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Machine Learning Approach for Medical Image Analysis

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Abstract: *Colorectal cancer, which is frequent, recognized tumors in both genders around the globe. As per the report generated by WHO in 2018, colon cancer placed in the third position, whereas 1.80 million individuals are affected. Precisely, it is the succeeding leading cancer, which is the second most common cause of cancer in females, and the third for males. The loss of control over the integrity of epidermal cells in bowel or malignancy can be the cause of colorectal cancer. An effective way to recognize colon cancer at an early stage and substantial treatment can reduce the ensuing death rates to a great extent. To perform Screening of Morphology of Malignant Tumor Cells in the colon, a Gastroenterologist may refer to cancer diagnosis tests for pathological images. In any Histology method, the process takes a significant duration of time due to infinite numbers of glands in the gastrointestinal system, which may lead to irreconcilable outcomes. By diagnosing through computer algorithms, can give practical and contributory results. Hence, accurate gland segmentation is one crucial prerequisite stage to get reliable and informative morphological image data. In this work, for colorectal cancer prediction various ML and DL algorithms are employed and compared for accuracy*

Keywords: Colorectal cancer, medical image, Machine Learning, Deep Learning

I. INTRODUCTION

The occurrence and fatality percentage of colorectal malignancy has much increased in contemporary years. More often, Pathologist's diagnosis depends on pathology reports of images and from biopsies, providing information about the escalation of cancer through the lymph and other organs of the body. This procedure not only takes a great deal of time and also price. However, it likewise has apparent constraints. The research study shows that the analysis of various pathologists has even more significant incongruity. The primary factor for this incongruity is that the pathology medical diagnosis technique is subjective as well as easily affected by the atmosphere. Diagnosis of photos utilizing computer based algorithms can be an efficient method for sustaining the medical diagnosis. The bowel is the collection of hollow organs that took part in a long, twisting tube starting from duodenum to the anus. It absorbs the fluids and electrolytes and compels the solid waste to the rectum along with anus for purgation. Various factors are taken into consideration for prediction of colorectal cancer. Colorectal cancer is a serious cancer type and is ranked as one of the top three most deadly and severe cancers in the world after breast cancer and lung cancer [8]. Colorectal cancer disease causes many cases of death, and it causes over 4000 people to die annually in the Kingdom of Saudi Arabia [7]. It affects human health by spreading to the lungs, ovaries, liver, and other portions of the digestive system [**10**]. Colorectal cancer is influenced by numerous factors, including gender, age, medical condition, smoking, alcohol, diet consumption, and genetic disease. Early indications of colorectal cancer include low hemoglobin and changes in bowel habits, such as diarrhea or constipation or a change in stool consistency for more than two weeks, along with bleeding, stomach discomfort, such as gas or pain, abdominal pain, and swelling in the colorectal area [**6**].

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II. LITERATURE SURVEY

1. Assessment of Tumor Invasion Depth in Colorectal Carcinoma Using Multiphoton Microscopy Shu Wang; Jianxin Chen; Yinghong Yang; Weizhong Jiang; Publisher: IEEE 2023

In this paper, multiphoton microscopy (MPM) was used to simultaneously label freely image loose areolar connective tissue in the submucosa and intramuscular septa in the muscularis propria to perform assessment of colorectal carcinoma invasion depth. The results indicated that MPM can accurately exhibit whether colorectal carcinoma invades into the submucosa or the muscularis propria.

2. Colorectal Tumor Segmentation of CT Scans Based on a Convolutional Neural Network With an Attention Mechanism Yun Pei; Lin Mu; Yu Fu; Kan He; Hong Li; Shuxu Guo; Xiaoming Liu; Mingyang Li; Huimao Zhang; Xueyan Li Publisher: IEEE 2023

The proposed network consists of three major modules: an encoder module, which is fed CT scans to attain the feature map; a dual attention module, which includes a channel attention module and a position attention module to obtain more contextual information in the deep layer of the network; and a decoder module, which restores the feature map to the original size of the input images

3.Screening of Pathogenic Genes for Colorectal Cancer and Deep Learning in the Diagnosis of Colorectal Cancer Yanke Li; Fuqiang Zhang; Chengzhong Xing, • Publisher: IEEE 2023

The three aspects of characteristics comprehensively excavate the genetic characteristics, and demonstrate the feasibility of the study through comparative analysis from different perspectives. Constructing a colorectal cancer gene network, analyzing the changes in the network structure during the development of colorectal cancer, and mining the network characteristics of genes are the first issues to be studied in this paper.

4. Characterization of the colorectal cancer in a rabbit model using quantitative high-frequency endoscopic ultrasound Cheng Liu; Yaoheng Yang; Lei Sun; Chih-Chung Huang,

Publisher: IEEE 2023

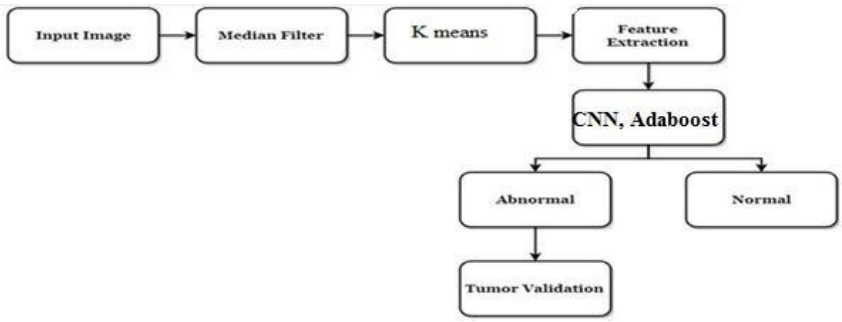
The field of knowledge of high-frequency EUS with quantitative ultrasound (QUS) for early colorectal cancer diagnosis is yet to be fully determined and a reproducible and feasible animal model is appropriate for further development of this novel modality. VX2 CRC Rabbit model is first time used as a model for endoscopic ultrasound imaging according to our knowledge. In this study, we for the first time show the application of high-frequency EUS along with QUS to characterize malignant colorectal tumor and benign colorectal tissue in a rabbit model of VX2 colorectal cancer.

5. Colorectal cancer recognition from ultrasound images, using complex textural microstructure concurrence matrices, based on Laws' features Delia Mitrea; Sergiu Nedevschi; Mihail Abrudean; Radu Badea

Publisher: IEEE 2023

In this work, we defined the co-occurrence matrix of complex textural micro- structures, determined by using the Laws' convolution filters, in conjunction with clustering methods and we experimented in order to perform automatic diagnosis of the colorectal tumors. These tumors were compared with the Inflammatory Bowel Diseases (IBD), as they have the same appearance with these affections in ultrasound images.

III. METHODOLOGY SECTION



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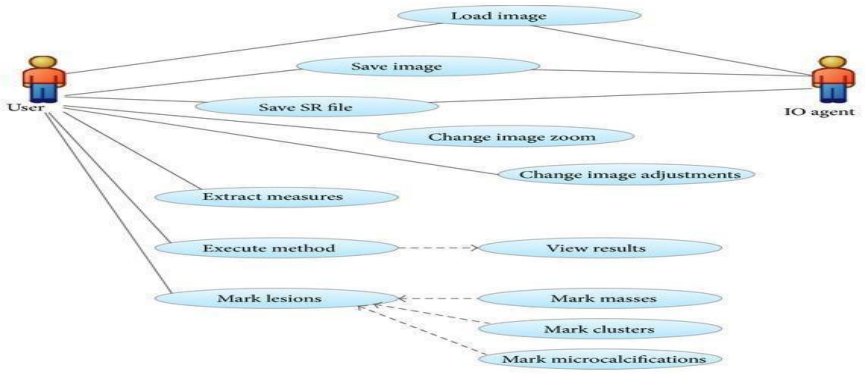

ML algorithms and feature selection techniques were used to detect colon cancer. The malondialdehyde (MDA) and maximum degree greedy (MDG) algorithms were used for feature selection. AdaBoost, and KNN algorithms have been applied to a public dataset that is made up of 62 cases and 2000 genes. There are 40 abnormal and 22 normal patients among them. The result showed that the Adaboost algorithm with the feature selection method achieved the highest accuracy with 95.161%.

IV. CONCLUSION

This project demonstrates the modeling of colorectal cancer as a classification task and describes the implementation of the ML approach for classifying colorectal cancer as either benign or malignant. The results of ML were compared on the basis of accuracy with existing systems. It was observed that classification implemented by ML technique in this project is more efficient compared to existing algorithms as seen in the accuracy and precision. Based on the results, ML technique is more efficient compared to other existing methods in colorectal cancer detection. In conclusion, AI has a major effect on human life in healthcare by improving the prediction of malignancies like colorectal cancer through the use of ML and DL algorithms.

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