



# EFFICIENT WAY TO DETECT BONE CANCER USING IMAGE SEGMENTATION

Muhammadu Sathik Raja,<sup>[1]</sup> Abirami K.<sup>[2]</sup>

Assistant Professor<sup>[1]</sup>, PG Scholar<sup>[2]</sup>

Department of Medical Electronics Engineering,

Sengunthar College of Engineering, Tiruchengode, Tamil Nadu, INDIA

<sup>[1]</sup>[scewsadik@gmail.com](mailto:scewsadik@gmail.com), <sup>[2]</sup>[abistar.139@gmail.com](mailto:abistar.139@gmail.com)

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**Abstract:** Cancer is an uncontrollable division of abnormal cells, which is spread over the parts of the body. Bone cancer is one of the types of cancer. Bone cancer is a malicious and malignant disease, caused due to uncontrolled division of cells in the bone. The most threatening and customarily occurred cancer is bone cancer. Earlier the detection of bone cancer is most challenging problem. The ultimate goal of this paper is to perform an investigation on the bone cancer images to find out the tumor. In this research we are comparing K- means and fuzzy C-Means clustering techniques to detect the presize precision tumor part in the bone. In this research initially image undergoes into the segmentation process and k-means and Fuzzy C-Means algorithms are applied to detect the accurate tumor part in the bone. In this research is fully employed MATLAB as a programming tool for the process of loading an image and to perform image segmentation. For clear understanding of this research the overview and the results will be displayed in the sessions of this paper.

**Keywords:** Tumor, k-means algorithm, image segmentation

## INTRODUCTION

This Disease can begin wherever in the body. It begins when cells become crazy and group out ordinary cells. This makes it difficult for the body to work the way it should. Tumor can be dealt with extremely well for some individuals. Truth be told, more individuals than any other time in recent memory have full existences after tumor treatment. Malignancy isn't only one infection. There are many sorts of disease. It's not only one infection. Malignancy can begin in the lungs, the bosom, the colon, or even in the blood. Diseases are indistinguishable in some ways, yet they are diverse in the ways they develop and spread. The cells in our bodies all have certain occupations to do. Ordinary cells isolate in a methodical way. They pass on when they are exhausted or harmed, and new cells have their spot. Disease is the point at which the cells begin to become wild. The tumor cells continue developing and making new cells. They swarm out ordinary cells. This causes issues in the piece of the body where the growth began. Growth cells can likewise spread to different parts of the body. For example, malignancy cells in the lung can go to the bones and develop there. At the point when malignancy cells spread, it's called metastasis (meh-TAS- tuh-sister). At the point when lung growth spreads to the bones, it's still called lung malignancy. To specialists, the growth cells in the bones look simply like the ones from the lung. It's not called bone malignancy unless it began in the bones. A few malignancies develop and spread quickly. Others develop all the more gradually. They additionally react to treatment in various ways. A few sorts of malignancy are best treated with surgery; others react better to drugs called chemotherapy (key-mo- THER-uh-pee). Frequently at least 2 medicines are utilized to get the best outcomes. When somebody has tumor, the specialist will need to discover what sort of disease it is. Individuals with malignancy require treatment that works for their sort of disease. Spreads to the bones, the malignancy cells in the bones will really be bosom disease cells.

## OSTEOSARCOMA

You can get osteosarcoma at any age. Be that as it may, it's the most well-known kind of essential bone disease found in adolescents and youthful grown-ups. Osteosarcomas can develop anyplace in the skeleton. The most widely recognized locales for osteosarcoma include:

### What is Bone Cancer?

Bone disease begins in the bone. Malignancy begins when cells in the body start to become wild. Cells in almost any piece of the body can progress toward becoming tumor, and can spread to different zones of the body.

### Types of bone tumors: Essential and optional bone tumor

Essential bone malignancy begins in the cells of the bones. The tumor cells are bone cells that have turned out to be harmful. All the data in this segment is about essential bone growth. The vast majorities who have tumor cells in their bones don't really have essential bone growth. They have disease cells that have spread into the bone from a growth somewhere else in the body. This is called auxiliary or metastatic bone disease. So for instance, in the event that you have bosom tumor that

- Around the knee
- The lower thigh bone (femur)
- The upper shin bone (tibia)
- Around the shoulder
- The upper arm bone (humerus)

### Ewing's sarcoma

Ewing's sarcoma is most basic in youngsters. It more often than not begins in the:

- Pelvis (hips)
- Thigh (femur)
- Shin (tibia)

You can get a Ewing's tumor in the delicate tissues of the body. Delicate connective tissue tumors are called delicate tissue sarcomas. These are dealt with an indistinguishable path from Ewing's bone tumors.

### Chondrosarcoma

Chondrosarcoma is regularly found in grown-ups matured in the vicinity of 30 and 60 years of age. It is a malignancy of ligament cells inside the bone. Ligament is the gleaming, smooth substance that typically covers the closures of bones in the joints. However, it can likewise be found inside the bone. Chondrosarcoma can become inside a bone or on the bone surface. The most widely recognized locales for chondrosarcoma are the:

- Hips (pelvis)
- Thigh bone (femur)
- Upper arm (humerus)
- Shoulder bone (scapula)
- Ribs

### Axle cell sarcoma

Axle cell sarcomas are fundamentally the same as osteosarcomas however don't create the hard substance called osteoid, which osteosarcomas do. They carry on like osteosarcomas and specialists treat them comparatively. They are typically found in grown-ups more than 40. There are a few sorts of axle cell sarcoma they are:

### Undifferentiated sarcoma of bone

This implies the cells are not particular. They are very undeveloped (youthful) and it isn't conceivable to tell which sort of ordinary bone cells they began from.

### Harmful stringy histiocyoma (MFH)

The greater part of the tumors that used to be called MFH are currently more precisely analyzed as different sorts of sarcoma. The modest number that would at present be called MFH are currently known as undifferentiated high review pleomorphic sarcoma. At the point when this tumor begins in the bone, your specialists may allude to it as shaft cell sarcoma of the bone.

### Fibrosarcoma

This is exceptionally uncommon and regularly found in moderately aged grown-ups. The most well-known site for fibrosarcoma is the thigh bone (femur).

### Leiomyosarcoma of bone

This is to a great degree uncommon and little is thought about this kind of shaft cell sarcoma. Your master will talk you through what they think about having leiomyosarcoma of the bone.

### Chordoma

Chordomas are an extremely uncommon, moderate developing sort of bone disease. Chordomas create from the notochord, which shapes the early spinal tissue in a child creating in the womb. After around a half year, this tissue is supplanted by bone. Be that as it may, now and then little zones of notochord may remain.

### RELATED WORK

Around 2 out of 5 chordomas (35 to 40%) develop in the skull or the bones amidst the face. The rest create in the bones of the spine. Worldwide Childhood Cancer Day is commended yearly on 15 February to bring issues to light and to express help for youngsters and teenagers with malignancy, survivors and their families. Every year, more than 200,000 kids are determined to have malignancy – an ailment that touches innumerable families and groups in all areas of the world. With access to quality care, over 80% of kids with tumor can survive, living full and solid lives. In any case, numerous youngsters in low-pay and center salary nations don't get or finish mind, and, accordingly, more than 90% of youth tumor passing's happen in low asset settings. World Cancer Day, sorted out by the Union for International Cancer Control (UICC) and praised every year on 4 February, is a chance to rally the worldwide group to end the treachery of preventable experiencing tumor. The topic of World Cancer Day 2017 is "We can, I can" and features the requirement for multisectoral cooperation. WHO has given direction on the best way to address the tumor trouble through exhaustive disease control, established on worldwide coordination and solid wellbeing frameworks? The Organization has helped lead engagement of accomplice UN offices and elements, for example, the UN Joint Global Program on Cervical Cancer Prevention and Control. Coordinated effort is basic to create a more grounded reaction against this ailment that unnecessarily kills millions around the globe every year.

#### Experimental methodology

##### K-means algorithm:

Clustering is a procedure of clustering objects into incoherent clusters so the data in a similar cluster are comparative; however data having a place with various clusters vary. A cluster is an accumulation of data question that are like each other are in same cluster and not at all like the objects are in other clusters. The interest for sorting out the sharp expanding data what's more, taking in significant data from data, which makes clustering strategies are generally connected in numerous application territories, for example, manmade brainpower, science, client relationship administration, data pressure, data mining, data recovery, picture preparing, machine learning, promoting, medication, design acknowledgment, brain research, insights et cetera. Group examination is an instrument that is utilized to watch the qualities of group and to concentrate on a specific cluster for promote examination. Clustering is unsupervised learning and don't depend on predefined classes. In clustering we measure the uniqueness between objects by measuring the distance between each pair of objects.

##### K-Means clustering algorithm

1. Consider data set of n objects. Let  $X=x_1, x_2, x_3, \dots, x_n$  be the set of data points and  $V=v_1, v_2, \dots, v_c$  be the set of centres.
2. Consider K fixed centre points. Randomly select cluster centres.
3. Take each point belonging to data set and associate it to the nearest centre till no point is left alone. Then form K groups.
4. Calculate the distance between each data point and cluster centres.
5. Assign the data point to the cluster centre whose distance from the cluster centre is minimum clusters.
6. At this point we need to relocate K new centroids.
7. Recalculate the new cluster centre using
8. Where  $C_i$  represents the number of data points in  $i$ th cluster.
9. After we have K new centroids, a new binding has to be done between the same data set points and the nearest new centres.
10. A loop has been generated, as a result of this loop we may notice that the K centres change their location step by step until no more changes are done.
11. If no data points were reassigned then stop the process otherwise repeat from step 5.

$$T_{ij} = \left( \frac{1}{\sum_{k=1}^c \left( \frac{d_{ik}}{d_{jk}} \right)^{\frac{2}{m-1}}} \right)$$

$$V_j = \left( \frac{\sum_{i=1}^n (T_{ij})^m X_i}{\sum_{i=1}^n (T_{ij})^m} \right)$$

where

$n \rightarrow$  is number of data points

$V \rightarrow$   $j$ th cluster centre

$m \rightarrow$  Fuzziness index

$c \rightarrow$  number of cluster centers

$T \rightarrow$  Membership of  $i$ th data to  $j$ th cluster center

$d \rightarrow$  Euclidean distance between  $i$ th and  $j$ th cluster centre

$$J(V) = \sum_{i=1}^C \sum_{j=1}^C \|X_i - V_j\|^2$$

$$V_i = (1/C_i) \sum_{j=1}^{C_i} X_i$$

Note: In K-Means the number of centres is fixed apriorily.

**Fuzzy C-Means algorithm:**

$$T_{ij} = \left( \frac{1}{\sum_{k=1}^c \left( \frac{d_{ij}}{d_{jk}} \right)^{\frac{2}{m-1}}} \right)$$

where

$$d_{ij} = \|X_i - C_j\|$$

$$d_{ik} = \|X_i - C_k\|$$

Fuzzy C-Means is one of the efficient clustering techniques to avoid the noise in the data. This method is invented by Dunn in 1973 and investigated by Bezdek in 1981. In this algorithm each data point is assigned with membership corresponding to each cluster centre on the basis of distance between the data point and the cluster centre. Formation of clusters can be done by grouping the data points with corresponding cluster centres. Each data point is assigned to each cluster centre on the basis of the factor distance. In this minimum distance is considered to group the data points with cluster centre. Where the distance is minimum between the centre and data point, that data point is grouped with that cluster centre. In this algorithm the data point may be belongs to one or more clusters but differentiation will be done by the percentage of the membership of data point with particular cluster centre. But finally summation of all the membership data points should be equal to one. After each iteration the cluster centres are updated by using the formula:

**FUZZY C-MEANS Clustering algorithm:**

- 1) Consider data set of n objects. Let  $X=x_1,x_2,x_3,..,x_n$  be the set of data points and  $V=v_1,v_2,..,v_c$  be the set of centres.
- 2) Select cluster centre.
- 3) Calculate the fuzzy membership  $T_{ij}$  by using the formula:
- 4) Compute the updated fuzzy centers  $V_j$  using the formula:
- 5) Repeat the step 2 and 3 until achieving the minimum J value and update the  $U(k) , U(k+1)$ . Where U is a fuzzy membership matrix.

Fuzzy C-Means is one of the efficient clustering techniques to perform segmentation on an input image. In this process segmentation is performed by means of various color factors because color posses wavelength values of an image. Similar wavelength values of an image are grouped into different clusters. Here we are using MATLAB 2013a to perform clustering on an image. Now let us observe the results of both K- means and Fuzzy C-Means algorithms:



**CONCLUSION**

In this paper we discussed about data mining clustering techniques and image segmentation. The main goal of this paper is to find out the accurate part of tumor in bone which leads to bone cancer. In this we discussed about image segmentation and K-Means & Fuzzy C-means algorithms to perform the clustering on bone image to find out the tumor. By comparing both the results we can prove that Fuzzy C- Means algorithm giving more accurate results than K-Means algorithm.

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