Consciousness, Cognition and Neural Networks in the Brain: Advances and Perspectives in Neuroscience

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Summary
This article reviews recent advances and perspectives in neuroscience related to consciousness, cognition, and neural networks in the brain. The neural mechanisms underlying cognitive processes, such as perception, attention, memory, and decision-making, are explored. The article also examines how these processes give rise to our experience of consciousness. The implications of these findings for our understanding of the brain and its functions are presented, as well as potential applications of this knowledge in fields such as medicine, psychology, and artificial intelligence. Additionally, the article explores the concept of a quantum viewpoint concerning consciousness, cognition, and creativity and how incorporating DNA as a key element could reconcile classical and quantum perspectives on human behaviour, consciousness, and cognition, as explained by genomic psychological theory. Furthermore, the article explains how the human brain processes external stimuli through the sensory nervous system and how it can be simulated using an artificial neural network (ANN) consisting of one input layer, multiple hidden layers, and an output layer. The law of learning is also discussed, explaining how ANNs work and how the modification of weight values affects the output and input values. The article concludes with a discussion of future research directions in this field, highlighting the potential for further discoveries and advancements in our understanding of the brain and its functions.

Keywords:

Artificial neural network, Cognition, Consciousness, DNA, Quantum transformation, Sensory nervous system

1. Introduction

Consciousness deals with the quality or state of being aware of something, a stunning experience of the internal and external world. It also deals with self-feelings, optimal self-control activities, memory, language, thought, and generation of portrait and genomic patterns when we close our eyes internally. Consciousness also defines our survival, the viewpoint of certainty, and awareness relies on the universe and us.

The advertising and source of consciousness in the world are conveyed in three possible general results. In the first kind, the consciousness is appeared but is not autonomous. The characteristic transformative results of the biological selection of the brain and nervous system using traditional physical procedures [1]. The typical viewpoint of consciousness is developed as the property of complex biological handling throughout the assessment. Feelings change regarding how, when and where consciousness is revealed, e.g. only in recent humans and in earlier organisms [2]. Furthermore, epiphenomenal unreliable thought, consciousness is transformative modification [3]. In this viewpoint, the key component of the universe is not awareness.

In the second division, the consciousness that has always been in the universe is considered a different quality, specific from bodily actions that are not organized by physical rule. Descartes, the viewpoints of duality religious and spiritual tactics, accept that awareness has occurred in that world from the beginning, e.g., the presence of power, “maker,” or segment of obvious Divinity [4]. However, consciousness has no foundation and representation in sciences, but it can indifferently influence physical matter and human behaviour.

In the third division, the different physical events are the consequence of consciousness going about as a part of exact physical laws; however not entirely understood; these events have continuously happened in the universe, like non-rational and proto awareness. The new science develops an instrument to arrange such events and link them with neuronal action, carrying almost central biased and sensible moments and unexpected behaviour control. These events particularly purpose the moments of quantum state decline (self-estimation) purpose the moments of quantum state decline (self-estimation). The component of existing hypotheses of the rules of the world should ultimately and reasonably explainable but not require these events [5]. “Orches treated subjective reduction,” that is, the theory of Penrose and Hameroff, also described the scientific framework [6]. “The Objective Reduction theory (OR)” proposed by Penrose describes that the proceedings of consciousness are conclusions that include the quantum computation inside the microtubules of the brain reducing and having realistic potentials.

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These viewpoints show that consciousness is an innate part of the movement of the world.
The rest of the paper is organized as follows: In Section 2, related work regarding the unexplained features of consciousness, quantum cognition, and artificial neural networks is discussed in detail. In Section 3, the high-accelerated regions (HARs) residing in human DNA and their role in understanding consciousness and cognition are explained in detail. Finally, Section 4 concludes the research and directions for future work are provided.

2. Related work

This section reviews existing literature on the unexplained aspects of consciousness, quantum cognition, and artificial neural networks to understand their strengths and limitations. A detailed review is provided below.

2.1 Unexplained features of consciousness

The consciousness is an increasing recognition of challenging computation among “integrate” and “flame” that is in the viewpoint of many researchers and scholars. These brain neurons switch chemically intervened neurotransmitters, whichare also interconnected among themselves. The instrument for creating neural computation can create unclear consciousness experiences [7]. The particular unexplained features of consciousness are explained below;

What recognizes consciousness from non-consciousness knowledge, and what is the way of sensational experience is a very durable question? The extraordinary awareness and individual emotions carry the behaviour and sensitivity called qualia by many thinkers [7]. Observation and behaviour might, at different times are unlinked by consciousness.

At somewhat distinctive times, “Binding” in different mind areas, the disparate tactile inputs are prepared that are bound together and transported together the consciousness substances [8]. Now there is a question of how the consciousness substances are bound together. The widespread region of the mind is synchronized by the polarization state of the synchrony neuronal layer [9]. Furthermore, this polarization is spread as a synchronized zone through the cerebrum. The electrical neural connection and entanglement require exact synchrony [6].

As indicated by Gödel's hypotheses, the non-compatibility and causality described by Penrose suggest that the mental nature of comprehension must come from some non-computable source and cannot be explained by computational frameworks [10, 11]. Besides, the computational neuron approach to the violation appeared to prevent any possibility for autonomous casual action or free will where algorithm computation determines all the supposed methods. To resolve the question “what are the non-computable factors present in the brain” something else is needed [11].

2.2 Quantum cognition

Quantum cognition is a lesser-researched area in comparison to consciousness. In quantum cognition, concepts such as decision-making, reasoning, and perception are better explained using the mathematical principles of quantum theory. The quantum theory explains puzzling findings in psychology, but it does not necessarily suggest that the brain is a quantum computer. To study why quantum cognition is an intriguing and attractive approach to psychology, we will focus on two quantum principles: complementarity and superposition. Complementarity suggests that in order to produce measurement outcomes, effects and psychological measures must be made successively. The background produced by the previous measure affects the subsequent reaction. Superposition suggests that the ability to convey all possible values is present within the superposition, but a definite value cannot explain certain mental states. It has been proven that many divergent and puzzling phenomena can be explained by these two principles working together [12]. Peter Bruza tries to attract a joining connection concerning mind and quantum mechanics in his paper “special issue of quantum models of cognition”. This theory is very helpful in the current scenario for understanding the modelling of cognitive science and sub-atomic phenomena. According to the authors, quantum theory evades persistent problems in their field [13].

The relationship between quantum mechanics and higher brain function is a very interesting. Many questions related to this topic are asked at many conferences, which shows that this is a very hot topic nowadays. Therefore, a very well-founded understanding is required to research this topic. It is already understood that quantum mechanics play an outstanding role in receiving the proton by eye and molecules. The question that is most concerned these days is whether any nervous system components are strongly coupled with its environment and whether these quantum computations are helpful for performing functions. Many scientists thought that only classical physics governs the interaction of neurons which is explained on the cellular level. But a few people believed that the operation of the higher brain centre is better explained only by quantum mechanics. However, many arguments lead to the uncertainty level in this research area which comes from the biophysics and neurosciences. The human brain

functions on three important physical scales: time, space, and temperature. The superposition is a key to playing a fundamental role in the quantum information processes. According to neurosciences, neurons are responsible for information processing because the whole functional unit of the nervous system is called neurons. A neuron cannot simultaneously be present in both firing and non-firing states, which is integral to producing superposition. Furthermore, the classical neural network that follows complex activity to produce interference and entanglement results from superposition. Quantum cognition is averse to fashioning such concrete models, which can explain this neurophysiological mechanism to represent information in the brain [14].

2.3 Artificial neural network

The working manner of the human brain is the main inspiration for the artificial neural network, an artificial adaptive system. The artificial neural network changes the inner structure in relation to a purpose objective. The artificial neural network mainly solves the nonlinear types of problems; its presence enables to recreate of the unclear rules that manage the prime explanation for these problems. The fundamental part of the artificial neural network is processing elements PEs, also known as a node, and another part is called connection. Separate input is given to every node, input provides communications from other nodes or the environment and its specific output. Every node can convert its peculiar global input into an output is the main function; the strength with which couples of nodes are excited or inhibited is the main characteristic of Each connection. Positive values, and inhibitory connections by negative ones indicate excitatory connections. As time passes, the connections between the nodes can change themselves. A learning process in the entire ANN is started by this self-motivated system [15].

The "Law of Learning" explains the mode in which nodes change themselves. The total energetics of an ANN is secured to time. The environment must automatically act on the ANN multiple times for it to modify its connections [16]. This action on the ANN is done by the environment, which is referred to as data. The significant instruments that describe the ANN are the learning process, one of which is considered an adaptive processing system. The learning process adapts the connections of an ANN to the data structure that makes up the environment, providing a way to "understand" the environment and the relationships that characterize it [17] [18].

The best way for the neuron organization is in a topological manner (more-dimensional structures, three-dimensional blocks and one- or two-dimensional layers) based on the amount of input and data quality. The feed-feed-forward topology is the most basic type of artificial neural network work [19, 20]. Depending on the quantity of input variables, a particular number of PEs is joined to an input layer. One or more hidden layers function inside the ANN through which information is forwarded. The final component of this structure is referred to as the output layer, which delivers the results. Although the result of the output layer is a binary value or a single number, it contains only one PE. the ANN consists of, it contains only one PE. the ANN consists of the PEs connected with other PEs in their neighborhood. Only one way these connections differ occurs between the subtypes of neural networks (Figure 1) [1, 21].

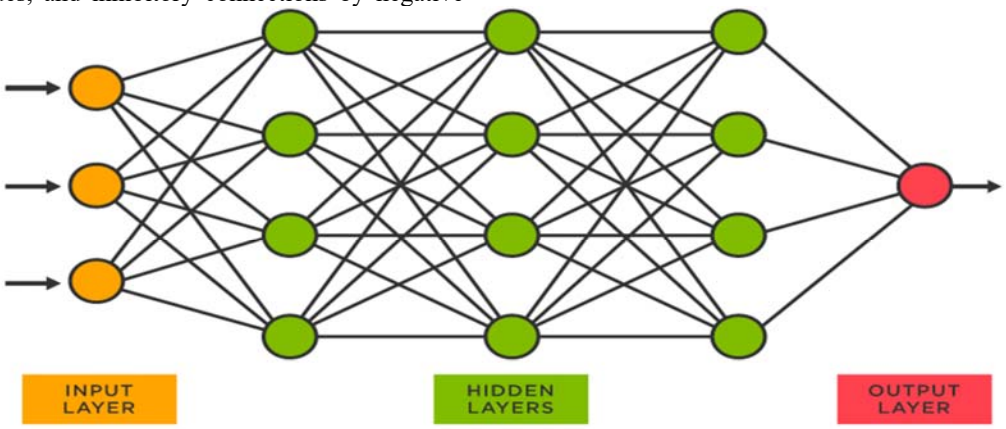

Figure 1. Neural networks and machine perception by labeling or clustering raw input data [22]

The input or output values are modified by the weight present in each of these connections. Throughout the training process, the value of these connection weights is determined. The ANN's learning capability depends upon the functionality mentioned above. There are no ordering guidelines written into the algorithm; therefore, it is vital to understand it. The network studies recognizing and categorizing input patterns from samples (Figure 2). Statistical computer software packages are normally used to obtain basic neural networks. Different neural networks work on the specialized softwares some companies offer (e.g. Neural Works Professional by NeuralWare Inc., Carnegie, Pennsylvania, USA or CLEMENTINE Data Mining tool by Integral Solutions Limited, UK). These software packages must be flexible and easy to use for widespread use.

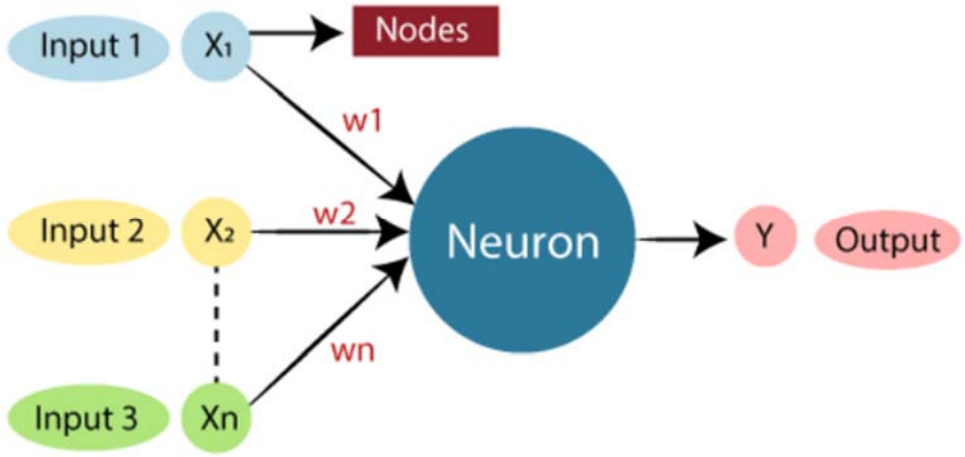

Figure 2. Neural Networks artificial neuron [23]

3. High accelerated regions (HARs) residing in human DNA

The formative and transformative system remains to a great extent, obscure behind the rise of particular human brain elements. However, the path is developed to link genetic and phenotypic changes in a human's developing brain by contrasting the genome with that of our nearest organic relative, the chimpanzee. The accelerated human regions that are DNA, show that the DNA arrangement does not change almost all through the mammalian advancement, yet encountered a rush change in people since the uniqueness of chimpanzees. This sudden transformative mark suggests a profoundly monitored capacity lost or changed in the human genealogy [24].

In the section below, the role of HARs in understanding consciousness and cognition, as well as quantum approaches and the processing of HARs, is explained in detail.

3.1 Role of HARs in understandings of consciousness and cognition

"Search for the missing science of consciousness" is the viewpoint of Penrose that deals with many thoughtful problems that are unsolved even these days [25-27]. He combines the rules of mathematics and quantum perspective to integrate the two concepts of consciousness and cognition in a new manner. Penrose thought there is a complex algorithm in the human mind that performs all complex tasks, because he believes in nature. Due to natural selection, it is proven that it is difficult to understand the structure and function of the human brain because it is very complex. I have firmly believed in the power of natural selection. But two essential questions arrived in the mind of most people, how the growth of the brain increases and how the brain performs these complexes functionally. The epigenomic regulation of consciousness and cognition, which has been produced over the past few years by the recent neuroscience learning [28] is integrated with the Penrose's math oriented slandered of universe and cognition [29] to deal with above mentioned questions. The branch of psychological genomics is epigenomic,

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how the expression of biological inheritance in our DNA is modulated by nature, including memory and learning [30]. The limitations of early "natural selection theory" are increased due to the epigenomic, which is the natural life process. For answering the Penrose predicament about natural selection and the brain's algorithmic nature, Psychological genomics, in particular, is an approach [31, 32].

The above discussion shows that the concept of high accelerated regions is not explained in the quantum perspectives related to consciousness and cognition. The high accelerated region makes the difference between humans and chimpanzees. Therefore, it is essential to make the machine conscious and cognitive. According to Penrose, many focused problems are unsolved even these days due to the absent science of consciousness allotted to these dilemmas [25, 26, 33]. In this paper, We explore the concept HARs with a quantum approach to consciousness and cognition that resolve the missing gap. The molecular loop used for transferring information between experiences of original consciousness and cognition genomics, brain and neurons is explained by the research started with the review of RNA/ DNA psychological epigenomics research.

Figure

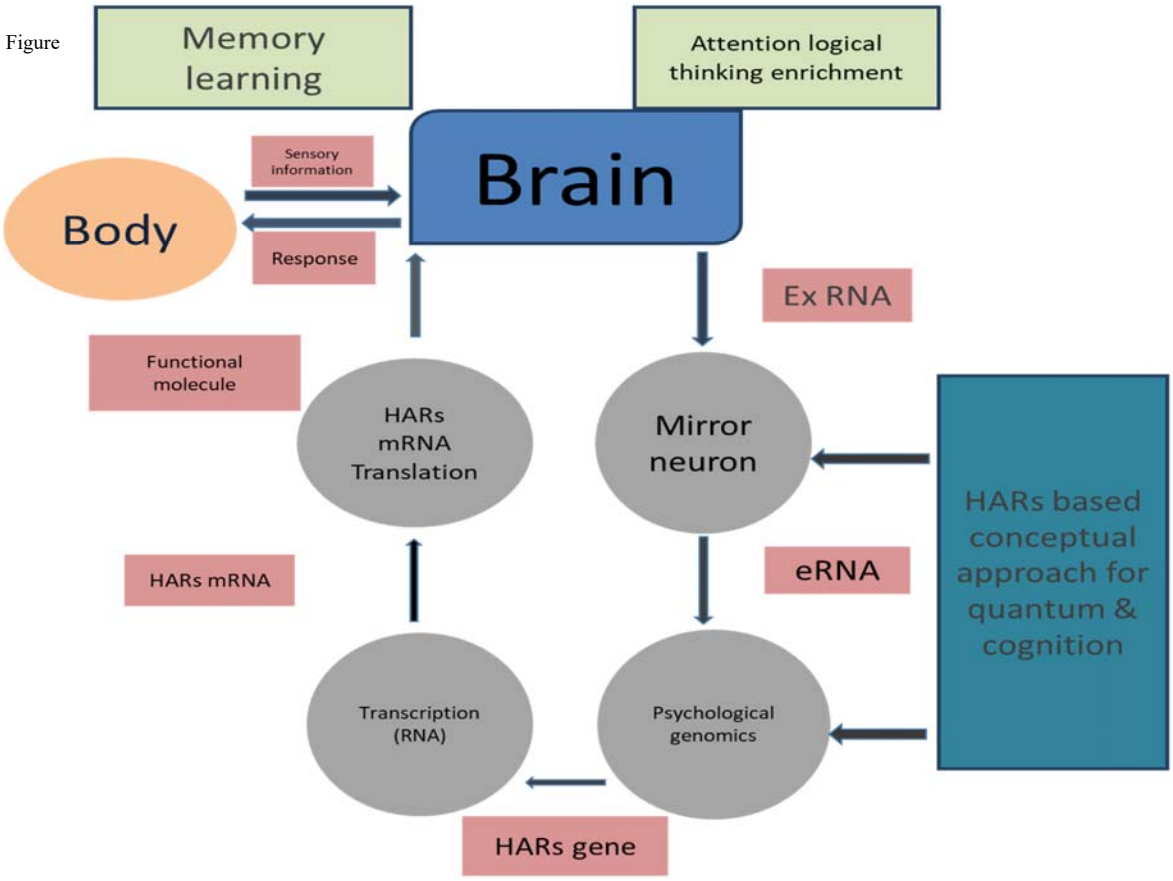

Figure 3. The high accelerated regions to explain consciousness and cognition

3.2 Quantum approaches and HARs processing

The nervous system is connected to the human body and helps operate all its essential functions. The author's research shows that the clusters of genes are mainly different from those of our adjacent cardinal relatives, which experience speedy alteration. These groups of genes are recognized as the Human Accelerator Regions (HARs). The external message is sent to the central nervous system in the brain as soon as the sensory nervous system senses it. This stimulus starts a series of forceful operations in the brain's neurons. The external ribonucleic acid is activated upon receiving the neurotransmitter message from the synaptic junction. The exRNA molecule influences the expression of another molecule known as enhancer RNA (eRNA). This eRNA stimulates the transcription events in the highly accelerated human genome region. In the first step the DNA segment of HARs is copied into the mRNA which is called transcription, and in the second step, the mRNA is translated into a functional molecule called protein; this process is called translation. This protein performs many essential functions, but here we will discuss only its role, which explains this protein component is responsible for the development of human neurons, which is the fundamental unit of the brain and is possibly involved in the interpretation and logical reasoning in the brain (Figure 3).

According to the research of Roger Penrose and Stuart Hameroff, the brain functions as a quantum computer, performing complex calculations by utilizing quantum mechanical phenomena such as the ability of particles to exist in multiple locations simultaneously [34]. The strands inside neurons could shape the essential unit of quantum calculation; these strands are present in the brain. The idea is intriguing because neuroscience currently has no satisfactory explanation for consciousness, the state of being self-aware and having tactile experiences and perceptions. However, many researchers are unconvinced, citing a lack of experimental evidence [34]. The unique research on mirror neurons was started by Rizzolatti et al. [35, 36] and others [37, 38]. Current neuroscience has greatly expanded on this by modifying brain or gene expression to include epigenomic processes, as seen in the study by Regey et al. on bird's song and courtship dynamics. For example, this study recognized how by modifying the transcription and translation cycle through action dependent on epigenomic expression of eRNA (enhancer RNA that enhances the ability of gene expression) answers. Clayton, a specialist in song bird neurogenomics, made the salient comment that this is the first time micro RNA has been shown to respond to a particular thought process [39].

Epigenomic information, through our extended definition of mirror neuron action, determines the change between the sound and spectra of the bird song and molecular eRNAs [40, 41]. It is very interesting that undeveloped male birds try to copy their father's songs. Unfortunately, some make mistakes. However, these are called blunders because of their distinctiveness, which is superficially a young female because the female then selects to mate with the male. The male and female behavior in which turning on molecular genomic RNA and DNA transcription and translation cycle leads to the appropriate hormone creation, ovulation and sexual actions in lady which are related with female and in males is song of males. Moreover, the current research on public communication of bats supports and extends this previous investigation on song of birds. As a model of human cognition, bats are suitable because they are mammals and provide better insights into communication. A recent subject of science. [42, 43] specifies how the gene (FOXP2) related to cognition and spoken language in humans, bats, and birds might be an earlier model for human language.

The above diagram shows the creative cycle in which the psychological genomic cycle of consciousness, cognition and brain is described [32]. Cognitions modulate gene expression via bioinformatics epigenomic loop modulating between nature and nurture. To enhance DNA (gene expression), cognitions are converted into eRNAs (enhancer RNAs), which produce codes for mRNAs (messenger RNA) that are used to produce proteins through the extended compound in the adaptive mirror neuron system, which reinforces communication between the brain and body [44].

4. Conclusion and future work

This paper has discussed the idea that the traditional Newtonian world is blended with the quantum ideas of consciousness and cognition. It has described how the accelerated regions of the human brain respond quickly when the sensory nervous system detects external stimuli. The classical and quantum alterations of human behaviour, consciousness, and cognition have been reviewed to support the use of genomic psychological theory in understanding the accelerated regions.

Future research directions in this field include examining the quantum field theory using the human cognition and neural network to verify the best loop of evidence from consciousness and cognition to express the progress of the original model, RNA, and DNA for transcription and

translation. Additionally, further research on the theoretical foundations, such as nonlinear dynamics, chaos theory, and the coupling of computer science, will be essential to allow the creation of "intelligent" agents such as artificial neural networks, that can adapt dynamically to complex problems.

Overall, this paper has highlighted the significance of understanding the neural mechanisms of cognitive processes in order to fully comprehend the functioning of the brain and consciousness. Further research in this field has the potential to lead to exciting discoveries and advancements in our understanding of the brain and its functions, as well as in areas such as medicine, psychology, and artificial intelligence.

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