



Review

A Comprehensive Overview of Neural Networks and AI for Advanced Applications

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ABSTRACT

Computer scientists now consider Artificial Neural Networks (ANNs), a subfield of AI, to be cutting-edge computing technology. This article provides an overview of AI research with an emphasis on current projects that make use of AI and Artificial Neural Networks (ANNs). Additionally, it takes into account the possibility of combining neural networks with other computational techniques, including fuzzy logic, to improve data interpretation. There has been a plethora of research and practical use of artificial neural networks (ANNs) during the last two decades, earning them a reputation as a leading soft-computing technology. Neural networks are most often used to solve problems in pattern recognition, data analysis, control, and grouping, which are the most widespread applications. Fast processing rates and the capacity to learn from examples are just two of the many impressive qualities of artificial neural networks. An overview of the field, where AI and ANNs are utilized, and a discussion of the crucial role that AI and NN played in many domains are provided by this study, which primarily aims to investigate the latest applications of Neural Networks and Artificial Intelligence.

Keywords

Artificial intelligence, Neural Networks, Machine learning, Soft computing.

INTRODUCTION

Intelligence = perceive + Analyze + React

The ability of a machine or computer to demonstrate intelligence in the context of solving complicated issues is known as artificial intelligence (AI) [1]. Integrating computer science with physiology, artificial intelligence (AI) Put another way, intelligence is the computational component of goal-attainment ability in the real world. Think, create, memorize, comprehend, recognize patterns, make decisions, adjust to change, and learn from experience—these are the abilities that make up intelligence. The field of artificial intelligence that focuses on teaching computers to mimic human behavior. Machine learning attempts to resolve intricate issues in a way that is more reminiscent of a human, and it does it in much less time. For this reason, it is referred to as AI [2]. The philosophy of artificial intelligence provides a useful framework for categorizing AI.

• Powerful AI

c) Stupid AI

Strong AI: What Is It?

To put it another way, the idea behind Strong AI is that one day robots will be able to think like humans. According to Strong AI, this sort of computer will be ubiquitous in the not-too-distant future, capable of doing all the tasks normally associated with humans and even surpassing them in intellect. In such scenario, the machines will be able to reason, think, and do all tasks that a person can. Strong AI is still a long way off, and researchers are still debating whether it's even feasible [3].

To what extent is weak AI dangerous?

Weak AI is based on the simple premise that robots may be trained to mimic human intelligence. Adding “thinking” capabilities to computers is a simple matter, according to weak AI, and this trend has already begun. When competing in a chess match against a computer, a human player could mistakenly believe that the machine is making superior moves. The chess software, however, does not involve any kind of strategy or thought. To make sure the program performs the appropriate movements at the right moments, a person inputs all of the moves into the computer beforehand. Additional instances of Weak AI include systems that recognize speech, drive-by-wire vehicles, and expert witness testimony [4].



One way to determine if a computer is intelligent is to put it through the Turing test. In his 1950 article “Computing Machinery and Intelligence,” Alan Turing presented the test. “Can machines think?” was the initial question that motivated this test. In this exam, a human judge talks to two humans and a computer, all of whom are trying to pass themselves off as human, using normal language. Every single one of the contestants are

A Comprehensive Overview of 58 Cutting-Edge Neural Network and AI Applications staggered over the landscape. The machine is considered to have succeeded if the judge is unable to distinguish between the two. The discussion is conducted only via a text-only channel, such a computer keyboard and screen, in order to evaluate the machine’s intelligence instead of its capacity to convert words into sounds. If a large number of questioners can’t tell the difference between a computer and a person, then it’s safe to say that computers think [5].

Roots of AI

Artificial Intelligence has identifiable roots in a number of older disciplines, particularly

- Philosophy
- Logic/Mathematics
- Computation
- Psychology/Cognitive Science
- Biology/Neuroscience

There is inevitably much overlap Example, between philosophy and logic, or between mathematics and computation. By looking at each of these in turn, we can gain a better understanding of their role in AI, and how these underlying disciplines have developed to play that role.

Goal of AI: An important goal of AI research is to devise machines to perform various tasks which normally require human intelligence

II. Introduction To Artificial Neural Networks

As an extension of mathematical models of biological nerve systems, artificial neural networks (ANN) have been constructed. The introduction of simplified neurons by McCulloch and Pitts (1943), sometimes known as connectionist models, sparked an initial surge of interest in neural networks. Every node in an Artificial Neural Network (ANN) is essentially a tiny processor (or “neurons”) with some (very little) local memory. The devices are designed to work only with data stored locally and inputs received via one-way connections or linkages [6]. In order to send signals to other nodes in the network, each node has its own set of rules for taking in incoming signals and adding them up. Callen states that the activation function is the set of rules used to calculate the output [7]. There are three levels to a neural network. There are three layers to a neural network: the input layer, which is responsible for communicating with the outside world; the hidden unit, which does calculations in response to user input; and the output layer, which displays the results. Neuronal synaptic weights are the primary means by which information is retained in neural networks. Until the network generates the output data, the input data is propagated from one layer to another. In the

case of multilayer perceptrons trained using the Backpropagation technique, an error is computed and sent backwards through the network if the output deviates from the desired output. The propagation of the mistake causes changes to the synaptic weights [8]. These Days As illustrated in Figure 3, scientists are now working on a silicon-based electronic network that aims to mimic the structure and function of the human brain. Artificial neural networks (ANNs) are a potent tool because of their capacity to generalize. Understanding how the brain functions, it becomes adept at recognizing patterns and A Comprehensive Overview of Neural Networks and AI for Advanced Applications takes note of them. The created neural networks can also recall things and learn patterns [9].

(a) Artificial neuron (b) Multilayered artificial neural network
Fig 4 Architecture of an artificial neuron and a multilayered neural network

The learning methods in neural networks can be classified into three categories. These are supervised learning, unsupervised learning and reinforcement learning

A. Types Of Learning In Neural Networks

Learning with Supervision: In supervised learning, networks receive both inputs and outputs that correlate to each other. For every node in the output layer, the inaccuracies or differences between the expected and actual responses are located in the forward direction. After then, the weight changes in the net are determined using these in accordance with the current learning rule. The idea that an outside instructor supplies the appropriate signals on certain output nodes is where the word “supervised” comes from. We can see supervised learning in action with rules like the perceptron rule and the delta rule. [10]

Unsupervised Learning: In this kind of education, a human instructor is not physically present. Consequently, the clustering approach is the foundation of this kind of learning. The input patterns are used to categorize the clusters. Another name for this kind of learning is self-organization. The rules of Hebbian and competitive learning are two such examples. Due to its higher neural prevalence, unsupervised learning is far more significant than supervised learning. How adjustments to network settings have fared dictates the kind of learning.

The foundations of reinforcement learning lie in the merging of supervised and unsupervised learning techniques. The goal of reinforcement learning is to optimize a numerical reward signal by learning how to link events to actions. With this kind of learning, you get points for right answers and minus points for bad ones. Learning with a critic, as opposed to a teacher, is another name for reinforcement learning. the eleventh

B. Activation Functions

An activation function $\Phi(\cdot)$ performs a mathematical operation on the outputs of neuron V_k . The activation functions are selected according to the types of problem to be solved by the network. In general, there are three types of activation functions, denoted by $\Phi(\cdot)$ First, there is the Threshold Function which takes on a value of 0 if the summed input is less than a certain threshold value (v), and the value 1 if the summed input is greater than or equal to the threshold value.



III. Applications of Neural Networks

Evolution of Neural Networks for Control of Pursuit & Evasion: Researchers in the field of artificial life

(Alife) is frequently moved towards the domain of Pursuit & Evasion to study the evolution of complex agent behaviors [13]. The MPEG movie sequences illustrate behaviors generated by dynamical recurrent neural network controllers co-evolved for pursuit and evasion capabilities is shown below in figure 2. From an initial population of random network designs, successful designs in each generation are selected for reproduction with recombination, mutation, and gene duplication. Selection is based on measures of how well each controller performs in a number of pursuit-evasion contests. In each contest a pursuer controller and an evader controller are pitched against each other, controlling simple "visually guided" 2-dimensional autonomous virtual agents. Both the pursuer and the evader have limited amounts of energy, which is used up in movement, so they have to evolve to move economically. These time-series are then fed into a custom 3-D movie generator [14].

Brain Computer Interface based on Neural Networks Brain Computer Interface (BCI) is one of hopeful interface technologies between human and machine. Brain computer interface is also called mind machine interface (MMI).

Brain Computer Interface (BCI) is a communication channel connecting a brain to a computer or other electronic device that enables signals from the brain to direct interaction with external activity, such as control of a cursor or users can inputs phone numbers by gazing at the keypad of monitor. The interface enables a direct communication pathway between the brain and the object to be controlled [16]. Brain Computer Interface can enable a person suffering from paralysis to write a book or control a motorized wheelchair. Since the was first described by Hans Berger in 1929 at present, EEG (electroen-cephalography) is the optimal choice for BCI implementation [17]. However, brain waves are very weak and there exist many kinds of noises. Therefore, what kinds of features are useful, how to extract the useful features, how to suppress noises, and so on are very important. So Neural networks can be applied for classification of noisy signals from sensitive signals and improve the accuracy of mental task classification [18]. Like other communication and control Systems, BCI's have inputs, outputs, and translation algorithms that convert the Former to the latter. BCI operation depends on the interaction of two adaptive controllers, the user's brain, which produces the input and the system itself, which translates that activity into output (i.e., specific commands that act on the external world) [19]. Over the past five years, the volume and pace of BCI research have grown rapidly. In 1995 there were no more than six active BCI research groups, now there are more than twenty [20][21].

Understanding and Description of Object Behaviors: This is one of the hot topics in computer vision. Trajectory analysis is one of the basic problems in behavior understanding. The learning of trajectory patterns can be used to detect anomalies and predict object trajectories. Trajectory analysis is the basis of scene understanding. The basic problem of behavior understanding is the target motion trajectory analysis. Currently the most common trajectory analysis methods focus on the geometric characteristics of the whole tra-

jectory and neglect the semantic information related to the common sub-trajectories [22]. Here the task is all about the modeling or creating representation of object behaviors using detailed, learnt statistical models. A statistically based model of object trajectories is presented which is learnt from the observation of long image sequences. Trajectory data is supplied by a tracker using Active Shape Models, from which a model of the distribution of typical trajectories is, learnt [23]. The techniques being developed will allow models of characteristic object behaviors to be learnt from the continuous observation of long image sequences. It is seen that these models of characteristic behaviors representation will have a number of uses, particularly in automated surveillance and event recognition without the need for high-level scene/behavioral knowledge. In automatic method for learning model of semantic region by analyzing the trajectories of moving objects in the scene or frame should be done in following manners. First the trajectory is encoded to represent both the position of the object and its instantaneous velocity, and then hierarchical clustering algorithm is applied to cluster the trajectories according to different spatial and velocity distributions. In each cluster, trajectories are spatially close, have similar velocities of motion and represent one type of activity pattern. Based on the trajectory clusters, the statistical models of semantic region in the scene are generated by estimating the density and velocity distributions of each type of activity pattern [24].

The model is learnt in an unsupervised manner by tracking objects over long image sequences, and is based on a combination of a neural network implementing Vector Quantization and a type of neuron with short-term memory capabilities. The distribution patterns of trajectories are learnt and recognized using a hierarchical self-organizing neural network. Models of the trajectories of pedestrians have been generated and used to assess the typicality of new trajectories (allowing the identification of incidents of interest' within the scene), predict future object trajectories, and randomly generate new trajectories [25]

Artificial Neural Networks in Computer Graphics: Now a days ANN's play an important role in graphics fields also. Graphics designers are trying to synthesis or merging actual or real images with computer generated images for enhancing visualization of the output image. Some of the most realistic images can be generated using Radiosity techniques. Radiosity for computer graphics was first introduced in [Goral et al.1984]. The idea was to simulate energy (light) transference from diffuse surfaces. The Radiosity method was further developed to account for the interaction of diffuse reflection between objects in scenes Radiosity for Virtual Reality Systems (ROVER) is emerging field for researchers to create virtual reality using ANN's [26].

It is generally recognized that traditional implementation of Radiosity is computationally very expensive and therefore not feasible for use in VR (virtual Reality) systems where practical data sets are of huge complexity [27]. There are two new methods and several hybrid techniques to the Radiosity research community on using Radiosity in VR applications. On the left column flyby, walkthrough and a virtual space are first introduced and on the left. On the right, one method using Neural Network technology is shown.



Autonomous walker & Underwater Robot Autonomous walking robots based on the concepts of modularization. The problems involved with making an autonomous walker break into several groups of functionally. Trying to build a single grand model that fits your idea of a walker is difficult at best. It's fortunate that like almost all complex problems, it reduces to more manageable smaller problems [29]. The research in this area involves combining biology, mechanical engineering and information technology in order to develop the techniques necessary to build a dynamically stable legged vehicle controlled by a neural network. Underwater robots and underwater machines are counted on helping the salvage procedure, escaping prevention of pollution, lifesaving at sea, and scientific exploration in the ocean and so on. In the underwater robot, therefore, Autonomous Underwater Vehicles (AUVs) have been developed actively during recent year. However, AUVs have various problems which should be solved such as motion control, acquisition of sensors' information, behavioral decision self localization and so on. The SOM (self organizing maps) and Recurrent Neural Network (RNN) are used for this purpose [30].

Facial Animation: Modeling and animation of human faces is one of the most difficult tasks in computer graphics today, even more so when life is to be breathed into digitized versions of real, well-known individuals. Facial animations created using hierarchical B-spline as the underlying surface representation. Neural networks could be use for learning of each variation in the face expressions for animated sequences. Some clustering and machine learning methods are combined together to learn the correspondence between the speech acoustic and face animation parameters. The main learning machine used for speech facial animations are HMM, SVM and Neural Networks [31].

a) 2D Animation: Two-dimensional facial animation is commonly based upon the transformation of images, including both images from still photography and sequences of video. Image morphing is a technique which allows in-between transitional images to be generated between a pair of target still images or between frames from sequences of video.

b) 3D Animation: Three-dimensional head models provide the most powerful means of generating computer facial animation. One of the earliest works on computerized head models for graphics and animation was done by Parke. The model was a mesh of 3D points controlled by a set of conformation and expression parameters.

Above figure shows different facial expression from different peoples in different situations. Thus neural networks and some others machine learning tools are used for recognition of expression.

Neural Networks Strengthens Technology behind antivirus functioning: Artificial neural networks and artificial intelligence techniques have played increasingly important role in antivirus detection and providing enough strengths to the internal functioning of antivirus so it can detect and fix all kind of viruses. At present, some principal artificial intelligence techniques applied in antivirus detection including heuristic technique, artificial neural network, data mining, agent technique, artificial immune and it believes that it will improve the performance of antivirus detection systems. IBM's

neural network boot detection technology provides additional security by mimicking human neurons in learning the difference between infected and uninfected boot records. By being shown many examples of viruses and non-viruses, the neural network learned to recognize viruses better than traditional heuristics hand-tuned by virus researchers. This neural network can detect an extremely high percentage of new and unknown boot record viruses automatically. Together, these technologies provide Norton Antivirus customers superior protection against both known and unknown boot sector viruses [32].

Speech Reading (Lip reading): Lip-Reading has been practiced over centuries for teaching deaf and dumb to speak and communicate effectively with the other People. Speech Vision, another term for lip-reading or speech reading, is a technique of understanding speech by visually interpreting the movements of lips, face and tongue using the information provided (if any) by the context, language, and any residual hearing. We convert the video of the subject speaking different words into images and then images are further selected manually for processing [33].

The input to a lip-reading system consists of a video which is first divided into frames. Lips are then segmented on the first frame and then lip contour is determined. An object tracking mechanism is then used to track the motion of lips on subsequent frames. The position of lip contour on each frame is stored in a database. A separate database of characters is also maintained. The position of lip contour is matched with the characters to determine what the speaker has spoken [35].

IV. Applications of Artificial Intelligence

Data Mining or Knowledge Extraction: Data mining is a fast-growing area. Data mining is a part of a process called KDD knowledge discovery in databases. This process consists basically of steps that are performed before carrying out data mining such as data selection, data cleaning, pre-processing of data, and data transformation [36]. "Data Mining is the use of computer algorithms to discover hidden patterns and unsuspected relationships among elements in a large data set. AI is a broader area than machine learning. AI systems are knowledge processing systems. Knowledge representation, knowledge acquisition, and inference including search and control, are three fundamental techniques in AI

Knowledge representation: Data mining seeks to discover interesting patterns from large volumes of Data. These patterns can take various forms, such as association rules, classification rules, and decision trees, and therefore, knowledge representation becomes an issue of interest in data mining.

Knowledge acquisition: The discovery process shares various algorithms and methods with machine learning for the same purpose of knowledge acquisition from data learning from examples.

Knowledge inference: The patterns discovered from data need to be verified in various applications and so deduction of mining results is an essential technique in data mining applications. Therefore knowledge representation knowledge acquisition and knowledge inference, the three fundamental techniques in AI are all relevant to data mining [37].



Artificial Systems: The first expert system was developed in 1965 by Edward Feigenbaum and Joshua Lederberg of Stanford University in California called DENDRAL. Expert systems may be considered to be a subset of Artificial Intelligence. Expert system is an artificial intelligence program that has expert-level knowledge about a particular domain and knows how to use its knowledge to respond properly. Domain refers to the area within which the task is being performed. Ideally the expert systems should substitute a human expert. Expert systems are Artificial Intelligence programs that have expert level knowledge about a particular domain and know how to use knowledge to responds properly. Domain refers to the area within which a particular task is being performed. Ideally an Expert system should substitute a human expert. Edward Feigenbaum of Stanford University has defined expert system as “an intelligent computer program that uses knowledge and inference procedures to solve problems that are difficult enough to require significant human expertise for their solutions [38].

Every expert system consists of two principal parts:

- A) The knowledge Base
- B) Reasoning or Inference Engine

Expert system = Knowledge + inference Engine

Program in traditional computer = Data structure+ algorithm

Knowledge base: The knowledge base stores all the facts and rules about a particular problem domain. It makes these available to the inference engine in a form that it can use. The facts may be in the form of background information built into the system or facts that are input by the user during a consultation. The rules include both the production rules which applied to the domain of the expert system. The heuristics of rules- of-thumb that are provided by the domain expert in order to make the system find solutions more efficiently by taking short cuts.

Inference Engine: The inference engine is the program that locates the appropriate knowledge in the knowledge base, and infers new knowledge by applying logical processing and problem-solving strategies [39].

Soft Computing: Soft computing is a partnership of computing techniques. The partnership includes fuzzy logic models and particle swarm techniques. All these computing techniques have been recognized as attractive alternatives to the standard well established “hard computing” paradigms such as stochastic and statistical methods bound by the concept called NP complete [40]. The dominant aim of soft computing is to exploit the tolerance for imprecision and uncertainty to achieve tractability, robustness and low solutions cost with less time than hard computing. The principal constituents of soft computing are fuzzy logic, neurocomputing, and probabilistic reasoning, with the latter subsuming genetic algorithms, belief networks, chaotic systems, and parts of learning theory. In the partnership of fuzzy logic, neurocomputing, and probabilistic reasoning, fuzzy logic is mainly concerned with imprecision and approximate reasoning; neurocomputing with learning and curve-fitting; and probabilistic reasoning with uncertainty and belief propagation [41].

The main components of Soft Computing are fuzzy logic neural networks, probabilistic reasoning, genetic algorithms and chaos theory shown in figure 18. In this framework it is shown that Fuzzy logic acts like kernel of the soft computing. Fuzzy logic main characteristic is the robustness of its interpolative reasoning mechanism. Within Soft Computing, Fuzzy Logic occupies a special place because it can be used as a springboard for generalization of any theory, including its partners in SC consortium. In Soft computing Fuzzy logic is mainly concerned with imprecision and approximate reasoning, neural networks with learning, Probabilistic reasoning with uncertainty and propagation of belief, Genetic algorithms with global optimization and search and Chaos theory with nonlinear dynamics. Each of these computational paradigms provides us with complementary reasoning and searching methods to solve complex, real-world problems. In large scope, FL, NN, PR, and GA are complementary rather than competitive [42][43][44].

Natural Language Processing: Natural Language Processing (NLP) is a subfield of Artificial Intelligence. NLP is a approach to analyzing text that is based on both a set of theories and a set of technologies. NLP is a form of human-to-computer interaction where the elements of human language, be it spoken or written, are formalized so that a computer can perform value- adding tasks based on that interaction. Natural Language Processing concerned with the interactions between computers and natural (human) languages like Hindi, English, and Spanish etc. The foundations of NLP lie in a number of disciplines, viz. computer and information sciences, linguistics, mathematics, electrical and electronic engineering, artificial intelligence and robotics, psychology, etc [45].

Goal: The goal of NLP as stated above is “to accomplish human-like language processing”. The choice of the word „processing” is very deliberate, and should not be replaced with Understanding.

Robotics: Robotics is one field within artificial intelligence. The term “artificial intelligence” is defined as systems that combine sophisticated hardware and software with elaborate databases and knowledge-based processing models to demonstrate characteristics of effective human decision making. It involves mechanical, usually computer-controlled, devices to perform tasks that require extreme precision or tedious or hazardous work by people. Traditional Robotics uses Artificial Intelligence planning techniques to program robot behaviors and works toward robots as technical devices that have to be developed and controlled by a human engineer. The Autonomous Robotics approach suggests that robots could develop and control themselves autonomously. These robots are able to adapt to both uncertain and incomplete information in constantly changing environments. It lets a simulated evolution process develop adaptive robots. The most intriguing use of robotics, however, is one that Mitsubishi just recently created. They have demonstrated robotic fish running AI programs, and swim around in the water. In fact, they look so real that only a close examination of the fish will reveal their robotic eyes [46]

Two of the many research projects of the MIT Artificial Intelligence department include an artificial humanoid called Cog and his baby brother Kismet. What the researchers learn while putting the robots



together will be shared to speed up development. Once finished, Cog will have everything except legs, whereas Kismet has only a 3.6-kilogram head that can display a wide variety of emotions. Kismet is an autonomous robot designed for social interactions with humans and is part of the larger Cog Project. This project focuses not on robot-robot interactions, but rather on the construction of robots that engage in meaningful social exchanges with humans [47]. The GOALS of most robotic research projects is the advancement of abilities in one or more of the following technological areas: Artificial intelligence, effectors and mobility, sensor detection and especially robotic vision, and control systems.

Swarm Intelligence: This is an approach to, as well as application of artificial intelligence similar to a neural network. Swarm Intelligence (SI) is an innovative distributed intelligent paradigm for solving optimization problems that originally took its inspiration from the biological examples by swarming, flocking and herding phenomena in vertebrates. The term SI has come to represent the idea that it is possible to control and manage complex Systems of interacting entities even though the interactions between and among the entities being controlled is, in some sense. Swarm Intelligence is the property of a system whereby collective behaviors of unsophisticated agents interacting locally with their environment cause coherent functional global patterns to emerge. Swarm Intelligence (SI) is a relatively new paradigm being applied in a host of research settings to improve the management and control of large numbers of interacting entities such as communication, computer and sensor networks, satellite constellations and more. The underlying features of SI are based on observations of social insects. Ant colonies and beehives, for example, have the interesting property that large numbers of them seem to conduct their affairs in a very organized way with seemingly purposeful behavior that enhances their collective survival [48],[49].

Swarm Intelligence-based Applications:

- Complex interactive virtual environments generation in movie industries.
- Cargo arrangement in Airline companies.
- Route scheduling in delivery companies
- Routing packets in telecommunication networks.
- Power grid optimization control
- Data Clustering, Data routing in Sensor Network
- Unmanned vehicles controlling in the U.S. military.
- Planetary mapping and micro-satellite controlling in NASA.

Artificial Intelligence in Aviation Industry: Airlines use expert systems in planes to monitor atmospheric conditions and system status. The plane can be put on autopilot once a course is set for the destination [50]. Recently researchers proposed model of aircraft intelligent landing system with dynamic neuro-fuzzy controller that enhances the fault tolerant capabilities of a high performance civil aviation aircraft during the landing phase when subjected to severe winds and failures such as stuck control surfaces [51].

Artificial Intelligence in Games: Modern computer games usually employ 3D animated graphics (and recently also 3D sound effects) to give the impression of reality. The AI found in most computer games is no AI (in the academic sense), but rather a mixture of

techniques which are although related to AI mainly concerned with creating a believable illusion of intelligence [52]. The phrase “game AI” covers a diverse collection of programming and design practices including path finding, neural-networks, and models of emotion and social situations, finite state machines, rule systems, decision-tree learning, and many other techniques.

AI Also Used In : Pattern recognition, Optical character recognition, Handwriting recognition, Speech recognition, Face recognition, Artificial Creativity, Computer vision, Virtual reality and Image processing, Diagnosis (artificial intelligence), Game theory and Strategic planning, Translation and Chatter bots, Automated Car Steering, Cheque fraud protection etc [53].

V. Conclusion

Approaches based on neural networks have a lot to offer the computer industry. Their adaptability and strength come from their capacity to learn by doing. It is also not necessary to comprehend the inner workings of a job in order to complete it; that is, to create an algorithm. Their rapid reaction and calculation speeds are a result of their parallel design, making them ideal for real-time systems. Making computers with intelligence on par with or higher than that of humans is the ultimate objective of AI research. This is the renowned “AI problem” of the last ten years, and academics are working tirelessly to find a solution that would bring artificial intelligence closer to human intellect. With the help of this review paper,

the use of neural networks and artificial intelligence to generate intelligent behavior is crucial. In the future, AI will aim to create computers and technologies that are much more advanced than what we have now. It is believed that computers with basic common sense, comparable to humans, will be created in the future, but limited to certain domains. Additionally, it is anticipated that future intelligent robots will also be able to carry out tasks associated with the human mind, including learning via experience, learning through rehearsal, cognition, and perception. The applications of AI and ANNs were shown using examples from fields such as expert systems, soft computing, swarm intelligence, brain computer interfaces, and brain computer interfaces.

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