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STUDY ON ROLE OF LOGIC IN AI18 AND PROBLEM SOLVING USING ARTIFICIAL INTELLIGENCE

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ABSTRACT: *Artificial intelligence plays a vital role in the field of research of management science and operational research areas.Artificial Intelligence is made up of 2 beautiful phrases Artificial and Intelligence, with artificial referring to "man-made" and Intelligence referring to "thinking power" therefore AI refers to "a man-made thinking power".AI is a research and a field of computer science.Create a machine with programmed algorithm which can work with own intelligence, which is an awesomeness of AI. In AIdomain examine the problem solving is the best standard which will examine clever undertaking to robotize the decryption of progression of this problem statement to be understand thoroughly. Different problem solving techniques have been brought forth in AI domain, for the most part by focusing on a specific reasoning way to deal with handle a specific class of problems. Examples like Machine Learning (ML), Constraint Solving (CS) and Theorem Demonstrating(TD) give ground-breaking approaches to solve AI problem statements.*

Keywords: Artificial Intelligence, Machine Learning, Case-based Reasoning, Artificial Intelligence Framework, Dynamic Investigation Problem, Investigation Problem

THE ROLE OF LOGIC IN AI

Logic makes the artificial intelligence program more intelligent. There are various AI tools, and each is dependent on logic. However, the logic is different for each type. Logic is a feature of reality. Logic defines the rules that can be used to operate on facts, partial facts, or non-facts in various combinations so as to arrive at a conclusion. This methodology forces theoreticians to think through problems on a new scale and at a new level of detail.The philosophical literature investigated on this topic. The consequences of action are studied in the literature on "seeing to it that," and reasoning about change is at least part of tense logic.

“The central construct is a variation on a branching-time modality of the sort that has been familiar since” [Prior, 1967]. If the user thinks that something is not right, then the program takes the user's suggestions and improves by itself. So, it slowly and gradually becomes more intelligent when it is trained for a number of reasons. Logic makes us arrive at a decision. AI uses logic, statistics, probability, and a host of other tools to simulate knowledge and intelligence.This tradition's formalisms not only help to formalize complicated, realistic planning issues, but they also bring whole new insights into reasoning about the causal effects of actions, state persistence, and interactions between actions and continuous physical processes.“In Rudolf Carnap attempted to clarify intentional analyses of linguistic meaning and to justify from a methodological point of view by imagining how the analysis could be applied to the linguistic usage of a hypothetical robot. Carnap hoped that the fact that we could imagine ourselves to know the internal structure of the robot would help to make the case for an empirical science of semantics more plausible. The philosophical issue that concerned Carnap

remains controversial to this day and thought experiments with robots have not proved to be particularly rewarding in addressing it" [Carnap,1955].Real robots, on the other hand, with real applications are a different story.Though it is difficult to predict whether they will be useful in resolving basic philosophical problems, they give a logic laboratory with revolutionary implications for the topic. They inspire the creation of whole new logical theories, which I believe will be as essential to philosophy as the late-nineteenth-century basic discoveries were. In most AI systems, logic is one of a basket of techniques or tools used to process information in order to arrive at intelligence. Logic is necessary for intelligence of any kind. AI uses logic, statistics, probability and a host of other tools to simulate knowledge and intelligence. In the end, logic is about reasoning—and only a small portion of our thinking is mathematical, whereas practically all of the mathematical reasoning done by non-mathematicians is merely calculation.

One of the most ambitious areas of computer science, in terms of reasoning, that is closest in spirit to philosophical logic, is AI. At the end of the day, all types of logic have advantages and disadvantages depending on the context, and the most important issue is choosing how to combine them contextually.

WIDE SCOPE OF AI

AI is utilized to create the fantasy of intelligence in the conduct of non-player characters (NPC). Be that as it may, the term game. AI is frequently used to refer to a broad range of calculations that, when all is said and done, incorporate techniques from control theory, mechanical autonomy, PC illustrations and software engineering.

The subject of artificial intelligence traverses a wide skyline. It manages different sorts of information portrayal plans, various techniques of keen pursuit, different methods, plans and numerous others.

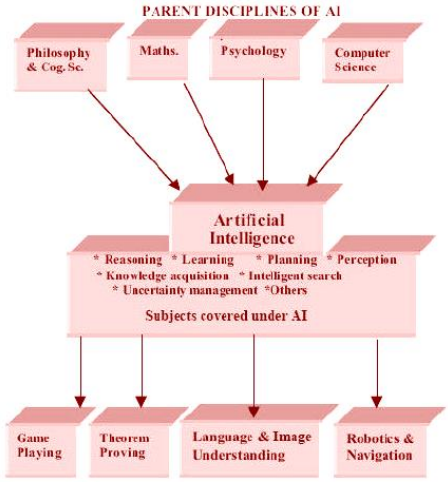

Figure 1.1: Application Areas of AI

The most common territories of AI incorporate Expert frameworks, Gaming, NLP, Image recognition model, Robotics and numerous others. Artificial intelligence has been enhanced with a wide range of information from cyber security, healthcare, banking, education & infrastructures, computer Scienceengineering&mathematics. AI was started with gaming and

theorem demonstrating programs & was continuously improved with hypotheses from various parent disciplines.

- **Learning Systems**

The concept of learning is represented here concerning a characteristic problem of learning of elocution by a kid from his mom. The conference arrangement of the kid gets the way to express the character "An" and the voice framework endeavors to emulate it. The distinction of the mother's and the youngster's articulation from this point forward called the error signal, is gotten by the kid's learning framework sound-related nerve and an incitation signal is created by the learning framework through an engine nerve for change of the way to express the kid. The adjustment of the kid's voice framework is preceded until the abundance of the error signal is inconsequential low. Each time the voice framework goes through an adjustment cycle, the subsequent tongue position of the youngster for speaking "An" is spared by the learning procedure. The learning problem examined above is an example of the outstanding parametric learning where the versatile learning process changes the parameters of the youngster's voice framework self-governing to keep its reaction sufficiently close to the "example preparing design". The artificial neural systems, which speak to the electrical simple of the biological sensory systems are picking up significance for their expanding applications in administered (parametric) learning problems. Other than this sort, the other common learning methods which we do accidentally are inductive and relationship based learning. In inductive learning, the student makes speculations from examples. For example, taking note of that "cuckoo flies", "parrot flies" and "sparrow flies", the student sums up that "feathered creatures fly". In similarity based learning the student for example, learns the movement of electrons in a particle comparably from his insight into planetary movement in heavenly bodies.

- **Information Representation and Reasoning**

In a reasoning problem, one needs to arrive at a pre-characterized objective state from at least one given starting states. In this way, the lesser the quantity of advances for arriving at the objective express, the higher the effectiveness of the reasoning framework. Expanding the productivity of a reasoning framework along these lines requires minimization of middle states, which by implication requires a sorted out and finish information base. A total and sorted out storage facility of information needs least search to recognize the suitable information at a given problem state. Association of information along these lines is of vital significance in information building. An assortment of information portrayal techniques are being used in AI. Generation rules, edges, filler, spaces& predicate logic are just a couple to make reference to. The selection of a specific kind of illustrative plan of information depends both on the idea of uses and the selection of clients.

- **Arranging**

Another critical territory of AI is arranging. The problems of reasoning and arranging share numerous common issues however have a fundamental distinction that begins from their definitions. The reasoning problem is basically worried about the testing of the satisfiability of an objective from a given arrangement of data and information. The arranging problem then again, manages the assurance of the methodology by which a fruitful objective can be

accomplished from the known starting states. Computerized arranging finds broad applications in mechanical autonomy and navigational problems.

- **Information Acquisition**

Procurement of information is similarly hard for machines for what it's worth for people. It incorporates new bits of information from, setting DS for existing information, learning information from nature, and refinement of information. Mechanized obtaining of information by ML approach is a functioning region in AI.

- **Deep Search**

Search problem consists of A state space, A start state, A Goal Test. The solution to a search issue is a series of operations known as the plan, which changes the start state to the target state. This strategy is carried out using search algorithms. Basically there are 2 types of search algorithm that is uniformed search and informed search.

Search problems which we by and large experience in Computer Science are of a deterministic sort i.e., the request for visiting the components of the pursuit space is known. For example, top to bottom first and expansiveness first search calculations, one knows the succession of visiting the hubs in a tree. In any event, the search difficulties we will encounter in AI are non-deterministic, and the request to visit the components in the hunt space is completely dependent on data sets.

- **Programming Logic (PROLOG)**

For almost a century, mathematicians and logicians have been preparing various instruments to speak to logical statements by emblematic administrators. PROLOG stands for programming in logic. Logic + control = Logic Programming, in logic we consider Facts & rules and in control we consider order of rules. It is widely used as a declarative programming language used in AI, and it is used for the syntax and semantics of the application. The central DS in prolog is that of a term. There are 5 categories like Fact & Rule, Unification, Arithmetic, List, and control in prolog. The logic of suggestions which was step by step advanced to deal with increasingly complex circumstances of the real world is called predicate logic. “One traditional assortment of predicate logic-based projects is Logic Program. PROLOG, which is a condensing for Programming in Logic, is a run of the mill language that supports logic programs. Logic Programming has as of late been recognized as one of the prime territory of research in AI” [8]. A definitive point of this examination is to stretch out the PROLOG compiler to deal with spatial - transient models and bolster a parallel programming condition.

- **Restrained Computing**

Restrainedprocessing, as per Prof. Zadeh, is "a developing way to deal with registering, which parallels the noteworthy capacity of the human personality to reason and learn in a domain of vulnerability and imprecision". It, when all is said in done is an assortment of figuring tools and techniques, shared by fluffy logic, ANN, hereditary calculations, conviction math, and a few parts of machine learning like inductive logic programming (ILP).

- **The executives of Imprecision and Uncertainty**

Data and information bases in numerous commonplace AI problems. The inadequacy of data from now on called imprecision, for the most part shows up in the database for:

- not have of proper data
- The sources have a low level of accuracy.

The inadequacy of knowledge, frequently referred to as vulnerability, starts in the knowledge base because of absence of assurance of the bits of knowledge reasoning. Different tools and techniques have been contrived for reasoning under deficient data and knowledge. 3portions of these techniques utilize:

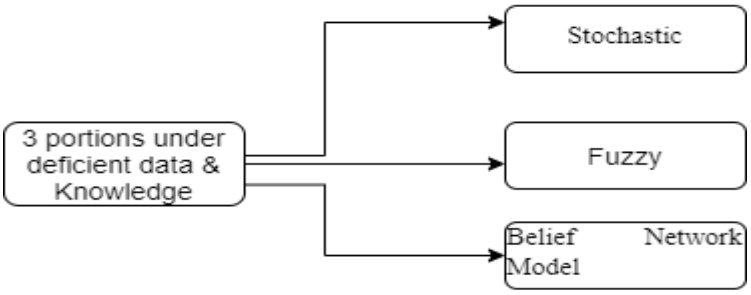

Figure 1.2: Diagram of 3 portions under deficient data & knowledge

In a stochastic reasoning model, the framework can move from one presented state to multiple states with the end goal of carefully solidifying the likelihood of progress to the following states from the given state.However, in a fluffy reasoning framework, the entire enrollment estimation of shift from one state to the next state may be more prominent than or equal to one. The conviction arrange model updates the stochastic/fluffy conviction allocated to the realities implanted in the system until a state of harmony is come to; following which there would be no more change in convictions. As of late, dealing with both data imprecision and knowledge vulnerability requires a unified approach.

➢ **Computer based intelligence Algorithm**

Formally, an artificial intelligence calculation for the most part means a non-traditional instinctive methodology for problem solving. The way to artificial intelligence approach is savvy search and coordinating. In a shrewd hunt problem/sub-problem given an objective (beginning) state, one needs to arrive at that state from at least one known beginning (objective) states. For example, think about the 4-perplex problem, where the objective state is known and one need to distinguish the moves for arriving at the objective from a pre-characterized beginning state. Presently the less number of states one creates for arriving at the objective the better that is the AI calculation. The inquiry that at that point normally emerges is: how to control the age of states? This can be accomplished by appropriately planning control systems, which would channel a couple of states just from an enormous number of legitimate states that could be created from a given beginning/middle of the road state. As an example, consider the problem of demonstrating a trigonometric character that kids are accustomed to doing during their schooldays. What might they do toward the start? They would begin with one side of the character, and endeavor to apply various formulas there to locate the conceivable coming about inductions. Yet, they won't really apply all the formula there. Or maybe, they recognize the correct up-and-comer formula that fits there with the end goal that the opposite side of the character that is by all accounts nearer in some sense (standpoint). At last, when the choice in regards to the selection of the formula is finished they apply it to the other side (say the L.H.S)

of the character and infer the new state. In this way, they proceed with the procedure and continue producing new middle of the road states until the R.H.S (objective) is come to. Yet do they constantly choose the correct competitor formula at a given state? From our experience, we realize the appropriate response is "not generally". Yet, what might we do in the event that we locate that after age of a couple of states; the subsequent expression is by all accounts far away from the R.H.S of the personality. Maybe we would like to move to some old state which is all the more encouraging i.e., closer to the R.H.S of the personality.

4 (Four) types of Popular search algorithms are diagrammatically presented here:

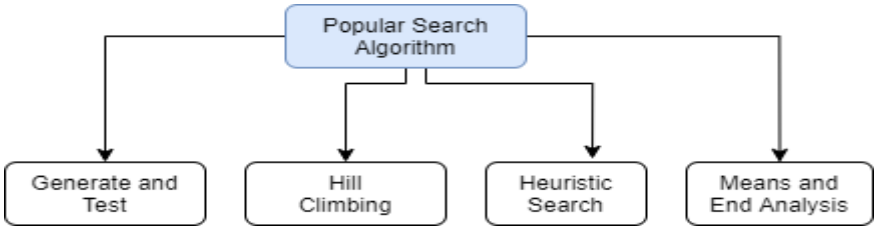

Figure 1.3: Types of Popular SA (Search Algorithm)

a) Generate and Test Approach

It is a heuristic technique. It uses DFS with backtracking. This approach will work in 2 modules: Generate and Test. Generate module: It will generate a possible solution. The Test module will test the solution.

The 3 steps of this approach

Step 1-Generate a possible solution

Step 2-Test to see if this is an actual solution.

Step 3-If a solution is found, then quit, otherwise go to step-1.

There are 3 properties of a good generator named: complete, non-redundant, and informed. This approach starts from the beginning state (root) of the problem and keeps growing the reasoning space until the objective hub or the terminal state is reached. The essential methodology utilized in this hunt is just the age of states and their testing for objectives, but it doesn't permit the separating of states.

b) Hill Climbing Search/Approach

This search has three important points named "Local search algorithm; it uses the greedy approach; and it has no backtracking." We can define it like this: It is a variation of the generation and testing methods in which feedback from the test procedure is used to help the generator decide which direction to move in search space. One more important thing is that it always moves in a single direction. The moral of this search is that if the new state is better than the current state, then the new state equals the current state. One simple example may be the 8 puzzle problem. There are three limitations known as "Local Maxima," "Plateau" and "Ridge". One approach to defeat this problem is to choose haphazardly another beginning state and then proceed with the above search process.

c) Heuristic Search

It tries to optimize a problem by using a heuristic function. Here, optimize means trying to solve a problem with minimum steps and costs. We used an inside informed search. Heuristic function can be defined as: It is a function H (n) that gives an estimation of the cost of getting

from node "n" to the goal state. It helps in selecting the optimal node for expansion. There are 2 types of heuristic search, named "Admissible" and "Non-Admissible." Admissible – In this heuristic function, one never overestimates the cost of reaching the goal. Non-Admissible – In this heuristic function, it estimates the cost of reaching the goal.“In any case, the most troublesome undertaking in heuristic hunt problems is the selection of the heuristic capacities. One needs to choose them naturally, So that as a rule ideally it is ready to prune the hunt space accurately” [9].

d) Means -Ends Analysis (MEA)

The MEA technique was first introduced in 1961 by Allen Newell and Herbert. A Simon in their problem-solving computer program, which was named the General Problem Solver (GPS). Basically, it is a problem-solving technique used in AI. The MEA analysis process is centered on the evaluation of the difference between the current state and the goal state. The following steps are followed by the MEA Analysis:

1. It uses both the backward and forward search strategies to solve major parts.
2. We will find out the difference between initial and final (goal) state.
3. We will use operators to reduce the difference between initial and final states.
4. Operator subgoaling – first perators are selected and then sub goals are setup.

In numerous scientific theorem-demonstrating forms, we use Means and Ends Analysis.

PROBLEM SOLVING USING ARTIFICIAL INTELLIGENCE

The procedure of solving a problem consists of 5 (five) steps,these are:

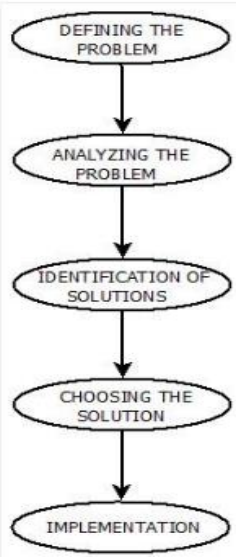

Figure 1.4: Steps in Problem Solving **Using Artificial Intelligence**

- **Characterizing the Problem**

The definition of the problem must be incorporated unequivocally. It should contain the conceivable beginning just as definite circumstances which should bring about adequate solution.

- **Breaking down the Problem**

Breaking down the problem and its prerequisite must be done as not many highlights can have enormous effect on the subsequent solution.

- **Recognition Of solutions**

This stage produces sensible measure of solutions to the given problem in a specific range.

- **Picking a Solution**

From all the distinguished solutions, the best solution is picked premise on the outcomes created by individual solutions.

- **Implementation**

Subsequent to picking the best solution, its implementation is finished.

CONCLUSION

Sherlock Holmes and medical drama TV programmes inspired this concept. In house tails, Dr. House and his colleagues generally see patients with complex conditions. Dr. House discussed this situation when all the doctors lost courage with this patient. He develops a plausible hypothesis to explain the patient's symptoms throughout this diagnostic procedure.Then, medical testing to prove the idea. Seeing contradicting results during diagnostics is fascinating. This eliminates part of his premise that the issue is characterised by these symptoms and can be demonstrated. His diagnosis process uses many reasoning methods.In this proposal, we offered a hybrid AI issue that mimics fairly general state, pharmaceutical, or criminal conclusions. We called this issue "IP" since the goal is to identify the suspect medical or criminal inquiry. There are many prospective determinations/suspects (competitors) and the question is how to use them based on the case rankings, sorted by increasing likelihood of being the cause of the sickness/liable of the crime (which we name the objective up-and-comer). Such ranking often drives more restorative tests/police inquiries focusing on the likely applicants, revealing more case facts. Thus, Dynamic Investigation Problem (DIP) describes the succession of identical difficulties to be answered. Background knowledge and topic information are needed to answer any issue. Thus, we may limit ourselves to one required fact. To express such a circumstance, we require CSP with one variable, taking 1esteems, and the case reality as the constraint. Finding an incentive to assign that variable without violating the constraint is the difficulty here.The essential information is seldom available. These challenges are called halfway "Constraint Satisfaction Problems". at particular, the conclusion is unclear at the beginning of the inquiry, hence CSP should be utilised to assess the possibility for further research. In comparable cases, regularities may be observed and utilised, and previous case counsel is part of the investigation approach.Dynamic inquiry difficulties fall under the Constraint Solving/Machine Learning challenge, making them more important to the vast Artificial Intelligence (AI) community.

REFERENCE

[1] R.J. Hyndman and A.B. Koehler. “Another look at measures of forecast accuracy”. *International Journal of Forecasting*, Vol. 22 no. 4, pp. 679– 688, 2006

[2] I. Miguel,“Dynamic flexible constraint satisfaction and its application to AI planning”, *Springer Science & Business Media*, PhD thesis, 2004

[3] R. Craven, F. Toni, C. Cadar, A. Hadad, and S. Matthew, “Efficient argumentation for medical decision-makA. Pease, S. Colton, R. Ramezani, J.W. Charnley, and K. Reed,

"A discussion on serendipity in creative systems". *In Proceedings of the Fourth International Conference on Computational Creativity (ICCC")*, pp. 64–71, 2013

[4] A. Pease, S. Colton, R. Ramezani, J.W. Charnley, and K. Reed, "A discussion on serendipity in creative systems". *In Proceedings of the Fourth International Conference on Computational Creativity (ICCC")*, pp. 64–71, 2013

[5] "House M.D TV Series",[Online] Available http://www.imdb.com/title/tt0412142, [Accessed on 2014]

[6] R. Ramezani and S. Colton. "Automatic generation of dynamic investigation problems",*In Automated Reasoning Workshop 2010 Bridging the Gap between Theory and Practice ARW 2010, PP. 34, 2010*

[7] Pang-Ning Tan, V. Kumar, and J. Srivastava. "Selecting the right objective measure for association analysis",*Information Systems*, Vol. 29 no. 4, pp. 293 – 313, 2004

[8] J. Chen, S. Muggleton, and J. Santos. "Learning probabilistic logic models from probabilistic examples",*In Proceedings of the 17th international conference on Inductive logic programming, ILP'07*, pages 22– 23, 2008

[9] D.E. Knuth,"Art of Computer Programming, Volume 2: Seminumerical Algorithms", *the. Addison-Wesley Professional*, 2014

[10] M. Hall, E. Frank, G. Holmes, B. Pfahringer, P. Reutemann, and I.H. Witten. "The wekadata mining software: an update",*ACMSIGKDD Explorations newsletter*, Vol. 11 no. 1, pp. 10 – 18, 2009

[11] P. Angelov,"Autonomous Learning Systems: From Data Streams to Knowledge in Real-time", *John Wiley & Sons*, 2012

[12] R.R. Bouckaert, E. Frank, M. Hall, R. Kirkby, P. Reutemann, A. Seewald, and D. Scuse. "Weka manual for version 3-7-8, 2013", 2013

[13] J.W. Charnley,"A global workspace framework for combined reasoning. PhD thesis", *Imperial College London,U.K, 2009*

[14] J. Hipp, U. G¨untzer, and G. Nakhaeizadeh. "Algorithms for association rule mining general survey and comparison",*ACM sigkdd explorations newsletter*, Vol. 2 no.1, pp. 58 – 64, 2000

[15] S Colton,"Automated theory formation in pure mathematics". Springer Science & Business Media, Verlag, 2012