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Hybrid Intelligence is the Future of Artificial Intelligence: A Psychological Perspective

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ABSTRACT

As artificial intelligence becomes ubiquitous in our lives, so do the opportunities to combine machine and human intelligence to obtain more accurate and more resilient prediction models across a wide range of domains. Hybrid intelligence can be designed in many ways, depending on the role of the human and the algorithm in the hybrid system. This paper offers a brief overview of hybrid intelligence, which describes possible relationships between human and machine intelligence for diagnosis of mental illness.How can we connect artificial intelligence with cognitive psychology? What kind of models and approaches were developed in these scientific fields? The main aim of this paper is to provide a broad summary and analyses about the relationships between psychology and artificial intelligence. Main goal of the artificial intelligence was/is to develop human level intelligence, but the technology transfer turned out to be much comprehensive, and these systems are used widely, and the research is blooming.The first part of the paper introduces the development, and the basic knowledge, general models of the cognitive psychology (gives also its relevant connecting points to artificial intelligence), it describes also the information processing model of the human brain.The second part provides analyses of the human computing interaction, its tasks, application fields, the psychological models used for HCI, and the barriers of the field. In order to extend or defeat these barriers, the science has to face several scientific, pragmatic, and technical challenges. Other important area demonstrated in this paper is the mental modelling used to prevent, prognoses, manipulate, or to support the human mental processes, like learning.The last part deals with the expert systems used to help people and relatives with autism and with the life simulation (applied mental model) in the virtual reality/virtual environment.The present paper is to introduce the different approaches, models of the artificial intelligence and cognitive psychology as a hybrid intelligence in the future and gave an outline of the scientific fields.

Key Words : Artificial intelligence, Hybrid intelligence, Human computing, Neural network

INTRODUCTION

Artificial Intelligence the word founded by John McCarthy a Professor emeritus of computer science at Stanford in the mid-1950s now becomes a revolutionary word in the field of computer science and information technology. John McCarthy was a giant and a seminal figure in the field of artificial intelligence. Here it is important to discuss the meaning of artificial intelligence, According to M.L. Minsky, "Artificial intelligence is the science of making machines do things that would require intelligence if done by men." Artificial intelligence is intelligence perceiving, synthesizing and inferring information demonstrated by machines as opposed to intelligence displayed by animals and humans. Most of the current development of artificial intelligence is based on brain cognition, however, this replication of biology cannot simulate the subjective emotional and mental state changes of human beings. It aims to promote the development of artificial intelligence and give computers human advanced cognitive abilities, so that computers can recognize emotions, understand human feelings, and

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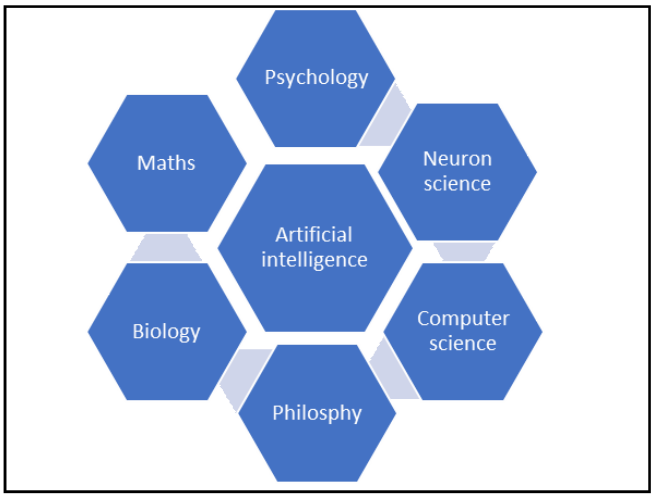
eventually achieve dialog and empathy with humans and other artificial intelligence (Zhao *et al.,* 2022).



Objectives :

1. To understand and discuss the nature and scope of Hybrid Intelligence.
2. To formulate the possible model for cognitive psychology with respect to hybrid intelligence.
3. To establish the relationship between cognitive psychology and artificial intelligence.
4. Application of artificial intelligence to diagnose, treatment and prevention of mental disorders.

Psychology and Artificial Intelligence:

Psychology is one of the basic sciences of artificial intelligence (AI). The founder of the psychology is Wilhelm Wundt (1832-1920), who engaged in empirical methods, and was interested in the thinking processes during his scientific work. Machine learning has a new landscape for humanity in the area of artificial intelligence (AI). Artificial intelligence (AI) approaches have recently been developed to support mental health professionals, primarily psychiatrists, psychologists, and clinicians, with decision-making based on patients' historical data (e.g., clinical history, behavioral data, social media use, etc.). Issues associated with AI in the context of clinical practice, the potential risk for job loss among mental health professionals, and other ramifications associated with the advancement of AI technology are discussed. The advancement of AI technologies and their application in psychological practice have important implications that can be expected to transform the mental health care field (Irshad *et al.*, 2022).

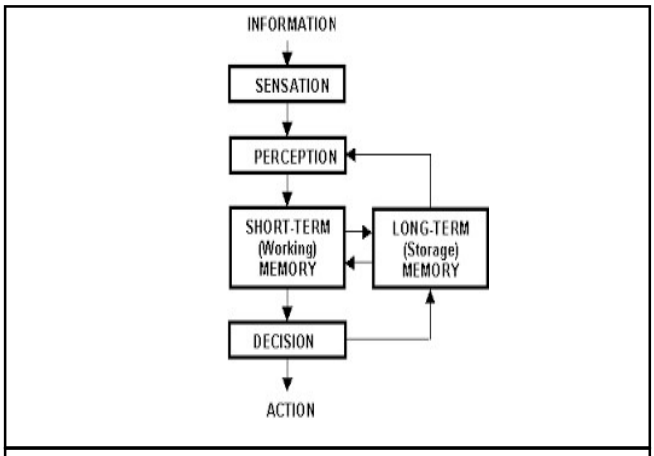


Fig. 1 : Information Processing Model of the Human Brain

Psychology had two main leading schools: behaviorism, and cognitivism. Behaviorism refused the theory of the mental processes, and insisted to study the resulted action or the stimulus strictly objective. The representatives of this theory have been decreasing with time.

Cognitive science and Artificial intelligence (A Hybrid Approach):

Here we are going to discuss how can we connect artificial intelligence with cognitive psychology? Types of models and approaches were developed in these scientific fields. Artificial intelligence is more and more evolving into a science of intelligence, and a report of work on computer semantics make clear that there is a great deal of emphasis on how the mind might, if not does, go about doing some of the intelligence tasks involved in resolving meaning. The information processing model of intelligence itself has been a stimulant to psychology. Cognitive psychology and AI share many metaphors. In hybrid intelligence we discuss the relationship between artificial intelligence and psychology by considering as an examine problem which is one of the central problems of artificial intelligence according to computer vision. Recent years have been marked by important developments in artificial intelligence (AI). It is now possible to design entirely new classes of experiments that are more promising than the simple tasks typically used for studying creativity in psychology. In addition, given the current and future AI algorithms for developing new data structures and programs, novel theories of creativity are on the horizon (Gobet and Sala, 2019).

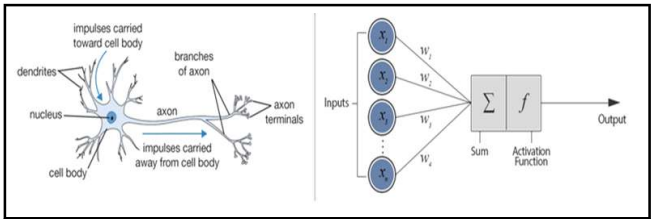


Fig. 2 : Biological Neuron vs Artificial Neural Network

Each and every organism contains a possible small model of the outer world, and the possible actions, each have ability to try different alternatives, and decide by the best, react before an expected future happens, or to analyze the consequences of the past, and react the most competent and safe way on a situation. AI is typically used to describe both the "technology designed to perform activities that normally require human intelligence" and the multidisciplinary field of science concerned with understanding and developing that technology (Luxton, 2014). The AI uses a combination of rule-based and fuzzy logic to understand patients' needs, agreeing on treatment plans that suit their budgets and are appropriate alongside other health conditions (Masri and Mat Jani, 2012). We all are come in a contact with Human Computing Interaction (HCI) every day, because this field includes the everyday use of computer, the user interfaces and expert programs which may use cognitive psychology in order to manipulate or help people. It is important in the HCI to understand the goals, intention of the user the problem-solving ability (with psychology), to understand the interaction (sociology), and to understand the physical ability of the users (ergonomic), to develop useful interface (graphical design), and to develop a system (computer science). We should find HCI application in virtual reality and virtual environment.

Human Computing Interaction:

We may come in a contact with HCI every day, because this field includes the everyday use of computer, the user interfaces and expert programs which may use cognitive psychology in order to manipulate or help people. In this paper, those tasks will be introduced where psychology has a relevant connection.

Virtual Reality is a new way of the human machine communication, which enables an interaction connecting to human senses. Stereo display systems provide for the user the experience of a real spatial representation, other systems provide also a possibility for a natural and intuitive direct interaction. An interesting technology is for example the modern tomography technology, CT, MRI (representing the human anatomy very detailed). Virtual environment provides 3D data sets. The main component of the user interface is to recognize, and analyze the hand gestures.

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 is relevant. Virtual human may possess several parameters: mental states (which produces emotional connection to the player), emotions, personality, memory, social norms behaviour, intelligence, motivation, are connected to sensors to be able to react on outer stimuli. The figure 3 illustrates the possible mental model of a virtual human. Technologies of Artificial Intelligence provide a basis for the dream of the virtual reality. (N.M. Thalmann) Social Norm includes status, rules of information and interaction, control of the process, nonverbal social interaction.

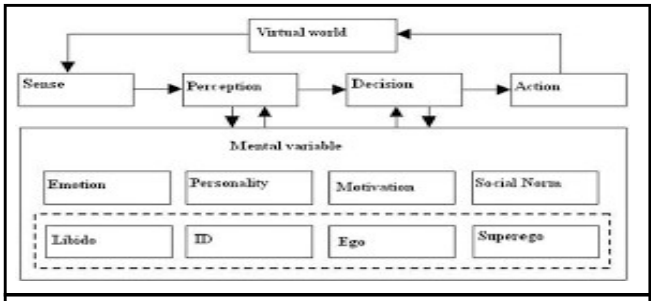


Fig. 3 : Possible Mental model of virtual human

In the beginning HCI management delegation and manipulation where the user controlled the devices like mouse, keyboard. But we cannot shut out the psychological processes out of the HCI. Actions are changes taking place in some milliseconds. Lost messages of the behaviour can be the following:

– Emotional and behavioral states (like: fear, joy)
– Manipulation (self and environment)
– Analyses/understanding of the signs of the behaviour: body language, nonverbal signs.
– Understanding the environment/context (with behaviour)

Mental Modelling:

Artificial Intelligence can also be applied for predicting mental processes. The main goal of this research is the fact, which the numbers of the mental illnesses are increasing, information is contradictory, and

data bases are growing. One research field is for example: to detect and model Alzheimer. Mental state of a human depends on outer stimuli and inner cognitive processes. The main parts of the mental state are the following:

- Emotion
- Motivation
- Personality
- Social Norm

Prevention of Mental Disorders:

The numbers of mental ill people are globally increasing from year to year, despite of the increasing number of researches (researches are mainly dealing with genetic, and environmental facts. Only in the USA, 7, 5 million children are involved in these illnesses, and from 1994 there exists research which tries to prevent the endangered children. The research will provide a model in which psychologists will be able to encroach in the development of the children in time. Mental illnesses are illnesses which disturber or limit people in their goals, the quality of life. It is also a psychological or behavioral pattern that occurs in an individual and is thought to cause distress or disability that is not expected as part of normal development or culture. Cognitive psychology attempts to understand cognition's complexity through research, testing, and building models of how the human mind handles and processes complex information during attention, memory, and perception (Zivony, 2019).

Expert Systems- Discovering, dealing with Autisms:

Autisms are also a mental disorder which could be detected in childhood. If the diagnostics happens in time, it can lead effective help/therapy. The main goal of our study is to develop technological aids, which will help Autistic individuals to be identified earlier and initiate early intervention for the management of autism. (System developed in Indian) The AI Gaming Systems imparts valuable training to the child using the agent model, to which neural net and positive Reinforcement agents are attached. Assessment comprises Pre-training (prior to usage of AI Gaming Systems) and post- The computers offer a context-free environment in which many people with autism feel comfortable, therapists and teachers are increasingly using virtual reality tools to teach life skills, such as crossing the road. Teacher, therapists use this virtual system, to develop the abilities of children (social interaction, cognitive processes, vocabulary, attention). AI offers a promising approach to assist and sometimes replace selected practices involved in mental health assessment and treatment (Fiske *et al.*, 2019).

Conclusion:

The paper provided a short but broad summary about application and use of hybrid intelligence (artificial intelligence using cognitive psychology) in future. The list of these application is not complete, because these research field is a dynamic changing area, and the fusion of the two sciences (cognitive psychology, and artificial intelligence) will provide amazing research fields. Mental modelling and Human Computing Interaction are leading research fields also in the cognitive psychology. Emotion recognition and cognitive robotics were not mentioned in this paper, but re also an important part of the shown field.

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