Artificial Intelligence and Its Importance in Modern Qualification Devices and Applications

Aysha I. Mansour, Yomna R. Alastal, Ramez A. Aish

Department of Information Technology, Faculty of Engineering and Information Technology, Al-Azhar University, Gaza, Palestine

Abstract—The World Health Organization has classified persons with disabilities as the most marginalized groups in the world, forming a broad spectrum and complex phenomenon, which defines the existence of a disorder in the structure or functions of the body, preventing the injured person from carrying out the activities of daily life, thereby limiting his activity, capabilities and ability to acquire skills. There are almost half a billion, perhaps more people with disabilities. This is because of a physical disability, mental insufficiency or sensory insufficiency. Rehabilitation techniques enable persons with disabilities to abandon people and rely on themselves so that they are So that they can participate and integrate In all the places where they can be, such as work and others.

Keywords— Artificial Intelligence; Robotics; Rehabilitation technology; Disability.

1. INRODUCTION:

Artificial intelligence advanced to become a substitute for human tasks, more quickly and more efficiently. The process of diagnosis in health care using the patient's medical "AI" techniques is more accurate due to the formation of a comprehensive background on the patient's health [1].

Rehabilitation will best address a person's functional ability within the restrictions imposed on him because of a disability or illness for which there is no known treatment to improve the quality of life for those who cannot achieve full functional restoration and assistive technology can mitigate the effects of disabilities that limit the ability to perform life activities Everyday [2]. It further supports independence by enabling people to perform their tasks that they were previously unable to perform.

2. HISTORY AND DEFINITIONS:

The term artificial intelligence: It was introduced in 1956, by programming expert John McCarthy where it was shown at a conference called Dartmouth. Its primary purpose was for machines to perform smart tasks that mimic human intelligence.

In 1957, he tested and solved his first problem, and in 1958 McCarty took the LISP language to create a program using artificial intelligence.

Research produced in the first sixties and seventies Research produced in the early 1960s and 1970s suggested problem solving with an expert system, called Dendral, while designing special applications in domain called organic chemistry, the basis for later MYCIN, the most important early use of AI in medicine. Among the types of disabilities that artificial intelligence addresses are impaired movement, cerebral palsy, and the problem of cognitive impairment and the blind [3]. There are more than a billion people in the world who have some form of disability. Where the latest statistics indicate that the number people with low vision globally There are about 285 million people with low vision (blindness + poor vision), with the Eastern Mediterranean Region accounting for 12.6% of blindness in the world.[4]

Worldwide, there are over a thousand million people with special needs nearly 15% Inhabitants of this world (i.e. one out of 7 people with disabilities) [5].

Of the branches of artificial intelligence are deep learning(DL), machine learning(ML), neural networks and expert system and another branches. the most important applications of Internet of things in the field of medicine IOT helping doctors and controlling medical devices.

IoT technology helps reduce expenses and expenses for health and medical institutions.

And by reducing the human factor and the intervention of artificial intelligence in everything that. It is programmed and is controlled automatically or automatically, thanks to smart sensors remote monitoring and monitoring of the patient [6].

• ARTIFICIAL INTELLIGENCE:

The artificial intelligence can solved complex problems associated with human intelligence, as it can help a large number of people via smartphones or health care, as the primary definition of AI is the ability to create machines that can think similar to the level of thinking Humans [7]. There are many types of AI, which are

- Self-awareness.
- Linguistic intelligence.
- Theory of mind.
- Interactive computing
- Limited memory
- Spatial AI
 - Computational AI. [8]

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Understanding types of artificial intelligence

will demonstrate the current capabilities of artificial intelligence

- Reactive Machines: Does not contain tasks that need memory. Not able to "learn". as chessplaving.
- Limited Memory: Machines can learn from data to • make decisions. These machines are trained with data that is stored in the memory to serve as a reference for solving problems In the future.
- Theory of Mind :it can understand the things she • interacts with by differentiating beliefs or emotions or needs and how to think.
- Self-aware: It developed to resemble the human . brain to the point where it evolved a self-awareness. There are other AI rankings they are ANI, AGI and ASI [9].
- **CATEGORIZATION OF PREVIOUS WORKS:** 3.

Advances in Robotics and Virtual Reality in Stroke: One of the causes of paralysis in the world is stroke, and this is because of the weakness of the nervous system that leads to disability and rehabilitation of paralysis is the natural treatment for improving life and recovery.[10] Stroke and other brain injuries affect more than 100 million worldwide. the impaired limb is not completely paralyzed but has limited movement capability [11].

The development of technology in the rehabilitation of palsy can enhancement the ability to participate and carry out daily activities [12]. Direct access to clinically proven treatments and complete recovery is out of reach for most survivors, resulting in a lifetime impairment. One of the tasks of artificial intelligence is to provide neurological rehabilitation in every home through robotic external structures guided by artificial intelligence.

In 2018, researchers created a 3D motion capture system to evaluate. Patient movement during a stroke Fugl-Meyer. The system included capturing and tracking patient movement and then the data is analyzed as an important stage of diagnosis. Where was chosen Inexpensive cameras as they are portable 3D consumer - Kinect V2 .Kinect camera provide a skeleton for every frame. in addition to RGB data. Moreover, registration is from several perspectives. Data can be converted from 2.5D representation to full 3D Time and data synchronization Kinect V2, Based on IR flight time technology, multiple depth is allowed . Simultaneous sensors with only slight interference. However, its weaknesses are that Microsoft Kinect PC Driver does not support connection multiple sensors in one computer. A unique solution has been developed to handle multiple computers. Connected to many kinectes simultaneously. Temporal synchronization is obtained between recordings using a network. Time Protocol Server (NTP). The consolidation takes place on the server running the system algorithms. The system uses multiple cameras, in addition to similar scenarios starting from 2 to

3.6is It is implemented for each structural link for every frame [13].

4. ASSISTIVE TECHNOLOGY:

Assistive Technology (AT): Any system used to Enable, Keep and enhance the capabilities of people with disabilities. As it is a set of devices and services through which persons with disabilities can achieve their own goals in order to facilitate their lives independently.[14] AT contains devices or any piece of equipment that contributes to the independence of A person with a disability. An example of AT is an electric wheelchair. The electric powered wheelchair was invented to solve the problems of people with special needs who cannot drive a wheelchair guide. It contains an electric wheelchair, sensors and computer as it was developed in 2020 to become a remote wheelchair with a 360-degree view Using WebRTC. figure 1 is shown General architecture of a smart wheelchair system



figure 1 : General architecture of a smart wheelchair system

5. ARTIFICAL INTELLIGENCE BASED **INTERACTIVE VIRTUAL REALITY :**

Virtual reality allows people to indulge Inside and interact with the generated 3D computer Simulated environments, Virtual reality can be used to establish virtual persons or other forms (for example virtual pets) persons with special needs can interact with this forms inside virtual environments (For example, in computer games). Also, VR It is created by computers that use data that describes the environment as objects that the user feels and interacts with [16].

virtual reality provides the ability To create and control environmental stimuli Where the user is available to interact and digital Manipulation to increase user awareness From the world. Its augmented and virtual reality systems It was used for engine job and recovery training After a stroke. Mayaank Pillai; Yilin Yang worked on designed assisted gaming system for hand rehabilitation Ready-to-play video games have recently been used as a rehabilitation tool as it is a way to integrate (VR) technologies & tracking (AI) games

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applied for the purpose of increasing the effectiveness of manual therapy at home.

It is implemented based on the introduction of a two-camera movement sensor (LEAP) to infrared tracking of 850 nm, and the Oculus virtual reality headset. An interactive game is developed on the Unity VR gaming platform that dynamically adjusts game levels according to Player performance by analyzing algorithms and observing hand gestures [17].

The game aspect provides the benefit of motivating users (i.e., behavioral reinforcement) One example of serious The game is equipped with a user motivation (behavioral enhancement) feature, and examples of rehabilitation games are exergames. Similar to video games where they allow the user to learn basic movement skills by practicing those movements in a virtual environment, and by combining the virtual mirror processing component, the simulation allows users to monitor their movements in the game Desai that occurred and tested exergame for rehabilitation where they use cost-effective cameras Low commercially available for example Microsoft Kinect V2, to create a 3D model of the person and immersing the model in interactive virtual environments. over there games such as (bowling simulation & shotput game) and virtual trivia game are designed to elbow movement [18].

6. INTERNET OF THINGS (IOT):

The Internet of Things is a system that supports the Internet, Hospitals and health centers can now take advantage of these technologies to monitor and study the activity of people and patients via mobile devices such as smartphones and wearable technologies that are wirelessly connected to the Internet.

IoT-based system, data collection, mining, and provision are all performed over the Internet [19]. In figure2 System architecture of the IoT based rehabilitation is shown [20].



Figure2 :System architecture of the IoT based rehabilitation

Bosubabu Sambana worked on designed the A multi-elastic bed using the IOT system monitors the patient's condition as it is equipped with mobile / SMS alerts based on IOT while monitoring patient health conditions such as blood pressure, heart rate, body temperature and pulse rate.

The user can view all operations via the mobile application. Created by CATIA V5. BED cum Chair This model is extremely suitable for paralysis patients. You can connect internet of things to multiple mobile devices via mobile applications. The smart system performs a temperature test and a patient's pulse with a heartbeat [21].

Ly Ha, et al. they explained about designing a remote wheelchair with 360-Degree Vision Using WebRTC. Remote wheelchairs can send biological signals to a wheelchair user for example information about blood pressure heart rate, & human temperature for developed monitoring in healthcare applications. the main idea This unique wheelchair provides efficient and safe navigation for wheelchairs The 360-degree remote wheelchair has been developed and implemented. Then it was developed WebRTC-based real-time voice and video communication protocol with acceptable Video quality performance. Finally, the artificial neural network was Update to assessment the video performance.

A remote wheelchair with a 360° view by WebRTC to able to full-duplex audio & video calling, a wheelchair for telepresence was developed and implemented with a more flexible web connection framework (WebRTC). WebRTC is a criterion that determines a group of communication protocols. In Figure 3 shows A telepresence wheelchair remotely with a camera.



Figure 3 A telepresence wheelchair remotely with a camera.

the use of a camera along with WebRTC able to deliver everything arounds you the wheelchair in $360 \circ [22]$.

7. ARTIFICIAL INTELLIGENCE AND ROBOTICS IN REHABILITATIO:

Robots can be help humans with disabilities, used to provide treatment. There is a small sized robot called RoboKind's Milo that education and training social behaviors for autistic person, robots provide new treatment strategies that focus To reduce weakness and improve motor performance. Lina, W. , Jiangbo, L. and Jian, L. They explained about designing a robot to qualify for upper limb exercise based on Kinect The robot consists of three parts: the hand, forearm, and arm.[23] Ronit & Shelly have explained a new stroke rehabilitation system with a robot called (Soft Bank, Aldebaran). One of the tasks of stroke rehabilitation is the ability to coordinate movements because daily activities are largely related to the

use of hands. This is a system that includes games. The functional tasks include from. The life of a sick person

The system works based on RTG movements toward the body. Exercise games are designed and implemented using universal RTG access Convey concrete things[24]

Hidalgo et. al they explained how its work the Gloves were manufactured for manual rehabilitation. this system is able to generate patient reports for review. As this system is lightweight and easy Transportation The system allows movement Flexion and stretching of the fingers, The system allows the use of mobile applications To monitor the patient's condition. The system stores the person's activities in a database [25].

There are robotic systems using machine learning that have made a major development in the field of gait rehabilitation, (such as Lokomat MIT-skywalker, & KineAssist), and many more examples of advanced robots [26].

8. DEEP LEARNING AND NEURAL NETWORKS IN REHABILITAION:

Deep learning: It is a domain that deals with finding algorithms that make the machine learn on its own by simulating neurons inside the body, whereas this algorithms are derived from brain function, they are called artificial neural networks. It is a domain that deals with finding algorithms that make the machine learn on its own by simulating neurons inside the body, whereas this algorithms are derived from brain function, they are called artificial neural networks [27]. It is considered a branch of machine learning [28].

Assistive Technology in deep learning Statistics indicate that 90% and more of rehabilitation sessions take place inside the home despite the development and progress of tools and devices to support rehabilitation, but there is still a lack of diversity in assistive devices [29]. Sidra, A. S. and Taha, M. they explained the design idea Blind Echolocation Device with Smart Object Detection smartphone camera is initialized and the video streaming starts. Was used the app named "IP WebCam" to capture video frames which are sent to the computer through an IP address. During the video

streaming, smartphone camera detects objects. By using Python programming language, the IP address of the camera is called in the code. The frames detection is done by the function cv2.VideoCapture() which reads the incoming frames. The smartphone camera keeps on taking images of its environment and the images of object are then converted into gravscale and binary within the code so that it may form a matrix for the detected object and may be read by the computer easily. The pre-processing stage involves the reading and resizing of the image which is then checked by the inception V3 which is a 42-layer deep learning network How the device works we download. Deep learning model and node search creation To get results in understandable form. then Determines The Node Lookup class that handles labels and Returns a string for each classification. Function Tensorflow creates charts in memory. Google TTS (Text-to-Speech) API through GTTS is used [30].

Also, Artificial intelligence is used as a way to overcome visual disturbances: a convolutional nervous system was performed CNN it is acronym for Convolutional neural network CNN neural networks can doing visual tasks similar to the visual levels of humans [31]. There is a question as to why data is not collected from others Possible receivers like cameras instead of eyes themselves? [32].

9. REHABILITAION DEVICES:

Susan Shepard explained the idea of device work for allows patients to perform neurological rehabilitation exercises away from traditional physiotherapy. Motus Nova worked an individual device in the field of personal medicine by artificial intelligence

This device can be used by a sick person at home. This device is similar to video games. This device can be used independently without resorting to anyone and without anyone's supervision. Artificial intelligence uses a range of monitoring sensors. The device collects the movement data of the person, where that data can be retrieved from the device itself or the computer. As the movement data is available for the patient to be able to share with the doctors to be able to guide the patient for personal therapy sessions. In figure 4 is shows Image of the Hand Mentor [33].



Figure4: The Hand Mentor

10. CONCLUSIONS:

Over last few years, AI has dominated all major industries, with an unprecedented rise in the number of systems, applications and software focused on machine learning and AI technologies. Smart machines have been developed by scientists and engineers that can simulate reasoning and develop knowledge and that imitate like how normal people work. This indicates that we are truly heading towards the future. The need for smart tools and devices will continue to increase gradually.

11. FUTURE TRENDS OF THE TECHNOLOGY:

The challenges are the future expectations that researchers seek to achieve. we should be supporting people with special needs in improving their independence, self-reliance, job ability and health status in addition to maintaining mental ,cognitive and physical health. We recommend developing the expert system at CLIPS, as CLIPS is a robust development environment that is engineers greatly benefits in modern technologies specialized in artificial intelligence. With the phenomenon of big data and analysis resulting from deep learning systems, artificial intelligence has become Among the most controversial technological trends today, in the long run And cultures. Although AI has impressive technical aspects, some fear it can be overcome Human intelligence. Even if the idea of helping him advance humans is accepted, risks must be expected .This artificial intelligence may be if a person loses control and awareness of its moral implications. the need to protect individual privacy is likely to raise concern. The latest development in the AI industry has prompted some of the concerns. For example about privacy violation: Microsoft Kinect is a type of sensor that is used because it offers many advantages, despite its drawbacks, it is very heavy and therefore not practical to use. Another disadvantage is privacy penetration, which can be done easily.

The field of rehabilitating the blind the researchers recommend to use the Radio Frequency Identification (RFID)

As it is the most cost-effective solution as it is used for navigation for the blind. another problems that IOT-based devices can face is the penetration of patient privacy.

At the end, investment and interest in AI will increase over time when large cases of use of AI (for example, autonomous driving or AI diagnosis) of significant economic benefit are achieved. The AI is expected to increase over the long term. there some questions Is intelligence Artificial substitute for humans? What are the possible procedures for taking shelter from the consequences of artificial intelligence?

We are looking forward To overcome these disabilities using artificial intelligence. Despite all this, no one denies the importance of medical treatment, but new smart technologies can cross borders and devise advanced technologies that are more beneficial to treatment.

12. SUMMARY:

The purpose of this paper is to share typical Artificial intelligence applications. A Rehabilitation engineering is concerned with restoring the lost physical and motor functions of the person, as the rehabilitation builds, designs and develops devices, systems, robots and technologies to meet the motor and functional needs to help patients navigate, communicate, hear, see and perceive

This paper focuses on the design, development and artificial intelligence application of rehabilitative and assistive technologies.

AI is used to treat in an interactive, innovative way through VR rehabilitation, electronic gaming devices and mobile robots for people with mobility difficulties. and many other methods was used.

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