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How Artificial Intelligence Improve Psychotherapy Research and Practice

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ABSTRACT

Artificial intelligence or the intelligence of machines and robots is a nascent science that has found its way in various fields of science, and the science of psychology is also not unaffected by the development, and in the advanced evolutionary process, the integration of artificial intelligence and psychology is one of the requirements of technology is cognitive science. Artificial intelligence research in psychology is modeling and producing intelligence like human intelligence. In this research, the latest basic developments of artificial intelligence in psychology have been discussed, while introducing different fields of application. Artificial intelligence in psychology, researchers depicts new horizons. The main purpose of this research is to provide a broad summary and analysis of the relationship between psychology and artificial intelligence and include things such as applications, systems of human thinking and action (human-computer interaction, data mining programs, mental-process modeling) and while introducing growth, undergraduate and General models in psychology and the intersection of psychology with artificial intelligence to the information processing model of the human brain and artificial intelligence and the difference in learning artificial neural networks and human intelligence, analytical psychological models of human-computer interaction, human-virtual modeling, mental modeling, expert systems and intelligence artificial and clinical diagnoses, etc. have been discussed.

Keywords: *artificial intelligence, psychology, intelligent systems, virtual human*

1. Introduction

Artificial intelligence (AI) has been introduced in various fields such as games, robots, law, stock trading, remote sensing devices and scientific inventions as well as diagnostic methods [1]. Many advanced AI applications are so enmeshed in conventional applications that they cannot be separated. Once something is implemented as a public program and widely used, it can no longer be designated as AI. Artificial intelligence applications seem to have a pervasive infrastructure in any particular industry. The late (1990s) and the beginning of the century (21st) were the starting points of merging the elements of AI technology into the larger framework of systems [2].

Interest in artificial intelligence is primarily focused on autonomous systems that may replace humans in related fields. Just as cognitive psychology may discover new avenues of research from algorithmic instruction theory; algorithmic instruction theory may have more practical implications as it assesses the complexity of human behavioral data. This human-centered focus

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is based on interdisciplinary synergistic research from neuroscience and cognitive psychology to theoretical computer science [3].

In this golden age of technology, without any end or limit, the moral and ethical implications of artificial intelligence are three-sided. One view says that many of us are already poverty-stricken without work, and there is little or no reason to create mechanical workers who can think independently. While another says that without the help of machines that can at least partially think for themselves, society cannot progress or benefit from it. In addition, the third group is not bothered about these issues at all, as is usual in human society [4].

Many psychologists think that the science of artificial intelligence can integrate all the phenomena produced by the human mind. The functionalist view sees the mind as a representational system and psychology as a branch of various computational processes, whereby mental representations are constructed, organized and decoded. There has been a discussion about how to explain various psychological phenomena computationally. Which artificial intelligence concepts can be used for computer modeling methods following the psychologist's point of view has not yet been seen [5].

Human-computer interaction

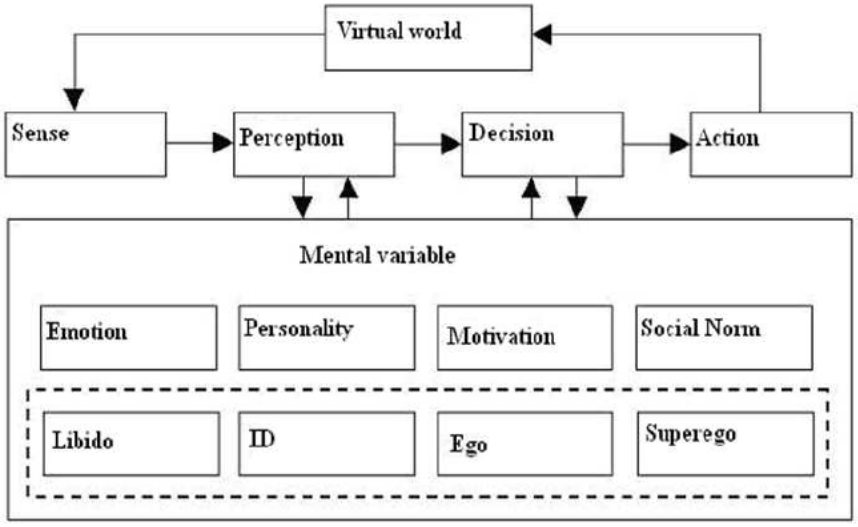
Everything related to human-computer interaction, from hardware to different software that deals with the design, evaluation and implementation of computer systems for human use. You may encounter these interactions every day, as this field involves the daily use of computers, user interfaces, and expert programs that probably use cognitive psychology to manage and help people [6].

Virtual reality is a human-computer intermediary that simulates real environments and allows the user to face it. Virtual reality is a new way of communication with humans that creates an interaction to connect with human senses and provides a direct and natural intuitive interaction. For example, one of the interesting technologies is the photography technology that represents the human anatomy in precise detail, and in some ways provides the virtual environment of CT and MRT (modern brain), or a set of three-dimensional data. The main elements of user interaction are recognition and analysis of hand gestures. Virtual environment is an important part of virtual reality, because more and more people are connected with them [7].

In these artificial environments (for example, games) human characteristics are related. The virtual human has various parameters such as mental states (which creates an emotional connection with the actor), emotions, personality, memory, behaviors according to social norms, intelligence, motivation that is connected to sensors which are able to react to the external stimulus [8].

The image below shows the mental model of the virtual human. Artificial intelligence technologies provide a basis for the dream of virtual reality [9].

Figure 1: Mental model of virtual human



2. Artificial intelligence and psychology

Artificial intelligence or machine intelligence is said to be the intelligence that a machine shows in different situations, in other words, artificial intelligence is said to be systems that can react similar to human intelligent behaviors, such as understanding complex situations, simulating thinking processes and human reasoning methods and answering succeed them, learn and have the ability to acquire knowledge and reason to solve problems. Most of the writings and articles related to artificial intelligence have defined it as the knowledge of knowing and designing intelligent agents [10].

Artificial intelligence should be seen as a vast area where many old and new knowledge, sciences and techniques meet. Its roots and main ideas should be sought in philosophy, linguistics, mathematics, psychology, neurology, physiology, control theory, probabilities and optimization, and various and numerous applications in computer science, engineering science, biological and medical science, social science and many other fields. There are other sciences.

The term artificial intelligence was first used by John McCarthy, who was the father of the science and knowledge of producing intelligent machines. He is the inventor of one of the artificial intelligence programming languages named Lisp [11].

Sometimes a distinction is made between the engineering side of AI and its theoretical side. As an engineering discipline, the goal of artificial intelligence is to invent and implement machines that can perform operations in a practical way. Accuracy, efficiency, flexibility and reliability are the main success criteria for such systems, and it seems that information related to human performance is neither necessary nor desirable [12].

The history of artificial intelligence shows that the design and description of the program has always relied on elements of human psychology. Hypotheses about cognitive processes are derived through intuition or introspective analysis of AI workers rather than empirical studies. Important programs such as Samuel's checker-player were developed, applied and tested without randomization with any correlational studies on human performance [13]. Perhaps part of the reason for AI's initial lack of interest in human studies is the uncertainty about the

attraction of psychology to emphasize the unconstitutionality of the constitution. Gelrenter's statements are confirmed through the geometry theorem proving program [14].

However, many AI workers have considered human studies. Still, empirical psychology can be ignored in favor of intuition or introspection. Even those researchers who explicitly confirm the importance of individual data ignore psychological studies in their work. Winston (1979) suggested that the first of five steps in creating an artificial intelligence learning program is to examine or describe some learning skills [15]. Winston's report of his plan to replicate the use of analogy in teacher-student interactions was not related to any study in educational psychology. Instead, Winston relies on his intuition to describe the merit associated with such behavior. Winston's program, as innovative as it is, would be more attractive if it was taken from the empirical basis of psychology [16].

Therefore, due to the creation of a closer connection between artificial intelligence and experimental psychology, progress is made in both aspects, that is, the principles of intelligent behavior, as well as their related computer programs. Elevating psychological assumptions from the level of ad hoc intuitions to the level of systematic empirical observations will longitudinally improve the quality of AI research and help integrate it with related studies in other disciplines. Now you have to think what will happen if artificial intelligence is combined with psychology? Basics such as psychology, philosophy, linguistics, mathematics, economics, which are the basics of artificial intelligence, can be expected from computers and robots. What consequences can be expected if humanoid robots are produced and artificial intelligence is combined with other sciences, including psychology? And what benefits does it bring to humans? And also, is human learning different from learning in artificial intelligence? And how does learning happen in artificial intelligence? Is it an imitation of humans or not? [17].

Table 1: Psychological theories related to artificial intelligence

Theorist	Theory
Alfred Adler	100% of serial killers were abused as children.
Eric Berne	Children without physical contact show their mental and physical retardation.
Robert Bolton	People learn communication skills from their community members.
Freud	Institution, self, super-self and unconscious.
Isabel Briggs Myers	Humans can perceive reality directly or by perception.
David D. Burns	Emotions are cognitive processes that can predict thinking.
Howard Gardner	The main art of intelligence includes: language, body, music and... Every human being is a unique combination of this intelligence.

Mental modeling

Artificial intelligence can also be used to predict mental processes. It is true that the number of mentally ill people is increasing and the information is shrinking and the database is growing. For example, one of the fields of research is finding and modeling Alzheimer's. The mental state of a human is dependent on external stimuli and internal cognitive processes. The main part of the state of mind is as follows:

1. Excitement: general and short reaction to an unexpected fact with a pleasant or unpleasant emotional state.
2. Motivation: It is the energizing, guiding and maintaining factor of behavior.
3. Personality: In psychology, the term personality is the style of a person, without having the slightest value judgment about it and talking about its ugliness, beauty, goodness, rightness and wrongness.
4. Social norm: Social norms are certain behaviors that are based on social values. Social values that gradually become social norms and by observing them, the society becomes orderly.
Social norms are certain behavioral methods that are common in a group or society, and a person learns, applies, and expects other members of the group or society to do it in the course of his life.

A. Prevention of mental disorders-

Based on the increase in the number of researches, the number of mental patients increases year by year. Only in the United States of America, seven and a half million children are involved in these diseases, and since 1994 there has been research that tries to prevent children from being at risk. This research provides a model according to which psychologists are able to intervene in children's development at the right time. Mental illnesses are diseases that limit and disrupt people's goals and quality of life. Mental illness is a psychological and behavioral pattern that occurs in a person and seems to be the cause of distress and disabilities that are not expected to be part of the developmental norm or cultural norm [18].

B. Data mining for mental illnesses

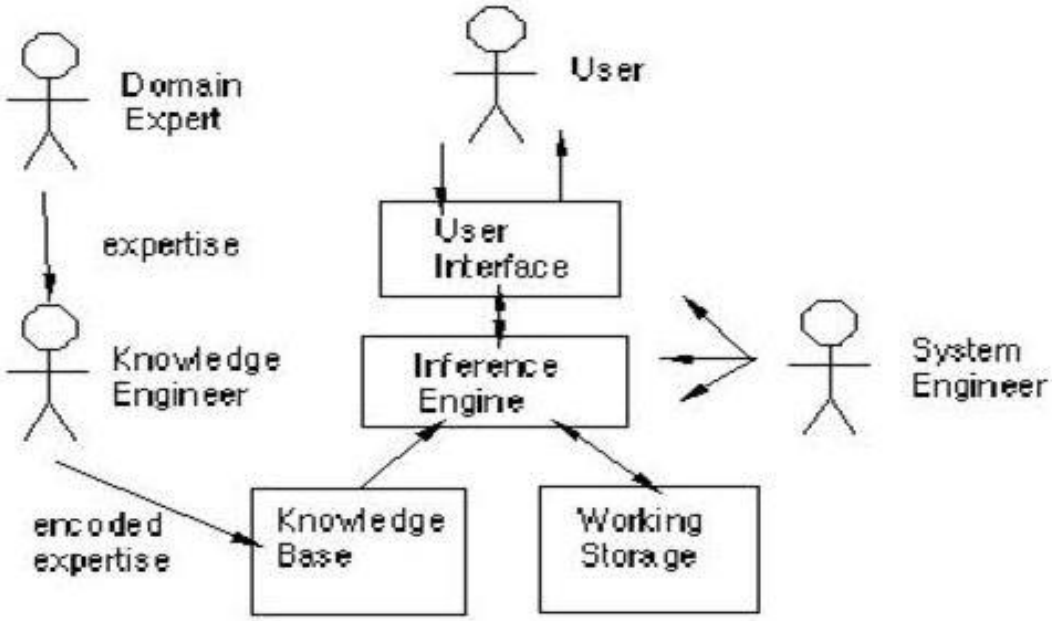
Knowledge discovery and data mining in the database are methods that have emerged as a useful tool for learning the structure of data. The process of data mining includes several steps that include data pre-processing, a choice of data mining algorithms, protocol execution and subsequent processing of the output. A simple data mining model is formed from the input of processed data into the data mining engine, and its output is knowledge in the form of an understandable structural model of the input data [19].
Autism is also a mental illness that can be identified in childhood, if the diagnosis is timely, it will lead to effective treatment. The main goal of our research is to create technological aids that will help autistic people to be diagnosed earlier and to start early intervention for autism management. Artificial intelligence game systems that convey valuable lessons to the child use the agent model in which the neural network and positive reinforcement of the agents are attached [20].
Assessment includes a pre-test and a post-test. Computers provide a text-independent environment in which many people with autism feel comfortable, and therapists and teachers are increasingly using virtual reality tools for teaching life skills such as crossing the street, teachers and therapists use this virtual system to develop children's abilities (social interactions, cognitive processes, vocabulary, attention) [21].

Expert systems in psychology

One question is, how will the use of expert systems in psychology be? Is cognitive simulation a computer program? To model human cognitive activities, it is traditionally used for expert and learner development. Models for intelligent educational systems are also effective for simulating learning structures. By using easy and inexpensive expert systems, students can develop simulations of cognitive processes, and this will also help them increase their intellectual abilities. At first glance, the relationship between psychology and expert systems seems to be close to each other, in fact, the foundations of artificial intelligence rely on the cognitive approach in psychology. From the point of view of psychology, expert systems can help in that, and if an expert system is developed with general rules about human behavior and thinking, then over time, it can talk directly with the patient [22].

Expert systems are complex programs whose main concern is to obtain sets of rules related to the human expert's experience in some specific fields. There are some limitations in their implementation, but they are usually related to the dimensions of their rules [23].

Figure 2: Components of an expert system



Different branches of artificial intelligence try to reproduce parts of human life behavior at every level, which starts from genetics and are artificial algorithms and networks, fuzzy theory and games, and every general system must have three key components, which include a knowledge base and an inference engine and be the interface. The knowledge base can consist of structured data such as tables of numbers, facts, laws, various relationships, critical values, special equations or qualitative sets. Inference engines can have different levels of complexity so that in scalable computing, we can solve problems at any level of complexity we need [24].

Using human data as a methodological exploration

The distinction between artificial intelligence as an engineering discipline and artificial intelligence as a philosophical inquiry is made according to the methods used, and not from the perspective of the tasks used. For example, one can consider an engineering strategy for recognizing visual patterns, playing games, or understanding natural language, as one can take a theoretical approach to automatic programming, tree searching, or even robotics. Job specifications or programming techniques are in no way responsible for the unusability of the two AI approaches. On the contrary, it depends on the method used and the goal of the researcher [25]. However, the commonalities between these two areas cannot be denied. Cognitive approach is a crossing point in psychology. In this domain, applications include simulation-based environmental learning, computer-based emotion recognition, simulation of intragroup social interactions, cognitive-behavioral therapies, computer-based psychiatry, electronic questionnaires, as well as automatic output generation, etc [26].

The findings of the National Institute for Health and Care Excellence (NICE) (2008) regarding the use of information technology in cognitive behavioral therapy have yielded promising results. New fields of research such as cyberpsychology have emerged, indicating the adoption of information technology in the field of psychology by the research fraternity. Inpatient psychotherapy has accepted two distinct levels of information technology applications [27]. In the first stage, this software practices in improving the efficiency, execution and performance of the therapist. In the second stage, this system is associated with complex systems that can involve the problems of the patient and the therapist during the treatment. With a few reservations clear, expert systems are expected to solve low and medium complexity problems.

Today, young people are more technically and technologically comfortable with various types of information technology. Retrieving information in corporate offices is now easier with the click of a button. This easy access to a broad view of research data on individual/group thoughts, feelings and behaviors by a psychologist is lacking and should be taken into account. Therefore, newer tools have been used by psychologists to collect data in social psychology as well as related fields of psychology. Therefore, to bridge the gap, a coordinated intelligent interface consisting of an expert and expert recovery system is the need of the hour with the need for an additional interface design agent [28].

Information technology and psychology

The computer is gradually entering the research or treatment of psychology and psychiatry. Not all experts see this development as a completely positive step [29]. These comments will be reviewed with the aim of resolving it. Direct interaction between the patient and the therapist is the main basis of psychotherapy. This arrangement is being replaced by information technology tools due to the penetration of the information society in our daily life. As a result, the gradual human-computer interaction is only the beginning of what will happen, it may even reduce the cash flows of this group of professionals. Adaptation to this scenario is expected in the next two decades to reach a new equilibrium point. However, computers have a long way to go to match the flexibility and dynamism of the human mind. Quality may be the first casualty in human-computer interaction. By reusing treatment programs, one can take advantage of the benefits offered by the new computer system and curb its adverse effects [30].

The resistance of patients cannot be underestimated, but as time passes, information technology is integrated into people's lives from the very beginning, and human-computer interaction is

only secondary. This type of rejection in the medical community was already observed with the Micyn test (the first automatic detection system). Unfortunately, to avoid possible misdiagnosis, the use of Micyn was not implemented. A diagnostic accuracy of 99% can be achieved with the implementation of an expert system, but in similar situations, doctors may require a comprehensive record, thereby showing their need only as an aid in the process rather than an option or alternative.

Nevertheless, a new discipline in social sciences, for example cyber psychology or the psychology of cyberspace, emerged. Studying the reaction of people and their cyberspace behaviors is another evolutionary concept created by computers and online networks [31]. Cyberpsychological research has been conducted to solve two main aspects, i.e., advanced IT applications to deal with various psychological issues and the consequences of using and interacting with various cyberspace tools and psychological and psychiatric issues among users. With the integration of the information society in every aspect of daily life, this new concept was a natural development with the increasing and diverse studies related to the application of information technology by psychologists [32]. In relation to the expected delivery of these systems in terms of the actual needs of the psychologist in terms of complexity and purpose of the typical applications of information technology is actually unavoidable. Global Settings the problem of user adaptation to the complexity of the system is another problem that is faced in this field. System performance tests using a minimal prototype can clear the first doubt, while implementing specific features for human-computer interface (HCI) will clarify the rejection of the problem by the user. Although only at the level of a tool, a good information system based on an expert system is needed, without it even electronic documents, known as manuals, cannot solve this problem.

A more interactive approach is expected from the use of intelligent tutoring systems (ITS). A system-dependent specialist ITS at the touch of a finger from the extensive combination between author event and psychology; to enhance work skills, customized help provided to the teacher to create new content and its appropriate application in ITS is needed [33].

Applications of artificial intelligence in psychology

The results of a highly cost-effective panic disorder treatment did not meet expectations from a computer-based program.

Educational games based on children's age have become regular and hold much potential that psychiatrists need to explore. The concept of using games in education is being used with an increasing level of complexity. These games are often based on complex expert systems or advanced types of artificial intelligence. Psychologists must integrate these strategies. Studies related to the use of 3D games as a therapeutic tool have been determined [34]. The first result seems to be promising. However, finding a universal treatment solution is an uphill task. Therefore, the supervision of the psychiatrist's guidance on the modification of the behavioral rules of therapeutic games is needed from time to time.

The dynamic superiority of artificial intelligence over psychology can be attributed to its strong mathematical backbone and important industrial applications. (1980s) saw the increasing use of expert systems as a market asset after manufacturing systems [35]. Expert systems and psychology cannot be separated. Over time, IT professionals realized that in order to invent new

techniques, there was a need for systematic extraction from people. Here, the Repertory Grid (RepGrid), which can provide data for analysis, was quantitatively and qualitatively identified and integrated into historical understanding. From a psychological perspective, expert systems can be implemented along with the psychology of personal construction. It should not be forgotten that these psychologist approaches are not cheap. Therefore, an intermediate system for the expert system with general rules about humans should be passed and a pattern of thinking should be created. Later, some kind of guidance will be implemented to gain self from direct interaction with the patient.

Expert systems are complex programs that select a set of instructions based on human expert experience in specific situations. Perceptions related to its implementation are usually applied in the dimension of a set of instructions and finally in providing the clarity of this set. In terms of computing, high-performance computing such as Grid or Cloud can reach great heights. However, knowing human thoughts is quite a complex matter, especially it cannot be expressed in words, and the lack of communication channel may further limit the transfer of knowledge. From a theoretical point of view, the application of these systems is huge, because the basic idea behind the development of AI is that it can imitate human thinking. But, we have a long way to go to achieve this feat [36].

Every expert system should include three main components. Knowledge base, inference engine and user interface. The universal translator seems to be the first application in the production line. It provides the level of knowledge to solve a wide and diverse database like Google, complemented by an equally powerful expert system. The use of expert systems in speech therapy can further strengthen its use. Researchers hope that due to this improved phase, a specialist system can be used to provide treatment at the patient's home [37].

Various AI techniques are used in general psychiatry. For example, even low-quality input data is sufficient in correctly diagnosing dyslexia by integrating the application of fuzzy and genetic algorithms. The passive voice itself can be used as an auxiliary source of information in creating a good analysis. Voice pathology is also used to find important psychological symptoms. The results of the Massachusetts Ear and Hospital Voice Disorders Database (MEEI) are one of these examples [38]. These results cannot be treated separately because several reasons can cause the patient's voice to change. When used in conjunction with other measurements, it can provide valuable information about the patient.

Artificial psychology

Artificial psychology and artificial emotion is a field that uses science to obtain comprehensive information. This vision of application of artificial psychology and artificial emotions is very broad, such as the creation of robots that have feelings and intelligence. The existing studies do not consider emotional decision-making and control systems; instead, they include factors such as the control mode of the human brain, which includes feelings, imagination, behavior and emotional decision-making. Artificial psychology and artificial emotions are known as new fields in psychology. The advanced stage of artificial intelligence is a new research that has a background in automation and information science. This basic theory includes brain science, psychology, physiological philosophy, neuroscience, human engineering, linguistics, aesthetics, computer science, law, information science, automation science and artificial intelligence. Almost all human mental activities are associated with emotions, that is, emotions with

motivation, emotions with cognition, emotions with behavior, emotions with decision making, emotions with evaluation, emotions with learning, emotions with character, emotions with memory, intelligent emotions, emotions with desire and... Therefore, the core of artificial psychology and artificial emotions should be the study of emotional stimulation of some minds and issues related to the implementation of the machine between emotions and mental activities. There are many practical applications of artificial psychology and artificial emotions, such as personal services, emotional controllers, human imitators, smart robots, smart homes, and wearable devices are only part of the applications of artificial psychology. At present, the uses of wearable devices such as counting steps and calorie consumption are related to physical health, but now it is possible to measure people's psychological feelings by using wearable devices, such as by collecting and analyzing human physiological symptoms. A machine can understand a human, so it can create a better human. From a theoretical point of view in artificial psychology, machines can show psychological activities such as emotion, personality, will, intelligence, so they can also show empathy [39].

Detection of early signs of autism by artificial intelligence

By using artificial intelligence to decipher brain scans, researchers were able to predict with remarkable accuracy when high-risk infants would develop autism by age 2. Autism has been notoriously difficult to diagnose before the age of two because it is diagnosed based on behavioral characteristics, including difficulty making eye contact or responding to one's name. Many warning signs are not present in children who are young, especially infants younger than one year old. AI-assisted MRI analysis at six and twelve months allowed researchers to predict with 81% accuracy whether the infants would develop autism. The ability to diagnose autism through brain scans could potentially help doctors benefit from early intervention [40].

Discussion

As with any emerging technology, caution must be used wisely to avoid optimistic biases and primarily to serve the best interests of the people the technology is designed to help. It goes without saying that artificial intelligence is here to stay, further emphasizing that the organization must be in tune with the economic and social changes of society. Otherwise, it will disappear.

Nevertheless, psychology is always a constant source of help to people struggling with insecurities and social adjustments. Furthermore, the development of advanced technology has in no way changed the mutual stimulus created by the patient-therapist interaction. Technological advances affect psychologists in many ways. However, the impact of technological advancement on psychology comes with its own set of positive and negative aspects, which clinicians, therapists, counselors, and researchers must deal with [41].

The process of getting to know the patient includes designing mental models based on a small amount of available information. Artificial intelligence is a prioritization of knowledge modeling because understanding human behavior is essential for imitation machines. Knowledge geometry is a model designed based on concepts (intuition) and vice versa (revision). The professional patient assesses the patient's behavioral patterns and maps them to specific conditions and subjects them to brief psychotherapy. The theoretical concepts of psychotherapy

are applied in cases where there is a conflict between the prepared psychotherapy plans and the target person. The re-modification operation is an inference process, where analogs and isomorphism databases are used as sources. By analyzing each family trend and pattern, it can be investigated and new methods devised for the system [13]. Feedback and maintenance mechanisms do not allow the system to gain new experiences and learning, thereby stopping its growth or resolving the desired conflict. This is referred to as case-based reasoning and is done with first-order logic. As the psychotherapist attempts to simplify the patient's symptom and relate it to a wider system of interaction and link it to the global scenario, this represents the intuitive operation of the geometry of knowledge. This is referred to as case-based reasoning and is done with first-order logic. As the psychotherapist attempts to simplify the patient's symptom and relate it to a wider system of interaction and link it to the global scenario, this represents the intuitive operation of the geometry of knowledge. This is referred to as case-based reasoning and is done with first-order logic. As the psychotherapist attempts to simplify the patient's symptom and relate it to a wider system of interaction and link it to the global scenario, this represents the intuitive operation of the geometry of knowledge [14].

This particular phenomenon is later used as collateral support for understanding the broader pattern in this case. Artificial intelligence is a process similar to machine learning. The system linkage method is a step forward in using computational intelligence as an auxiliary tool in evaluating the behavioral pattern of couples, families and individuals. Among the many artificial intelligence strategies, first-order logic, automatic theorem proving, and fuzzy logic can be used to match psychotherapeutic interventions related to the description of essential regions, genogram creation, self-determination assessment, cognitive interaction pattern testing, and improvement [24, 25]. Despite these developments, the idea that AI research has not yet evolved as a universal method for complex problem formulation should not be ignored [26].

Conclusion

In this research, short and broad summaries about the application of artificial intelligence in psychology were presented. The list of applications of artificial intelligence in psychological studies is not yet complete, and the day-to-day process of integrating artificial intelligence and psychology has covered various fields of cognitive science and will provide amazing research fields, and it should be noted that in the not so distant future, we will witness the development of intelligence. Artificial intelligence is found in psychological factors and manifests itself like humans, and learning through artificial neural network will greatly help artificial intelligence and bring machine learning closer to human learning, and science must wait for the very surprising results of the integration of psychology in the not too distant future are artificially intelligent.

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