

Artificial Intelligence Using a Neural Network System to Support Human Resources in the Workplace

Mohammad Ali Alqudah

*Department of Computer Science, Khazar University, Azerbaijan
mohammad.ali@khazar.org*

Abstract

Artificial neural networks mirror the behaviour of the human brain, allowing computer programs to recognize patterns and solve common problems in the fields of artificial intelligence, machine learning, and deep learning and from it an attempt to represent human behaviour according to learning algorithms; These artificial networks target cognitive and cognitive activities associated with brain function. The current study aims mainly to reveal the nature of the relationship between human resources and the smart organization through the neural network system and the level of its practices, the neural network resembles the sources of human mental activity as an effective resource in the functional environment, and to identify the most important what these super-intelligent applications can add to organizational behaviour. The data was analyzed using The simulation system for neural networks through mean clustering tests and to indicate the level of influence of inputs and outputs to reach the proposed model, as well as tests of accuracy and performance of the model, the level of error in training neural networks, then the strength of the relationship between layer nodes, the weights of the effect of hidden neurons (layer hidden) and the relative importance The dimensions of the inputs over the outputs of the final model. The results of the study showed that the practice of smart organizations has a greater impact on the human resources elements The study recommended that decision centres should realize the importance of the simulation system in neural networks in providing solutions for to administrative problems because of the time, effort, and money it saves, in addition to the accuracy of the results, in addition to the need to continue to Disseminate and adopt human resources because it is the basis on which to achieve an important strategic competitive advantage and The necessity of compatibility of the objectives set by the Bank with the economies of knowledge, electronic commerce, and mutual communication and innovative knowledge.

Keywords: neural networks, artificial intelligence, human resource, organizational behaviour

Introduction

The knowledge industry, its possession, and then its transmission and dissemination, has become a feature closely related to scientifically advanced, technologically, and technically advanced societies. The concept of knowledge has become closely related to the concept of power, even if the dimensions and goals of this power are numerous. Concepts that were adopted from knowledge as rooted in their formation, such as the concept of “knowledge society, knowledge economy, knowledge management, knowledge capital ... etc.” For a concept that is self-contained, studied by disciplines, dealt with my studies, and in which research and fields are deepened, it gains its weight from the weight of knowledge, because it is the industry of the future, and the wealth of nations looking forward to tomorrow, controlling the initiative, and proactive for excellence and eager for it; In the midst of all this, the concept of knowledge technology emerged, within the enormous information and communication technology tide, which the post-modern stage knew at a high level of expectation.

The huge scientific development that followed the information revolution of information technology and communication media, allowed the emergence of the concept of simulating human knowledge; That is, searching for models that can represent the amount of knowledge that distinguishes humans from skills, experiences, and acquisitions; As a person has tried to search for ways to transfer his knowledge experience to smart media, which saves him time and effort in his daily life dealings, no matter how different aspects of these transactions are, and their goals are numerous. These systems are based on advanced pillars to turn into super-intelligent networks, whose interactive environment is represented by the computer and its accessories, and their technological capabilities are researched; So, the human mental capacity, including its trilogy; Thinking, Awareness and Perception, looking at the possibility of simulating human intelligence with its complex mental functions through computing, thus what is known as artificial intelligence appeared.

Artificial intelligence, like a quantum leap in the world of advanced and accurate technology, has opened the way for the search for an exceptional alternative to human intelligence, with the possibility of applying this alternative intelligence in several areas based on data and data, most of which are digital, based mainly on smart systems technology, and branches of engineering and abstract mathematics. and specializations from the humanities, and gave a strong impetus to the emergence

of designs parallel to the design of the human brain, as the main source of various cognitive mental processes, and the most important of these designs are what is known as artificial neural networks, which derive their name from the representation of the human vital neural network, which depends on precise mathematical programming using Computing is an attempt to simulate the functioning of the neurons of the human brain, which are the source of various voluntary cognitive functions (mental) that distinguish humans from other organisms. One of the most important areas that can benefit from the skills of artificial intelligence techniques, such as neural networks, is the field of management, as it is a vital field that includes within its organizational environment human resources that seek to develop their management methods and raise the level of their tasks, in an attempt to improve the efficiency of their performance for their various functions, by introducing technology in The management and management process, depending on what is known as management by technology, through our research paper; We seek to research the possibility of using artificial neural networks as an alternative to performing some human resource tasks, as energies that need support and cognitive refinement, through a behavioural simulation of their organizational behaviour within the work environment, by asking the following question: Can artificial neural networks perform administrative functions based on a modelled simulation of resource behaviour Human in his organizational environment? As solving some administrative problems or predicting organizational phenomena? We have dealt with this problem, and tried to answer it by adopting a number of elements that we have clarified in our next study.

Artificial Intelligence and Simulated Technology

There were many definitions that tried to approximate the concept of Artificial Intelligence as a unique simulated technology experiment that seeks to create highly advanced techno-technological systems, simulating human biological systems, most notably the bio-neural system, and focusing more on intelligence as the most prominent human activity characterized by complexity and privacy.(Dick, 2019) This is because the concept of artificial intelligence is closely related to several sciences and disciplines. From linguistics and linguistics to mathematics(Thierer et al., 2017)

And logic, to computer and software engineering, to neurosciences and genetic algorithms, without forgetting the active role of psychological sciences, especially cognitive psychology and its great contribution to the search for ways to develop

learning and comprehension activities, all of which have to do with human cognitive functions(Vinuesa et al., 2020).

Artificial intelligence is defined in its simplest concepts as: “A computer simulation of the cognitive processes that humans use in performing actions that we consider intelligent, and these actions vary widely in nature; they may be understanding a spoken or written linguistic text, playing chess, solving a puzzle or a mathematical problem. Or writing a poem, or making a medical diagnosis, or inferring a way to move from one place to another. The researcher in the science of artificial intelligence begins his work first by choosing one of the activities agreed upon as intelligent and then makes some assumptions about the information that a person uses when performing this activity. and inferences, then enters them into a computer program and then observes the behaviour of this program(Khrais, 2020).

The roots of artificial intelligence as a fertile field of knowledge for research go back to the forties of the last century, a period that witnessed an increase in research and studies related to the development of computing applications based on computers of various generations.(Chui, 2017)This is the name for artificial or neuron neural networks; Where did the research actually begin in the possibility of simulating the work of the human brain, while in the sixties began to pay attention to the field of Heuristic search, which is one of the research techniques in artificial intelligence, while in the seventies the research was based on what is known as systems based on knowledge representation and processing, to be Paying attention to the eighties and beyond, when Japan announced the implementation of a program for the development of fifth-generation computers; This generation was known for its performance efficiency, speed of implementation and response compared to previous generations, and the generation that paved the way for the emergence of what is known as smart computers, with knowledge-based computing systems based on knowledge bases, to make a qualitative leap in the development of artificial intelligence research and the emergence of what is known as machine learning(Butcher & Beridze, 2019).

Artificial intelligence programs seek a realistic simulation of human knowledge, relying on inferential operations, and not only work with binary machine language (0,1), but go beyond it to use non-numeric symbols, and on languages based on the interpreter and not the translator, which makes them able to visualize concepts At its different levels, given that human knowledge is multi-level, and these programs are also characterized by their ability to make decisions in the absence of data and complete information available about these decisions, or their conflict, and this is similar to a close extent, the process of human reasoning towards finding solutions and making decisions based on intuition. In the absence of data and facts about these

decisions or their contradictions, and these programs have the ability to learn from mistakes by acquiring the ability to infer symmetry, and access to generalities. Cognitive psychology has also contributed to the development of these programs to identify the methodology of the work of human intelligence (Nishida et al., 2017).

From the foregoing, it can be said that artificial intelligence, as a broad scope that includes among its cognitive innovations the innovations of symmetry, has given way to the emergence of the concept of technology simulating not only human knowledge but its material and moral assets, and the emergence of the concept of artificial neural networks and their connection to the field of technology (computing technology), evidence of the integration between The triad of experiential sensory knowledge, abstract knowledge, and mental knowledge, it is a reconstruction and design of the system from interactive thinking between the existing innovative development or known as Technology Innovation, and what the human experience must reach from innovative patterns that enhance the simulation of human life(Wall, 2018).

Artificial Neural Networks

The definition a neural network

Artificial neural networks are one of the most controversial areas of artificial intelligence among researchers and scholars of this discipline. Which largely reflects the extent to which this precise technological trend has developed, as it is closely related to an attempt to simulate the activities of the most important vital organ of the human organs, the brain, despite the complex structure of the latter, and the specificity of its vital processes(Silva Araújo et al., 2019).

Artificial Neural Networks can be defined as ANN, or what are also called Simulated Neural Networks. It is an interconnected group of virtual neurons, created by computer programs to resemble the work of a biological neuron or electronic structures, that use a mathematical model to process information based on the communicative method in(Li et al., 2019; Simonyan & Zisserman, 2014)

computing; Thus, artificial neural networks are similar to the human brain in that they acquire knowledge by training and store this knowledge using interconnecting forces within neurons called synaptic weights(Zhang et al., 2018)

Artificial neural networks have been designed from computer programs to simulate in their structure and functions the human brain, with its billions of neurons (the number of human brain cells is estimated to be about 100 billion neurons), and each

cell has about 1,000 types of inputs, and it has connections and connections with other cells. These artificial neural networks acquire the intrinsic characteristics of the human brain in terms of their synaptic connectivity, distributed and parallel processing of information, which is the basis of Computing Neural; Neural networks consist of interconnected computer units, each unit carrying out processing operations and transmitting results to other units, so these networks can learn through training (Bejarbaneh et al., 2018; Garcelon et al., 2018).

So artificial neural networks; It is a software synthesis of instructions and commands formulated according to mathematical rules in the form of functions, whose goal is to replicate the work of the nervous system represented in the functions of the brain, and the various connections that connect the activities of these functions and their outputs to the rest of the vital organs responsible for the most important thing that distinguishes humans from other organisms; It is the thinking function, which is the main axis for which these simulated networks are designed, as it relies on the learning and training processes, the principles of processing and information processing, and the participatory method of transferring processing outputs and transforming them into knowledge outputs that simulate human experience; So this combination does not depend on the transfer of ready-made expertise, but rather its manufacture from databases based on the most important knowledge-making processes, from collecting raw data, learning to process it, and training to transfer and share it (He et al., 2016). The following model (Figure 1) illustrates the structure of a computerized neuron:

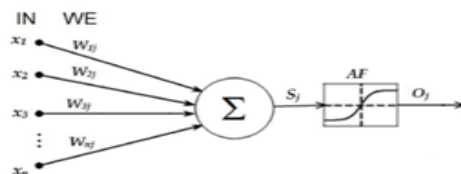


Figure 1. Structure of a computerized neuron

The neuron includes the input signals, and the processing element, which determines the level of activation of the accumulated strength of these signals by weighing the correlation given to each element or signal input and output of the neuron shown in numerical values (0,1). The following figure (Figure 2) represents a comparison between a biological neuron and an artificial neuron:

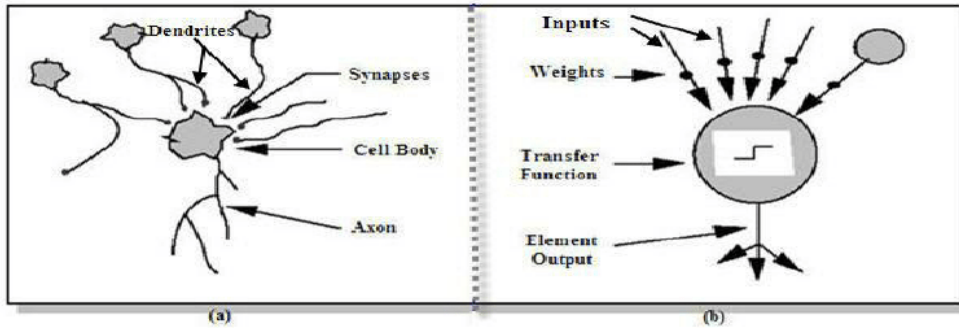


Figure 2. Comparison between a biological neuron and an artificial neuron.

(Hamdi & Aloui, 2015) Research and studies that dealt with the field of neural networks return to the work related to the concept of cybernetics, specifically what was done by the scientist Norbert Wiener, who worked at the Massachusetts Institute of Technology; In 1954, he published a book entitled “Human Use of Humanity: Information Control and Society.” In this book, he indicated that the human system is similar in its function to the machine system. During the fifties, artificial intelligence scientists began trying to create an intelligent machine that could resemble the human brain (Silver et al., 2016). Because the computer industry

And its development in its beginnings at that period, the technology available at the time did not help them in making the required machine, and one of the most important attempts that characterized that period was that of Frank Rosenblatt in 1957, who made what he called the perception, a simplified model similar to the retina of the eye, and enabled him to teach This perceptual sensor has some specific forms, but it was criticized because of the simplicity of the model, which reduced the interest in research related to the field of neural networks until the eighties, when it began to work on the fifth generation of computers, and the interest returned to a greater degree in this field (Schmidhuber, 2015; Simonyan & Zisserman, 2014).

Characteristics of the artificial neural network

Artificial neural networks are characterized by capabilities and characteristics that make them one of the most important artificial intelligence systems, most notably: - The ability to distinguish patterns, self-learning, providing solutions to problems that require non-algorithmic solutions; After training and providing it with training data that enables it to determine and modify weights continuously, there are several rules for learning, including: (Schmidhuber, 2015) Herb rules, field Hop law, Delta rule, Kohomen's law - its use of the exploration approach, its search for optimal solutions, improvement of the proposed solution through training and learning, And its wide use in cases of prediction, classification, modelling, simulation, grouping, filtering,

abstraction, interpretation of solutions, in addition to its use in building simulation models for problems that we do not use in solving other artificial intelligence systems and techniques. The use of neural networks in various business activities; Especially in the field of operations management, financial analysis, control and control, stock and bond price forecasting, currency exchange rates and risk management, investment portfolio analysis, bank credit, e-commerce, and support for electronic management decisions (Li et al., 2019).

The architecture of the artificial neural network

An artificial neural network consists of several components, including:

Input Layer: It receives input signals from outside the neural network and corresponds to the dendrites in the vital neuron in humans.

Weights: represent the connections between layers in artificial neural networks, which correspond to natural neural networks (Yusri et al., 2018).

The middle layer is Hidden layer: It is the process of discovering and distinguishing characteristics, classifying and analyzing the inputs by giving certain weights to each of them, and using an analytical function to modify those weights, based on the comparison of the target results (Schmidhuber, 2015).

Output Layer: It is the last layer that gives the real output after a series of manipulations that take place through the previous layers.

Threshold: It is the limit that determines the extent and type of output to be compared with the desired output (Target Output).

Benefits of Artificial Neural Network

Among the most important benefits of using artificial neural networks are the following (Xiaosong et al., 2019)

- It deals with the non-linearity that exists in reality, ie it deals with the non-linear models.
- It deals with incomplete data, ie incomplete.
- Operates with a large number of variants.
- It gives general solutions with high predictive powers.

Artificial Neural Networks and the Regulatory Environment

Artificial neural network and expert systems

Expert systems are among the most prominent artificial intelligence systems applied in organizations, as they are systems based on knowledge bases, and fundamentally different from traditional database-based systems. Expert systems are based on the technology of representation and storage of knowledge, and accumulated human experience, In a specific scientific or applied field. The knowledge is represented by the knowledge engineer, who, through observation, interview and analysis, models the knowledge gained from the experts in the analysis, and writes it with a computer program or an algorithm through which the computer can implement it and meet the needs of the non-expert user later (Junio Guimarães et al., 2019). While neural networks are not based on knowledge modelling technology

Humanity, or human intelligence, and does not seek programmed solutions, and therefore does not need the intervention of knowledge engineers. They are subject to many variables, so the capabilities of these networks are described by the term layers of knowledge for their ability to cognitive analysis (Khan et al., 2020).

Artificial neural networks are not just simulation, modelling or prediction solutions only, but go beyond that to an attempt to search for solutions to the most complex problems, and the most prominent sudden phenomena (non-linear phenomena), relying on the process of learning and training, by focusing on the exact software and physical aspects of the computing process, It aims to establish an intelligent system that transcends the mathematical and programming operations of the computer to create experienced hardware that can deal with these intelligent mathematical software, and the complex human brain structure transcends the precise anatomical aspect to the external morphological aspect. Among the environments that have tried to implement this type of application, we find the organizational and administrative environment, where the organizations' strategies are looking for solutions to take their organizational decisions, which are considered as supportive of their work process and continuity (Egrioglu et al., 2013). There are two important types of artificial neural networks applied in organizational environments:

A- Single-layer networks: They are considered one of the simplest types of neural networks and consist of an input layer and an output layer, which represents the function of the neuron. If there is no input (X_1, X_2, \dots, X_n) affects weights (w_1, w_2, \dots, w_n), to produce a final output, let it be v as follows: $v = F[\sum x_i w_i]$

B- Multi-layer networks: They consist of three layers; An input layer, a hidden middle layer) and an output layer, and the middle layer may be one layer, or several layers, depending on the nature of the problem under study, and the development has been in training multi-layer networks using the reverse propagation method. That is, there are inputs (X_1, X_2, \dots, X_n) that affect the weights (W_1, w_2, w_n) to produce an output (Y_1, Y_2, \dots, Y_M), which in turn affects the weights ($0_1, 0_2, \dots, 0_m$), to produce a final output Z as follows:

$$Z = F \left[\sum O_j Y_j \right] = F \left\{ \sum O_j F \left[\sum X_i W_{ij} \right] \right\} \quad (4-5).$$

The multi-layer network model is considered one of the best models applied in the organizational environment. The following figure (Figure 3) shows a model of a multi-layer neural network

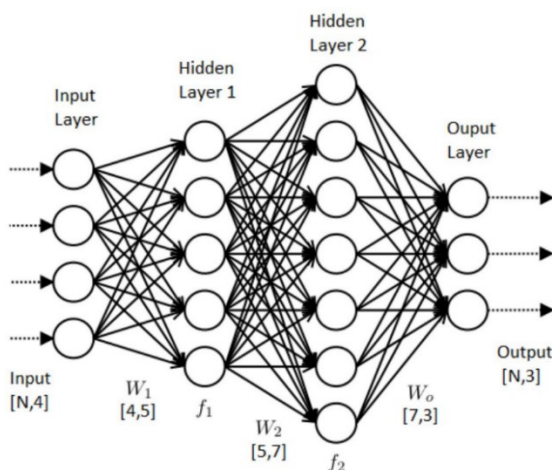


Figure 3. Model of a multi-layer neural network

The neural network in this model consists of three levels; input level, hidden level, output level; Each level contains a simple processing unit or element associated with the processing elements and units in the subsequent level, and because of this structure, the artificial neural network can provide an easy and efficient way to find a solution to the problem studied, i.e. a relatively easy way to model or predict the behaviour of non-linear phenomena, making it The best methods applied in the two currencies of modelling and forecasting compared to the traditional statistical models and methods applied in the fields of management and organization (Nord et al., 2019).

Artificial Neural Networks and Nonlinear Phenomena

Linear Organizational Phenomenon

The organizational phenomenon is considered one of the human phenomena in which the human directly intervenes in its occurrence, which makes it characterized by the character of privacy and uniqueness, and the characteristic of kinetic dynamics in the sense that it is not fixed, as it is difficult to study it in isolation from the conditions of its occurrence due to the overlap of several elements and aspects in it, the most important of which are the socio-cultural and geo-environmental aspects. Even economic and political (Lin et al., 2016; Peng et al., 2018). The organization, as the most important units forming the social structure and the most important interactive forms within it, faces many challenges, to draw up its organizational strategy that it is supposed to follow to continue within its context organizational without drifting or going back, in order to achieve the goals and gains for which these strategies were developed, and for which this organization was established, which makes it classified in the category of nonlinear phenomena. The term nonlinear may be a mathematical term; It refers to a state of heterogeneity and non-overlap between numerical variables, which are difficult to enumerate and express with a linear mathematical function, but the non-linear organizational phenomenon from an administrative perspective; It is everything that happens intentionally or suddenly and unexpectedly in the organizational environment and affects the rest of the organization, and requires intervention to find solutions. Finding solutions to them, and one of the most important solutions for dealing with such phenomena is simulations, modelling and prediction (Njitacke & Kengne, 2018).

The difference between the concept of simulation, modelling, and prediction

Simulation has multiple concepts, many in different epistemological contexts that include simulation activity. necessary, to describe the behaviour of a phenomenon, and the simulation process begins with building a model for the problem under discussion and then implementing experiments and solutions for the complex model in digital computers.” Modelling is not very different from simulation but is one of the basics of simulation; It means a description of a specific situation or topic, where this situation or topic is expressed by a mathematical equation, which includes in its composition a set of variables, and the modeling process depends on many statistical methods and laws, which make it necessary for the modelling user to be familiar with statistical methods and theories. Forecasting in general is “an expectation and estimation of future events under uncertain conditions” or “constructing a perception of what the phenomenon will be like in the future, in a more accurate sense; a process of intelligent and thoughtful estimation and estimation based on the nature of the phenomenon, its development and growth in its current situation, The degree,

directions, extent and strength of growth after all these have been subjected to the appropriate measuring tools (Jaensch & Polifke, 2017).

Computerized or artificial neural networks are considered one of the most effective ways to predict the behaviour of the organizational phenomenon, as it is not fixed. This prediction includes tracking the changes that occur to it, since it began to occur, even trying to predict the results that you will reach, and make predictions about the solutions that can pass them depending on the education algorithms that we mentioned previously with the reverse propagation algorithm, which is used with multi-layer neural networks, as it includes two layers Inputs, outputs and hidden layers, called middle layers, are connected to the rest of the layers by ganglia or neurons; As each layer in the neural network contributes its work, the input layer receives all the data related to the phenomenon or problem under study, in its digital form, where the human resource responsible for decision-making and searching for effective solutions for this, collects all indicators about the phenomenon and enters them, so that the middle layer receives the inputs The reception takes place at the level of the neuronal ganglia, where the connection of each neuron node with its predecessor through weighted connections contributes to receiving these inputs. Assembling and transforming calculates the weights of the inputs and determines the quality of the outputs. As for the process of processing the input data, it is done by multiplying each input from the neuron of the previous layers, with the weights of the weighted communication links with the neurons so that the products of the multiplication are collected, where the conversion function intervenes in the process of producing the output that will be transmitted to the neurons of the other layers.

Since artificial neural networks depend on the principle of learning, to identify problems, learning methods have been developed that are compatible with the nature of the neural network (Goldt et al., 2019).

The multi-layered neural network, which can interact with the three layers of the network, is the Generalized Delta Rule, also known as the back propagation rule.

This rule was dealt with in a book published under the title Distributed Parallel Processing, and this learning rule is considered complex compared to the simple learning rule of a neuron (Schädler et al., 2021).

Conclusion

The great development witnessed by all technology-based fields with its various achievements; It allowed the emergence of the process of exchanging roles between

humans as innovators, achievers and manufacturers, and between what they invented, manufactured and accomplished, as learning and training were no longer the preserve of humans, but extended to even machines and software, so that the matter turned from mere learning to a thinking project, inventing systems that think instead of humans, And mimic his most unique behaviours. The need to match technology to human life, and to focus on the smallest details related to various tasks and activities with a cognitive dimension, requires a great effort by researchers and scholars, to develop these technical systems, because the matter goes beyond the idea of innovation, to the idea of innovation success and come out in a similar way to the bio-mental system, and this What cannot be completely and completely, due to the complex set of characteristics and features that the respondent enjoys about his similarity. The space of human knowledge is growing and aspiring to control the advanced techno-informational development at an accelerating pace. It is the era of artificial intelligence; And who is trying to compete with the human intelligence system, even though the latter is its main source, and because it is the source, the degree of its control may decrease and weaken, and it may increase and strengthen, and the conflict remains between what humans really need, and what can be accomplished, paralleling this limit of development and accelerating with it. Since the field of administration and administrative organizations is not immune from this conflict, the human resource needs to enter the fray of confrontation, and search for ways to seize the opportunities for progress.

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