

# Fuzzy C means based approach for analysis of Varicose Veins

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## Abstract

Large data sets are divided into clusters of smaller sets of the same data using a technique called data clustering. One of the artificial intelligence decision-making techniques with a broad variety of uses is fuzzy logic. It has been established that fuzzy logic works well in practically all systematic disciplines. In the realm of medical imaging, the fuzzy C-means clustering algorithm is a widely used unsupervised method. This research suggests a method for the diagnosis of varicose veins based on a Fuzzy C-means algorithm approach. With this, the programme processes the supplied picture and finds any ailment. It includes applying image processing to automatically categorize and identify varicose veins.

**Keywords:** Fuzzy C Means, X-ray image, Varicose veins.

## I. INTRODUCTION

Areas of interest (ROIs) are produced from 3D image data through the process of medical image segmentation, exactly like they are in MRI or CT scans. The main objective of segmenting this data is to identify the deconstruction points necessary for a particular inquiry, such as mimicking the placement of a genuine package or almost putting CAD-designed implants within a container. While medical image segmentation may be a time-consuming operation, advances in Artificial Intelligence (AI) software tools are making it easier to carry out routine tasks.

When working with CT, MRI, and other types of scans, segmentation frequently uses data from the background image data to construct a mask [1]. Drug users can choose to do their reviews in 2D or 3D, depending on the task. There are many different tools and techniques accessible in segmentation software, such as completely manual options to analyse the data or semi-automated procedures like thresholding and region expansion [2]. Additionally, segmentation operations for cardiovascular images are available, with options tailored to various heart diseases.

For certain instances involving medical data, it might only be required to use a few segmentation techniques. As briefly indicated above, there are a number of methods for locating areas of interest in a bone when studying the location of medical bias, and many of these may be automated using scripts or AI techniques [3-4]. However, for certain systems, especially those that need to deal with uncommon diseases or complex traumas, more time and a wider range of software capabilities may be needed to get the segmentation results that are needed.

The phases in the segmentation process for medical images, nevertheless, may be impeded by uneven illumination, noise interference, habitat factors, and picture blur because it is the step used to identify and separate the region of interest [5-6]. The fuzzy clustering methodology, which is intuitive, easy to use, and has great accuracy, is one of the simplest approaches for picture segmentation. FCM falls short on concession acknowledgement.

To correct these issues, a new technique called FCM clustering is utilised as the better criterion. It is a clustering approach in which information points may be built to on one group shared correlations of each, identifying parallels and linkages within each cluster [7]. The specific position of each knowledge use, which may be in a region of interest surrounding by two or more clusters, is determined using least-squares solutions.

## II. LITERATURE SURVEY

Ru Jia et al. predicted a study in 2021 to achieve clear vein visual picture findings without the need of expert instruments. This method is the most specialised and requires the least amount of practical expertise when compared to other methods [8-9]. They frequently use Wiener estimate to biophysically identify parameters from the spectrum reflection term images  $m_c$  with relation to the distinction in light characteristics between blood and gene tissue [10]. To get historical data, Mc simulation is used. The biological study of blood produces images of vein patterns. Before processing, images are frequently used to decrease the impact of light and body surface on colour. Results from experiments suggest that the proposed approach will perceive the veins accurately and purely. In the treatment of spider veins, it is more than helpful [11].

The use of infrared images for the detection of varicose veins due to the fluctuating temperature in the legs will be established in analytical practice by Brain Remesses et al. in 2019. Finally, a method was developed because it was tailored to the person's leg, contained distinguishing elements in each image, and scaled the FLIR ONE pro to the required temperature level.

In 2019, Ruizong Zhu et al. present a project that uses tube epithelial tissue cells as the analysis object to develop a deep CNN for sick veins in the lower legs. This will increase the accuracy of classification and detection. In order to improve the network's capacity for characteristic extraction, the network site analyses the data layer using the Google-inception Net model as the initial convolutional layer and then extracts several scale features of the image through subsequent convolutional layers. Additionally, the MFM activation perform is employed rather than the ReLU activation perform to create a competition mechanism that may extract options with numerous compact and decreased network layer parameters, improving network feature extraction capability [12].

In 2018, Ali et al. specified that segmentation is a vital step to the fine findings of human tissue layer lesions with thought of up the separations of various clusters of pictures accept like options.

Using enormous starting rules and mathematician weights, Kumar et al. (2017) added the method of eliminating, grouping, and adding to reason fuzzy weights in order to make assessments based on interactive distance [13]. Basic FCM abstraction FCMs methodologies included dimensional data subsumption, weighting changes for each cluster membership, and neighbourhood cluster distribution analysis.

In 2014, Khalid and his colleagues illustrated that FCMs will diagnose some special diseases, like eye disease that is associate ill characterised by extended weight within the eyeball, creating lot damage the cranial nerve, and it's the foremost astounding reason for eye deficiency and irreversible, with early findings and acceptable treatment that it might continue for a protracted time.

In the same year, Norouzi et al. demonstrated that the structure of clustering algorithms is identical to the distribution technique without requiring any informational discipline [14-15]. These methods have an unsupervised learning algorithmic rule and individual authority to calculate similar options in the image and hold some things, such as; keys to recognise different options that have similar attires.

In 2013, Jiang et al utilised the FCM technique, and fuzzy grouping testing was used to extract and rank the transform items.

In the same year Yambal and Gupta showed that segment method is unsupervised classification algorithm and a vital step before image recognition process used as help to another process like detection for magnetic resonance imaging neoplasm, usually real works of clustering are finding anomalies, distinguishing salient features, classifying data, and compressing knowledge, using standard FCMs algorithmic rule rely upon hierarchic self-organising map, the desire of image segmentation method is to effectual segmentation of interference pictures [16-17] .

## III. METHODOLOGY

### A. Fuzzy C Mean Clustering

Many techniques were created over many years to improve medical clustering with demands to obtain an accurate diagnosis, however FCM was the most accurate one in unsupervised learning techniques. Once you've given a supervised process your images or your chosen data, it will remove odd choices and segregate them based on pattern recognition. FCM distributes a single information piece to two or more clusters. The drawback of those methods is that behaviour teams cannot use the same labels. For instance, the cyst (tumour) in the test image will be verified by FCM without being described.

In contrast to other methods, FCM clustering is a very accurate and comprehensive segmentation technology used in programmed medical image processing. It responds as preprocessing, which helps with techniques for classification and detection and is typically used for diagnostic activities. As in fuzzy logic, FCM permits detailed information to be divided into many clusters such that each information point has a portion of the tolerance for belonging to each cluster.

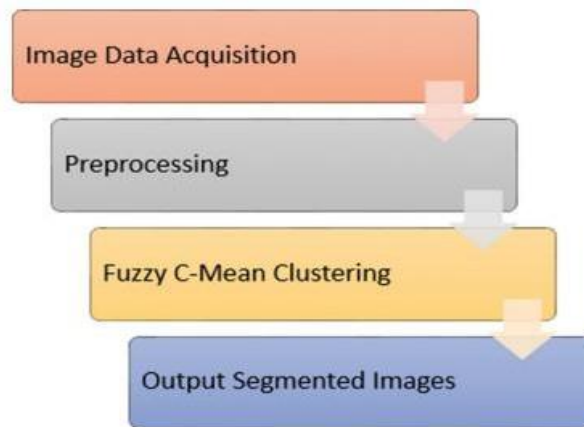


Fig 1. Process of FCM clustering

#### B. Image processing

The MATLAB programme uses the pictures from magnetic resonance imaging to segment the gray-colored histogram, identify the chart's components, convert the image to the Hue Saturation Valued image scale to understand the intensity of the image, and finally display it on an individual basis [18-20].

#### C. Image Acquisition

The acquisition of a vein picture is involved. The vein imaging is finished on schedule inside the different motion videos, so the veins seem darker than the picture of the background. The chosen vein picture is captured in a range of frames, producing a still image for the image processing process [21-23].

#### D. Conversion from RGB to Grayscale image

With this technique, a colour image is turned into a coloured greyscale image. The three hues shown in the illustration are red, green, and blue. The vein picture is well visible on the green channel. Given that the green

colour channel will make veins more brilliant and reduce background noise [24-26].

#### E. Image improvement

The purpose of picture enhancement is to accurately elevate the veins for presentation. The first step is to remove noise interference that was present in the median filter-processed picture. To change the picture's pixel and neighbourhood values, the image is moved along the window. In this approach, the picture has an assembling component, is visible in a dark environment, and is encircled by a lighter environment. The veins are then made smaller to improve the appearance [27].

#### F. Guassain Blur

In the image processing, a Gaussian blur (also refer as Gaussian smoothing) is based on Guassain function includes blurring of image (named after scientist Carl Friedrich Gauss). It is widely utilised in graphics code, generally to scale back noise in the image to decrease details in the image. It is used in computer algorithms to enhance image at different scales- space representation and space implementation.

#### G. Median Filtering

A Gaussian blur, which is also known as Gaussian smoothing in image processing, is based on the Guassain function and blurs the image. It is named after the physicist Carl Friedrich Gauss. It is frequently used in graphics programmes, usually to reduce visual details by reducing noise in the image. It is applied in computer techniques to improve images at many sizes, including space implementation and representation.

#### H. Homomorphic Filtration

Homomorphic filtering is commonly used in image improvement. An image's brightness is adjusted uniformly, while at the same time, the contrast is raised. It is used to remove interference. The components are produced additionally by taking into consideration the log of the picture quality, enabling the frequency domain to be utilised to separate the image's component parts. Illumination effects, which should be viewed as multiplicative noise, might be reduced by using filtering in the log domain.

## IV. RESULTS AND DISCUSSIONS

The degree of identification and accuracy is increased in this study by using the fuzzy C means approach for image processing and extraction. The colour picture of the vein is first captured, and then it is transformed to a grayscale image. The view of the vein picture is improved by this procedure. This makes the picture brighter and decreases the backdrop.



Fig 2. Input Image



Fig 3. Conversion of RGB image into Grayscale image

Gaussian smoothing is used to blur the picture in grayscale. The noise is diminished. The histogram equalisation process adjusts the image's contrast. The filtered pictures are then shown in the figure in order to increase the quality utilising the median filtering and homomorphic filtering processes.

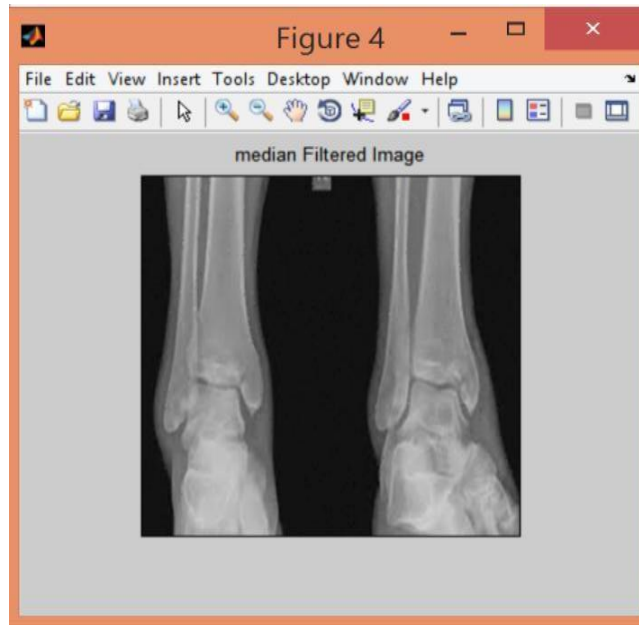


Fig 4. Median Filtered Image

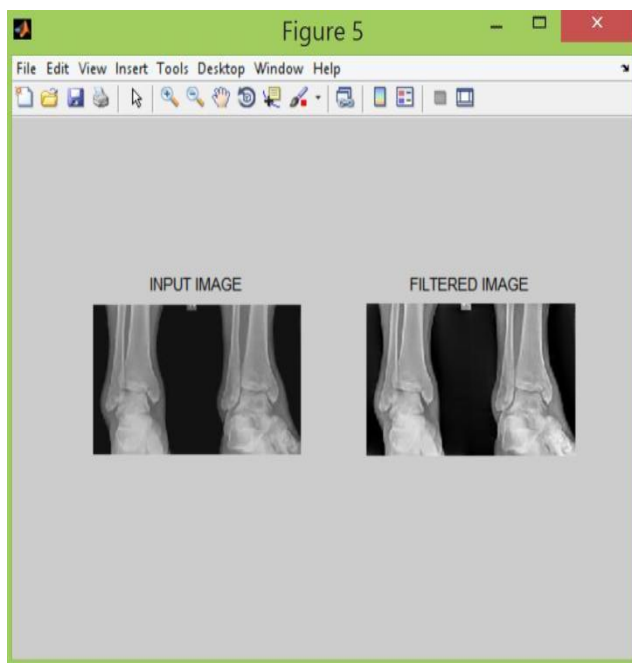


Fig 5. Homomorphic filter Image

This employs fuzzy c-means logic to extract images of the disease-causing varicose veins. In image segmentation, it is significant. Picture processing and segmentation are involved. The original image is divided into several sizes for better analysis and recognition. The peaks that are thought to be recognisable picture elements are identified in the resulting segment from the histogram equalisation. By summing the pixel values from each image in each dimension, a total that is averaged is produced. Varicose veins become apparent as it reaches a certain point, making the sickness easier to spot.

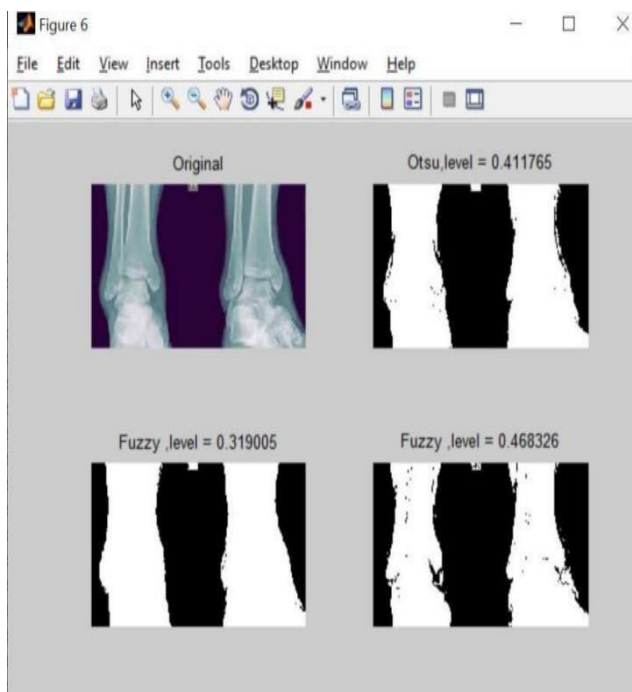


Fig 6. Segmented Image

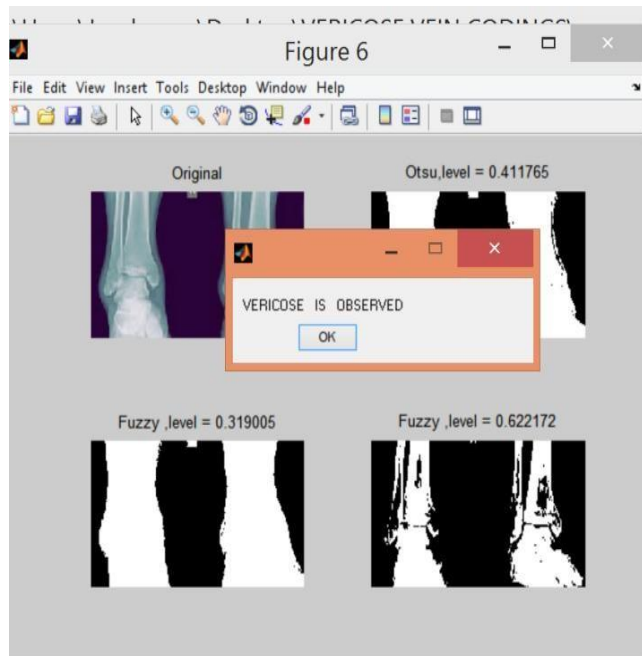


Fig 7 Segmented Image where Varicose Veins is observed

## V. CONCLUSIONS

In the medical area, image processing and segmentation have improved, allowing for early illness diagnosis. In order to increase the degree of identification and accuracy, this study employs the fuzzy C means approach for image processing and extraction. The partitioning approach makes advantage of image segmentation. The peaks that are thought to be recognisable picture elements are identified in the resulting segment from the histogram equalisation. By summing the pixel values from each image in each dimension, a total that is averaged is produced. Varicose veins become apparent as it reaches a certain point, making the sickness easier to spot.

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