

# Web Based Voice Controlled Advanced PACS to Diagnose Lungs Cancer and Related Anomalies

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**Abstract:-** PACS (picture archiving and communication system) is a medicinal imaging technology that is utilized basically in medicinal services associations to safely store and dissect carefully transmit electronic pictures. PACS a needed asset in contemporary hospitals, has demonstrated its key position in the department of radiology for archiving and collecting medical images, followed by its inclusion with the department of radiology. In this paper we have included work 3D displaying of DICOM pictures, calculation of segmented cancer part with fine calculations, voice recognition for a program to get and translate correspondence or to comprehend and complete spoken directions, and forecast of malignancy utilizing examinations of cancer symptoms.

**Keywords:-** MRI, DICOM, K-NN, SVM, FNA, PACS)

## I. INTRODUCTION

In this modern world, Healthcare medical imaging system plays an important and major role in critical factor for the quality of diagnostic and treatments. Sri Lanka holds a one of a kind position in South Asia as one of the first of the less created countries to give general wellbeing. Even though many technologies arrived in medical field, due to the poor knowledge in medical technology it cannot do any impact or solve the problems. Sri Lanka needs more easy to use and simpler to handle system so as to use in occupied calendar. Picture archiving and Communication System (PACS) is the back-bone of the investigation about medicine pictures as it is well adjusting a few gauges, for example, DICOM. It gives efficient capacity, recovery, the executives, conveyance and introduction of medicinal pictures. Electronic pictures and reports are transmitted carefully by means of PACS.

Breast cancer is one of the most prevalent cancers among women in the world, accounting for the majority of new cases of cancer and cancer deaths, according to global statistics. The aim of this assessment is to determine which characteristics are most useful in predicting cancer that is

malignant or benign. If the patient has conform the cancer hospital requiring to get the MRI and CT, then analyzation of images in diagnosing lung cancer, 3D multiplications of CT and MRI outputs makes them profoundly exact what's more, explicit to every patient. These 3D prints give specialists more data than what's conceivable in a 2D portrayal of a patient's life structures in an itemized manner. Identifying the boundaries of lung cancer to ascertain the volume of it will be helpful in finding accurate volume calculation with less errors.

Voice transcription programming is gradually supplanting the medical job that a medical transcriber. By moving endlessly from a transcriber, the specialist is set in a position where they have more noteworthy command over their patient records here we use actions that can be done using voice controls rather than manual operation in the system e.g.: Rotate the 3D model.

## II. LITERATURE SURVEY

Now if we take Srilanka due to growth of the population and The increase amount of diseases and in busy life schedule having manual reports of patients and handling that is very difficult and it also can make way to many errors and misconceptions [1]. Using the PAC system generated MRI DICOM images can be modelled in to 3D . Immense success can achieve by the Doctor in surgeries and also calculation volume and can able to identify the severity of the condition by observing 3D model rather than 2D DICOM Images. Visualizing the brain tumor and calculating its volume are features of the proposed system [4].

There are some algorithms and methods used to make Breas cancer prediction Jiminguo1, BenjaminC. M. Fungs, Farikhund introduced the Leiden University Medical Center choice tree algorithm with breast cancer information sets [1]. The information sets have 574 patients at that hospital who have had surgery. Thus, within three years of original diagnosis, they produce the recurrence of breast cancer through a Decision Tree Algorithm. The classifier

anticipated precision of 70 percent. The Classifier precisely predicts the recurrences of the disease in 55 patient for the autonomous Classifier of 65 patient. The classifier also divides patients into two based on the trait of their disease and their significance to early recovery. There is a big amount of articles on the application of Data Mining methods for survivability assessment [2]. The most of the articles on the application of Data Mining methods for survivability assessment. Several studies have been reported to have focus on the significance of breast cancer method. These studies have implemented distinct approaches to data mining and provided problems, Decision Tree, Artificial Neural Network, Genetic algorithms, Support Vector Machines

Some algorithms and techniques are used to model 3D from 2D medical pictures. For small configuration computers, Multi-Planning rendering (MPR) does not require too many calculations. Method Volume Render (VR) is used to visualize the object's full volume. Cloudiness and color must be calculated at each Voxel by projecting rays through the volume data [2].

Finding volume can help in finding the severity of the cancer and the risk of the operation. Estimates of tumor volume provide only anatomical information and not true functional information [3]. There are some current systems accessible for segmentation of the brain tumor. M. Karuna and Ankita Joshi suggested an "Automatic detection and assessment of brain tumor using MATLAB" system [4]. This scheme includes segmentation through the Neuro Fuzzy Classifier, but many input pictures are needed to train an image to the neural network.

Now if we take Sri Lanka due to increase of the population and the increase amount of diseases and in busy life schedule having manual reports of patients and handling that is very difficult and it also can make way to many errors and misconceptions [5]. There are some software packages for speech recognition that are accessible commercially for speech recognition. IBM Via Voice 98 with General Medical Vocabulary's, Dragon Systems naturally-speaking Medical Suite, version 3; and General Medicine Edition, L and H Voice-xpress [6]. Twelve doctors completing their training with each software package compare these software packages and dictated a summary of medical advancement and discharge. The measurements analyzed in the research [6] are medical abbreviations, medical vocabulary and general English vocabulary compared across package using a standardized, strict scoring strategy. IBM software's was discovered to have the smallest general errors rating software's relative to other, consecutive generations of speech recognition. The item is extremely costly for use in developing nations such as Sri Lanka, although it is successive. Creating medical reports using voice recognition is done as part of the PAC system with a minimum cost and as the high purpose of saving physicians time. PAC system will be the solution to the above problem. It is more convenient and user friendly so that and medical staffs can learn it and make use of it.

### III. METHODOLOGY

The scheme has been created using codeIgniter, tensorflow. Jupyter's ML notebook. MATLAB was used for image processing and wamp, xampp was used for server and database.

#### A. Voice Recognition and system controlling

Speech is an extremely appealing way to interact with human computers. It's free of hands. It only takes normal hardware for use (a HighQualityMicrophone or NormalMicrophones) [6]. Fundamentals of Speech Recognition comes at a very simple bit rate. Recognizing people's speech, especially continuous speech without loaded training for a vocabulary of enough complexity is very hard. By using new processes, flow diagrams, algorithms, and methods we can process speech signals easy and recognize speech-text. In this system it develops a single line speech-to-text system [7].

The following are the voice production elements that are examined while implementations use distinct voice related functionalities. They are Phonation (producing sound), Fluency, Intonation, Pitch variance, Voice (including aeromechanical components of respiration). Basic voice recognition components are the sound card, microphone, speaker profile, language mode

Utterances Grouping and analyzing the words, matching the words, converting to text. The speaker-recognition scheme can be seen as functioning in four phases [8].

- Analyzing.
- Features extractions.
- Modeling.
- Test.

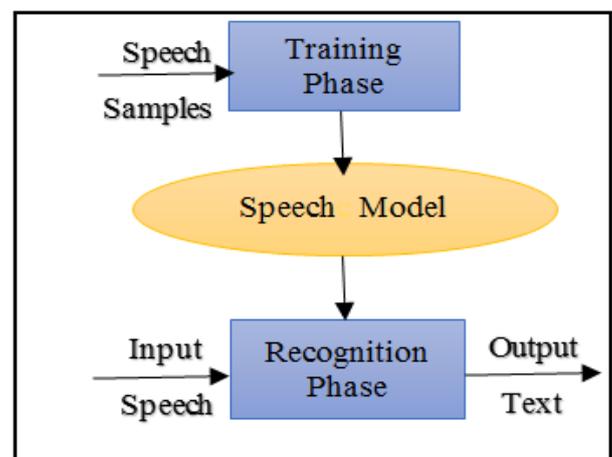


Fig 1:- Voice recognition process

Capturing the voice and removing unwanted background noise. Converting to analog to digital format. The models are intended either for a particular speaker or for an autonomous speaker. The manner in which the speaker talks also plays a part in recognizing speech. Some models, with a pause in between, can acknowledge either

single. Testing data to test the model .then converting to the API.

**B. Breast cancer prediction**

In this research are aim is to classify tumors as malignant (cancerous) or benign (non-cancerous) using features from multiple cell pictures. To calculate characteristics, a digitized image of a Fineg Needlea aspiration (FNA) of a breast mass is used. They portray features of the image's cell's nucleus. Breast cancer information from the kajal internet was gathered [9].

There are 530 instances with 33 attributes in the collected dataset. The class allocation is framed as unlikely, likely and beneficial. Therefore, there are 32 independent variables and 1 variable dependent. For the independent variables and dependent variable, the nominal values are set. The non-modifiable factors are the first 10 variables and the modifiable factors are the next 22 variables and the last variable is the danger of breast cancer.

➤ *Logistic Regression Algorithm*

It is the go to technique for issues with binary classification. It is applied in predictive modeling [15]. Logistic regression is called for the perform used at the core of the strategy, the supplying perform. Logistic Regression Algorithm has the highest accuracy value 0.98.

➤ *K-NN Algorithm*

In pattern recognition, the K-Nearest Neighbor formula may be a non-parametric methodology used for classification and regression. In each cases, the input consists of the K Nearest training examples within the feature house [6]. K-NN may be a sort of instance-based learning's-nn algorithm accuracy value 0.97.

➤ *SVM Algorithm*

The objective of the supporting vector machine-leering algorithm is to find a hyper plane in an N-dimensionalx space. The accuracy value is 0.97.

➤ *Decision tree algorithm*

Decision-Trees-Classfier is an easy decisions learn algorithms which only recognizes categorically data for model building. The fundamental concept is to build a DecisionTree by using a top to down-greedyz-searching through-training the data set to evaluate each attribute at each node. It-utilizes-statistical property known as gaining data to select which attribute to test at each node in the tree. Information gaining measures how well a specified attribute distinguishes-the-training-sample-according to theirclassification. The accuracy value is 0.95.

**C. Calculate the Tumor Volume**

➤ *Hidden Markov Random Field Model*

HMRF-EM method of MRI segmentation. This method has been effectively connected to tissue segmentation. MRI images Segmentation by utilizing an alternate count and slice size of pictures. Hidden Markov Random Field model is gotten from Hidden Markov Model [10] [11]. This is characterized as procedures created by a Markov chain. State progression can't be watched straightforwardly, yet can be seen after certain means [12].

$$P(y|x) = \prod_{i \in S} P(y_i|x_i)$$

In a HMRF model y is an observable random field & x is a hidden random field.

$$P(x_1, x_2, x_3, \dots, x_n, y_1, y_2, y_3, \dots, y_n) = P(y_1)P(x_1|y_1) \prod_{k=2}^n P(y_k|y_{k-1})P(x_k|y_k)$$

This equation is used to find the probability.

➤ *Hmrf Using The Em Algorithm*

$$x^* = \arg \max\{p(y|x, \theta)P(x)\}$$

Calculation is used to choose the sample parameter  $\theta$  for every pixel and comprises of two stages. First incorporates the estimation of the absentminded data which is required to shape an all-out enlightening accumulation and the second incorporates the development of the normal probability work for the absolute instructive gathering. We search for the naming  $x^*$  which fulfills.

$$P(x) = Z^{-1} \exp(-U(x))$$

MRF can proportionately be portrayed by a Gibbs Dissemination.

➤ *Threshold Method*

This is utilized to change over unique picture to binary picture. When the lung picture darker than the background picture, [13] [14]

Gray level pixel < T equal black color.  
Gray level pixel > T equal white color.

➤ *Voxel Images*

Voxel is a solitary pixel that given by: (Length \* Width \* Slice size). [15]

To improve the output, HMRF-EM algorithm wants to marginally wide edges of the distinguished articles in the MRI scan image and accomplished by utilizing Gaussian blur filter algorithm. The G (x, y) is

$$G(x, y) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x^2+y^2)}{2\sigma^2}}$$

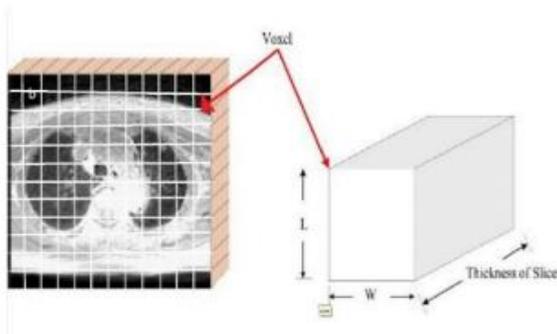


Fig 2:- Voxel

**D. 3D Modelling**

In this project, the real 2D medical images were used as the input data. Required number of DICOM images of human parts will be in-putted to the system to get a high accuracy 3D model of the given DICOM images set.

**IV. MARCHING CUBES ALGORITHM**

The Marching Cubes (MC) algorithm by Lorensen and Cline is most used algorithm for extraction of iso surface out of volumetric data. This algorithm produces a triangle mesh by computing iso-surfaces from discrete data. a. By drawing all these triangles, we can build a three dimensional representation of the CT-Scans [17] [18].

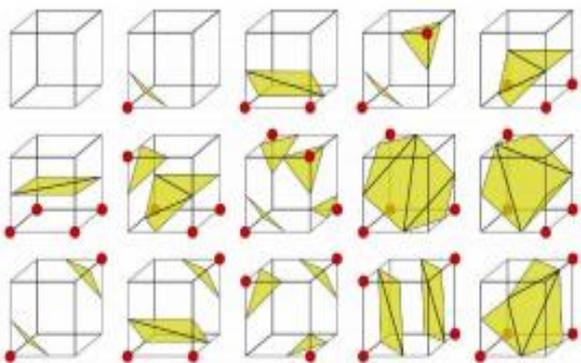


Fig 3:- 3D rendering by marching cube algorithm

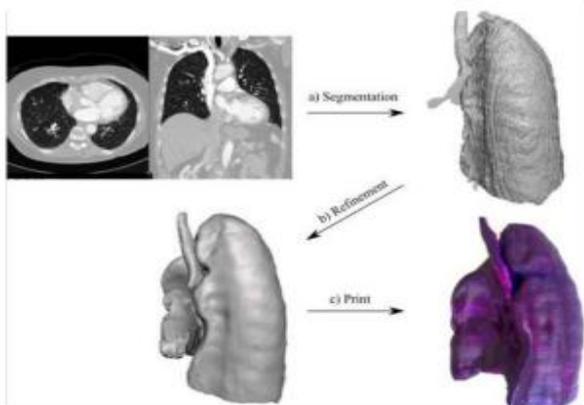


Fig 4:- Process of DICOM

**V. RESULTS**

We used some steps to get output. This image segmentation are used to get a unique picture.

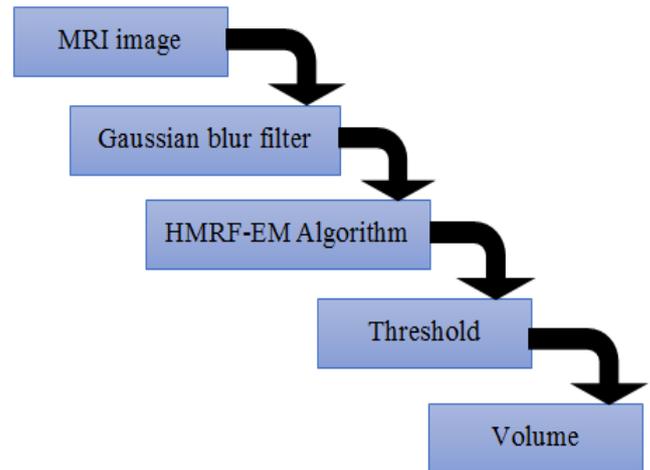


Fig 5:- Processing of Volume

Canny edge identification is connected on the first picture so we clearly identify border edge. While, at that point Gaussian calculation is used on the primary picture to get the perception y. The outcomes discovered uncovers the underlying picture which are come about because of the k-means have morphological openings, and not safeguard the watchful edges, for example these picture are not smooth enough. In this way, the HMRF refines picture out all of these disservices .The last outcome is segment effect area and calculate volume.

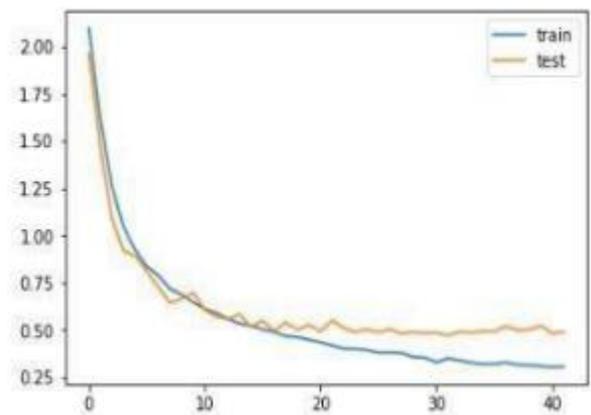


Fig 6:- Trained Graph of Voice Recognition

It detects system words. When the physician presses the AI, in voice recognized function, the voice of the physician is detected and converted in to text. The specialized thing here button and his voice is converted to audio through the system. Then it's converted in to text. The below table will lead us to measure the accuracy and the efficiency of the voice recognition system. Table show the test value and train data.

Algorithms	Accuracy
Logistic Regression Algorithm	98%
K-NN Algorithm	97%
SVM Algorithm	97%
Decision Tree Algorithm	95%

Table 1:- Testing of Breast Cancer

## VI. CONCLUSION

Radiologists can use lung cancer segmentation to make the 3D lung model and calculate the region of lung cancer without critically examining medical images. Voice created in a scheme where the voice commands can regulate the part of the system. It is unknown the-actual-cause of-breast-cancer, but-early therapy can be a useful way to prevent and detect breast cancer as well. Data mining technology is-the simplest and easiest way to predict whether it is recurrent or non-recurring breast cancer. Data mining algorithms such as decision tree, support vector machine naïve Bayes give more precise outcomes in many of the articles mentioned above.

## VII. FUTURE WORK

Only 3D lung pictures can be rendered by a developed scheme. It is possible to develop cancer in the future by rendering 3D model of other body composition and anatomies such as core. In addition, voice could be created into a scheme where voice commands can regulate the entire PAC scheme and Voice controlling is more accurate and more function controlling, reducing manual operating time. Developing other related disease prediction.

## REFERENCES

- [1]. Health, "Healthdata," 2019. [Online]. Available: <http://www.healthdata.org/sri-lanka>.
- [2]. Q. J.R, "'Induction of Decision Trees," Volume 1., March, 1986.
- [3]. N. P. P. S. S. a. S. A. Ayushi Trivedi, "Speech to text and text to speech recognition systems-Areview," Department of Computer Science, NMIMS University, Mumbai, India.
- [4]. V. R. J. Daemen, "The block cipher rijndael", Proceedings of the Third International Conference on smart, 2000,.
- [5]. [Online]. Available: <https://www.aapm.org/meetings/amos2/pdf/35-9796-86628-984.pdf>. [6] B.-H. J. B. Lawrence Rabiner, "Fundamentals of Speech Recognition".
- [6]. E. M. B. Raghavendhar Reddy, "'Speech to Text Conversion using Android Platform", in International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622, January - February 2013, pp. , Vol. 3,
- [7]. B. W. Y. Santosh K. Gaikwad, " "A Review on Speech Recognition Technique", in International Journal of Computer Applications (0975 – 8887), November 2010., pp. Volume 10– No.3, .
- [8]. kajal, "kajal," [Online]. Available: <https://www.kaggle.com/ucil/breast-cancer-ison-sin-data..>
- [9]. A. A. J. P.-M. B. Duquette, "'3D segmentation of abdominal aorta from CT-scan and MR images", Computerized Medical Imaging and Graphics, vol. 36, pp. 294-303, 2012..
- [10]. Y. B. M. a. S. S. Zhang, "'Segmentation of brain MR images through a hidden Markov random field model and the expectation-maximization algorithm", Imaging, IEEE Transactions on, vol. 20, pp. 45-57, 2001..
- [11]. Y. B. A. G. B. S. M. a. C. Zheng, "'Four-chamber heart modeling and automatic segmentation for 3-D cardiac CT volumes using marginal space learning and steerable features", Medical Imaging, IEEE Transactions on, vol. 27, pp. 16681681, 2008..
- [12]. M. H. V. a. B. R. Sonka, "'Image processing, analysis, and machine vision: Cengage Learning", 2014..
- [13]. S. S. a. K. N. V. Al-Amri, "'Image segmentation by using threshold techniques", 2010. arXiv preprint arXiv:1005.4020.
- [14]. D. T. A. S. C. a. H. B. Cooper, "Effect of voxel size on 3D micro-CT analysis of cortical bone porosity", Calcified tissue international,, vol. 80, pp. 211-219, 2007.
- [15]. lg, "logical," [Online]. Available: [ieeexplore.ieee.org](http://ieeexplore.ieee.org)
- [16]. K-nn, "K-NN," [Online]. Available: [https://www.researchgate.net/publication/242579096\\_A\\_n\\_Introduction\\_to\\_Logistic\\_Regression\\_Analysis\\_and\\_Reporting](https://www.researchgate.net/publication/242579096_A_n_Introduction_to_Logistic_Regression_Analysis_and_Reporting).
- [17]. Sio, C. C., Ngan, M., Yi, J., & Chen, X. (2011). Volume Rendering with Marching Cube Algorithm. University of Southern California, date Feb, 11.
- [18]. [Online]. Available: [indexive.com](http://indexive.com)
- [19]. J. Guo *et al.*, "Revealing determinant factors for early breast cancer recurrence by decision tree," *Inf. Syst. Front.*, 2017.
- [20]. R.M. Sherekar and Anand Pawar, "A MATLAB Image processing approach for reconstruction of DICOM Images for Manufacturing of customized anatomical implants by using rapid prototyping," *American journal of Mechanical Engineering and Automation*, vol. 1, no. 5, pp. 48-53, 2014.
- [21]. Fuzzylogic [Online] Available: <https://www.scribd.com/book/145718199/Fuzzy-Logic-with-Engineering-Applications> [Accessed: 16-September-2016].
- [22]. M Karuna and Ankita Joshi, "Automatic detection and severity analysis of brain tumors using gui in matlab," *International Journal of Research in Engineering and Technology*, vol. 02, no. 10, 2013.

- [23]. Dr. Denham Pole “Electronic Patient Records in Sri Lankan Hospitals”, Sri Lanka Journal of Bio-Medical Informatics 2010;1(1):43-45 [Accessed: January 04 2015]
- [24]. E.G Devine, S. A. Gaehde, and A. C. Curtis, “Comparative Evaluation of Three Continuous Speech Recognition Software Packages in the Generation of Medical Reports,” J. Am. Med. Informatics Assoc., vol. 7, no. 5, pp. 462–468, 2000.