Chapter 41 Conventional and Non-Conventional ANNs in Medical Diagnostics: A Tutorial Survey of Architectures, Algorithms, and Application

Devika G.

b https://orcid.org/0000-0002-2509-2867 Government Engineering College, K. R. Pet, India

Asha G. Karegowda Siddaganga Institute of Technology, India

ABSTRACT

Computer technology advancements in recent days have offered professionals in different fields the ability to gather data, process information, store, and retrieve at a faster rate and make effective decisions. The large collection of data among all various applications including medical diagnosis has paved the need to employ advanced artificial neural networks (ANN). This chapter provides a detailed working view of ANN, covering its various architectures and design techniques in brief. A detailed analysis and summary of medical diagnostics applications using various ANN techniques will be leveraged. Imbalanced data is the major problem with medical data. This chapter briefs on the various methods to handle imbalanced data. Finally, future directions and potential current challenges are suggested for additional applications in neural networks.

DOI: 10.4018/978-1-6684-2408-7.ch041

INTRODUCTION

In recent time's artificial neural networks (ANNs) has become a popular and helpful model for classification, clustering, pattern recognition and prediction in many disciplines including medical. ANNs are one category of the of machine learning (ML) and has become relatively competitive to conventional regression and statistical models regarding usefulness (Dave, 2014). Currently, artificial intelligence, information security, big data, cloud computing, internet, and forensic science are all hotspots and exciting topics of information and communication technology (ICT). ANNs full applications can be evaluated with respect to data analysis factors such as accuracy, processing speed, latency, performance, fault tolerance, volume, scalability and convergence (He, 2009; Muzoffair, 2018). The great potential of ANNs is the high-speed processing provided in a massive parallel implementation and this has heightened the need for research in this domain (Izebudien, 2014). ANNs can be developed and used for image recognition, natural language processing and so on. Nowadays, ANNs are mostly used for universal function approximation in numerical paradigms because of their excellent properties of self-learning, adaptivity, fault tolerance, nonlinearity, and advancement in input to an output mapping (Wang, 2018). In (Raval, 2016) usage of machine learning techniques for medical diagnosis analysis of disease considering reports of lab and symptoms for acute analysis is considered.

Scope of the Work

ANN for medical diagnosis is an active research area currently, and researcher's estimates to it to be more widely used in biomedical systems for next few decades as its result are restricted to linear form. ANN will identify disease by learning method without using details of how to recognize the disease, hence it doesn't require any algorithm to identify disease.



Figure 1. Number of research work on ANN year wise from 1996-2019 (*Source Google*)

30 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: <u>www.igi-global.com/chapter/conventional-and-non-conventional-anns-in-</u> medical-diagnostics/288991

Related Content

Emerging Perspectives on Using Avatar-Based Management Techniques for Internet User Investigations: Social Media as an Information Source

Leyla Ayvarovna Gamidullaeva, Sergey Mikhailovich Vasin, Nadezhda Chernetsova, Elena Shkarupeta, Dina Kharichevaand Maria Gerasimenko (2020). *Avatar-Based Control, Estimation, Communications, and Development of Neuron Multi-Functional Technology Platforms (pp. 268-280).*

www.irma-international.org/chapter/emerging-perspectives-on-using-avatar-based-management-techniques-for-internetuser-investigations/244797

Avatar-Based Control and Development of Neuron Multi-Functional Platforms for Transformation Processes in the Digital Economy

Vardan Mkrttchian, Serge V. Chernyshenkoand Ekaterina Aleshina (2020). *Avatar-Based Control, Estimation, Communications, and Development of Neuron Multi-Functional Technology Platforms (pp. 231-247).*

www.irma-international.org/chapter/avatar-based-control-and-development-of-neuron-multi-functional-platforms-fortransformation-processes-in-the-digital-economy/244795

Meta-Heuristic Parameter Optimization for ANN and Real-Time Applications of ANN

Asha Gowda Karegowdaand Devika G. (2021). *Applications of Artificial Neural Networks for Nonlinear Data* (pp. 227-269).

www.irma-international.org/chapter/meta-heuristic-parameter-optimization-for-ann-and-real-time-applications-ofann/262916

A Theoretical Framework for Parallel Implementation of Deep Higher Order Neural Networks

Shuxiang Xuand Yunling Liu (2016). Applied Artificial Higher Order Neural Networks for Control and Recognition (pp. 351-361).

www.irma-international.org/chapter/a-theoretical-framework-for-parallel-implementation-of-deep-higher-order-neuralnetworks/152110

A Novel Framework on Biomedical Image Analysis Based on Shape and Texture Classification for Complex Disease Diagnosis

Reyana A., Krishnaprasath V. T.and Preethi J. (2020). *Deep Neural Networks for Multimodal Imaging and Biomedical Applications (pp. 104-117).*

www.irma-international.org/chapter/a-novel-framework-on-biomedical-image-analysis-based-on-shape-and-textureclassification-for-complex-disease-diagnosis/259490