Deep Learning Algorithms in Oral Cancer

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Oral cancer is a dangerous and extensive cancer with a high death ratio. Oral cancer is the most usual cancer in the world, with more than 300,335 deaths every year. The cancerous tumor appears in the neck, oral glands, face, and mouth. To overcome this dangerous cancer, there are many ways to detect like a biopsy, in which small chunks of tissues are taken from the mouth and tested under a secure and hygienic microscope. However, microscope results of tissues to detect oral cancer are not up to the mark, a microscope cannot easily identify the cancerous cells and normal cells. Detection of cancerous cells using microscopic biopsy images helps in allaying and predicting the issues and gives better results if biologically approaches apply accurately for the prediction of cancerous cells, but during the physical examinations microscopic biopsy images for cancer detection there are major chances for human error and mistake. So, with the development of technology deep learning algorithms plays a major role in medical image diagnosing. Deep learning algorithms are efficiently developed to predict breast cancer, oral cancer, lung cancer, or any other type of medical image.

Keywords: oral cancer ; oral squamous cell carcinoma ; neural network

1. Introduction

Oral cancer is one of the most frequent deadly diseases and has long been a serious public health concern across the world. Oral cancer is a subset of head and neck malignancies, with 475,000 new cases diagnosed each year globally. Early-stage sickness has a survival rate of about 80%, whereas late-stage sickness has a survival rate of less than 20% [1][2]. Squamous cell carcinoma of the oral cavity is the most prevalent form of oral cancer, accounting for more than 85% of cases. Although early detection of oral cancer is critical, most patients are identified at the last stage of the illness, resulting in a dismal prognosis.

Due to the clinical appearance of oral cancer being insufficient to identify the dysplastic state, analysis, or degree, therapy selection based on the clinical appearance of the illness is insufficient.

Oral cancer is linked to a variety of risk factors, and the post-treatment survival rate is similarly unexpected [3][4]. Biological models, as well as medical forms of related and lesion-free tumor models, may be recognized in many regions of the body using appearance models and stereotypes without labeling. Potentially cancerous lesions like leukoplakia, erythroplasia, and oral submucosal fibrosis are also common in the at-risk group. It is also critical to distinguish between benign and malignant tumors. Age, gender, and smoking history can all have an impact on the prognosis of oral cancer [5]. Understanding the advancements of technology such as artificial intelligence may help to resolve any healthcare snags [6][7]. A sore or ulcer that does not heal and may cause discomfort or bleeding is the most prevalent indication of cancer. White or red sores in the mouth, lips, gums, or tongue that are not healing, a lump or mass in the mouth, loose teeth, chewing or swallowing difficulties, jaw swelling, trouble talking, and persistent painful throat [8]. The use of Artificial Intelligence in the treatment of oral malignant growths has the potential to address existing problems in disease detection and prognosis prediction. Artificial intelligence, which replicates human cognitive capabilities, is a technological achievement that has captured the imaginations of scientists all around the world [9]. Its application in dentistry has only just begun, resulting in amazing results. The tale begins about 300 BC. C. Plato depicted an important model of brain activity. The artificial intelligence system is a framework that accepts information, discovers designs, trains using data, and generates outcomes [10][11]. Artificial intelligence operates in two stages: the first, which involves training, and the second, which includes testing. The parameters of the model set are determined by the training data. Data from prior instances, such as patient data or data from other examples, are used retrospectively by the model. The test phase is subsequently subjected to these criteria. Various biomarkers identified by artificial intelligence in various research have established prognostic variables for oral cancer. Early detection of a malignant tumor improves patient survival and treatment options [12]. Much research on medical image analysis for smartphone-based oral cancer detectors based on artificial intelligence

algorithms has been done. Artificial intelligence technology makes it easier to diagnose, treat, and manage patients with oral cancer. To aid diagnosis, artificial intelligence decreases physician burden, complicated data, and exhaustion [13]. Given the practicality and alleged benefits of deep learning techniques in cancer prediction, their use in this field has gotten a lot of interest in recent years. This is because it is designed to assist doctors in making educated decisions, therefore enhancing and encouraging better patient health management. Surprisingly, technological advancements have resulted in the transition from neural networks to deep neural networks. This deep learning method has also been lauded for its potential to enhance cancer management.

2. Current Works

The researchers' objective was to diagnose the early stages of oral cancer utilizing the less accurate output of Naive Bayes, Multilayer Perceptron, KNN, and Support Vector Mechanical techniques. Oral cavities and analysis improve classification precision [14]. The researcher's objective is to develop a model for doctors. Use tree-based decision-making approaches, artificial neural network vector maintenance methods, and DATA, NN, and HDM high precision analyses. The representation of the ADM's score is the best suited for detecting breast cancer recurrence since it has the highest precision and the lowest error level. When both ANN and DT are evaluated, the results suggest that SVM is the best technique for diagnosis [15]. Madhura V, Meghana Nagaraju, and their colleague review several reports to investigate the diagnosis of oral cancer using machine learning [16]. They then utilize categorization rules to anticipate and association rules to demonstrate attribute co-dependency [17]. It then employs the a priori technique to pick frequent item sets and construct the association rule from the bottom up, employing a breadth search and hash to efficiently count the items. In their study, researchers utilize an adaptive fuzzy system based on deep neurons to get exact findings in data mining techniques. The procedure starts with data processing and grouping with Fuzzy C-Means. The architecture of an adaptive fuzzy system based on deep neurons has been presented, and analysis methods have been used to obtain correct findings such as precision, accuracy, and so on [18]. Their study made use of data sets including 251 X-rays from the equator, which were then subdivided into experimental data testing and training methods such as in-depth ANA investigations, transfer studies, and Convolutional Neural networks [19].

The researcher's objective was to test novel automation ways for Oral Squamous Cell Carcinoma diagnoses on clear pictures utilizing in-depth training and Convolutional Neural Network methods. The focus of this Convolutional Neural Network is on the search for quotations, pictures, training, data, and evaluation [20]. Oral cancer can exhibit a wide range of patterns and behaviors [21]. In recent years, researchers used numerous machine learning techniques to overcome cancer [22], and the machine learning models can detect cancer. Machine learning predicts oral cancer is way better than previous prediction techniques [23]. Oral cancer is a fatal disease, and the major root of this fatal disease comes from the genome [24] and a variety of pathogenic changes [25]. Early prediction of oral cancer [26] and its treatment can increase the patient survival chances. Oral cancer is a progressive and very complicated disease [27] that can only predict using numerous machine and deep learning algorithms. So, the researchers provide the combining machine learning strategies [28] to predict oral cancer in its early stages. Researchers can use different histopathological machine learning [29] approaches to overcome cancer. Some researchers provide the fused machine learning-based solution [30] to predict cancer using real-time data and achieved good accuracy using different neural algorithms. Previous research used cloud-based deep learning approaches [31] to overcome cancerous diseases and gave better treatment to decrease the high mortality rate in females. Machine learning approaches help in genes association to overcome the cancerous empowered with deep learning approaches [32]. Researchers used digital images [33] to predict cancer using artificial neural networks and deep CNN [34] approaches to get highly efficient results. During the COVID phase, various researchers apply machine learning approaches to COVID patients to predict cancer [35] and get highly efficient results using different preprocessing techniques. Deep learning radionics-based detections [36] on cancerous patients give high feature results with the help of chemoradiotherapy.

The researcher's objective was to test novel automation ways for Oral Squamous Cell Carcinoma diagnoses on clear pictures utilizing in-depth training and Convolutional Neural Network methods. The focus of this Convolutional Neural Network is on the search for citations, pictures, training, data, and classification. The researchers used machine learning techniques and genetic data to predict oral cancer development in OPL patients. To examine the course of oral cancer in individuals with a history of OPL, the researchers employed a Support Vector Machine, Multi-Layer Perceptron, a minimally invasive procedure, and a DNN [37]. The researcher utilized ordered electrical machines to classify the usage of hyperspectral to identify lung cancer in the amplification attempt. They divided the data into pictures using a Convolutional Neural Network. In this regard, in-depth research approaches were used to address the lack of an independent design of the cancer detection system [38].

The majority of the approaches need complex system configuration, resulting in significant operational expenses. The researchers assessed several cancer detection approaches and clarified the benefits of symptomatic simulations. As a result, HSI can be used to classify data. They use a vector support machine with a self-mapping structure to categorize the data [39].

Table 1 shows most of the previous research used machine and deep learning techniques to predict oral cancer using OSCC biopsies and other datasets, but they did not achieve the highest accuracy due to their highlighted weakness. As observed from previous studies oral cancer prediction is an important mission to save many lives.

Table 1. Compare and weaknesses of previous studies.

Publication	Method	Dataset	Accuracy	Limitation
A.Alhazmi [26]	ANN	Public	78.95%	Requires data preprocessing
C.S. Chu [27]	SVM, KNN	Public	70.59%	Requires data preprocessing
R.A.Welikala [28]	ResNet101	Public	78.30%	Requires data preprocessing and learning criteria decision method
V. Shavlokhova [40]	CNN	Private	77.89%	Requires better image data preprocessing techniques and learning criteria method
M. Aberville [20]	Deep Learning	Public	80.01%	Requires data image preprocessing techniquesClass instances
H. Alkhadar [23]	KNN, Logistic Regression, Decision Tree, Random Forest	Public	76%	Requires handcrafted features

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