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Medical Imaging – Gastroenterology- A Literature Assessment

Sirisha Eedupuganti, Pragnyaban Mishra

Abstract: ***The present day life styles are changing the food habits of the human beings by force and these food styles are leading towards problems related to health care in particular. Because of the dynamic changes, the impact of the health is being deteriorated and many diseases are therefore getting triggered to the mankind. Among the various diseases, gastroenterology related diseases are being growing exponentially because of the in healthy food styles. This indirectly leading towards diseases in particular to liver and pancreas. Many researchers and eminent practitioners in the field of domain are experimenting to compact the disease from further complications. The complications include liver cancer, enlargement of liver, shrinkage of liver, pancreas problems which eventually leads to diabetic diseases. The present article aims at bringing out the different methodologies and techniques that are developed by the eminent researchers to highlight the state of work in the present domain.***

Keywords: Diabetes, Liver, Liver Enlargement, Pancreas, Shrinkage Of Liver.

I. INTRODUCTION

With the current developments in the field of medical sciences, many automated technologies have been brought into light in order to assist the practitioners in treating the patient more effectively. These methodologies are mostly focused on electronic based computer assisted tools. In order to understand about the various diseases that are prone to the man kind can be broadly classified into text based and context based systems. Using these techniques the experts can visualize the various insights and developments about a particular disease and also help them towards better understanding about the treatment administer for a specific complicated disease around the globe.

In spite of the evolutionary growth in medical diagnosis and tools associated for the identification of the diseases. Still there are many challenges and these challenges are leading towards the issues related to problems related to mankind.

There are many diseases which need further precise knowledge and still many patients are reported of mortality due to improper or timely identification of the diseases.

Among the various diseases that hamper the individual's health, gastroenterology's is one such disease which is mostly populated now days.

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***** Correspondence Author
Mrs. Sirisha Eedupuganti*, Department of Computer Science & Engineering, Research Scholar, Koneru Lakshmaiah University, Vijayawada, India. E-mail: eedupuganti13@gmail.com
Dr. Pragnyaban Mishra, Department of Computer Science & Engineering, Koneru Lakshmaiah University, Vijayawada, India. E-mail: pragnyaban@kluniversity.in

If these diseases not identified in prior, it leads to further complications right from damaging the liver, pancreas and other surrounding parts of the intestine. Therefore, to assist the researchers in developing new methodologies which can more precisely identify the diseases of gastroenterology.
In this article the detailed literature about the works carried out, in this field of domain are presented in chronological order along with the diseases focused by each of the reviewers together with the methodologies populated. A brief review is presented as in the following section.

II. REVIEW OF LITERATURE

This section highlights the reviews presented by eminent reviewers during the last one and half decade in the field of medical sciences.

Table I: Detailed literature about the works carried out, are presented in chronological order along with the diseases focused by each of the reviewers together with the methodologies populated.

Year of publication	Diseases focused	Techniques used
2019	brain tumor [1], Lung Nodule, Alzheimer's Disease [2], lung cancer,	deep convolutional neural network VGG19 [1], Guided Latent Dirichlet Allocation (GuidedLDA) method, position weighted Precision (wPrecision), swarm intelligence feature selection technique and multistage Naive Bayes classifier [2], K-nearest neighbor (KNN)[2], and support vector machine [2], three dimensional local circular difference wavelet patterns (3D LCDWP), three dimensional local circular difference patterns (3D LCDP), enhanced residual network
2018	Alzheimer's disease, gastrointestinal diagnosis [3], breast tumours, Computed Tomography (CT) brain images, liver and biliary system [4], brain magnetic resonance images, breast cancer	landmark-based deep feature learning (LDFL) framework, Convolutional neural network, Ontology Construction and retrieval [3], deep convolutional neural network (CNN), Densely-Connected Multi-Magnification(DCMMH) framework, local binary patterns and the histogram of oriented gradients, SVM with radial basis function , sift technique, GLCM and Hu-moments [4], Self-organising map algorithm

2017	Chest disease diagnosis, Anatomical categorization, Breast cancer diagnosis, Vertebrae irregularity diagnosis, Lung cancer diagnosis, Alzheimer diagnosis, Metastatic Neoplasm, noncancerous tumor, non-Neoplasm disease [5], normal infusion, esophageal, stomach -colorectal cancer, Lung Diseases [6], spine MRI images	multi-level semantic mining and retrieval framework with latent Dirichlet allocation [5], speedup technique of LSH [5], hadoop File System, Map/Reduce algorithm, Convolution neural network(CNN), multi-task learning in deep learning(TFL), Dijkstra's shortest path first to capture the basic organization of the data [6], Fused Context-Sensitive Similarity algorithm [6], supervised learning approach, Stochastic Gradient Descent (SGD) with backpropagation, k-means clustering
2016	Interstitial lung diseases [7], tomography images of the liver, x-rays images [8]	Supervised learning [7], metric learning algorithm [7], Adapted SVM and nearest neighbor search, convolutional neural network [8], Radon Barcode (RBC) [8], Region of Interest (ROI) [8].
2015	breast cancer, computed tomography images, adrenal, cardiac, chest, kidney, small bowel, and stomach [9], Skin diseases, lung cancer [10], knee, chest, brain, and leg	Scale-invariant feature transform, kernelized and supervised hashing method, wavelet decomposition, wavelet coefficients [9], k-means segmentation algorithm [9], border detection method, Seed region growing [10], GLCM [10], Support vector machines [10], Linear kernel function [10], Polynomial kernel function [10], Radial basis function [10], K-SVD, Orthogonal Matching Pursuit (OMP) algorithm, quadratic mean, amplitude, root-mean square deviation using Gabor filter, fuzzy edge detection, Feed Forward back propagation neural network algorithm
2014	X-ray images [11], melanoma - Skin Cancer, mammography images, MRI images[12]	Simultaneous Clustering and Attribute Discrimination (SCAD) algorithm [11], case-adaptive classification, Support Vector Machine, Scale Invariant Feature Transform Fusion Technique [12]
2013	Stomach and esophagus [13], breast cancer, Brain Tumor, Brain diseases [14], CT images, MRI images, Digestive System Diseases [15]	Normalized Cut Algorithm [13], MapReduce computing algorithm, Hadoop File System model, BEMD-GGD, BEMD-HHT, relative entropy, Euclidean space, Wavelet Transform, Modified fuzzy pseudo-partitioning technique, Two-Layer K-Means Algorithm, PCA, KD tree, Modified Local Binary pattern [14], Gray-level histogram, Gray level co-occurrence matrix,
		Multi-modal query strategy , hierarchical classification technique [15], Natural language processing technique [15], Automatic and Semi-automatic image annotation techniques [15]
2012	esophagus, Neuroblastoma (NB) and follicular lymphoma (FL), Lung Tumours / Cancers, Liver Tumor, Dental images, Human Retinal [16], endoscopy images, skull images	Auto correlation Gabor feature(AGF), auto correlation homogeneous texture(AHT), CIE Lab, HSV, co-occurrence histograms, adaptive thresholding algorithm, ROI, graph edit distance calicutaion, Fourier Descriptors, MPEG-7 Gabor filter and edge histogram descriptors, PCA, cluster based indexing, Local Binary Pattern(LBP), Euclidean distance method, canny based edge detection [16], Fourier descriptor, Euclidean space, Manhattan distance, Daubechies wavelet transform
2011	microscopic pathology or dermatology, cell carcinoma, Heart Diseases [17], radiological image, Skin Cancer, CT images [18], MRI images [18], X-ray and sonography images[18], mastography Images [18], Lung Cancer, MRI images of the head and neck [19],	RF(relevance feedback) based similarity fusion technique , BIC (Border/Interior classification), Gabor Transform, Haralick, GLCM, intersection kernel support vector machines, Genetic Algorithm [17], Relevance Feedback [17], IRMAcon scheme, minimum redundancy maximum relevance feature, co-clustering analysis, SVM, Gray level co-occurrence matrix, Edge histogram descriptor, euclidean distance, Fourier descriptor (FD) [18], Daubechies wavelet transformation, Empirical weight optimization technique [19]
2010	Screening Mammography, Normal brain [20], Atrophy [20], Stroke [20], Cysts [20], Tumor [20], Trauma/haemorrhage [20], Skin cancers, Ultrasound images, X-Ray images, MRI images, Mammogram images, breast cancer, Diabetic retinopathy follow up [21].	modified DCT, two-dimensional PCA (2DPCA) technique, support vector machine [20], singular value decomposition (SVD), 2D Gabor filter, PCA, LDA, symmetric short kernel filters, arithmetic coding, non-negative tensor factorization [20], K-nearest neighbour [20], Genetic algorithm, Bhattacharyya distance metric or euclidean distance, Generalized gaussian density, BEMD-Hilbert [21], BEMD- GGD [21].

2009	Radio graphic Images, Uterine cervix [22], mammogram, brain or lung, skin disease, MRI or CT of colonoscopy, osteoarthritis and musculoskeletal diseases, Thorax-X-ray images, Blood Cell Images, Radiology Images, Skin Diseases, head and neck MRI images [23], breast cancer, head cancer, neck cancer	Patterns for next generation database systems (PANDA), raster scan technique using sliding window size of user choice, Gaussian distribution Region based searching tool [22], Omega algorithm, least square linear regression, Zamora hierarchical segmentation, Howe hierarchical segmentation, Euclidean Distance, Correlation, Histogram Euclidean Distance, Histogram Intersection, Gustafson Kessel Fuzzy classifier, Fuzzy unit classifiers, Ensemble Technique [23], Empirical weight optimization technique [23], The Limited Rank Matrix Learning Vector Quantization (LiRaM LVQ), statistical machine learning algorithm-Large margin nearest neighbor (LMNN), K- nearest neighbor search], incremental learning technique, Adaptive support vector machine, principle component analysis, k-NN algorithm
2008	lumbar intervertebral fibrocartilage images and cervical disc images [24], Medical X-ray images [25]	Fourier descriptors [24], Fourier transform [24], new hierarchical merging scheme and feed forward artificial neural network (MLP) classifiers [25], semantic classes [25].
2007	17 different radiological X-ray classes [26], Brain diseases [27]	GMM-KL Framework [26], adaptive statistical similarity matching technique [27], relevance feedback technique [27], PCA [27].
2006	PET Images - brain studies [28]	Optimal image-sampling schedule technique [28]
2005	lung disease [29], bronchiolar disease [29]	fuzzy logic techniques [29]
2004	Mammograms [30]	neural networks and support vector machines [30], binary classifier and a regression module [30]

III. METHODOLOGY

In order to identify the diseases related to liver and pancreas, many modals have been developed and projected by the reviewers. However, in most of these cases, the identification is based on symptoms. In general, they may be several diseases within the liver and pancreas which share common symptoms. If these symptoms are not identified clearly leads to further complications. Therefore, to have a precise view of these symptoms feature play vital role.

There are many feature extraction techniques that are existing in the literature. Some of them include edge based techniques, shape based, color based, texture based etc. However, in this area of proposed research work we have considered the feature vectors like GLCM (Gray-Level Co-Occurrence Matrix), SURF (Speeded-Up Robust Features) together with semantic interpretations and features.

The main advantage of these feature selection models is that GLCM provides a unique selection pattern for the different set of similar images and SURF can be used for object recognition, image registration, classification or 3D reconstruction.

In order to have more precise view the proposed thesis, we would like to consider Bi-VARIATE features into consideration. These features will be taken as inputs and we try to fit in a statistical mixture model using which the parameters (mean and standard deviation) of the features are well identified.

IV. RESULTS

Table II: Testing values for disease prediction

Input (Features)	Actual Output	Expected Output	Test case Pass/Fail
65, 1, 0.7, 0.1, 187, 16,18	1	1	Pass
40, 1, 0.9, 0.3, 293, 232, 245	1	1	Pass
17, 0, 0, 9, 0.3, 202, 14, 11	0	0	Pass
33, 0, 0.5, 1.4, 111, 777, 156	1	0	Fail
25, 0, 0.6, 0.1, 183, 91, 53	0	0	Pass

The first column in the result table describes the features or values from the reports given by the hospital. If these values are matched with our trained database values, we can predict the disease. The second, third and fourth columns describes whether the disease is identified or not.

V. CONCLUSION

The present article is developed with a focus on various developments that are carried out in particular in the field of gastroenterological diseases together with the various methodologies that are being used to counter attack each of the diseases that are identified. This article helps the budding researchers to explore a comprehensive review about the domain and understand about the tools and techniques considered against each of the disease and helps in planning out further developments that can strengthen their probability of ratifying the diseases more precisely.

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AUTHORS PROFILE

Mrs. E. Sirisha, recieved M.Tech in the field of Computer Science from Andhra University, and Research Scholor in the field of Computer Science, KL University . Working as Assistant Professor in department of Computer Science and Engineering, Gayatri Vidya Parishad College of Engineering (Autonomous). Research areas include Image Processing and Semantic Web. Published six papers in international journals.

Dr. Pragnyaban Mishra, recieved Ph.D in the field of Computer Science from Sambalpur. Working as Associate Professor in department of Computer Science and Engineering, KL University. Research areas include Big Data Analytics. Published seven papers in international journals.