University of Messina

ISSN 2612-4033

Journal of Clinical & Developmental Psychology

Journal homepage: http://cab.unime.it/journals/index.php/JCDP/index

Artificial Intelligence and Clinical Psychology - Current Trends

Mohammad Tahan[1*], Photis Zygoulis[2]

[1] Young Researchers and Elite Club, Birjand Branch, Islamic Azad University, Birjand, Iran.

t.mohammad2@gmail.com

[2] Electronic governance coordinator – Ph.d candidate, University of Athens, Greece.

fotiszygoulis@gmail.com

ABSTRACT

Psychotherapy endows a sense of control in patients gripped with emotional conflicts which allow them to handle their reflexes and regain composure through conscious and behavioral alterations. These transformational changes can be brought about by improving their listening skills, observational capacities, creating awareness, making them more attentive and intervening. Specialised tools and techniques are employed through the course of therapy which not only alters but also accentuates their cognitive and effective understanding. The idea of amalgamating these two broad ambits: the complexities of psychology and dynamism of artificial intelligence has gained momentum in recent times. This review focuses on how machine intelligence through computer-implemented psychotherapeutic tools can enhance self-awareness through computer-implemented psychotherapeutic tools can enhance self-awareness.

Keywords: *Artificial Intelligence; Applications; Psychology*

* *Corresponding author*: Mohammad Tahan, Islamic Azad University, Birjand, Iran
E-mail address: t.mohammad2@gmail.com

https://doi.org/10.6092/2612-4033/0110-2184

Introduction

The Artificial Intelligence (AI) role in psychological science is still underestimated with the help of psychological science specialists. Sometimes psychologists reject the use of specialist structures in their fields of endeavor because they worry that the laptop will replace them. Sometimes they do not pick out the full workable of the use of Information Technology. The identical reactions have been encountered among medicine docs when the first computerized diagnose system was tested. The AI has now not reached yet that stage of performance successful of emulating simultaneously all pieces of human behavior, but researchers are on the right music of getting there (Klein, 1999). Anyhow, there are many intersection factors between these two domains.

Having artificially sensible machines that think, learn, reason, experience, and can function autonomously, without supervision, is one of the most fascinating goals in all of Computer Science. As the sorts of problems, we would like machines to clear up get extra complex; it is becoming a necessary goal as well. One of the many troubles associated with this goal is that what studying and reasoning are have so many possible meanings that the solution can without difficulty be misplaced in the sea of opinions and options. The aim of this paper is to set up some foundational principles, theory, and ideas that we experience are the spine of real, self-sustaining Artificial Intelligence These article evaluations traits in artificial brain (AI) technologies and their cutting-edge and potential purposes in scientific psychological practice. Some of the principal AI assisted activities reviewed include scientific training, treatment, psychological assessment, and scientific choice making. Thinking for an integrated AI-based clinician gadget is, also, introduced. Issues associated with AI in the context of medical practice, the plausible for job loss among mental health professionals, and different ramifications related with the advancement of AI technological know-how are discussed. The development of AI applied sciences and their application in psychological exercise have essential implications that can be predicted to transform the mental fitness care field. Psychologists and other mental fitness care gurus have a necessary section to play in the development, evaluation, and ethical use of AI technologies.

Artificial Intelligence

Artificial Intelligence (AI) is technology designed to operate activities that typically require human intelligence. AI is additionally described as the multidisciplinary area of science that is worried with the development and learns about of this technology. The subject of AI finds its genesis with the establishing of the pc age in the 1940s, and it was officially given its name by laptop scientist John McCarthy in 1956 (Buchanan, 2005, for a assessment of the history of AI). AI technological know-how can be in the structure of bodily machines, standalone pc software, disbursed across net-works,

utilized to robotics, or engineered from living biology or coupled to it (e.g., brain– pc interfaces). This science can be purposed for specialized shrewd functions or to emulate complex human behavior that is capable of reasoning, learning, and acting upon surroundings as a self-sufficient shrewd agent (Russell & Norvig, 2003). Imperative branches of AI comprise of the learn approximately of tablet learning, counterfeit neural systems, and home-grown dialect handling. Machine getting to know is the capability of computers to look at but being unequivocally modified (Samuel, 1959), artificial neural networks are mathematical, computational, or technological fashions that mimic the common sense and learning functions of neurons in a intelligence (Krogh, 2008), and natural language processing is involved with how computers technique human natural languages (Manning & Schütze, 1999).

AI has been utilized to activities in the discipline of medicinal drug seeing that the 1970s, especially in the areas of expert structures for clinical choice making and in biomedical lookup (Morelli, Bronzino & Goethe, 1987; Patel et al., 2009; Shortliffe, 1993; Szolovits, 1982). The emergence of AI in medicinal drug has also introduced forth the scientific journal "Artificial Intelligence in Medicine" and quite a few formerly critiques and proposals of AI purposes in psychiatry have been published (e.g., Garfield, Rapp, & Evens, 1992; Hand, 1985; Morelli, 1989; Servan-Schreiber, 1986). The use of AI technologies in the mental health care discipline stays a burgeoning location that has considered important tendencies in the last decade. The constant makes in laptop performance as well as advances in different technological areas such as in virtual reality, pc expertise acquisition, language processing, sensing, and robotics have enabled new and thrilling capabilities that had been only dreamed of in the past. The contemporary and forthcoming applications of AI technologies can be predicted to have a profound impact on the discipline of psychology and mental health care in general. It is consequently essential for psychologists and others in the mental health care discipline to be conscious of any ability and ramifications of the use of cutting-edge and emerging AI technologies.

The relation between psychology and expert systems is nearer that looks at a first glance. In fact, the bases of synthetic brain - AI - be counted on the cognitive method in psychology. The AI dynamics used to be greater than the evolution of psychology due to its strong mathematic aid and the vital industrial functions AI provided. The manufacturing systems, and then the professional systems emerged around the 80's as a market asset (Shaw & Gaines, 2005). The links with the foundation is no longer loosed yet. The expert structures want the help of the psychology. After the primary wave of eagerness, the IT specialists have caught on that there is a want for enhancement of a few strategies to form a proficient run the show extraction from individuals. Here the repertory grid elicitation used to be diagnosed as being useful and built-in into the local "know how". From the factor of view of

psychology, the expert systems can be used in conjunction with private assemble psychology. Unfortunately, the psychologist approach is not economically feasible. But a compromise can be reached if an expert device with customary rules about human behavior and thinking is developed, and then, in time, a structure of self-acquiring new rules from direct dialog with the affected person will be used.

The professional structures are complicated purposes that have as their fundamental challenge to seize a unique set of rules regarding the experience of a human professional in some unique field. There are some limits in their implementation, however normally utilized to dimension of guidelines set and eventually to readability of this set. From the computing electricity point of view, in modern times there are new procedures in excessive overall performance computing like GRID or CLOUD computing that can assure all the wished scalability. Probably the complexity of human thinking, of natural language and additionally its imperfections as a verbal exchange channel, may limit the information transfer. The application of these systems is almost unlimited from a theoretical point of view, because at the origin of artificial Genius – AI – laid the concept of making an attempt to replicate human thinking. However, this is still not generally complete. As a result, a number of branches of AI try to replicate pieces of lifestyles behavior at any level, starting with genetic algorithms and neural networks and finishing with artificial life, fuzzy and game theory. Any expert gadget ought to have three key components: the knowledge base, the inference engine, and the interface. The expertise base can be composed of structured records like tables of numbers, facts, if-then rules, a variety of relationships, vital values, someday equations or units of qualitative descriptors. In the order of this database, an exceptional logic interpreter is used for the inference machine. Inference engines can have distinct complexity levels. The top information is that the engine can be parallelized (Urbani et al., 2010), so that, into a scalable computing medium, we can solve problems on any level of complexity we need. On top of the inference engines, we discover the rule-based system. Of direction, those are parallelizable too (Petcu, 2006). These systems are based totally on complicated businesses of regulations – metarules - used to deal with the execution of different rules.

The fact the structures are parallelizable opens the opportunity of growing some other form of dispensed artificial intelligence. The term usually refers to a complicated system of shrewd marketers deployed onto a distributed system. It is no longer clear why the usual term artificial brain that in modern times covers all the unique branches was selected to define only the smart retailers' utility in allotted computing. Usually the regularly occurring time period is allotted expert systems.

Psychology is one of the basic sciences of artificial talent (AT). The founder of the psychology is Wilhelm Wundt (1832-1920), who engaged in empirical methods, and used to be fascinated in the

wondering approaches all through his scientific work. The major aim of the science is to mannequin human wondering (in AI the Human Computing offers with this question), but additionally an different question rose: How can we clear up psychological, human-near questions or issues with artificial intelligence methods? If we possess the special description of the brain, it will enable us to mannequin this on computer, for example: a broader grasp of Natural language processing, perception emotional intelligence, sight.

The researchers in social sciences or psychology want to readapt to our on-line world realities. As a result, new approaches of gathering records about people or communities have to be developed. There are probabilities of managing facts retrieval from Internet. There are many tiers in extracting expertise from digital documents, or from social networks. In the beginning, a search engine is willing to perform because the expert will set some brief or long time period areas of interest, normally referred by way of the use of a key-word set. One possibility is to thoroughly improve the search engine from scratch. This method is very high-priced in terms of challenge resources, but it has the advantage of having an exceptional tune round the trouble specification. This strategy is recommended particularly when the search is made in nicely defined giant databases with managed access; otherwise, the use of accessible global search engines dynamic libraries can effortlessly take care of the problem. The most vital search engines are Google, Yahoo or Bing. The business method of Google prohibits the use of their libraries in that scope; however, the Microsoft Bing alternative can be used except any problems.

In human-to-human communication, there are many difficulties involving the ordinary ambiguities of Natural language or cultural differences. As a result, the primary problem of looking out includes the minimization of informational redundancy. Worse than that, generally, a search method involves a set of words from the user knowledge and there are correct chances that his dictionary has solely a partial match to the ones of different authors who have written some records that is without a doubt needed with the aid of that user. In the case of psychology, we have a massive problem because many schools have the equal universe of discourse (over 50% match), however alas they use different discourse universes, and from time to time even distinct preferred notations. This makes it very challenging to follow a facts retrieval system to efficient filter the news appears in the domain. As a result, an efficient dedicated retrieval device for a psychologist will need to be constantly tuned with the researcher in order to shortly adapt. This method can pressure maybe, in time, the device to gather sufficient guidelines to limit step by step the supplementary input needs from the expert. in method all the troubles involving exceptional representations of the identical knowledge, an expert device can be used. The Internet has more information about a character than one can expect. That is due to the non-stop increasing dependence of the human to the IT related tools.

Intelligent dealers also have some unique AI algorithms integrated. Their development looks to be in shut relationship with disbursed systems. The marketers commonly need a unique framework to be loaded on each concerned machine. The improvement of industrial purposes is slow due to the fact of protection associated problems. No one can guaranty yet that a piece of code achieved into the framework cannot be detrimental for the host. That is why carrier-oriented structure starts off evolved to achieve interest. Anyhow, the clever retailers have a big practicable both from the idea and the practice point of view. There are quite a number of classifications of clever agents; however, from the implementation factor of view, the difference between week and robust retailers appears to be extra useful (Wooldrige et al., 1995). The susceptible retailers have the following properties:

- Proactive - when agents can provoke behaviors and courses of motion in order to attain their objectives.
- Reactive: retailers can answer to external events.
- Autonomous: marketers do not need human interaction.
- Social: agents two can two speak with two other retailers using an agreed two Agent

Communication Language (ACL) and ontology (e.g. Knowledge Query and Manipulation Language (KQML) for clever agents). Strong marketers will inherit the traits of vulnerable agents, but enrich them with the following characteristics:

- Rationality: an agent will take no action in such a way that would contradict its objectives.
- Benevolence: dealers ought to no longer act in such as way that would compromise different agent or its host environment.
- Veracity: agents are truthful.

For our Human–computer interaction (HCI) we want to use strong agents. We propose to use the Bickmore approach as a beginning base in designing HCI interface. He developed a gadget primarily based on a mixture between sensible dealers and advanced HCI techniques in order to collect the exceptional viable personal relationship between the human and the laptop (Bickmore, 2003). From all sorts presented, we choose to use the following type of agents:

• Social agents are defined as those artefacts, primarily computational, that are intentionally designed to display social cues or otherwise to produce a social response in the person using them (Bickmore, 2003). Their introduction is based on various studies that prove that people change their behaviour and evaluation of the relation with an animated virtual reality character, which can emulate some social interaction abilities.

• Affective agents are those intentionally designed to display affect, recognize affect in users, or manipulate the user's affective state (Bickmore, 2003). They have abilities in the emotional intelligence field. They most control various levels of verbal and nonverbal communication

normally used by a person. Here we can mention the facial expression, the body posture, the color of skin response, the use of grips, the use of natural voice and synchronized the emulated mood with the voice tone. One of the problems is the detection of user mood. This can be done using various pattern recognition tools (for speech, face recognition, voice recognition and analysis, posture and skin color) and then to use the same knowledge database as the emulated person. Figure 1 shows the relationship of artificial intelligence with other sciences.

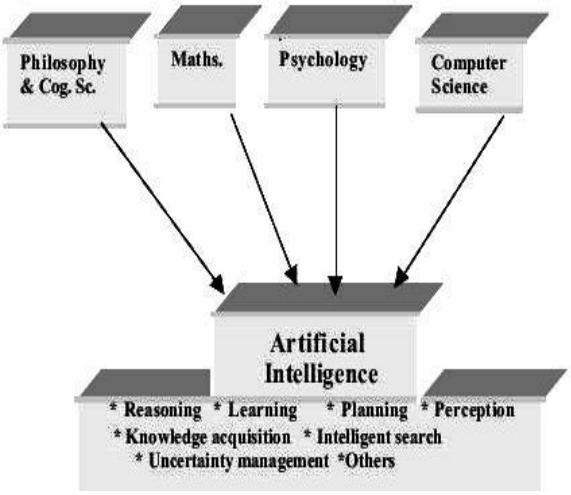

Figure 1. Affective agents

Clinical Psychology

The assisted cognitive psychotherapy has been examined given that the 90', and the end result seem to be encouraging (Wood et al., 1998). The Computer aided Cognitive Behavioral Therapy – CCBT - is used in conjunction with the psychotherapist and, based totally on affected person input, it can suggest some commonplace instructions in patient remedy and even take care of some component of it (Marks et al., 2007). As in other applications, the use of these structures for the duration of the therapeutic process can limit the time spent by using the specialist with the patient, however dramatically extends the time of remedy equipment due to electronic supervision. Because in most cases the key of success is increasing as a great deal as viable the time allotted by way of the patient to the supervised treatment, then there are many expectations from this approach. Yet the gadget has its limitations. For example, until now it cannot offer solutions to issues like compulsive gambling, nightmares, enuresis and tics. This is anticipated due to gravity and complexity of noted problems. So, we might also argue that these structures are useful and that they will be constantly developed, but there is no way that they totally change the specialist yet.

The hypnotherapy may also be conducted in a traditional manner, but right effects are also acquired via the use of a number in part or totally electronic techniques. Because the computer can totally

control the audio/video glide in anything manner is necessary, the IT involvement in this field is higher. In table 1, the techniques overall used in conjunction with a laptop are introduced (Frost, 2008).

Problem	Recommended Techniques	Used Methods
Stress	Self-hypnosis	Interactive web applications
Anxiety	Hypnotherapy	Interactive web applications
Depression	Relaxation therapy	Stand-alone applications
Phobias on various forms	Meditation	Multimedia support
Cognitive issues (e.g. positive thinking)	Stress management	Mini mixing desks

Table 1. Computer-based hypnotherapy application

Nowadays, the use of digital fact has turn out to be widespread in the health care offerings in order to help the psychotherapist. The specialists commence to think about that the VR function will consistently amplify in the future within the area of medical psychology (Riva, 2005).

The assisted cognitive psychotherapy has been tested since the 90', and the result seem to be encouraging (Wood et al., 1998). The Computer aided Cognitive Behavioral Therapy – CCBT -is used in conjunction with the psychotherapist and, based on patient input; it can suggest some general directions in patient treatment and even handle some portion of it (Marks et al., 2007). As in other applications, the use of these systems during the therapeutic process can decrease the time spent by the specialist with the patient, but dramatically increase the time of treatment appliance due to electronic supervision. Because in most cases the key of success is increasing as much as possible the time allocated by the patient to the supervised treatment, than there are many expectations from this approach. Yet the system has its limitations. For example, until now it cannot offer solutions to problems like compulsive gambling, nightmares, enuresis and tics. This is expect due to gravity and complexity of mentioned problems. These systems are useful and, so, they will be continuously develop, but there is no way that they entirely replace the specialist yet.

The hypnotherapy may be conducted in a classic manner, but good effects are also obtained by the use of various partially or totally electronic techniques. Because the computer can fully control the audio/video flow in whatever manner is necessary, the IT involvement in this field is higher.

AI Applications in Psychology

In panic and phobia disorders treatment, the results of using computer application were not so impressive; though from an economic efficiency point of view there was a real success (McCrone et al., 2009).

The video games are already used in education of young people of unique ages, so this manageable has attain the psychiatrist expert attention. So, the idea of the use of games in schooling at a range of tiers of complexity appears. The video games are, in most of cases, based totally on complex expert systems or on different varieties of superior artificial intelligence. The psychologists have not disregarded this approach. As a result, research about using 3D games as centered remedy gadgets have been conducted (Coyle et al., 2005). First-Order Consequences appear to be promising, but it is hard to find a popular remedy solution. Therefore, the therapeutic games want behavior guidelines change from time to time, beneath the psychiatrist supervision. The relation between psychology and professional systems is nearer that appears at a first glance. In fact, the bases of artificial Genius - AI – matter on the cognitive approach in psychology. The AI dynamics used to be greater than the evolution of psychology due to its sturdy mathematic help and the vital industrial functions AI provided. The manufacturing systems, and then the professional structures emerged around the 80's as a market asset (Shaw & Gaines, 2005). The hyperlinks with the beginning are no longer loosed yet. The specialist structures need the help of the psychology. After the first wave of enthusiasm, the IT experts have understood that there is a want for improvement of some techniques to make an environment friendly rule extraction from people. Here the repertory grid elicitation was diagnosed as being useful and integrated into the neighborhood "know how". From the factor of view of psychology, the professional structures can be used in conjunction with non-public construct psychology. Unfortunately, the psychologist strategy is not economically feasible. However, a compromise can be reached if a specialist gadget with everyday policies about human behavior and wondering is developed, and then, in time, a structure of self-obtaining new regulations from direct dialog with the affected person will be used.

The expert structures are complicated functions that have as their most important subject to capture a particular set of rules involving the journey of a human expert in some specific field. There are some limits in their implementation, but generally applied to dimension of regulations set and subsequently to clarity of this set. From the computing electricity point of view, presently there are new procedures in excessive overall performance computing like GRID or CLOUD computing that can guarantee all the wished scalability. Probably the complexity of human thinking, of Natural language and additionally its imperfections as a conversation channel, can also restriction the information transfer. The utility of these structures is almost unlimited from a theoretical factor of view, because at the origin of artificial intelligence – AI – laid the thinking of attempting to replicate human thinking. But this cannot be one as a complete yet. As a result, a range of branches of AI try to replicate pieces of lifestyles behavior at any level, opening with genetic algorithms and neural

networks and ending with synthetic life, fuzzy and sport theory. Any expert gadget has to have three key components: the expertise base, the inference engine, and the interface.

The expertise base can be composed of structured records like tables of numbers, facts, if-then rules, a number of relationships, fundamental values, sometime equations or sets of qualitative descriptors. The Use of a Selective Database Technique in Order, a unique logic interpreter is used for the inference machine. Inference engines can have distinct complexity levels. The correct information is that the engine can be parallelized (Urbani et al., 2010), so that, into a scalable computing medium, we can resolve problems on any degree of complexity we need. On pinnacle of the inference engines, we locate the rule primarily based system. Of course, these are parallelizable too (Petcu, 2006). These systems are primarily based on complex groups of regulations – Meta rules - used to deal with the execution of other rules.

The correlation between Artificial Intelligence and Clinical Psychology

Virtual Environment is an important part of Virtual Reality, because more and more people connect to them. In these artificial environments (for example, games), human like attributes are relevant. As represented in figure 2, virtual human may possess several parameters: mental states (which produces emotional connection to the player), emotions, personality, memory, social norms behavior, intelligence, motivation, are connect to sensors to be able to react on outer stimuli. Picture illustrates the possible mental model of a virtual human. Technologies of Artificial Intelligence provide a basis for the dream of the virtual reality. Social Norm includes status, rules of information and interaction, control of the process, nonverbal social interaction.

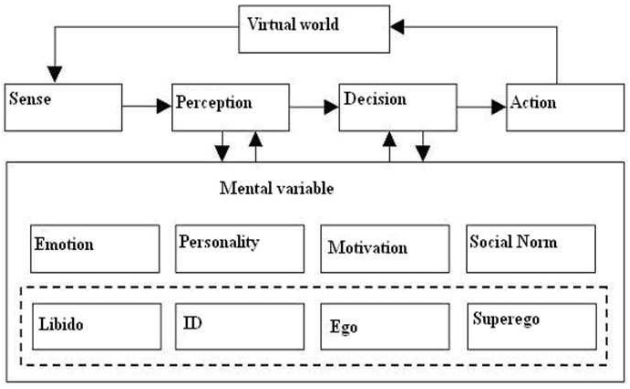

Figure 2. Virtual world

Artificial Psychology is a theoretical discipline that was first proposed by Dan Curtis (1963). This theory states that Artificial Intelligence will approach the complexity degree of human Genius when the artificially smart system meets three very essential conditions:

• Condition 1: The artificially smart system makes all of its decisions autonomously (without supervision or human intervention) and is capable of making choices primarily based on facts that is 1) New, 2) Abstract, and 3) Incomplete.

• Condition 2: The artificially smart device is capable of reprogramming itself (evolving), based on new facts and is capable of resolving its own programming conflicts, even in the presence of incomplete information.1

• Condition 3: Conditions 1 and 2 are met in conditions that had been no longer part of the original operational machine (part of the authentic programming), i.e., novel situations that were not foreseen in the layout and initial implementation of the system.

We trust that when all three prerequisites are met, then the possibility will exist that the artificially clever system will have the ability attain conclusions based on newly obtained and inferred data that has been discovered and saved as memories. At this point, we trust the standards exist, such that the new field of Artificial Psychology wishes to be put into vicinity for such systems. The first simulation of a psychotherapist that used a human-computer interface used to be the ELIZA pc program in 1966 (Weizenbaum, 1976). The program was designed to imitate the empathic conversation style of Carl Rogers (Rogers, 1951), and it used a query and answer layout to respond to statements that its consumer typed on a keyboard. ELIZA used language syntax to grant formulated responses based totally a programmed model and therefore solely mimicked conversation. In the early 1970s, psychiatrist Kenneth M. Colby developed a program called PARRY at Stanford University that simulated a man or woman with paranoid schizophrenia and, like ELIZA, the software should communicate with others (Güzeldere & Franchi, 1995). PARRY is credited as being the first software to bypass the Turing Test. The Turing Test (Turing, 1950), named after Alan Turing, is a method for judging the brain of machines. To pass by the test, a laptop program must impersonate a human real-time written dialog with a human decide sufficiently adequate so that the judge cannot reliably distinguish between the application and a real person. Tests of PARRY confirmed that specialist psychiatrists had been unable to distinguish between PARRY and a real character with paranoid schizophrenia (Teuscher & Hofstadter, 2006).

Technology has now developed into superior virtual human avatars (virtual fact simulated humans) that are successful of carrying on interactive and wise conversations. The coupling of virtual truth simulation, natural language processing, and knowledge-based AI successful of reasoning makes this possible. Researchers at University of Southern California's (USC) Institute for Creative Technologies, for example, are currently growing life-like digital human sufferers for use in scientific training and talent acquisition (Rizzo, Lange, et al., 2011). The digital truth sufferers are designed to mimic the signs and symptoms of psychological problems and engage with therapists via verbal

dialogue. They can also be modified for precise affected person population simulations and trainee ability levels. Some of the attainable benefits of this technology include the functionality for trainees to receive adaptive and customized training that is rather realistic and additionally on hand to the trainee at any time. This can furnish the introduced gain of freeing up instructors to play a greater advanced position in guiding pupil training. However, more researcher are necessary in order to decide how tremendous these structures will be.

AI-enabled digital truth human avatars have the doable to be used for all different kinds of person-to-person interactions in intellectual health care, which include psychological treatments, assessments, and testing. The use of virtual actuality avatars to grant people with statistics about intellectual fitness assets and aid are already in use (DeAngelis, 2012; Rizzo, Lange, et al., 2011). For example, Sim Coach (www.simcoach.org) designed to connect army service members and their families to fitness care and other well-being resources (Rizzo, Lange, et al., 2011). This kind of AI technological know-how may also one day revolutionize tele practice—AI-enabled avatars ought to be accessed remotely to provide psychological services to anywhere where there is an Internet connection. One of the benefits for patients is that these automatic AI-enabled virtual consultants can be readily accessed via patients at any time and grant them with simple assessments, recommendations, and referrals for in addition therapy that are tailor-made to the patient's person needs. Another gain of digital truth avatar system is that persons who are involved about privateness and the stigma associated with looking for care in person may additionally be greater willing to are looking for help from a virtual care company in the remedy of their home. Another benefit of this technology is that it is more inter-active and enticing than static informational Internet Web sites. These structures also have the achievable to help practitioners by means of serving as usually reachable specialist consultants that have discovered and possess know-how in particular domains or disciplines.

The use of AI-enabled kiosk-based computerized health screening systems may additionally be high-quality in settings where large numbers of humans want to be screened, such as in the military. Systems that use AI machine learning and reasoning standards go beyond mere computerized surveys with logic-based algorithms and gate questions; they ought to make assessments greater environment friendly and sophisticated due to the fact of the capability to method complex data, personalize to the individual, and minimize uncertainty in screening outcomes.

Integrated AI applied sciences can additionally provide a simulated practitioner with abilities that are beyond those of human practitioners, correctly making it a remarkable clinician. The notable clinician could be constructed with advanced sensory technologies such as infrared imaging (to notice body temperature modifications indicative of modifications in internal states) and optical sensing capable

of observing and examining refined facial expressions, eye blinking, vocal characteristics, and other patterns of conduct that furnish clinically relevant information. Machine olfaction technological know-how could additionally be used to sense the presence of alcohol, for example. The technological know-how ought to use facial awareness science to verify the identification of sufferers and also get admission to and analyze all data handy about the patient from electronic medical records, session notes, assessments, and trying out effects via wi-fi technologies. Furthermore, the extraordinary clinician may want to conduct classes with entire autonomy or serve as an assistant to practitioners in the course of scientific assessments and treatments. For example, this technology ought to assist the human practitioner with documents review, monitoring of physiological data, pretreatment clinical interviews, or check administration.

One of the earliest purposes of pc and AI science in the clinical field that also has direct applicability to the mental health care area is the use of specialist systems for medical selection making. An specialist system is a computer software designed to comprise the understanding and capability of an expert in a unique domain (McCarthy, 1984), and decision guide systems are a class of professional gadget that is specially designed to resource in the technique of choice making (Finlay, 1994). Many of these systems are rule-based specialist systems that have information and regulations preprogrammed and therefore require a priori expertise on the phase of the selection maker. Decision aid structures can also be designed to use information mining strategies to search and discover patterns and relationships in data and therefore do no longer require a priori knowledge (Hardin & Chhien, 2007). In addition, fuzzy expert structures are expert systems that use fuzzy good judgment instead of Boolean logic. Fuzzy logic (Zadeh, 1965) is an approach of reasoning that deals with approximate values (e.g., some degree of “true”) rather than fixed and actual values (e.g., “true” or “false”) and is useful for working with uncertainties all through selection making. Fuzzy modeling and fuzzy-genetic algorithms are techniques used to help with the optimization of regulations and membership classification (Jagielska, Matthews & Whitfort, 1999 for an evaluation of these concepts). One of the first scientific selection aid programs at Stanford University in the early 1970s was developed. The system, recognized as MYCIN, to discover microorganism causing infections and blood clotting illnesses, was designed (Buchanan & Shortliffe, 1984; Short-liffe, 1976). Built via interviewing experts, MYCIN used to be a rule-based gadget that used a typed question and answer dialog. Al-though the device carried out nicely in tests, it was once by no means put to scientific use mainly because of the computing technology limitations of the day (Buchanan & Shortliffe, 1984). The advancements in computing power and AI technological know-how in view that then, however, have noticeably extended the skills of medical professional systems. With the use of neural network ideas and computer studying techniques, current expert systems can discover patterns, trends, and

which means from complex data that are too complex to be processed by using people or different computer-based technologies. Support vector machines (SVMs; Cortes & Vapnik, 1995), for example, use computer studying to analyze, classify, and recognize patterns in records and have lately been examined in the classification of quite a few ailments consisting of Parkinson's disorder (Gil & Johnson, 2009) and Alzheimer's ailment (Kohannim et al., 2010).

The use of specialist structures in the intellectual fitness subject has lagged in the back of utility in the clinical field, however the applicability of AI more advantageous systems is being realized. For example, Masri and Mat Jani (2012) proposed an AI-based Mental Health Diagnostic Expert System (MeHDES) that would encode human experts' knowledge of intellectual fitness issues into a know-how base using rule-based reasoning techniques. Fuzzy good judgment methods would then be used to determine the severity degree of a specific ailment to be measured, and fuzzy-genetic algorithms would be used to decide and recommend customized treatments that think about the patient's finances and basic fitness condition. AI-enabled virtual reality human avatars with speech detection and Natural language processing technology ought to additionally decorate expert systems by using providing a human-like verbal communicate interface. These systems should have access to the corpus of expert expertise regarding psychiatric and scientific problems and be fed facts from affected person medical information and trying out results. Other realistic functions of AI-enabled expert structures encompass assistance with evaluation of medicine use, monitoring, and identification of contraindications (Bindoff, Stafford, Peterson, Kang, & Tenni, 2012). Moreover, the thought of artificial wise multiagent could additionally be used to have artificial "minds" work at the same time to make choices and provide solutions to problems in medical exercise or research. Along these lines, McShane, Beale, Nirenburg, Jarell, and Fantry (2012) talk about a gadget that enables the introduction of synthetic intelligent marketers that can function as individuals of multi agent groups (i.e., each artificial and human clinical experts) to become aware of and unravel clinical diagnostic inconsistencies.

The advantage of AI-based clinical decision assist systems is that they can deal with high levels of complexity in facts and can therefore aid practitioners with extracting relevant records and making most excellent decisions. These structures can also help practitioners deal with uncertainty and assist pace up choice making. The applications of AI-enabled scientific choice help systems can minimize needs on staff time and it can assist reduce limitations of limited practitioner competence in precise areas. Moreover, as humans are inclined to making mistakes as result of cognitive mistakes and fatigue, AI science has the attainable to enhance capabilities and reduce human blunders in medical decision making in all health care fields.

Conclusion

The presence of AI technology can already be found all around us. It is used in logistics planning, finance (to monitor and trade stocks and to conduct other banking functions), data analysis, manufacturing, Internet search engines, automobiles, mobile de-vice applications (e.g., Apple's Siri speech recognition software), aircraft guidance systems, and in a plethora of other applications (Kurzweil, 2005; Russell & Norvig, 2003). Moreover, full human brain simulation is a possibility in the near future. Notably, the Blue Brain Project (Switzerland) aims to create a synthetic brain by reverse-engineering the mammalian brain down to the molecular level. In 2009, they successfully developed a model of rat's cortex, and a full human brain simulation may be possible in 20 years (Neild, 2012). In 2013, the Obama administration announced a billion-dollar investment in a brain-mapping project that consists of a consortium of both private and public organizations (i.e., Defense Applied Research Projects Agency; National Institutes for Health, National Science Foundation; Markoff, 2013). The project aims to create a functional map of neural networks of the human brain (Alivisatos et al, 2012). The current and planned research and development investment in both the private and public sectors are indicative of the focus on the advancement of AI and associated technologies. The application of AI technologies in the mental health care field is undoubtedly a growth area that is destined to have a profound influence on psychological practice and research in the years ahead.

The field of psychology has historically made important contributions to the field of AI. For example, Frank Rosenblatt was the psychologist who built the Mark 1 Perceptron (Rosenblatt, 1957) - the first machine that could learn on its own using neural network concepts. The work of neuropsychologist Donald O. Hebb, whose theory for how neurons learn by the strengthening of connections between them (Hebb, 1949), set the foundation for the study of artificial neural nets in AI. The work of psychologist David Rumelhart and colleagues (Rumelhart, McClelland & PDP Research Group, 1986) furthered the study of neural-net models of memory that influenced the development of machine learning. Moreover, the entire "cognitive revolution" in psychology during the 1960s led to interest in computer models of human cognition. The further contributions of psychologists and other health care professionals in the study, development, and implementation of AI technology can be expected. Some of the areas to which psychologists and others in the mental health care field may contribute include research toward the development of new and creative approaches to designing AI technologies, laboratory and field evaluation of AI systems, and the study of how humans and AI interact with each other. Some other examples of research in this area may include study of the social relationships between people and artificial intelligent agents as well as the psychological effects of human-like robots on people (and vice versa). Furthermore, psychologists can contribute to decisions

regarding the ethical use of this technology in psychological practice, research, and in all other areas of society.

As with any emerging technology, caution needs to be used judiciously to overcome optimistic biases and, primarily, always to serve the best interests of the people for whom the technology is designed to help. Not to mention that Artificial intelligence (AI) is here to stay. Further emphasizing that the organization must stay attuned to the economic and social changes of the society; otherwise, it will fade away (Tahan, 2018).

As discussed in this article, there are many practical applications of AI technology that may serve to benefit patients, health care providers, society by enhancing care, increasing efficiency, and improving access to quality services. There is, nonetheless, the risk of this technology having negative implications as well. In the near term, specific applied use and collaboration with AI-enabled systems that serve to assist mental health care professionals can be expected. In the not-so-distant future, the widespread use of the AI technologies discussed in this article may be commonplace. Psychologists and all mental health care professionals must therefore be prepared to embrace and guide the use and study of AI technologies for the benefit of patients, the profession, and society as a whole.

References

Acampora G., Loia V., Nappi M., Ricciardi S. (2007). *Human-Based Models for Ambient Intelligence Environments* published in Xuan F. Zha (Ed.), Artificial Intelligence and Integrated Intelligent Information Systems: Emerging Technologies and Applications IdEA Group publishing, Singapore, pp. 1-18. https://doi.org/10.4018/978-1-59904-249-7.ch001

Alivisatos, A. P., Chun, M., Church, G. M., Greenspan, R. J., Roukes, M. L., & Yuste, R. (2012). The brain activity map project and the challenge of functional connectomics. *Neuron*, 74 (6), 970 –974. https://doi.org/10.1016/j.neuron.2012.06.006

Anderson, M., Anderson, S. L. (2011). *Machine ethics*. New York, NY: Cambridge University Press. https://doi.org/10.1017/CBO9780511978036

Ashcroft, M. (1997). *Human Memory and Cognition*. Prentice Hall Professional.

Asimov, I. (1942). *Runaround: Astounding science fiction*. New York, NY: Street and Smith Publications, Inc.

Asimov, I. (1985). *Robots and Empire*. New York, NY: Doubleday.

Banks, G. (1986). Artificial intelligence in medical diagnosis: the INTERNIST/CADUCEUS approach. *Critical reviews in medical informatics*, 1(1), 23–54.

Banziger T., Grandjean D., and Scherer K. R. (2009). Emotion Recognition from Expressions in Face, Voice, and Body: The Multimodal Emotion Recognition Test (MERT). *Emotion*, 9 (5), 691-704. https://doi.org/10.1037/a0017088

Bartneck, C., Lyons, M. J., Saerbeck, M. (2008). *The relationship between emotion models and artificial intelligence.* Proceedings of the Workshop on the Role of Emotions in Adaptive Behaviour and Cognitive Robotics in affiliation with the 10th International Conference on Simu-lation of Adaptive Behavior: From animals to animates (SAB 2008). Osaka, Japan.

Bickmore T. W. (2003). *Relational Agents: ffecting Change through Human-Computer Relationships*, Doctor of Philosophy thesis at the Massachusetts Institute of Technology.

Bindoff, I., Stafford, A., Peterson, G., Kang, B. H., & Tenni, P. (2012). The potential for intelligent decision support systems to improve the quality and consistency of medication reviews. *Journal of Clinical Pharmacy and Therapeutics*, 37, 452-458. https://doi.org/10.1111/j.1365-2710.2011.01327.x

Brynjolfsson, E., McAfee, A. (2011*). Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy*. Cambridge, MA: MIT Sloan School of Management.

Cohn J. F. & Sayette M. A. (2010). *Spontaneous facial expression in a small group can be automatically measured: An initial demonstration. Behavior Research Methods,* 42(4), 1079–1086. https://doi.org/10.3758/BRM.42.4.1079

Coyle, D., Matthews, M., Sharry J, Nisbet, A. Doherty, G. (2005). Personal Investigator: A therapeutic 3D, game for adolescent psychotherapy. *Journal of Interactive Technology & Smart Education*, 2(2), 73-88. https://doi.org/10.1108/17415650580000034

Czeran, E. (2011), *Regăsirea informatiilor din retele de socializare* - M.Sc. thesis, "Gheorghe Asachi" Technical University of Iasi, Romania

Damasio A. (1994). *Descarte's error: Emotion, reason, and the human brain*. New York: Gosset/Putnam.

Davis, M, Whalen, PJ. (2001). The amygdala: vigilance and emotion. *Molecular Psychiatry*, 6, 13-34. https://doi.org/10.1038/sj.mp.4000812

DeYoung, C. G., Hirsh, J. B., Shane, M. S., Papademetris, X., Rajeevan, N., and Gray, J. R. (2010). Testing predictions from personality neuroscience. *Psychological Science*, 21(6), 820-828. https://doi.org/10.1177/0956797610370159

Eichenbaum, H. (2002). *The cognitive neuroscience of memory*. New York: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195141740.001.0001

Erdman H.P., Klein M. H., and Greist J. H. (1985). Direct Patient Computer Interviewing. *Journal of Consulting and Clinical Psychology*, 53 (6), 760-773. https://doi.org/10.1037/0022-006X.53.6.760

Frost, B. (2008). *Computer and Technology Enhanced Hypnotherapy and Psychotherapy. A review of current and emerging technologies*. http://www.neuroinnovations.com/ctep/technology_and_computer_enhanced_psychotherapy.html

Hance, E. (1976). *Computer-Based Medical Consultations. MYCIN*. New York: Elsevier.

Jonassen D. H. & Wang S. (2003). Using expert systems to build cognitive simulations. *Journal of Educational Computing Research,* 28 (1), 1-13. https://doi.org/10.2190/TTGM-5TWG-3P1F-GG9D

Klein J.T. (1999). *Computer Response to User Frustration*, MIT Media, Laboratory Vision and Modeling Group Technical Report TR#480. https://doi.org/10.1145/632863.632866

Kowalski, G. (2011). *Information Retrieval Architecture and Algorithms*, Ashburn, VA, USA, Springer Science + Business Media. https://doi.org/10.1007/978-1-4419-7716-8_8

Levine, P., (1997). *Walking the Tiger: Healing Trauma*. North Atlantic Books, Berkeley, CA

Lin D, Pantel P. (2001). DIRT - Discovery of Inference Rules from Text, *Proceedings of the seventh ACM SIGKDD international conference on knowledge discovery and data mining*, pp. 323-328, ACM, New York. https://doi.org/10.1145/502512.502559

Major N., Ainsworth S., Wood D. (1997). REDEEM: Exploiting Symbiosis Between Psychology and Authoring Environments. *International Journal of Artificial Intelligence in Education*, 8, 317-340

Marks M., Cavanagh K. and Gega L. I. (2007). Computer-aided psychotherapy: revolution or bubble? *British Journal of Psychiatry*, 191, 471-473. https://doi.org/10.1192/bjp.bp.107.041152

Marsella, S. & Gratch J. (2002). *A Step Towards Irrationality: Using Emotion to Change Belief.* 1st International Joint Conference on Autonomous Agents and Multi-Agent Systems, Bologna, Italy. https://doi.org/10.1145/544741.544821

Mc Cune B., Tong R. M., Dean J.S., Shapiro D. G., Rubric (1985). A System for Rule-Based Information Retrieval, *Ieee Transactions on Software engineering*, 11 (9), 939-945. https://doi.org/10.1109/TSE.1985.232827

McCrone, Paul, Marks, Isaac M., Mataix-Cols, David, Kenwright, Mark and McDonough, Michael (2009). Computer-Aided Self-Exposure Therapy for Phobia/Panic Disorder: A Pilot Economic Evaluation, *Cognitive Behaviour Therapy*, 38 (2), 91-99. https://doi.org/10.1080/16506070802561074

Palacios A. M., Sánchez L., Couso I., (2010). Diagnosis of dyslexia with low quality data with genetic fuzzy systems, *International Journal of Approximate Reasoning*, 51, 993-1009. https://doi.org/10.1016/j.ijar.2010.07.008

Paulraj, M P, Sazali, Yaacob, Hariharan. (2009). Diagnosis of Voice Disorders using Mel Scaled WPT and Functional Link Neural Network, *Biomedical Soft Computing and Human Sciences*, 14(2), 55-60.

Petcu D. (2006). A Parallel Rule-based System and Its Experimental Usage in Membrane Computing Scalable Computing. *Practice and Experience*, 7(3), 39-49.

Rialle V., Stip E., O'connor K., (1994). Computer mediated psychotherapy ethical issues and difficulties in implementation. *Humane medicine*, 10 (3), 185-192.

Riva G., (2005). Virtual Reality in Psychotherapy: Review. *Cyberpsychology & Behavior*, 8 (3), 220-230. https://doi.org/10.1089/cpb.2005.8.220

Saenz-Lechon N. et al. (2006). Methodological issues in the development of automatic systems for voice pathology detection. *Biomedical Signal Processing and Control*, 1(2), 120-128. https://doi.org/10.1016/j.bspc.2006.06.003

Saggion H., Stein-Sparvieri E., Maldavsky D., Szasz S. (2010). NLP Resources for the Analysis of Patient/Therapist Interviews, LREC 2010 *conference proceedings*.

Schipor O. A., Pentiuc St. Gh., Schipor D. M. (2008), A Fuzzy Rules Base for Computer Based Speech Therapy, *proceedings of 9th International Conference on Development and Application Systems*, Suceava, Romania, May 22-24, 305-308

Seong-in K., Hyun-Jung R., Jun-Oh H., M. Seong-Hak K. (2006). An expert system approach to art psychotherapy. *The Arts in Psychotherapy*, 33, 59-75. https://doi.org/10.1016/j.aip.2005.07.004

Shaw M. L. G. and Gaines B. R. (2005). *Expertise and expert systems: emulating psychological processes*. Knowledge Science Institute, University of Calgary.

Tahan, M. (2018). Artificial Intelligence applications and psychology. *Avicenna Journal of Neuropsychophysiology*, 5(2): 1-13. http://dx.doi.org/10.32598/ajnpp.4.3.210

Urbani J., Kotoulas, S., Maaseen J., Drost N., Seinstra F., van Harmelen, F. & Bal, H. (2010), *WebPIE: a Web-scale Parallel Inference Engine*, Submission to the SCALE competition at CCGrid '10. https://doi.org/10.1016/j.websem.2011.05.004

Wikipedia. (2011). *Comparison of agent-based modeling software*. https://en.wikipedia.org/wiki/Comparison_of_agent-based_modeling_software

Wood S. D., Belar C. D. and Snibbe J. (1998). A Comparison of Computer-Assisted Psychotherapy and Cognitive-Behavioral Therapy in Groups. *Journal of Clinical Psychology in Medical Settings*, 5 (1), 103-115. https://doi.org/10.1023/A:1026210020906

Xu, Hong Chen, Song-Chun Zhu, and Jiebo Luo Zijian (2008) A Hierarchical Compositional Model for Face Representation and Sketching. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 30 (6), 955-969. https://doi.org/10.1109/TPAMI.2008.50

Yang, Y., Raine, A. (2009). Prefrontal structural and functional brain imaging findings in antisocial, violent, and psychopathic individuals: a meta-analysis. *Psychiatry Research: Neuroimaging*, 174 (2), 81–88. https://doi.org/10.1016/j.pscychresns.2009.03.012

Zuell, C., Harkness, J., Hoffmeyer-Zlotnik, J.H.P. (1996). Contributions to the Text Analysis and Computers Conference, September 18-21, 1995, Publisher: Zentrum für Umfragen, Methoden und Analysen (ZUMA), Druck & Kopie Hanel, Germany.