



Assistive Technology Intervention in Healthcare

Edited by
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Preface

Assistive technology (AT) in healthcare and rehabilitation has had consistent applications in the treatment of and intervention in several conditions. AT is nothing but a type of product, system or equipment used to improve the functional capabilities of different-aged people, from children to older people. It may improve the quality of life and ease dependence on family members or caregivers for the person with disabilities. Nowadays, many types of AT are commercially available on the market, such as hearing aids, wheelchairs, augmented communication, and so on. Internet of Things (IoT)-enabled devices have made remote monitoring possible in the healthcare sector by unleashing the potential to keep patients safe and healthy and enabling medical professionals to provide superlative care.

Adolescent idiopathic scoliosis, commonly known as AIS, is a major severe orthopedic anomaly observed in a significant part of the human population. The disease arises during adolescence and may become fatal if untreated. Detection of the region of interest (RoI) based on histogram analysis, localization of vertebrae segments and edges with the help of advanced image processing methods and deep-learning algorithms has the potential for better treatment strategies. The IoT has revealed a paradigm shift in health, introducing benefits like availability, accessibility and cost-effective delivery of individualized care. Enabling such a shift requires that hardware and software work together to enable widespread technical innovations. Electronic health records (EHRs) are becoming popular among radiologists, clinicians, pharmacists, healthcare providers and researchers for effective treatment and diagnosis, as they contain confidential and critical information about patients.

Reversible logic (RL) has received immense consideration in recent years due to its ability to lower power dissipation. There are six different types of reversible gates, based on simulation and evaluation of different parameters using Verilog and SPICE; the Toffoli gate shows remarkable results. Using a Toffoli gate, different combinational and sequential circuits are designed and simulated using both reversible and irreversible logic. It has been observed that results using reversible logic are exceptional.

COVID-19 has brought about disruptive and transformative digital automation in the health sector worldwide with multifold investments in upgrades. The situation has led to many developing cost-effective digital health technologies by using existing smartphones and integrating smart watches. Epilepsy disease management systems can also be made affordable. Among these, the technique known as segmented microaneurysm using the measures of entropy, skewness and kurtosis gives high performance regardless of image contrast. Augmented continuous particle swarm optimization successfully detects microaneurysms and helps to diagnose diabetic retinopathy in the early stages in an efficient way. In the same way, another technique known as computational fluid dynamics (CFD) has been an effective tool for obtaining insight into the circulatory system's physical

functioning. Similarly, gait analysis has become a significant way to gauge movement debilities and provide therapeutic interventions in the early phases of neurological diseases.

Biosensors are analytical devices used for identifying alterations in biological processes or biological elements such as tissues, cells, acids, enzymes or microorganisms, converting them to electrical signals. A biosensor is a combination of transducer and biological sensing elements used for modifying data into electric signals. Autism spectrum disorder (ASD) is a neurodevelopmental disability that impairs the social interaction and communication skills of an individual and can include repetitive behavior. The behavioral features of ASD emerge during the later part of the first and second years of life. The early detection of abnormalities in an EEG may be used as a biomarker for developmental cognitive disorders and is emphasized in this book.

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It is with immense pleasure that we express thankfulness to our colleagues for their support, love and motivation in all our efforts during this project. We are grateful to all the reviewers for their timely reviews and consent, which helped us improve the quality of the book.

We may have inadvertently left out many others, and we sincerely thank all of them for their help.

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