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Can Artificial Intelligence Truly Reason? A Philosophical and Logical Inquiry into Machine Reasoning

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Abstract

AI can perform functions such as language processing, decision-making, pattern recognition, and problem solving. It can also perform reasoning functions that are more complex. However, many still question whether reasoning performed by machines is actual reasoning, or just reasoning that has been simulated by various computations. This paper looks at machine reasoning through philosophy, logic, and computer science, which are all interrelated fields. Within the field of philosophy, it looks at reasoning and its components such as understanding and knowledge. It also examines the functions of reasoning like justification and intentionality. Within the field of logic, it looks at areas of formal inference, reasoning, epistemic logic, and structure functions of reasoning like rule-based and non-monotonic reasoning. Lastly, it examines the field of computer science on the basis of reasoning performed by AI systems through various functions like algorithms, knowledge representation, machine learning, and large language models. It argues that reasoning performed by machines is formal and functional reasoning. However, reasoning performed by AI lacks many components of human reasoning such as consciousness, and lived experience. Various intentional understanding components like self-reflective justification are also neglected. It argues that AI systems should not be viewed as substitutes for human rationality. They are reasoning systems that produce functional outputs bound by premised rationality.

Keywords: Artificial Intelligence, Machine Reasoning, Formal Logic, Philosophy of Mind Epistemic Logic, Computational Philosophy, AI Ethics.

1. Introduction:

Artificial Intelligence (AI) is well on its way to becoming one of the most remarkable phenomena in the world in the recent decades. Now, its application is in education, health

Can Artificial Intelligence Truly Reason? A Philosophical and Logical Inquiry... R.Raja, S.Umer, S.Islam & S.Naaz sciences, banking, accounting, law, media, transport, and creative arts, research, and countless other activities. An AI system has capabilities of data sorting, data generation, image recognition, decision making, information retrieval, problem solving, generating human-like responses, and many other things. As a result of this rapid growth, AI has grown beyond its initial domain of a computer science topic and has grown into a logical, philosophical, ethical, social, and moral issue. The relevant question is no longer about whether AI is able to produce an output that is correct or not, but whether that output embodies some form of reasoning, understanding, knowledge, and whether it involves a judgment of any sort [4-7].

There has been a considerable amount of debate about machine intelligence and philosophy. Turing proposed the now commonly known Turing Test in his 1950 paper printed in *Mind* that pivoted the philosophy discussions to observable characteristics as opposed to speculations of a machine's consciousness. His paper set a benchmark for the philosophy of AI and machine intelligence. As of now, most working AI systems still prompt more questions on intelligence and reasoning on a machine. Just because a machine is capable of a task or response deemed intelligent, does that mean the machine possesses reasoning?

This is an important distinction to make. Although reasoning is typically related to the structuring of a problem and justification of that problem through conclusion, thinking is much broader. Logic dictates that reasoning has to do with the accuracy of the conclusions and inferences, and computer sciences relate reasoning to the ability of a system to arrive at a conclusion through the construction and justification of an argument. However, philosophy relates reasoning to meaning, understanding, and epistemic responsibility [2, 8-10].

The Simultaneous development of symbolic AI placed predictive value on this issue. Newell and Simon postulated that the science of computing could derive value from an empirical study on symbols and structures and therefore placed symbolic manipulation at the core of the science of intelligent behavior [3]. The physical symbol system hypothesis, postulated by Newell and Simon, became a central part of the Newell and Simon study and postulated the idea that manipulative behavior could be ascribed to the manipulation of symbols. This idea draws a strong correlation of AI with formal logic as symbolic AI relies on structures, symbolic representation, and formal reasoning. Nevertheless, the main objection advocated by the researchers cited, is manipulating symbols according to prescriptive modal logic is not synonymous with comprehending the underlying meaning of that logical system [2, 11, 12].

Consequently, the branch of logic has effectively bridged the divide between philosophy and computer science. Logic is also applied to describe the intended form of intelligent behavior as well as in policy formulation, logical reasoning, and conclusion drawing from the proposed goals in the context of AI to manage uncertainty and logic systems, as well as to demonstrate intelligent mechanized behavior. The field of reasoning and intelligence deals with mechanized systems, non-monotonic systems, reasoning, and systems that deal with the theory of logical propositions in the context of Artificial Intelligence [22, 14, 13, 15, 16]. It is clear from the context that reasoning in Artificial Intelligence is essentially a programming problem that relies on knowledge systems and rationality.

The reason for the paradigm shift can also be placed on the need and have cited reasoning as a central tenet in the field of Artificial Intelligence. This is mainly because of the structures that include large language models, systems for reasoning and diagnosis, tools that provide intelligent systems with the ability to reason and the ability to draw conclusions, as well as explanation and support systems that pertain to reasoning [20, 19, 21, 18, 17].

This paper investigates the intersection of computer science, logic, and philosophy and asks if AI can reason. AI can perform formal, functional, and computational reasoning, but the author agrees AI cannot reason like human beings. Human reasoning is more than inferencing and includes consciousness, context, lived experience, justification, intentionality, and moral responsibility. Machine reasoning, on the other hand, is performed through algorithms, data structures, symbolic rules, and probabilistic models and involves recognition of patterns. AI cannot be machine reasoning, and the purpose of this paper is to articulate this distinction. The reasoning like computation of AI places it more in the realm of a sophisticated machine than a rational, human-like being.

2. Conceptual Background:

2.1 Meaning of Reasoning

Another concept that is central to computer science, logic, and philosophy is reasoning. Reasoning generally is about moving from given premises, observations, or beliefs to conclusions. Logic is focused on reasoning as it pertains to the validity of an inference, the consistency of the given propositions, and the relationships between propositions and conclusions. Between the two, it is deductive reasoning that is concerned with conclusions being the necessary results of the given premises; whereas inductive, and in particular, abductive reasoning, focus on the relationships of propositions comprised of premises that may not lead to conclusion, and propositions that explain, and even result from, the given premises in a situation defined by a high degree of uncertainty [13, 14, 17]. Reasoning is connected to meaning, justification, and intentionality in addition to truth and epistemic responsibility, all of which are the primary concerns of philosophy [10, 5, 2]. Reasoning is a primary concern of logic, and functions as a reflective mental structure which is of utmost interest to philosophy.

2.2 Intelligence, Reasoning, and Understanding

Intelligence, reasoning, and understanding are distinct concepts as far as a particular area is concerned. A broad categorization of an intelligent individual would include being able to learn and to adapt to and solve problems, perception, memory, planning, and decision making. Practical illustrations of an intelligent system and definitions of intelligence in the realm of computer science are strongly tied to tasks like language processing, visual recognition, searching, planning, and prediction, all of which are considered to be deeply cognitive, as opposed to reasoning, which is less cognitive and therefore far less complex [4, 14]. Reasoning, on the other hand, is an activity that is related to intelligence and, of all the mental abilities, is prescriptive and self-regulatory as shown in Fig. 1, human reasoning and machine reasoning differ in their foundational components and resulting outputs. A system may be perceived as intelligent, albeit in a very limited area of its operation, and yet the lack of reasoning capability would negate any philosophical depth. Understandably, this is very complicated.

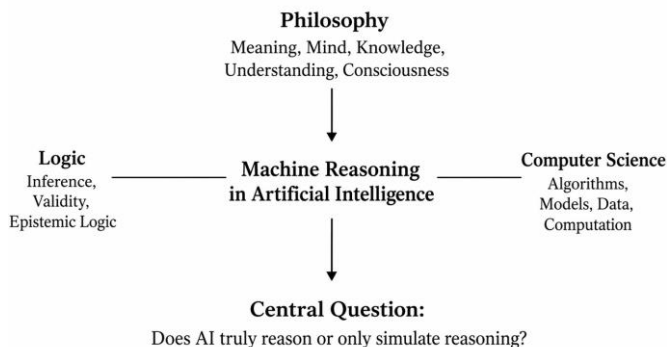


Fig. 1. Interdisciplinary framework of the study

It incorporates the meaning, context, significance, and consequences. This is part of why Searle’s critique of symbolic AI is important. A machine can accurately handle different combinations and sequences of symbols and yet not understand what the symbols represent. Similarly, Dreyfus demonstrated human intelligence is not fully reducible to the purely associative manipulation of symbols. Understanding cannot happen without the context and without the lived experience.

2.3 Linking philosophy, logic, and computer science

There are substantial connections between the three fields of philosophy, logic, and computer science, and this is the case in the study of machine reasoning. The case would include the questions posed by philosophy like: What is reasoning?

What is knowledge? What is understanding? Can machines possess beliefs or intentions? Are machines responsible in some way? It would include the questions posed by logic: What do we mean by inference, validity, and consistency? What is knowledge, and from what domain do we know it? Almost everything applicable to reasoning is nonmonotonic * [15, 16, 22]*. Almost everything applicable to reasoning is distributed among the formalisms of computer science. Information systems based on reasoning distributed among the formalisms of computer science that are based on algorithms, symbolic formal systems, machine learning, automatic theorem proving, logic-based expert systems, and reasoning-based systems. All three fields of study are interpreted as aspects of the mind that concentrate on reasoning. A logically, technically, and contextually meaningful account of reasoning in AI, assuming the absence of all three criteria simultaneously, is unacceptable. Purely technical descriptions are void of meaning and consciousness, and purely philosophical descriptions ignore the formal mechanisms of reasoning that AI systems deploy.

That being said, the conceptual lens of this paper centers on a layered perspective on reasoning. At the level of logic, reasoning is a formal relationship between premises and conclusions. At the level of computation, reasoning involves the implementation of algorithms, the construction of formal systems and the implementation of artificial intelligence. At the level of philosophy, the essence of reasoning involves justification, meaning, intentionality, and understanding.

This approach gives room to the idea that AI can execute both formal and computational reasoning, as well as engender doubt as to the existence of true human-like understanding.

Thus, the question is not really whether AI is able to mimic reasoning, the question is whether reasoning is tantamount to reasoning in the ultimate philosophical sense [1, 2, 8, 5].

3 Literature Review:

Artificial Intelligence and machine reasoning draw from highly intertwined traditions. The philosophy of machine intelligence sees machine reasoning through the lenses of formal logic, epistemology, and what is often referred to as the first generation of symbolic AI. The second generation of symbolic AI, which is often associated with the machine learning (ML) revolution, is especially concerned with epistemic clarity. Finally, it is important to understand the role of computational philosophy in the formulation of such a question, as machine reasoning is not a purely technical problem. It is the multidisciplinary intersection of logical and computational performance, reasoning framework, and philosophical thought of the machine.

3.1 Turing and Machine Intelligence

Modern philosophy of machine intelligence was born with Alan Turing's famous paper, "Computing Machinery and Intelligence," with him famously taking the first step in answering a more simplified version of the question posed by Turing, namely, whether a machine is able to think [1]. As opposed to answering the abstract question posed by him, Turing proposed to call a machine intelligent if the machine passes a particular test of ability (or a test of imitating a sufficiently intelligent being as proposed by Turing). The approach of Turing in responding to the question on whether a machine can think by the rather practical test of imitating rather than inferring the inner states of mental being (or thinking) of that machine or the ability of the machine to think has had a long-standing influence on the entire philosophy of machine intelligence.

Turing's influence on machine intelligence remains important in providing directions to the philosophy of machine intelligence. Nevertheless, his test of machine intelligence is not sufficient to provide an answer to a more abstract question of whether a machine understands. The abstraction drawn to that particular test by later philosophers, such as Searle, is that the ability of the machine to manipulate symbols and produce a response that is of the quality of the response that the machine is able to make, does not mean that the machine understands the logic behind producing it [2]. More recently, Dennett has suggested that complex systems can show intelligent behavior if they can be rationally or goal-directedly interpreted even if there is no lower reason for that [8]. The influence of Turing and all of his contemporaries show the ongoing duality: machine performance in a given task may be intelligent, but the machine may not possess the thinking (or understanding) necessary to be judged to be intelligent.

3.2 Logic and Artificial Intelligence

Logic is fundamental to the history of Artificial Intelligence. For the early AI researchers, the challenge of 'intelligence' was regarded as a problem of symbolic representation, rule application and inference, and search. In their models, Newell and Simon argued that one could account for intelligent behaviour via the construction of a physical symbol system, where symbols were manipulated according to formal rules [3]. The view expressed by the two researchers was the basis of symbolic AI and helped to establish a close relationship between logic and computation.

Formal logic provides AI with a number of techniques to represent knowledge, derive new knowledge, and assess the robustness and soundness of inferences drawn. Genesereth and Nilsson's study on the logical foundations of AI illustrates that formal systems can aid in the simulation of intelligent behaviour [13]. Nilsson has also argued that for AI to have logic, there has to be a structure for the representation, and soundness must be ensured [14]. Within this context, the AI researcher views the process of reasoning as a structural representation that is manipulated formally according to the rules of logic.

Nevertheless, to a large extent, classical logic is inadequate for the modeling of intelligence, as it is manifested in the real world. Intelligence generally is associated with a certain degree of uncertainty, information that is not complete, and reasoning that is context-dependent and involves exceptions. For this reason, reasoning in AI has usually focused on non-monotonic reasoning. The theories of circumscriptions by McCarthy and default reasoning of Reiter have attempted to capture the reasoning mechanisms that allow intelligent agents to make assumptions that can potentially be revoked when new information is presented to [15, 16]. These cases suggest that AI reasoning puts a premium on flexible, yet formal structures systems that can manage uncertain and incomplete knowledge.

3.3 Epistemic Logic

Epistemic logic seeks to understand machine reasoning, and it deals with knowledge, and information and belief states.

Traditional epistemology examines the definition of knowledge, analyses the justification of belief, and outlines the distinction of true knowledge from mere subjective opinion. Epistemic logic addresses all these problem domains by employing abstract operators for knowledge and belief and forms logical, formal and epistemic questions [23]. Because of this, it effectively answers any questions in the domain of artificial intelligence systems, as such systems will need to elicit the discriminate knowledge from the unknown, the belief from the learned, and the inferred from the remainder knowledge of the agent or agents.

In the domain of AI, the epistemic logic is convenient for the modelling of intelligent agents, multi-agent systems, planning, communication, and decision models. It gives the possibility for researchers to show statements such as "Agent A knows that proposition p is true" or "Agent B believes that Agent A knows p". Such formal tools are complementary to the knowledge of computer science, as AI systems will very often have to reason, not only concerning facts, but also concerning the knowledge that is available to other agents, and very often to themselves as well [24]. Dynamic logic deals with the logic of agents and the change of systems under new information, and the focus of this branch is the change of knowledge and the new information that is gained [25].

The merits that epistemic logic brings to this paper is the distinction that it creates between information and processes that are related to the epistemology or philosophy of information. An artificial agent or intelligent system may be able to store, organize, and retrieve information, but is incapable of true belief concerning facts, justification, and epistemic awareness. Goldman delineates the view on theories of cognition and epistemology in the relationship between both domains, and suggests that the processes that are used by agents in the information and belief systems, in particular justification and the clarity of truth, are the knowledge processes [10]. For these reasons, epistemic logic will aid

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in understanding in what areas AI may truly be associated with knowledge as opposed to the representation of knowledge in a formal and an operable framework.

There is also an abundance of literature on reasoning in AI that is organized into machine learning and symbolic AI.

What sets Symbolic AI apart is its focus on rules, symbols, and logic. It represents knowledge and understands intelligent behavior via symbol manipulation. Examples of this school of thought include expert systems and logic programming [3, 13]. Machine learning, on the other hand, is supposed to recognize and understand patterns learned by systems during training.

4. Methodology:

The methodology of the current study is obviously analytical and conceptual, and is based on elements of qualitative research. In this study, there was no opportunity for design-based empirical testing, survey creation, interviewing, and no opportunity for collecting field data and performing statistical analyses. In this paper, the problem of machine reasoning will be analyzed through the prism of (1) philosophical approach, (2) logical reasoning, and (3) programming (or, to be more precise, computational) reasoning. The main goal of the methodology is to define the conceptual boundaries of human reasoning and machine reasoning, and to articulate the conditions of the possibility of machine reasoning (or reasoning of AI systems) in a meaningful sense, if at all.

4.1 Conceptual and Analytical Method

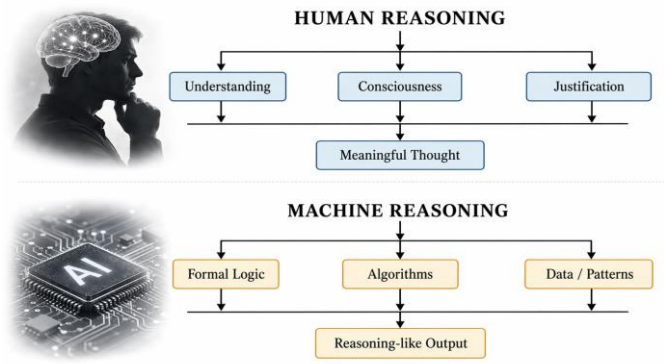
The major technique in this study is the conceptual and analytical method. The necessity for the conceptual method is due to the fact that the main problem of this study – whether Artificial Intelligence actually reasons – must be philosophical and thus, must be treated as such; it is probably not empirical. The study analyses fundamental philosophical, logical, and Artificial Intelligence theories on reasoning, intellect, comprehension, knowledge, and inference and justification [1, 2, 5, 14].

The nature of the analytical method is that it is aimed at drawing the distinctions between the notions of intelligence, reasoning, and understanding that are related to each other but, nevertheless, are not identical. It also enables the study to analyze whether reasoning carried out by AI systems should be deemed as engaging in reasoning, or should be regarded as reasoning – which is the product of a formal and computational process.

4.2 Comparative Interdisciplinary Approach

This study utilizes a comparative interdisciplinary approach. Within this study the author will compare human reasoning to machine reasoning and analyze using a framework that incorporates philosophy, logic, and computer science. Of course, philosophy will focus on meaning, mind, consciousness, knowledge, and understanding. In this analysis, tools such as inference and logical validity as well as epistemic and procedural reasoning will be utilized. Finally, the technical study of computer science, particularly pertaining to algorithms, models, the representation of knowledge, and symbolic and machine learning systems will also be employed [13, 15, 16, 4]. Because of the nebulousness of the reasoning of machines, this framework becomes even more necessary. A description that is purely technical will describe how certain AI systems compute outputs but will leave open the question as to whether the outputs themselves demonstrate some form of understanding

Can Artificial Intelligence Truly Reason? A Philosophical and Logical Inquiry... R.Raja, S.Umer, S.Islam & S.Naaz and/or rational judgment. Likewise, a description that is purely philosophical will pose various conceptual questions that will ultimately remain unanswerable without the



appropriate formal and computational mechanisms employed within AI systems. As shown in Fig. 2, human reasoning and machine reasoning differ in their foundational components and resulting outputs.

Fig. 2. Interdisciplinary framework of the study: comparison between human reasoning and machine reasoning.

4.3 Analytical Framework

The study uses a structured analytical framework to facilitate a comparison between human reasoning and AI-based machine reasoning. The framework identifies a range of dimensions along which reasoning of any kind may be examined, including: basis, logic,

Dimension	Human Reasoning	AI / Machine Reasoning
Basis	Conscious thought, experience, language, memory	Algorithms, data, rules, statistical patterns
Logic	Often informal, contextual, flexible	Formal, computational, probabilistic
Understanding	Meaning-based	Pattern-based or representation-based
Knowledge	Linked with belief, truth, justification	Linked with data, representation, retrieval
Error correction	Through reflection, experience, dialogue	Through training, feedback, updating
Context	Social, cultural, emotional, historical	Model-dependent and data-dependent
Moral judgment	Can involve values and responsibility	Requires external ethical programming or human oversight
Limitation	Bias, emotion, irrationality	Lack of consciousness and lived understanding

understanding, knowledge, error-correction, context, moral judgment, and limitation. These dimensions create a systematic structure for the comparison and help the study to discern the areas of convergence and divergence between human reasoning and machine reasoning.

Table 1. Comparative framework of human reasoning and AI / machine reasoning

4.4 Scope and Nature of the Study

This research is theoretical and not empirical. This is because the study of the status of reasoning in Artificial Intelligence is a research problem. It is not the focus of the study to find out the public opinion or user behavior and as a result it is the goal of the study to present the philosophical, and logical nature of machine reasoning. The study is therefore, an interpretive reading with conceptual comparison, cross-disciplinary synthesis of the related literature [8, 10, 20, 19, 21].

This method thus, shows the major claim in the paper. The claim is that AI systems can still do formal and computational reasoning. The claim shows that AI systems do not and cannot do reasoning as human do.

5. Human Reasoning and Machine Reasoning:

Human reasoning and machine reasoning are most informative when comparing the philosophical constraints and computational capabilities of Artificial Intelligence (AI). While strategizing, both human beings and AI move from derive conclusions to given conclusions, but the methodologies are quite different. Human reasoning incorporates consciousness, lived experiences, and the social context. In contrast, machine reasoning involves rules, algorithms, and patterns derived from data and a computational model [2, 8, 4, 5]. The therefore the crux of the problem, is not whether AI can produce accurate conclusions, but rather the process AI utilizes to produce its conclusions, can it be classified as reasoning in a philosophical sense.

5.1 Human reasoning as Conscious, Contextual, and Interpretive

Human reasoning cannot be simplified as a movement from premises to conclusions. It involves a conscious effort and it is a contextual and interpretive process. Not surprising, people reason using their language, memory, perception, and emotion. In addition to their, people also draw from their experience and self-reflection. Information processing therefore not only involves interpretation but meaningful expression with intention as well as context [2, 8, 9].

From the lens of reasoning, Philosophy involves justification, and the explication of a belief or idea in support of the construction of new knowledge. In the process of reasoning each individual constructs new knowledge in such a way that the knowledge support, and extend the previously acquired knowledge. An individual can draw their own conclusions and from those conclusions they are able to engage with constructs of reason and assess the validity and reliability of the evidence as well as engage in a debate of social and moral agency in reasoning.

Goldman posits that for the justification and formation of belief, the cognitive processes of individuals that justify belief are necessary elements that help evaluate information (Goldman, 1986). Therefore, for the justification of belief, human reasoning needs to go beyond what is formally valid and should also include the elements of judgment, responsibility, and an adequate epistemic state.

Human reasoning is contextual. Necessary meaning is brought to formal symbols in the case of the integration of appropriate social situations, cultural beliefs, emotional experiences, and other relevant practical situations where one stands. Taking the example of the statement 'I am fine,' the meaning of the statement may change in accordance with the response or tone, the context, the relationship, and the situation. A formal reasoning system could interpret the statement as a linguistic unit, but in a social context, a human

being interprets the statement beyond the formalism of symbols that maximize meaning with social and emotional interpretation. The inadequacy of relying on a formal reasoning system is one of the main points in Dreyfus' criticism of the theory that human intelligence and reasoning is nothing more than a system of a formal reasoning system based on symbols (Dreyfus, 1972).

Therefore, reasoning should be comprehended in the context of meaning, interpretation, and the integration of uniquely human elements such as self- reflection, self-awareness, and being judgmentally responsible. Reasoning should also be flexible, creative, and human enough to mitigate the potential for bias, and emotional and cognitive irrationality.

5.2 Machine Reasoning as Formal, Algorithmic, and Computational

Machine reasoning is formal, algorithmic, and computational. Machine reasoning in symbolic AI systems is based on symbols and formal rules. AI systems reason by processing inputs accordance to rules, patterns, and/or learned representations/statistics.

Newell and Simon argued that real intelligence must involve formal symbols demonstrated that manipulating symbols lies at the core of intelligent behavior. This theory greatly impacted the development of rule-based systems, expert systems, theorem provers, and even logic programming. Machine reasoning using formal logic on a set of rules and propositions is vital when developing the sup- ports needed to allow reasoning to take place. Many logics-based AI applications use basic and high-level reasoning to reach a conclusion. Within the bounds of formal logic, reasoning, and representation of a solution, Genesereth, and Nilsson show how one can begin to build systems that utilize basic artificial intelligence techniques. Nilsson also supports this notion and states that intelligent systems must possess some predetermined logic to facilitate the manipulation and representation of knowledge. Creating logic systems and operational structures to allow the reasoning part of a system is vital in the construction of an intelligent system that incorporates elements of manipulation and representation of knowledge of a given system. Machine systems are also reliant on formal logic systems. Many logics-based systems use basic and high-level reasoning to take in a set of propositions and reach a conclusion. These systems can compete in the market. Machine reasoning can use elements of representation similar to those of a human, but it is simply a machine reliant on predetermined logic and structures to testimony a system. This is a vital part of systems construction. Machine systems are reliant on predetermined formal logic systems. Many systems use basic and high-level reasoning to take in a set of propositions and reach a conclusion. These systems can compete in the market.

This is a vital 's consideration. Machine systems can take in elements of representation similar to those of a human, but they are simply machines relying on predetermined logic and structures. edge case.

The ability of an AI system to produce an explanation, answer a math question, or construct an argument does not entail comprehension of any of these activities. Bender et al. argue that, despite being able to produce fluent language, a lack of genuine comprehension underlies large language models because they can only produce outputs based on statistical patterning. Statistically based language models can produce outputs that appear fluent, but these outputs are not based on meaning. Further, let's note that the framework for reasoning that AI systems employ today is largely based on algorithms, statistical reasoning, and computational machinery [20]. [18] [17] [4] [19] [21]..

Machine reasoning also shares a few interesting points in comparison to human reasoning. Machine reasoning and human reasoning involve the gathering of knowledge, and informing the reasoning process, and drawing valid conclusions. Both types of reasoning can also employ different forms of reasoning, including deduction, induction, abduction, analogical reasoning and probabilistic reasoning. The domain of reasoning may differ, but the tasks performed by a human expert and an AI diagnostic system that involve the examination of the symptoms, detection of a discernible pattern, and the delivery of a plausible, and reasonable conclusion, is a good example of comparable machine reasoning and human reasoning.

The ability of reasoning is another aspect human and AI reasoning share. Humans may further the ability to reason through several different approaches, including education, dialogue, and even good old life experiences, while AI systems may be improved and fine-tuned by employing further datasets, or even improved datasets. Performance also becomes more accurate over time, but the systems of improvement differ. Both machine and human reasoning share the ability to err.

There may be some issues with human reasoning, such as; bias, emotion, social pressure, poor memory, and incomplete information. Machine reasoning issues relate to biased data, poor model design, lack of examples, hallucination, overfitting, or lack of contextual grounding [20, 18]. So, we cannot say either is perfect, human reasoning or machine reasoning, and both should be evaluated, corrected, and critiqued.

The most important difference between human reasoning and machine reasoning lies in consciousness and understanding. Humans are able to run their reasoning in a first-person sense. Humans are able to run their reasoning in a first-person sense. Humans, reflections, doubts, truth, revisions, beliefs, and judgments. In machine systems, consciousness, self, and xp are non-existent. Machine systems, unlike human systems, also have the capacity to run reasoning and generate outputs whilst also observing the meaning of those outputs [2, 5]. The other difference is intentionality. Human reasoning is directed toward the meaning, purpose, meaning, and end goals. Human reasoning is directed toward the meaning, purpose, meaning, and end goals. AI systems may be designed to optimize certain objectives, but, unlike human systems, the objectives of AI systems are not self-defined nor self-justified. The objectives of AI systems are those of their human programmers, users, and/or instructive training processes, thus implying an absence of intrinsic purpose or moral intention [8, 7].

There is also a contextual difference. Human reasoning is contextual on a social, historical, emotional, and cultural basis. Human reasoning is contextual on a social, historical, emotional, and cultural basis. The reasoning process is dependent on the data representation, formal representation, and ordered reasoning which is contextual on social, historical, and emotional levels. Machine reasoning, unlike human reasoning, is also able to improvise, but improvisation stems from unpredictability and lack of a final determinable outcome of a given reasoning process. This elucidates why AI is reliable for structured tasks, but falls short for those demanding common sense, moral reasoning, and physical understanding [12, 18, 17].

Human reasoning involves moral accountability. Unlike AI, which can never be morally praised, blamed, and questioned for a decision, human factors who incorporate AI into their decisions remain morally responsible. This is especially true for reasoning done in areas like

Can Artificial Intelligence Truly Reason? A Philosophical and Logical Inquiry... R.Raja, S.Umer, S.Islam & S.Naaz healthcare, law, education, governance, and public policy, for example, which are inevitably both technical and ethical [6, 7, 5].

The most salient, identified features of human reasoning vis-a-vis machine reasoning are organized in the following tables.

Table 2. Similarities and differences between human reasoning and machine reasoning

Dimension	Human Reasoning	Machine Reasoning
Nature	Conscious, contextual, interpretive	Formal, algorithmic, computational
Basis	Experience, memory, language, culture, reflection	Algorithms, data, rules, models, statistical patterns
Understanding	Meaning-based and lived	Pattern-based or representation-based
Knowledge	Connected with belief, truth, and justification	Connected with data, representation, and retrieval
Context	Social, cultural, emotional, historical	Data-dependent and model-dependent
Learning	Through experience, education, dialogue, reflection	Through training, updating, feedback, and optimization
Error	Bias, emotion, poor judgment, incomplete knowledge	Biased data, hallucination, model limitation, lack of grounding
Moral Responsibility	Human beings can be held accountable	Responsibility belongs to designers, users, and institutions
Main Strength	Meaningful judgment and contextual understanding	Speed, scale, consistency, and computational power
Main Limitation	Irrationality, bias, emotional error	Lack of consciousness, intentionality, and lived understanding

Human reasoning and machine reasoning converge at functional level and deviate at meaning level. Reasoning-like tasks, at times, can be accomplished by AI systems at an impressive speed and accuracy. Nevertheless, machine reasoning is still formal, computational, and externally focused. Unlike machine reasoning, reasoning is made by humans and is interpretive, conscious, and contextual and because of this accountable. From this thought, along the core proposition of the paper, reasoning like computational task is possible by AI, however, reasoning not yet being possessed by AI, is at the level of philosophy of person.

6. Logic as the Basis for Machine Reasoning:

Logic has always been one of the fundamental building blocks of machine reasoning. Reasoning in Artificial Intelligence means representing information, processing rules, drawing conclusions, updating assumptions, and assessing the relationship between propositions. Logic provides the form through which all activities can be represented and modeled in a computer. Regardless of the fact that modern AI frameworks predominantly use statistics, and machine learning principles, the logical approaches to machine reasoning

are fundamental to understanding machines and their ability to inference systems, explanation, and planning/verification, and represent knowledge. Therefore, a useful conversation on machine reasoning requires some understanding of deductive logic, rule-based inferencing, non-monotonic reasoning, and epistemic logic, coupled with the ability to represent knowledge.

6.1 Deductive Logic

One of the classic styles of reasoning is deductive logic. A conclusion in deductive reasoning should necessarily follow from the premises if the argument is valid. An example can be, 'All humans are mortal' and 'Socrates is human' leads to the conclusion that, 'Socrates is mortal'. This kind of reasoning is fundamental to machine reasoning, as it provides certainty of the answer given definiteness of the conditions. A deductive system doesn't make theories, but derives answers according to the formal rules of inference.

In AI, deductive logic is done theorem proving, formal verification, expert systems, planning systems, and logic programming. These systems rely on well- defined premises, rules, and inference mechanisms.

When a system has a set of propositions and a valid inference rule, it is capable of deriving a conclusion systematically and reliably [13, 4]. Deductive logic is, therefore, valuable in the fields of mathematics, legal reasoning, soft- ware verification, and safety-critical systems—areas in which the requirements of consistency, correctness, and traceability are critically important.

From a pragmatic perspective, deductive logic has its limitations, particularly in reasoning, which is mainly incomplete or inconsistent, or in dynamically shifting situations where not all relevant premises are given. Environments within classical deductive logic are systems with a finite set of premises and a given set of conclusions that are drawn from those premises. AI systems, by their nature, are designed to operate in a real-world open environment. In such environments, information that is system reported to or available within the systems is often incomplete or contradictory. As a consequence, the role of deductive logic in reasoning is primarily a foundational one, but it is not truly sufficient in its role [14, 17].

6.2 Rule-Based Inference

Rule-based inference is one of the most notable logical systems in Artificial Intelligence. It employs the use of conditional rules, defined in an "if-then" frame.

As a meaning of illustration, a medical expert system may be constructed around the following rule: if a patient has a fever, cough, and difficulty in breathing, then the possible cause is a respiratory infection. Such rules are utilized to bridge the gap between the observed facts and the most probable conclusions within AI Systems.

Rule-based systems were particularly critical in the early days of symbolic AI and expert systems. Such systems were designed to capture the expertise of domain specialists in the form of a rule-based system and utilized inference engines to determine the applicability of the rules to the specific problem.

Newell and Simon's work with symbolic systems articulated the production of intelligent behavior via formal symbol manipulation and rule-based rational behavior [3]. Genesereth and Nilsson also demonstrated that logical rules could be a basic building block for

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knowledge representation and reasoning within the context of Artificial Intelligence (AI) systems [13].

When compared to many modern machine learning systems, rule-based systems are usually able to justify the conclusions they arrive to by exposing the rules they employed to derive those conclusions. This aspect of rule-based systems also makes them especially useful within systems where interpretability is necessary. Nonetheless, rule-based systems can be extremely inflexible when they are presented with problems that are novel, ambiguous, and/or context-dependent. Rule-based systems are reliant on pre-designed rules, so they are more likely to fail when designed rules cannot accommodate the actual state of the world [4, 18]. For these reasons, rule-based inference is more effective for tightly constrained reasoning, but it is insufficient for more loosely structured, common-sense reasoning.

6.3 Non-Monotonic Reasoning

To address the various shortcomings of classical logic, non-monotonic reasoning was developed. In the classical monotonic sense of logic, once a premise is valid, the conclusion drawn from that premise is also valid and does not change. However, the ways in which people reason is often more fluid. In most cases, people can revise drawn conclusions once they are presented with new information. As an example, one may be fairly confident in saying that all birds can fly, but this statement would most likely be qualified if the specific bird they are referring to is a penguin.

Non-monotonic reasoning is which reasoning can be continued and/or revised, is vital to Artificial Intelligence (AI) and reasoning because real world reasoning is often characterized by shortcuts, gracefully ignorant resignations (and reasoning) and the ambiguity of lacking information and/or the information lacking certainty.

McCarthy's theory of circumscription along with Reiter's default logic is an important contribution to this field [15, 16]. Circumscription helps the system practice default reasoning by minimizing exceptions, while default logic offers frame-contraction methods to reasoning with suspended assumptions.

The most relevant of these is probably that of the commonsense reasoning of AI. Humans also make daily reasoning assumptions even with partial knowledge. AI systems must also possess such capabilities to reason in ordinary environments. Assume that an AI assistant has to schedule a meeting. Also, it has to assume that the meeting will occur at the designated portal unless it is told that the meeting has been relocated. Non-monotonic logic enables the systems to transcend the bounds of determined reasoning and advance to reasoning that is context and content sensitive, and also flexible, [22, 14].

6.4 Epistemic Logic

For a comprehensive discussion of these concepts, please see Section 3.3 for full details.

7. Philosophical Limits of AI Reasoning:

Imitating human reasoning is complex and comes with philosophical boundaries. These boundaries show that machine reasoning cannot equal human reasoning. AI can generate answers, solve problems, and give explanations, but, unlike humans, AI systems lack consciousness, intentionality, lived experience, moral responsibility, and self-justification [2, 5, 7].

7.1 Lack of Consciousness

Reasoning with AI falls short in the consciousness department. Human reasoning is combined with consciousness and the ability to accurately reflect on oneself and the reasoning that follows. AI systems lack awareness of the subtleties of the data being worked on. Even if intelligent looking answers are generated, it does not mean that the AI has, in any capacity, understood what it has done or thought about it [2, 8].

7.2 Lack of Intentionality

Laid reasoning is intentional and directed to specific meanings, values, and/or goals. When humans reason, they not only understand what they are reasoning about, but why and to what end. Obviously, while AI systems can seem to appear intentional, such goals are determined by outside reason, be it programming, data, or even the organization the AI serves. Therefore, AI lacks intentionality, but is simply a calculated operation [2, 5].

7.3 Lack of Lived Experience

Embodied existence, experience, and reasoning involve emotions and interaction with society and the environment. Irrespective of the rules that govern AI, they lack experience and are devoid of participation in and engagement with the world.

While they can analyze the description of human experiences, they cannot go through those experiences. This is the gap between machine outputs and human comprehension [12, 11].

7.4 Lack of Moral Responsibility

A human being can make decisions and be appreciated, blamed, interrogated, or held accountable for the decision. However, this is not the case for AI systems as a decision undertaken with AI, the accountability and responsibility rest on the human or the institutions that design, train, deploy, and make use of the AI system. This becomes critical in healthcare, the law, education, governance and public policymaking; areas in which the reasoning undertaken has ethical implications [6, 7, 5].

7.5 Lack of Self-Reflective Justification

AI, like human beings, can also engage in reasoning, justified by the ability to reflect on the rationale and justify. AI systems can elaborate on reasoning; however, this is not introspective and does not entail examining the beliefs and the rationale behind it. Thus, AI can provide justification-like outputs, but it does not have self-reflective justification in the different senses of meaning it takes in philosophy [10, 20, 18].

The philosophical restrictions of AI reasoning demonstrate that AI and human reasoning are different. AI can ease reasoning for human beings by undertaking reasoning that is formal, computational and statistical, however it does not have the conscious, experiential, reflective, intentional moral, and philosophical orientation of human reasoning/ thought. Hence this is why AI should be considered a powerful and advanced thinking/reasoning prop system and not as a rational/moral being.

8. Discussion:

Artificial Intelligence is capable of reasoning throughout various formal and computational traditions, but when reasoning is defined as human rational judgment, then AI's reasoning should be viewed as something different. AI systems have a great deal of exposure to information that allows them to create and execute rules and identify different features in the information. Having this ability means they can come to conclusions and describe the processes used to create these conclusions. Because of these skills, using AI in teaching and training programs, healthcare, legal systems, in the finance and research, and in the decision-support systems is very productive. Nonetheless, from the perspective of the philosophy of

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mind, the question will always be, are these activities forms of reasoning or a particular kind of computational formalism? [4, 13, 14]

8.1 AI Can Reason Formally

AI can be said to reason in a formal sense when reasoning involved in a system is defined as logical-deductive reasoning. In many branches of symbolic AI, including expert systems, theorem provers, and logic-oriented systems, machines are capable of performing formal reasoning consistently and much faster than humans. If we consider reasoning as structured and logical, the following branches are especially useful to AI in solving problems of various types and producing structured results that are consistent with the systems and frameworks [3, 13, 15, 16]. In this sense, formal reasoning is a real area of AI development that enhances systems of reasoning that are logical and/or computational.

Formal reasoning, however, is not the same as human reasoning. A system can deduce a correct and formal conclusion without the system having an understanding of that conclusion and the phenomenon, or the object, to which the conclusion refers. Knowing the distinguishing features of formal reasoning can eliminate the preconceived understanding of reasoning that creates a distinction in the case of reasoning and the understanding of that reasoning, and intention-ality that comes from that reasoning. We can think of Searle's criticism as a type of example of a formal system of reasoning manipulating symbols according to a particular system that means defining the meaning formal systems [2].

8.2 AI Can Assist Human Reasoning

In numerous ways, including augmenting the speed of calculations and analyses, the volume of information that can be processed, the ability to discern the pattern of the results and the decision of the results, and the ability to devise the analytical process used to devise the results. (Supplement material) AI mechanisms can evaluate and assist in addressing complicated challenges. In this example, AI activity can potentially rationalize, collaborate in cognitive processes, and operate in subconscious cognitive functions uncharacteristically to human behavior, acting in the domain of human thinking at a high speed and beyond the normative scale [4, 5, 17]. Processing large amounts of text, generating text, and running predictive analytics can potentially augment cognitive functions, particularly in the field of social science and behavioral studies. AI systems provide improved text generation following the structure to be complied with and offer potential courses of action within the logic of argumentation. Depending on the type of framework to be adhered to and the reasoning type, the AI system generates processes resembling logic, which takes shape in the form of structured reasoning [21, 19]. Each sample should undergo quality control as the AI systems under certain circumstances can offer answers resembling reasoning and be a product of the systems, and potentially be the result of biases, either socially or personally. AI can augment some aspects of reasoning, but cannot rationalize the entire cognitive process of the human, which now intertwines the conscious, the distractive, the value, the meaning of existence, the judgment of reality to cognitive functions, and self-reflection.

Consequently, AI should not supplant human logical reasoning, particularly in areas of ethical concern [2, 12, 10].

8.3 Reasoning Is Layered

The reasoning section posits that reasoning should be conceived in layered rather than singular uniform capacity. First, reasoning may be formal. Second, reasoning may be computational and be understood in terms of processes, structures, models, and reasoning

Can Artificial Intelligence Truly Reason? A Philosophical and Logical Inquiry... R.Raja, S.Umer, S.Islam & S.Naaz through probability. Third, reasoning may be epistemic and involve knowledge, belief, justification, and evidence. Fourth, and perhaps the most complex, reasoning may be philosophical and human, incorporating consciousness, meaning, intentionality, lived experience, and moral responsibility.

This layered reasoning framework theoretically plunks in between the two extremes. The reasoning framework brings us closer to the middle of the two extremes. The one extreme would be to argue that AI doesn't reason at all. AI systems definitely perform a variety of formal and computational reasoning tasks. The other extreme would be to argue that AI systems reason in an exact way that a human would. An accurate position would be that AI reasons in a formal and computational way, but not in the end in the philosophical way a human would [1, 2, 8, 5].

The reasoning section supports this paper's main point that AI can understand formal systems, reason statistically, and computationally. AI can enhance human reasoning. It lacks intentionality, lived experience, moral responsibility, and self-justifying justification to perform human reasoning.

So, AI should be seen as Reasoning Systems that help optimize and enhance human reasoning rather than as full replacements for it.

9. Conclusion:

Artificial Intelligence has excellent processing capacity that imitates human reasoning to a certain extent. By analyzing large quantities of data, applying general formal rules, identifying relations between various data and drawing logical conclusions, AI can do reasoning and analysis of data autonomously in a systematic manner [4, 13, 14]. However, reasoning of AI should not be equated to human reasoning. Due to its very nature, AI reasoning must always utilize an algorithm, a prescriptive model, a processed data set, a set of symbolic rules and, and on top of that, purely statistical and logical associations.

Human reasoning is also conditional, contextual, and the core building block is interpretation. The human mind and human beings in general do much more than just absorb and process information, they understand the implications of that information, question its legitimacy, and often contextualize and relate outcomes of that information to their personal experiences. Such a comprehensive reasoning should be done in the way that upholds the essence of the mind, which is analysis, reflection and validation through the lens of one's own morals.

This is why machine reasoning may produce correct result, but still may not involve the sensorium of human beings, consciousness, reflective self-justified experience and true volition.

The research, therefore, perceives AI not so much in the framework of a subject ('rational') (in the sense of true analytical reasoning), but more in the sense of reasoning support. The AI contributes to human rational and analytical reasoning and judgment in a more rapid and precise manner, and supports human judgment in detecting logical analytical relations and patterns and in making sound conclusions. However, it cannot comprehend human ethic rational reasoning, contextual and rational analysis [6, 7, 18, 20].

Whereas integrated reasoning is a framework developed at the intersection of philosophy, logic and AI (and computer science in general), the focus of future studies on AI reasoning should be on philosophy, logic and AI. Philosophy is needed to clarify the

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meaning of such reasoning constructs as consciousness, intentionality, knowledge and moral responsibility. Logic is needed to explain reasoning validity, structures, non-monotonic reasoning and knowledge representation.

Computer science is essential to dissect algorithms, machine learning models, data structures, computational systems, and the structures for applied AI [1, 22, 15, 16].

In summary, AI is capable of computation that bears some resemblance to reasoning, yet the reasoning done by humans is always grounded and conscious computing. AI research of the future needs to avoid setting the machine's reasoning purely as either a technical challenge or a philosophical issue. It needs to be framed as a challenge and as a question that is to be solved at the crossroads of philosophy, logic, and computer science.

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