Miscellaneous Artificial Intelligence and Machine Learning Models For Multimedia and Medical Applications

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Abstract.

The research article presents the study on artificial neural networks and machine learning in different research domains and bids in interactive human, medical and real-world multimedia applications. The AIML has been proven in healthcare to link genetic codes, increase hospital productivity, and power surgical robots. In medical applications, It has been used extensively for electronic health records, sensor data, imaging, -omics, and medical text are some of the data types that are most frequently utilized for machine learning in biomedical research. The different models of ANN have provided good accuracy for the prediction and evaluation of the performance of different medical and multimedia systems.

Keywords. Machine Learning, Artificial Neural Networks, Deep Learning, Multimedia Applications, Medical Information

1. INTRODUCTION

Machine learning (ML) has advanced particularly quickly in the last ten years in the field of healthcare. Many healthcare requirements [1] that are expected to enhance patient care, lessen the burden on healthcare workers, reorganize healthcare operations, and give people more control over their health [2] have already begun to take shape. The development of image-based triage and second readers is one instance where machine learning for healthcare has been successful in translating computer vision. The utilization of electronic health records (EHRs) to foretell the risk and course of certain diseases has also made rapid progress. There are innumerable uses for ANN. To get the most out of the operational front, technology and AI applications can be implemented across a wide range of sectors and businesses [3]. The healthcare sector is now testing and using AI for surgical procedures [4] in operating rooms as well as medication administration and various patient treatments.

2. APPLICATIONS OF AIML

Machine learning modes have been used extensively for different multimedia applications [5] such as stock market prediction, social media, medical diagnosis, healthcare, defence, aerospace, electronics software, hardware accelerators [20], forensics and signature verifications, weather forecasting, facial recognition, and robotics applications [21]. Fig.1 presents the overview of the different applications of the AIML. The healthcare service system serves a crucial role in the medical area, which has great demands on human life. In order to advance, healthcare experts in developing countries are using cutting-edge technologies like machine learning and AI. Improvements in the healthcare sector have sparked research on intelligent, human-cantered healthcare systems. AI technologies have an impact on the development of monitoring and critical care units in clinics and hospitals. Modern discoveries in prediction, inhibition, medicine, and healthcare are quickly, cheaply, and more effectively addressed by these developments. The process of medical diagnosis welcomes a variety of AI applications to enhance service delivery, improved disease detection, prediction accuracy, and

many other areas. AI-assisted medical procedures are revolutionizing the field's reliance on the extensive study. These activities include the creation of new drugs, clinical diagnostics research, individualized medicine, robotic surgery, skilled human prenatal care, radiography, reviewed prescriptions, and evaluated patient information analytics.

Fig. 2 Major domains of AI and ML

3. MODEL STUDY & RESULTS

Table 1 summarizes the miscellaneous ANN and machine learning models for medical diagnoses and multimedia applications

Table 1 Miscellaneous model and applications

Description	**Accuracy**	**AI-ML**	**Application**
Csernansky et al. [1]	76.9%	Logistic Regression Model	MRI
Paikaray et al. [2]	95.10%	Random forest	Heart stroke predictions
Nadakinamani et al. [3]	100 %	Random Tree	cardiovascular disease
Kumar et al. [4]	93.00 %	Decision tree classifier and algorithm	Hardware in loop testing and automation in power window control

Kumar et al. [6]	88.12%,	Multiple linear regression	Brain Tumor detection and MRI image segmentation
Hooda et al. [7]	91.70%	K-means clustering	Estimation for the surface roughness of superhydrophobic coated surfaces in self-clearing solar panels
Yang et al. [8]	88.2%	Dirac Delta Net	Hardware accelerator and Co-design for ConvNet with embedded FPGAs
Mohsin et al. [9]	100%	K-Nearest Neighbor Classification	Hardware accelerator with embedded FPGAs for mobile devices
Rani et al. [10]	75.16%, 74.03%, 83.50%, 85.81%	K-Nearest Neighbor (75.16%), Bayesian Network (74.03%), Regression Tree (83.50%), and Support Vector Machine (SVM)	Recognition in human-robot interaction
Zhao et al. [11]	95.00 %	Boosted regression tree	Robot-assisted surgery in healthcare organizations
Wang et al. [12]	92.5%, 91.3% 95.4%,	K-nearest neighbors (k-NN) (92.5%), Support vector machine (SVM) 91.3%, and Logistic regression (LR) (95.4%)	Data augmentation and robot-assisted surgery
Raju et al. [13]	99.40%	Component Analysis (PCA) with the integration of Discrete Wavelet Transform	Global and local facial recognition
Gui et al.[14]	90.20%	short-term memory (LSTM) and random forest model	Perdition of flight delay for surveillance-broadcast
Rhee et al. [15]	64.00 %	Random tree	Forecasting the meteorological drought for remote sensing and ling range
Prashanth et al. [16]	96.40%	Naive Bayes + SVM	Early detection of Parkinson's disease using multimodal features

Firdausi et al. [17]	96.8%	Decision tree	Malware detection on the internet
Kumar et al. [18]	97.99 %	Decision tree regressor (92.74) Random forest regressor (92.49) Multiple linear regressors (97.99)	Hardware chip design analysis for pre-synthesis and resources projections for network-on-chip communication
Banna et al. [19]	90.00 %	CNN	Robotics and automation industries for cognitive behavior and dynamic actions.
Goel et al. [21] [24]	81.00 %	Level set methods	Providing the review of AI and machine learning for the different real-time applications in medical applications and brain tumor is one of the applications which is reviewed and analyzed using different methods such as level set, Otsu etc.
Kumar et al. [22]	71.42% 78.26% 86.95% 84.34% 80.45% 91.39%	Otsu's method Watershed algorithm DWT K-means Level set CNN	For brain tumor study, analysis, and prediction for the different diseases and cases. Deep learning applications for a brain tumor and further use for analyzing the type of tumor.
Dhyani et al. [23]	91.00 % 83.00%	ResRNN Classifier (91.00), and DesNet which is working g with multiscale deep fusion neural networks.	For the study and analysis of the performance evaluation of the ECG database for the prediction of the Arrhythmia diseases
Khatter et al. [24]	>90.00%	Controlled Competitive Learning	Used for clustering and medical data analysis
Agarwal et al. [25]	73.84%	Deep Convolution Adversarial Networks	Detecting melanoma, a form of advanced skin cancer

4. CONCLUSIONS

Supervised learning, unsupervised learning, and reinforcement learning are the three categories into which ML algorithms are divided. Supervised learning is the paradigm used the most frequently for machine learning operations. It is typically used for data where it fits to analyse the input and output variables to analyse the closeness. Examples of supervised learning include linear regression, support vector machines, random forests, gradient boosting, logistic regression, and artificial neural networks. Since the data are not implicitly divided into different categories, an unsupervised learning system does not have labelled data. The outcome of this study reveals that ANN has been used extensively for several medical applications, diagnosis, and healthcare industries. The different versions of ANN algorithms such as CNN, RNN, and feedforward ANN, have proven better accuracy of > 90 % in comparison to other algorithms and models for the same diagnosis and multimedia applications.

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