Interactive personalized recommendation systems for human health

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1 Introduction

Recent research in Artificial Intelligence (AI) and recommendation systems have focused on developing highly intelligent and interactive algorithms, utilizing information's acquired from healthcare sensor networks. Regardless of its requirement for higher computational power and the huge volume of healthcare data, a large number of researchers are proactively involved in finding appropriate solutions against this background.

This is the editorial of "Interactive Personalized Recommendation Systems for Human Health" special issue of the Journal of Ambient Intelligence and Humanized Computing Springer Journal. The response of the research community has been significant, and many original contributions have been submitted for consideration. Among that totally 29 papers were accepted after going through a rigorous review process. All of the accepted research papers have significant elements of novelty, and it adds reasonable contributions to the existing research works in this domain. They not only provide novel ideas and state-of-the-art techniques in the field, but also stimulate future research in the sustainable environment.

2 Medical AI and novel applications

The paper entitled "Integrating HSICBFO and FWSMOTE Algorithm Prediction through Risk Factors in Cervical Cancer," by Geeitha S, Thangamani M., introduces a new methodology to analyze risk factors involved with cervical cancer. They integrate two algorithms, namely HSICBFO and FWSMOTE, to achieve their objectives. This can improve the prediction accuracy and enables earlier detection of cervical cancer.

The prime focus of the paper entitled "Accurate Detection of Myocardial Infarction Using Non-Linear Features with ECG Signals" by Chaitra Sridar, Oh Shu Lih, Jahmunah Vignes, Joel En Wei Koh, is to detect myocardial infarction with the help of nonlinear features obtained from the ECG signals. It evaluates ECG signals based on training performance and test accuracy. The results are convincing.

The paper entitled "Deep Learning-based and Automated Skin Lesion Segmentation and Intelligent Classification Model" by M Yacin Sikkandar, Ph.D, Bader Awadh Alrashheadi, Prakash NB, Hemalakshmi GR, Mohanarathinam A, K Shankar developed a deep learning assisted classification model for automated skin lesion segmentation and intelligent classification. Results have shown that this approach offers enhanced classification accuracy with minimal computation requirements.

The prime objective of the paper entitled "Predicting Autism Spectrum Disorder from Associative Genetic Markers of Phenotypic Groups using Machine Learning" by Karthik S, Sudha M, is to deal with autism spectrum disorders. It successfully identifies the genetic markers of the phenotypic group using machine learning algorithms.

A stimulating research is described in the paper entitled "An Effective Deep Learning Features based Integrated Framework for Iris Detection and Recognition". The authors are J Jayanthi, Laxmi Lydia E, Ph.D., Krishnaraj N, Ph.D., T Jayasankar, Lenin Babu R, Ph.D., Adaline Suji R, Ph.D. A deep learning model is developed to detect and recognize the iris movement. It extracts the features based on the training model and appropriately predicts the iris movements in

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a reliable way. The experiments are stimulated for various real-time use cases.

The paper entitled "A Hybrid Machine Learning Framework to Predict Mortality in Paralytic Ileus Patients using Electronic Health Records (EHRs)," by Fahad Shabbir Ahmad, Liaqat Ali, Raza Ul Mustafa, Hasan Ali Khattak, Tahir Hameed, Iram Wajahat, Seifedine Kadry, Syed Ahmad Chan Bukhari introduces a hybrid machine learning-based framework to predict paralysis patients using Electronic Health Records (EHR). The accuracy and precision measures are comparatively significant.

Ren Gang, Senthil Murugan Nagarajan and Prathik Anandhan present an called "Mechanism of the Effect of Traditional Chinese Medicine Fumigation on Blood Lactic Acid in Exercise Body". This article focus on preventing lactate accumulation and lactic acid into the body caused by physical exercises. It enhances muscle strength and eliminates exercise-induced muscle fatigue through the use of machine learning assisted predictive models.

The authors "Kirubakaran J, Prasanna Venkatesan G.K.D., Sampathkumar K, Kumaresan M, Annamalai S" presented an innovative research entitled "Echo State Learned Compositional Pattern Neural Networks for the Early Diagnosis of Cancer on the Internet of Medical Things Platform." The prime objective of the research work is cancer detection from the Internet of Medical Things. It develops deep learning assisted predictive models for the early diagnosis of cancer disease. The effective implementation of deep neural network algorithms offers appropriate results with improved accuracy and reliability.

The paper entitled "Brain Epilepsy seizure detection using Bio-inspired Krill Herd and Artificial alga optimized neural network approaches" by Ahed Abugabah, Ahmad Ali AlZubi, Mohammed Al-Maitah and Abdulaziz Alarifi, introduces effective bio-inspired machine learning techniques to predict the epilepsy seizure from the EEG signal with maximum recognition accuracy. The selected features are processed using an artificial alga optimized general Adversarial Networks. The network recognizes the intricate and abnormal seizure patterns. Then the discussed state-of-art methods are examined simulation results.

The authors Qiang Lin, Tongtong Li, P.Mohamed Sha-keel, R. Dinesh Jackson Samuel, presents an interesting research work entitled "Advanced Artificial Intelligence in Heart Rate and Blood Pressure Monitoring for Stress Management." It makes a successful attempt in developing artificial intelligence (AI) assisted predictive model for heartbeat and blood pressure monitoring among the individuals. It successfully reduces stress among individuals.

The paper entitled "An Improved Convolutional Neural Network for Abnormality Detection and Segmentation from Human Sperm Images" is authored by TopPrabakaran L, A. Raghunathan. This paper presents novel deep

learning-assisted convolutional neural network algorithm for abnormality detection from human sperm images. The results indicate improved performance measures with enhanced accuracy, precision, and recall measures.

3 Algorithms and big data analytics

The paper authored by Selvam L, ArokiaRenjit J., entitled "On Developing Dynamic and Efficient Cryptosystem for Safeguarding Healthcare Data in Public Clouds" focuses on preserving security and privacy measures across cloud based healthcare systems. The proposed cryptosystem model well-satisfies the security requirements of the healthcare systems.

The paper entitled "Fuzzy Based Decision Making Approach for Big Data Research on Health Information Management System" by Baogang Bai, Yuhui Baia, explores fuzzy-based decision-making model for health information management systems. It is established with the help of big data algorithms. It has been shown that this model offers comparatively better results than the existing algorithms.

The paper entitled "Novel medical image encryption using DWT block-based scrambling and Edge maps," authored by "S Jeevitha, N Amutha Prabha," constitutes the fifteenth paper. This work presents a novel and secure image encryption methodology to effectively process and analyze medical images.

Fabián Herrera, Rodrigo Niño, Carlos Enrique Montenegro Marín, Paulo Alonso Gaona García, Iñigo Sarriá Martínez de Mendivil, Rubén González Crespo, Ph.D. are the authors of the paper entitled "Computational method for monitoring pauses exercises in office workers through a vision model". The authors have explored a computational model using deep learning and computer vision techniques to monitor office workers in exercise activities. It efficiently reduces the probability of cardiovascular diseases caused by sedentary work style.

The paper entitled "Secure Prediction and Assessment of Sports Injuries using Deep Learning-based Convolutional Neural Network". It is authored by Hesheng Song, Hanxiu ying, Carlos Enrique Montenegro-Marin, Sujatha Krishnamoorthy. The deep convolutional neural network model developed in this work accurately predicts and assess injuries that occur during sports activities.

The paper entitled "Unsynchronized Wearable Sensor Data Analytics Model for Improving the Performance of Smart Healthcare Systems," and it is authored by "Osama AlFarraj, Amr Tolba". Managing healthcare data from sensor networks is often a complex process. This work overcomes this problem with efficient data analytics and predictive models.

4 Systems, tools and services

The paper entitled "Fuzzy Assisted Fog and Cloud Computing with MIT System for Performance Analysis of Health Surveillance System" by Edward J Ciaccio, Tan Ru San, N Arunkumar, Seifedine Kadry, U Rajendra Acharya, Selvakanmani S, Sumathi M, emphasizes performance measures associated with the Medical Internet of Things. It implements a fuzzy assisted algorithm to optimize the performance of fog and cloud-assisted MIT.

The article entitled "The Design and Research of a New Pharmaceuticals-vending Machine Based on Online Medical Service" authored by Chuanmei Hu, Caixia Chen, Tianjin Zhou, Guifen Ren, Yudina Xia, Xuemei Yu forms the fourteenth paper. The authors present an innovative pharmaceuticals vending machine to meet the demands of the increasing pharmaceutical. It intends to meet the personalized needs of the users and maintains the machine efficiently.

The paper entitled "A Multi-scale and Rotation-Invariant Phase Pattern (MRIPP) and a Stack of Restricted Boltzmann Machine (RBM) with Preprocessing for Facial Expression Classification" is authored by A. Sherly Alphonse, K. Shankar, Jeyasheela Rakkini M J, Ananthakrishnan S, Suganya Athisayamani, Robert Singh A, Gobi R. This work introduces two approaches namely MRIPP and RBM to efficiently preprocess the facial expressions. The experimental results meet the state-of-the-art.

The paper entitled "Overlapping Gait Pattern Recognition using Regression Learning for Elderly Patient Monitoring" is authored by "Ahmed E. Youssef, Yasser Kotb, Hassan Fouad, Ibrahim Hassan Mustafa". This work intends to monitor elderly patients using regression techniques. The predictive models are created using deep regression algorithms.

The paper entitled "Structural modeling and Phylogenetic analysis for infectious disease transmission pattern based on Maximum Likelihood Tree Approach" is authored by Nourelhoda M. Mahmoud, Mohamed H. Mahmoud, Salman Alamery, Hassan Fouad. This work designs a machine learning-based likelihood tree approach to predict the possibility of infectious disease transmission. It is evidenced by the simulation that the outcomes of this approach is satisfactory and adds value to the research community.

An interesting research work entitled "A Queueing Model with Improved Delay Sensitive Medical Packet Transmission Scheduling System in E-health Networks" is authored by Sundar Raj A, Chinnadurai M. The authors present an efficient queueing model to reduce the delay in medical packet transmission across E-health networks. It successfully optimizes the performance of E-health networks and offers improved quality of services.

5 Miscellaneous methodologies for human health

The research article entitled "Spatial distribution and content determination of Ganoderic acid F in tablets using confocal Raman microspectroscopy" is authored by "Yu Su, Yingxin Zhang, Yue Wang, Bixi Sun, Shuyou Yang, Changlong Zhou, Bing Han". This work aims to identify spatial distribution and components of Ganoderic acid F tablets without the destruction of the actual tablet. The spatial distribution of the drug components is analyzed using deep learning approaches, and the results are found to be reasonably satisfactory.

The research work entitled "Fuzzy Unordered Rule Induction Algorithm based Classification for Reliable Communication using Wearable Computing Devices in Healthcare" and it is authored by Sharavana Kumar M. G., Sarma Dhulipala V. R., Baskar S. Currently, research on wearable healthcare devices and body sensor networks is gaining increased attention due to its widespread applications. In this research, the authors present a fuzzy based efficient classification model for wearable healthcare devices with secure and reliable communication measures.

The paper entitled "A novel optimal feature selection technique for medical data classification using ANOVA based whale optimization" authored by Usha Moorthy, Usha Devi Gandhi, forms the seventeenth research work. The authors introduce a hybrid feature selection model to classify heart diseases based on distinct datasets. It is observed that this work offers better classification accuracy even with lesser system features.

Zhao Zhang, Bala Anand Muthu and Sivaparthipan C.B are the authors of the paper entitled "The Necessary of Constructing Preventive Health Intervention Policy under the trend of Deep Aging in China". It is a well-known fact that aging forms the major cause of various diseases. This work offers preventive health intervention policies using machine learning approaches to reduce the risk of aging among people in China.

The paper entitled "Forecasting of the SARS-CoV-2 Epidemic in India using SIR model, Flatten curve and Herd Immunity," and it is authored by Maheshwari V, Sandeep Kumar M, Prabhu J, Prasanna M, Sukumar Rajendran, Uma Shankar Subramaniam, Aroul Canessane R, Vijay Anand R, Alagiri I, Manivannan SS. This work makes an interesting attempt to prevent epidemics in India and to explore more on herd immunity. The attempt is successful, and it makes reasonable contributions against this context.

The paper entitled "Development of Patient-Specific Dental Implant using 3D Printing," authored by "P Balamurugan, N Selvakumar". This study explores the design criteria of the dental implant using 3D printing. It successfully finds

an efficient framework for the design and optimization of the patient centric dental implant.

6 Conclusions

All of the above papers address either technical issues in AI technologies or medical data processing or propose novel application models in the various medical AI fields. They also trigger further related research and technology improvements in application of e-health. Honorably, this special issue serves as a landmark source for education, information, and reference to professors, researchers, and graduate students interested in updating their knowledge of medical AI, recommendation systems, big data, Internet of Things, and novel application models for future information services and systems.

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