Dabcte the Mit Press. Cambridge

3-Hogger .C.J& Kowalski R.A1992. Logic Programming In Shapiro S,C (ed)Encyclopegia Of Artifical Intelligence Vol 1 john wiley & sons New York

4- Maccarthy.J. and Patrick.H 1981.Some Philosophical Problems From The Standpoint Of Artificial Intelligence. From Readings in Artificial

Intelligence. Edited BY Webber in Californio BL. and Nilsson NI Morgan Kaufmann pub Lishees

5-Elkan. C. 1996 Fuzzy Logic In. D. M. Borchert (ed) The Encyclopedia Of Philosophy. Supplement. Macmillon Reference Nowyourk VOL3

6-Gevarter. W. B. 1985. Intelligent Machines Prentice-Hell Inci New Jersey.