**Artificial intelligence in Health care**

This research article (Alanazi, 2022)examines the growing role of Machine Learning (ML) in healthcare, emphasizing its potential to enhance medical outcomes through advanced computational power and big data. The article distinguishes between supervised learning, which uses algorithms like linear regression, support vector machines, and decision trees to predict labeled data, and unsupervised learning, which identifies patterns in unlabeled data for applications such as fraud detection. Clinical applications of ML include developing decision support systems and predicting high-risk populations for targeted public health interventions. The article also highlights the importance of integrating ML concepts into medical education to enable health professionals to effectively interpret and guide research in this field.

This research(Callahan and Shah, 2017) explores the application of Machine Learning (ML) to electronic health records (EHRs), highlighting its potential to enhance patient risk scoring, predict disease onset, and improve hospital operations. It reviews current uses of ML in clinical settings and contrasts these with traditional analysis methods, noting the advantages ML offers. The chapter also addresses the methodological and operational challenges associated with implementing ML in healthcare research and practice. Finally, it provides insights into future areas where ML could profoundly influence health and healthcare delivery.

This research (Nayyar et al., 2021) reviews the application of machine learning (ML) technology in healthcare, emphasizing its role in enhancing, rather than replacing, human physicians. ML is highlighted as a key tool for developing computational approaches that offer solutions to complex healthcare problems. The chapter examines recent literature on ML's use in diagnosis, prognosis, and treatment planning, noting how it can provide faster and more accurate solutions for medical practitioners. While acknowledging the limitations and challenges of ML in healthcare, such as the evolving nature of medical science and technology, it discusses the opportunities ML presents for improving healthcare solutions. The chapter also stresses the importance of an interdisciplinary approach to fully leverage ML's potential in healthcare and aims to present novel and high-quality research facilitated by ML techniques.

# Machine learning in Brain Tumor Classification

In this study (Sharif et al., 2022) , a new automated deep learning method is introduced for multiclass brain tumor classification, addressing the challenge of low accuracy often faced in medical imaging. The approach involves fine-tuning the DenseNet201 pre-trained model and using deep transfer learning on imbalanced data. Features are extracted from the average pooling layer, but since this alone isn't sufficient for accurate classification, two feature selection techniques are proposed: Entropy–Kurtosis-based High Feature Values (EKbHFV) and a modified genetic algorithm (MGA). These selected features are further refined and fused using a non-redundant serial-based approach, followed by classification with a multiclass SVM cubic classifier. The method was evaluated on the BRATS2018 and BRATS2019 datasets, achieving over 95% accuracy, demonstrating its superiority compared to other neural networks.

This paper (Mohsen et al., 2018)explores the use of Deep Learning, particularly a Deep Neural Network (DNN) classifier, for classifying brain MRI images into four categories: normal, glioblastoma, sarcoma, and metastatic bronchogenic carcinoma tumors. The study leverages the discrete wavelet transform (DWT) for feature extraction and applies principal component analysis (PCA) for dimensionality reduction. The combined approach was found to perform well across various evaluation metrics, demonstrating the effectiveness of Deep Learning in addressing complex medical imaging problems.

This paper (Alqudah et al., 2020) discusses the use of Deep Learning, particularly a Convolutional Neural Network (CNN), for grading brain tumors based on T1-weighted contrast-enhanced MRI images. Brain tumor grading is crucial for developing effective treatment plans, as early detection and accurate classification can significantly impact patient outcomes. The study classifies brain tumors into three categories: Glioma, Meningioma, and Pituitary Tumor, using a dataset of 3064 images. The CNN model demonstrated high effectiveness, achieving an accuracy of 98.93% and sensitivity of 98.18% for cropped lesion images. For uncropped lesions, the accuracy was 99% with a sensitivity of 98.52%, while segmented lesion images yielded an accuracy of 97.62% and sensitivity of 97.40%. These results highlight the potential of CNNs as a powerful tool for brain tumor classification in medical imaging.

This paper addresses (Deepak and Ameer, 2019) the critical problem of brain tumor classification in computer-aided diagnosis (CAD) systems, specifically focusing on distinguishing between glioma, meningioma, and pituitary tumors. The proposed system utilizes deep transfer learning, leveraging a pre-trained GoogLeNet model to extract features from brain MRI images. These features are then classified using established classifier models. The study employs a patient-level five-fold cross-validation on a figshare MRI dataset, achieving a mean classification accuracy of 98%, surpassing other state-of-the-art methods. Additional performance metrics, including AUC, precision, recall, F-score, and specificity, are also reported. The paper highlights the effectiveness of transfer learning, particularly when training samples are limited, and provides a detailed analysis of misclassifications, emphasizing the practical implications of the research.

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