CHAPTER 5 - DIGITAL MAMMOGRAPHIC ANALYSIS

5.1 INTRODUCTION

Digital image processing is obtained through descriptive analysis and the predictive analysis for clinical decision making process. While processing the medical applications, the applications are required high level of accuracy and the appropriate result. To increase the efficiency of the mammographic breast cancer level detection, the analysis is carried out the univariate Equivalent algorithm is designed in the previous chapter. The designed algorithm is implemented using Matlab programming and the obtained results are presented along with statistical analysis in this chapter and next chapter. This chapter provides the cluster analysis results of various patients and the obtained results.

5.2 MAMMOGRAPHIC PREPROCESSING

Preprocessing is a technique to prepare the image for the analysis process and will ensure the image analyses the result to be accurate. As mammograms are difficult to interpret, preprocessing is necessary to improve the quality of the image and make the feature extraction phase as an earlier and reliable one. The classification of tumor is surrounded by breast tissue that makes the calcifications preventing accurate detection. A preprocessing usually noise reducing step used to improve image and calcification contrast.

The system is equipped with standard BIRADS (Breast Imaging Reporting and Data System) with NORAS BI 320. Accuracy, speed, and efficiency are essential when it comes to interpreting soft tissue examinations as well as performing biopsies. Siemens syngo® workplaces (e.g. MultiModality WorkPlace) are equipped with a great number of computer-
aided tools such as syngo BreVis for real-time analysis and syngo BreVis Biopsy for interventional procedure planning.

Syngo BreVis is easy-to-use, fast, and reliable. Quick pre-processing and precise motion correction enable efficient breast reading and reporting. This flexible tool provides various functionalities – such as customized layouts and the ability to display and compare MR images with correlating ultrasound or X-ray mammography images. Additionally, the system is equipped with standard BIRADS (Breast Imaging Reporting and Data System) Reporting, Auto-Subtraction and Auto-MIP; elastic image correction in case of patient movement, curve evaluations, color overlay maps and the calculation of lesion volumes.

The Images are fetched and collected using syngo BreVis for the analysis. The collected images are preprocessed and presented in the JPEG file format. The images are collected with ascending red16,Auxctq16 ,BWlnVLog16, BW Parabolic16, correction16,Cyclic16 ,Descending red16, Design16,.Grayscale16 ,Hot body16, Hot metal16, Iso count16, Heart16, Rainbow16 , Red16, Spectrum, Parathyroid16, Warm metal 16 , Mirror +90 , Mirror _90 , +90,-90 , magnify + and Magnify – geometrical process using the same medical imaging tool. After fetching the preprocessed image, the stored digital mammographic images are ensured for further analysis.

5.3 IMAGE CROPPING

The operation cropping is a process which is used to cut the black parts of the image and written labels. It removes the unwanted parts of the image to improve the appearance such as the change of aspect ratio. This operation is done using image editing software such as Adobe Photoshop. It is a pixel based image editor, which is used for editing,
animation and authoring. The original image contains 1012 X688 pixels. After cropping, the size of the image is 260 pixels width and 555 pixels height. Horizontal Resolution is 300 dpi. Vertical Resolution is 555 dpi. Bit depth is 24. The frame count is 1. The color representation is RGB.

The image is swept vertically and horizontally to make all images in same size. To sweep the image vertically cut 2.2x4.7 inches. To sweep the image horizontally cut 4.7x2.2 inches using the software Adobe photoshop. The size of the image is DPI of the output device (i.e) 300 dpi.

\[
\text{Image width} = \frac{\text{width}}{\text{dpi}} = \frac{260}{300} = .87 \text{ inches}
\]

\[
\text{Image height} = \frac{\text{height}}{\text{dpi}} = \frac{555}{300} = .1.85 \text{ inches}
\]

The size of preprocessed image is 260X555 pixels. After cropping the size of the image is .87x1.85 inches as presented below

Fig 1: Amul1 Original image
The processed image is processed further analysis. The image is in the form of pixel, these pixels are converted using Digital number with RGB color scheme expressed below.

5.4 CONVERSION OF IMAGE INTO NUMBERS

True color image is an image in which each pixel is specified by three values one each for the red, blue, and green components of the pixel scalar. M by-n-by-3 array of class uint8, uint16, single, or double whose pixel values specify intensity values. For single or double arrays, values range from [0, 1]. For uint8, values range from [0, 255]. For uint16, values range from [0, 65535]. The process is implemented with Unit8 bit range values of the preprocessed and converted images.

In RGB color model, each color appears in its primary spectral components of red, green, and blue. The colour of a pixel is made up of three components; red, Green, and blue(RGB), described by their corresponding intensities. Color components are also known as color channels or color planes (components). In the RGB color model, a color image can be represented by the intensity function.
I_{RGB} = (F_R, F_G, F_B) \text{Where } F_R(x,y) \text{ is the intensity of the pixel } (x,y) \text{ in the red channel, } F_G(x,y) \text{ is the intensity of pixel } (x,y) \text{ in the green channel, and } F_B(x,y) \text{ is the intensity of pixel } (x,y) \text{ in the blue channel. The intensity of each color channel is usually stored using eight bits, which indicates that the quantization level is 256. In RGB color model, each colour appears in its primary spectral components of red, green, and blue. The color of a pixel is made up of three components; red, green, and blue (RGB), described by their corresponding intensities. The intensity of each color channel is usually stored using eight bits, which indicates that the quantization level is 256. The index value is presented as 0 to 255.}

An image consists of number of pixels. The position of pixel is determined by x y co-ordinate system. The pixels are arranged in rows and columns. Each pixel is associated with digital number. Digital numbers are ranged from zero to some higher number on grayscale. It can be described in numerical terms on a three co-ordinate system with x, y and Z. Where x,y is the co-ordinate position, and Z is the intensity which is giving digital number which is displayed as a grey scale intensity value. In this mammography analyzes the pixel is the combination of RGB [on line 53].

In this process unwanted parts of the image can be removed and taking only breast area,(i.e) making all images in equal size. So that Region of Interest can be processed in the same resolution. If the image is resized then odd number of pixel becomes equal. Region of Interest is the process of selecting a part of an image to perform some operation on it. In my research, I have selected whole breast area as a region of Interest.

The image represented in the multi dimensional layer based digital numbers (DN). The DNs are represented according to the layer such as R.G, B. as per above mentioned functional conversion true image to digital number of Unit 8. This combinational array is
represented according to the layer. These arrays are converted into an equalizing array in two dimensions. The sample pixel Digital Numbers are discussed in the previous chapter.

As per the description of the previous chapter, the common and multiple attribute results are described below.

5.5 COMMON ATTRIBUTE ANALYSIS

Initially, as a sample of four properties are selected and implemented for all the four images of all the patients.

5.5.1 Common Attribute Computed average density values for Amul

The four common attributes are processed and as a sample result for patient Amul is presented below

Table 5: Common Attribute Computed average density values for Amul 1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amul1_min08</td>
<td>img 3</td>
<td>69.76</td>
</tr>
<tr>
<td>2</td>
<td>amul1_mirror</td>
<td>img 4</td>
<td>45.12</td>
</tr>
<tr>
<td>3</td>
<td>amul1_-90</td>
<td>img 4</td>
<td>48.45</td>
</tr>
<tr>
<td>4</td>
<td>amul1_+90</td>
<td>img 4</td>
<td>47.22</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.
Table 6: Occurrence of average density and cancer level from Amul image 1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>1</td>
<td>69.76</td>
<td>69.76</td>
<td>2.49</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>3</td>
<td>140.25</td>
<td>46.75</td>
<td>1.34</td>
</tr>
</tbody>
</table>

Density Index = (FAD /20) - 1

As per the occurrence that high density value 2.49 is identified as a maximum density with the occurrences of 1 for the 3rd cluster. Though the occurrences are high for the 4th cluster with 3 times its average density is 46.75 second maximum. Therefore the cluster 4 is rejected based on the maximum high average density.

Table 7: Common Attribute Computed average density values for Amul2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amul2_min08</td>
<td>img 3</td>
<td>88.82</td>
</tr>
<tr>
<td>2</td>
<td>amul2_mirror</td>
<td>img 3</td>
<td>58.84</td>
</tr>
</tbody>
</table>
As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>amul2_-90</td>
<td>img 3</td>
<td>58.14</td>
</tr>
<tr>
<td>4</td>
<td>amul2_+90</td>
<td>img 3</td>
<td>57.33</td>
</tr>
</tbody>
</table>

Table 8: Occurrence of average density and cancer level from Amul image 2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>4</td>
<td>263.13</td>
<td>65.78</td>
<td>2.29</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 2.29 is identified as a maximum density with the occurrences of 4 for the 3rd cluster.
Table 9: Common Attribute Computed average density values for Amul3

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amul3_min08</td>
<td>img 3</td>
<td>61.1</td>
</tr>
<tr>
<td>2</td>
<td>amul3_mirror</td>
<td>img 3</td>
<td>47.27</td>
</tr>
<tr>
<td>3</td>
<td>amul3_-90</td>
<td>img 3</td>
<td>46.24</td>
</tr>
<tr>
<td>4</td>
<td>amul13+90</td>
<td>img 3</td>
<td>51.48</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

Table 10: Occurrence of average density and cancer level from Amul image 3

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>4.00</td>
<td>206.09</td>
<td>51.52</td>
<td>1.58</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
As per the occurrence that high density value 1.58 is identified as a maximum density with the occurrences of 4 for the 3rd cluster.

Table 11: Common Attribute Computed average density values for Amul4

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amul4_min08</td>
<td>img 3</td>
<td>52.15</td>
</tr>
<tr>
<td>2</td>
<td>amul4_mirror</td>
<td>img 4</td>
<td>42.72</td>
</tr>
<tr>
<td>3</td>
<td>amul4_-90</td>
<td>img 3</td>
<td>43.17</td>
</tr>
<tr>
<td>4</td>
<td>amul4_+90</td>
<td>img 3</td>
<td>42.41</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

Table 12: Occurrence of average density and cancer level from amul image 4

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>3</td>
<td>137.73</td>
<td>45.91</td>
<td>1.30</td>
</tr>
</tbody>
</table>
As per the occurrence that high density value 1.3 is identified as a maximum density with the occurrences of 3 for the 3\textsuperscript{rd} cluster. From the table of four images, the high density values are summarized and the density level of cancer is computed using four common properties of amul.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>img 4</td>
<td>1</td>
<td>42.72</td>
<td>42.72</td>
<td>1.14</td>
</tr>
</tbody>
</table>

As per the average index value is 1.91 of all the processed images the stage of cancer is computed is at the stage of 2 and it is invasive type of cancer.

5.5.2 Common Attribute Computed average density values for Amutha

The four common attributes are processed and as a sample result of patient Amutha is presented below

<table>
<thead>
<tr>
<th>Name of Image</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amul1</td>
<td>2.49</td>
</tr>
<tr>
<td>Amul2</td>
<td>2.29</td>
</tr>
<tr>
<td>Amul3</td>
<td>1.58</td>
</tr>
<tr>
<td>Amul4</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>7.66</td>
</tr>
<tr>
<td>AVG</td>
<td>1.91</td>
</tr>
</tbody>
</table>
Table 13: Common Attribute Computed average density values for Amutha1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amutha1_min08</td>
<td>img 3</td>
<td>75.95</td>
</tr>
<tr>
<td>2</td>
<td>amutha1_mirror</td>
<td>img 3</td>
<td>48.89</td>
</tr>
<tr>
<td>3</td>
<td>amutha1_-90</td>
<td>img 3</td>
<td>49.07</td>
</tr>
<tr>
<td>4</td>
<td>amutha1_+90</td>
<td>img 3</td>
<td>49.1</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

Table 14: Occurrence of average density and cancer level from Amutha image 1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>4</td>
<td>223.01</td>
<td>55.75</td>
<td>1.79</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
As per the occurrence that high density value 1.79 is identified as a maximum density with the occurrences of 4 for the 3rd cluster.

Table 15: Common Attribute Computed average density values for Amutha2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amutha2_min08</td>
<td>img 3</td>
<td>64.42</td>
</tr>
<tr>
<td>2</td>
<td>amutha2_mirror</td>
<td>img 4</td>
<td>43.7</td>
</tr>
<tr>
<td>3</td>
<td>amutha2_-90</td>
<td>img 4</td>
<td>44.45</td>
</tr>
<tr>
<td>4</td>
<td>amutha2_+90</td>
<td>img 4</td>
<td>43.4</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

Table 16: Occurrence of average density and cancer level from Amutha image 2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>1</td>
<td>64.42</td>
<td>64.42</td>
<td>2.22</td>
</tr>
<tr>
<td>Sl No</td>
<td>Clustered Image</td>
<td>No of Occurrence</td>
<td>Total Density</td>
<td>Avg Density</td>
<td>Level of Cancer</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------</td>
<td>------------------</td>
<td>---------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>3</td>
<td>131.55</td>
<td>43.85</td>
<td>1.19</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 2.22 is identified as a maximum density with the occurrences of 1 for the 3\textsuperscript{rd} cluster. Though the occurrences are high for the 4\textsuperscript{th} cluster with 3 times its average density is 43.85 second maximum. Therefore the cluster 4 is rejected based on the maximum high average density.

**Table 17: Common Attribute Computed average density values for Amutha3**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amutha3_min08</td>
<td>img 4</td>
<td>49.51</td>
</tr>
<tr>
<td>2</td>
<td>amutha3_mirror</td>
<td>img 4</td>
<td>52.85</td>
</tr>
<tr>
<td>3</td>
<td>amutha3_-90</td>
<td>img 4</td>
<td>50.55</td>
</tr>
<tr>
<td>4</td>
<td>amutha3_+90</td>
<td>img 4</td>
<td>52.41</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.
Table 18: Occurrence of average density and cancer level from Amutha image 3

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4</td>
<td>205.32</td>
<td>51.33</td>
<td>1.57</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 1.57 is identified as a maximum density with the occurrences of 4 for the 4th cluster.

Table 19: Common Attribute Computed average density values for Amutha4

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amutha4_min08</td>
<td>img 3</td>
<td>38.28</td>
</tr>
<tr>
<td>2</td>
<td>amutha4_mirror</td>
<td>img 3</td>
<td>48.24</td>
</tr>
<tr>
<td>3</td>
<td>amutha4_-90</td>
<td>img 3</td>
<td>48.29</td>
</tr>
<tr>
<td>4</td>
<td>amutha4_+90</td>
<td>img 3</td>
<td>47.65</td>
</tr>
</tbody>
</table>
As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

**Table 20: Occurrence of average density and cancer level from Amutha image 4**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>4</td>
<td>182.46</td>
<td>45.62</td>
<td>1.28</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 1.28 is identified as a maximum density with the occurrences of 4 for the 3rd cluster. From the table of four images, the high density values are summarized and the density level of cancer is computed using four common properties of Amtha.

<table>
<thead>
<tr>
<th>Name of Image</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amutha1</td>
<td>1.79</td>
</tr>
<tr>
<td>Amutha2</td>
<td>2.22</td>
</tr>
<tr>
<td>Amutha3</td>
<td>1.57</td>
</tr>
<tr>
<td>Amutha4</td>
<td>1.28</td>
</tr>
</tbody>
</table>
As per the average index value of all the processed images the cancer is computed at the stage of 2 and it is also of invasive type of cancer.

5.5.3 Common Attributes Computed average density values for Antonyammal (Antony)

The four common attributes are processed and as a sample result of patient Antonyammal is presented below

Table21: Common Attribute computed average density values for Antonyammal image1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>antonyammal1_min08</td>
<td>img 4</td>
<td>39.8</td>
</tr>
<tr>
<td>2</td>
<td>antonyammal1_mirror</td>
<td>img 4</td>
<td>40.55</td>
</tr>
<tr>
<td>3</td>
<td>antonyammal1_-90</td>
<td>img 4</td>
<td>63.43</td>
</tr>
<tr>
<td>4</td>
<td>antonyammal1_+90</td>
<td>img 4</td>
<td>60.62</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.
Table 22: Occurrence of average density and cancer level from Antonyammal image 1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4</td>
<td>204.40</td>
<td>51.10</td>
<td>1.56</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 1.56 is identified as a maximum density with the occurrences of 4 for the 4th cluster.

Table 23: Common Attribute Computed average density values for Antonyammal2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>antonyammal2_min08</td>
<td>img 4</td>
<td>75.37</td>
</tr>
<tr>
<td>2</td>
<td>antonyammal2_mirror</td>
<td>img 4</td>
<td>38.61</td>
</tr>
<tr>
<td>3</td>
<td>antonyammal2_-90</td>
<td>img 4</td>
<td>56.15</td>
</tr>
<tr>
<td>4</td>
<td>antonyammal2_+90</td>
<td>img 4</td>
<td>75.86</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.
Table 24: Occurrence of average density and cancer level from Antonyammal image 2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4</td>
<td>245.99</td>
<td>61.50</td>
<td>2.07</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 2.07 is identified as a maximum density with the occurrences of 4 for the 4th cluster.

Table 25: Common Attribute Computed average density values for Antonyammal3

<table>
<thead>
<tr>
<th>Antonyammal3</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>antonyammal3_min08</td>
<td>img 4</td>
<td>52.9</td>
</tr>
<tr>
<td>2</td>
<td>antonyammal3_mirror</td>
<td>img4</td>
<td>44.5</td>
</tr>
<tr>
<td>3</td>
<td>antonyammal3_-90</td>
<td>img 4</td>
<td>44.75</td>
</tr>
<tr>
<td>4</td>
<td>antonyammal3_+90</td>
<td>img 4</td>
<td>44.39</td>
</tr>
</tbody>
</table>
As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

**Table 26: Occurrence of average density and cancer level from antonyammal image 3**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>4.00</td>
<td>186.54</td>
<td>46.64</td>
<td>1.33</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 1.33 is identified as a maximum density with the occurrences of 4 for the 3\(^{rd}\) cluster.

**Table 27: Common Attribute Computed average density values for Antonyammal 4**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>antonyammal4_min08</td>
<td>img 4</td>
<td>42.35</td>
</tr>
<tr>
<td>2</td>
<td>antonyammal4_mirror</td>
<td>img 4</td>
<td>42.96</td>
</tr>
<tr>
<td>3</td>
<td>antonyammal4_-90</td>
<td>img 4</td>
<td>43.46</td>
</tr>
<tr>
<td>4</td>
<td>antonyammal4_-+90</td>
<td>img 4</td>
<td>43.55</td>
</tr>
</tbody>
</table>
As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

**Table 28: Occurrence of average density and cancer level from antonyammal image 4**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4</td>
<td>172.32</td>
<td>43.08</td>
<td>1.15</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 1.15 is identified as a maximum density with the occurrences of 4 for the 4th cluster. From the table of four images, the high density values are summarized and the density level of cancer is computed using four common properties of Antony.

<table>
<thead>
<tr>
<th>Name of Image</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antonyammal1</td>
<td>1.56</td>
</tr>
<tr>
<td>Antonyammal2</td>
<td>2.07</td>
</tr>
<tr>
<td>Name of Image</td>
<td>Level of Cancer</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Antonyammal3</td>
<td>1.33</td>
</tr>
<tr>
<td>Antonyammal4</td>
<td>1.15</td>
</tr>
<tr>
<td>Total</td>
<td>6.11</td>
</tr>
<tr>
<td>AVG</td>
<td>1.52</td>
</tr>
</tbody>
</table>

As per the average index value of all the processed images the cancer is computed at the stage of 2 and it is also of invasive type of cancer.

5.5.4 Common Attributes Computed average density values for Anjali 1

The four common attributes are processed and as a sample result of patient Anjali is presented below

**Table 29: Common Attributes Computed average density values for Anjali1**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anjali1_min08</td>
<td>img 4</td>
<td>40.64</td>
</tr>
<tr>
<td>2</td>
<td>anjali1_mirror</td>
<td>img 4</td>
<td>61.14</td>
</tr>
<tr>
<td>3</td>
<td>anjali1_-90</td>
<td>img 3</td>
<td>60.89</td>
</tr>
<tr>
<td>4</td>
<td>anjali1_+90</td>
<td>img 3</td>
<td>60.62</td>
</tr>
</tbody>
</table>
As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

Table 30: Occurrence of average density and cancer level from Anjali image 1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>2</td>
<td>121.51</td>
<td>60.76</td>
<td>2.04</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>2</td>
<td>101.78</td>
<td>50.89</td>
<td>1.54</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 2.04 is identified as a maximum density with the occurrences of 2 for the 3rd cluster.

Table 31: Common Attributes Computed average density values for Anjali2

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anjali2_min08</td>
<td>img 4</td>
<td>64.63</td>
</tr>
<tr>
<td>2</td>
<td>anjali2_mirror</td>
<td>img 4</td>
<td>61.29</td>
</tr>
<tr>
<td>3</td>
<td>anjali2_-90</td>
<td>img 4</td>
<td>61.28</td>
</tr>
<tr>
<td>4</td>
<td>anjali2_+90</td>
<td>img 4</td>
<td>61.87</td>
</tr>
</tbody>
</table>
As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

**Table 32: Occurrence of average density and cancer level from Anjali image 2**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4</td>
<td>249.07</td>
<td>62.27</td>
<td>2.11</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 2.11 is identified as a maximum density with the occurrences of 4 for the 4th cluster.

**Table 33: Common Attributes Computed average density values for Anjali3**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anjali3_min08</td>
<td>img 4</td>
<td>74.46</td>
</tr>
<tr>
<td>2</td>
<td>anjali3_mirror</td>
<td>img4</td>
<td>61.13</td>
</tr>
</tbody>
</table>
### Anjali3

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>anjali3_-90</td>
<td>img 4</td>
<td>58.43</td>
</tr>
<tr>
<td>4</td>
<td>anjali3_+90</td>
<td>img 4</td>
<td>57.9</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

### Table 34: Occurrence of average density and cancer level from Anjali image 3

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4</td>
<td>251.92</td>
<td>62.98</td>
<td>2.15</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 2.15 is identified as a maximum density with the occurrences of 4 for the 4th cluster.
Table 35: Common Attributes Computed average density values for Anjali4

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Name of the Image</th>
<th>Clustered Image</th>
<th>Density Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anjali4_min08</td>
<td>img 4</td>
<td>58.89</td>
</tr>
<tr>
<td>2</td>
<td>anjali4_mirror</td>
<td>img 4</td>
<td>59.46</td>
</tr>
<tr>
<td>3</td>
<td>anjali4_-90</td>
<td>img 4</td>
<td>58.97</td>
</tr>
<tr>
<td>4</td>
<td>anjali4_+90</td>
<td>img 4</td>
<td>59.14</td>
</tr>
</tbody>
</table>

As per the table values, the high density values are selected along with the cluster number for further occurrence computation and presented in the next table.

Table 36: Occurrence of average density and cancer level from Anjali image 4

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Clustered Image</th>
<th>No of Occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>4.00</td>
<td>236.46</td>
<td>59.12</td>
<td>1.96</td>
</tr>
</tbody>
</table>

As per the occurrence that high density value 1.96 is identified as a maximum density with the occurrences of 4 for the 4th cluster. From the table of four images, the high density
values are summarized and the density level of cancer is computed using four common properties of Anjali.

<table>
<thead>
<tr>
<th>Name of Image</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anjali1</td>
<td>2.04</td>
</tr>
<tr>
<td>Anjali2</td>
<td>2.11</td>
</tr>
<tr>
<td>Anjali3</td>
<td>2.15</td>
</tr>
<tr>
<td>Anjali4</td>
<td>1.96</td>
</tr>
<tr>
<td>Total</td>
<td>8.26</td>
</tr>
<tr>
<td>AVG</td>
<td>2.06</td>
</tr>
</tbody>
</table>

As per the average index value of all the processed images the cancer is computed at the stage of 2 and it is also of invasive type of cancer.

From the common property analysis of mammographic images, the similar attributes are implemented on the selected ROI and the results are presented with four patients. In all the cases, the common properties are paired or similar to all the four images which are processed on the particular patients. The attribute correlation and the regression analysis are presented in the forth coming chapter.

5.6 MULTIPLE ATTRIBUTE ANALYSIS

The same images are evaluated with different attribute process. Around 18 properties as well as mix of attributes are indentified in addition to this four properties are executed and the result of same patient is listed below.
5.6.1 Multiple Attribute Computed average density values for Amul

The similar process carried out for all the above mentioned geometric properties. For each property, high density value and the corresponding image index is presented.

Table 37: High Density of Amul 1

<table>
<thead>
<tr>
<th>S.No</th>
<th>Geometric Attribute</th>
<th>Clustered image</th>
<th>Density value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amul1 _ascendingred16</td>
<td>3</td>
<td>35.76</td>
</tr>
<tr>
<td>2</td>
<td>Amul1-mag125</td>
<td>4</td>
<td>36.36</td>
</tr>
<tr>
<td>3</td>
<td>Amul1-Acxutq16</td>
<td>1</td>
<td>44.22</td>
</tr>
<tr>
<td>4</td>
<td>Amul1-bwlnvlog16</td>
<td>1</td>
<td>30.98</td>
</tr>
<tr>
<td>5</td>
<td>Amul1-bwparabolic16</td>
<td>4</td>
<td>12.31</td>
</tr>
<tr>
<td>6</td>
<td>Amul1-Correction16</td>
<td>4</td>
<td>28.12</td>
</tr>
<tr>
<td>7</td>
<td>Amul1-cyclic16</td>
<td>4</td>
<td>11.28</td>
</tr>
<tr>
<td>8</td>
<td>Amul1-grays16</td>
<td>1</td>
<td>42.87</td>
</tr>
<tr>
<td>9</td>
<td>Amul1-heart16</td>
<td>2</td>
<td>19.48</td>
</tr>
<tr>
<td>10</td>
<td>Amul1-mini08</td>
<td>3</td>
<td>69.76</td>
</tr>
<tr>
<td>11</td>
<td>Amul1-mirror</td>
<td>4</td>
<td>45.12</td>
</tr>
<tr>
<td>12</td>
<td>Amul1-rainbow16</td>
<td>1</td>
<td>53.02</td>
</tr>
<tr>
<td>13</td>
<td>Amul1-random16</td>
<td>0</td>
<td>32.04</td>
</tr>
<tr>
<td>14</td>
<td>Amul1-red16</td>
<td>4</td>
<td>26.15</td>
</tr>
<tr>
<td>S.No</td>
<td>Geometric Attribute</td>
<td>Clustered image</td>
<td>Density value</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>15</td>
<td>Amul1-region16</td>
<td>4</td>
<td>35.12</td>
</tr>
<tr>
<td>16</td>
<td>Amul1-spectrum16</td>
<td>2</td>
<td>73.83</td>
</tr>
<tr>
<td>17</td>
<td>Amul1- -90</td>
<td>4</td>
<td>48.45</td>
</tr>
<tr>
<td>18</td>
<td>Amul1+90</td>
<td>4</td>
<td>47.22</td>
</tr>
</tbody>
</table>

For the density value the occurrence is generated based on the image index.

The high density identified clustered images are presented below

1. Ascendind Red16  
2. Mag1.25  
3. Acxutq16  
4. bwlnvlog16  
5. bwparabolic16  
6. Correction16  
7. Cyclic16  
8. Grays16
<table>
<thead>
<tr>
<th>S.No</th>
<th>Clustered image</th>
<th>No of occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>32.04</td>
<td>32.04</td>
<td>0.60</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 4 is high occurrence value of 9 modes but the index 3 is low occurrence of 2. As per the calculated average value of affected density 52.76 is high value. Therefore, the high values equivalent index of stage is computed. The level value is computed using following formula

\[
\text{Level of cancer index} = \left( \frac{\text{Average Density}}{20} \right) - 1.
\]

Where, the value 20 is the interval range value of five stage cancer identification value.

As per the computed and presented above table of patient amul1 the first processed image shows that her cancer density level is maximum of 52.76 with the stage index of 1.64. But this has to be confirmed with other images which fetched for the same patient. The densities of the remaining three images are also processed in the similar manner and its final table is presented. The results are analyzed in the next chapter.

For each property, high density value and the corresponding image index is presented.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Clustered image</th>
<th>No of occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>4</td>
<td>171.09</td>
<td>42.77</td>
<td>1.14</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>93.31</td>
<td>46.66</td>
<td>1.33</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>105.52</td>
<td>52.76</td>
<td>1.64</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>9</td>
<td>290.13</td>
<td>32.24</td>
<td>0.61</td>
</tr>
</tbody>
</table>
Table 39: High Density of Amul 2

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amul2-ascending red16</td>
<td>img 3</td>
<td>50.10</td>
</tr>
<tr>
<td>2</td>
<td>Amul2-Acxtq16</td>
<td>img 3</td>
<td>49.72</td>
</tr>
<tr>
<td>3</td>
<td>amul2_bwlnvlog16</td>
<td>img 1</td>
<td>33.64</td>
</tr>
<tr>
<td>4</td>
<td>amul2_bwparabatc16</td>
<td>img 3</td>
<td>11.59</td>
</tr>
<tr>
<td>5</td>
<td>amul2_correction16</td>
<td>img 4</td>
<td>25.97</td>
</tr>
<tr>
<td>6</td>
<td>amul2_cyclic16</td>
<td>img 3</td>
<td>58.22</td>
</tr>
<tr>
<td>7</td>
<td>Amul2-heart16</td>
<td>img 2</td>
<td>25.60</td>
</tr>
<tr>
<td>8</td>
<td>amul2_hotbody16</td>
<td>img 1</td>
<td>44.62</td>
</tr>
<tr>
<td>9</td>
<td>amul2_hotmetal16</td>
<td>img 1</td>
<td>48.97</td>
</tr>
<tr>
<td>10</td>
<td>amul2_isocount16</td>
<td>img 3</td>
<td>41.97</td>
</tr>
<tr>
<td>11</td>
<td>amul2_mag125</td>
<td>img 3</td>
<td>37.30</td>
</tr>
<tr>
<td>12</td>
<td>amul2_min08</td>
<td>img 3</td>
<td>88.83</td>
</tr>
<tr>
<td>13</td>
<td>amul2_mirror</td>
<td>img 3</td>
<td>58.84</td>
</tr>
<tr>
<td>14</td>
<td>amul2_parathyroid</td>
<td>img 2</td>
<td>73.72</td>
</tr>
<tr>
<td>15</td>
<td>amul2_rainbow16</td>
<td>img 2</td>
<td>66.25</td>
</tr>
<tr>
<td>16</td>
<td>amul2_red16</td>
<td>img 4</td>
<td>73.15</td>
</tr>
</tbody>
</table>
### AMUL - 2.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density value</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>amul2_-90</td>
<td>img 3</td>
<td>58.15</td>
</tr>
<tr>
<td>18</td>
<td>amul2_-+90</td>
<td>img 3</td>
<td>57.34</td>
</tr>
</tbody>
</table>

#### Table 40: Occurrence of average density and cancer level from Aamul image 2

<table>
<thead>
<tr>
<th>S.No</th>
<th>Clustered image</th>
<th>No of occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>3</td>
<td>127.23</td>
<td>42.41</td>
<td>1.12</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
<td>165.57</td>
<td>55.19</td>
<td>1.76</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>10</td>
<td>512.05</td>
<td>51.21</td>
<td>1.56</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>2</td>
<td>99.13</td>
<td>49.56</td>
<td>1.48</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 3 is high occurrence value of 10 modes and the index 4 is low occurrence of 2. As per the calculated average value of affected density 55.19 is high value. As per the computed and presented above table of patient amul2, the processed image shows that her cancer density level is maximum of 55.19 with the stage index of 1.76 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.
### Table 41: High Density of Amul 3

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amul3 Ascending Red16</td>
<td>img 3</td>
<td>43.27</td>
</tr>
<tr>
<td>2</td>
<td>amul3 Auxctq16</td>
<td>img 3</td>
<td>42.63</td>
</tr>
<tr>
<td>3</td>
<td>amul3 Grayscale16</td>
<td>img 3</td>
<td>52.35</td>
</tr>
<tr>
<td>4</td>
<td>amul3 Heart16</td>
<td>img 2</td>
<td>21.91</td>
</tr>
<tr>
<td>5</td>
<td>amul3 Hotbody16</td>
<td>img 1</td>
<td>56.18</td>
</tr>
<tr>
<td>6</td>
<td>amul3 Hotmetal16</td>
<td>img 1</td>
<td>38.87</td>
</tr>
<tr>
<td>7</td>
<td>amul3 Mag125</td>
<td>img 3</td>
<td>47.18</td>
</tr>
<tr>
<td>8</td>
<td>amul3 Mini08</td>
<td>img 3</td>
<td>61.10</td>
</tr>
<tr>
<td>9</td>
<td>amul3 Mirror</td>
<td>img 3</td>
<td>47.27</td>
</tr>
<tr>
<td>10</td>
<td>amul3 Parathyroid16</td>
<td>img 2</td>
<td>58.34</td>
</tr>
<tr>
<td>11</td>
<td>amul3 Rainbow16</td>
<td>img 1</td>
<td>57.53</td>
</tr>
<tr>
<td>12</td>
<td>amul3 Region16</td>
<td>img 4</td>
<td>31.77</td>
</tr>
<tr>
<td>13</td>
<td>amul3 Spectrum16</td>
<td>img 3</td>
<td>54.12</td>
</tr>
<tr>
<td>14</td>
<td>amul3 SUV_100_16</td>
<td>img 3</td>
<td>52.78</td>
</tr>
<tr>
<td>15</td>
<td>amul3 Warmmetal16</td>
<td>img 3</td>
<td>36.99</td>
</tr>
<tr>
<td>16</td>
<td>amul3 Xray16</td>
<td>img 1</td>
<td>57.14</td>
</tr>
<tr>
<td>S.No</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density value</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>17</td>
<td>amul3_-90</td>
<td>img 3</td>
<td>46.24</td>
</tr>
<tr>
<td>18</td>
<td>amul3_+90</td>
<td>img 3</td>
<td>51.48</td>
</tr>
</tbody>
</table>

Table 42: Occurrence of average density and cancer level from Amul image 3

<table>
<thead>
<tr>
<th>S.No</th>
<th>Clustered image</th>
<th>No of occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4</td>
<td>209.72</td>
<td>52.43</td>
<td>1.62</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>80.25</td>
<td>40.12</td>
<td>1.01</td>
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<tr>
<td>4</td>
<td>3</td>
<td>13</td>
<td>535.43</td>
<td>41.19</td>
<td>1.06</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>1</td>
<td>31.77</td>
<td>31.77</td>
<td>0.59</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 3 is high occurrence value of 13 modes and the index 4 is low occurrence of 1. As per the calculated average value of affected density 52.43 is high value. As per the computed and presented above table of patient amul3, the processed image shows that her cancer density level is maximum of 52.43 with the stage index of 1.62 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.
Table 43: High Density of Amul 4

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amul4Ascendingred16</td>
<td>img 4</td>
<td>33.26</td>
</tr>
<tr>
<td>2</td>
<td>amul4Auxctq16</td>
<td>img 3</td>
<td>35.83</td>
</tr>
<tr>
<td>3</td>
<td>amul4Bwlnvlog16</td>
<td>img 1</td>
<td>26.29</td>
</tr>
<tr>
<td>4</td>
<td>amul4Bwlog16</td>
<td>img 2</td>
<td>48.44</td>
</tr>
<tr>
<td>5</td>
<td>amul4Correction16</td>
<td>img 4</td>
<td>23.49</td>
</tr>
<tr>
<td>6</td>
<td>amul4Cyclic16</td>
<td>img 4</td>
<td>11.15</td>
</tr>
<tr>
<td>7</td>
<td>amul4Grays16</td>
<td>img 1</td>
<td>62.42</td>
</tr>
<tr>
<td>8</td>
<td>amul4Magni125</td>
<td>img 4</td>
<td>30.52</td>
</tr>
<tr>
<td>9</td>
<td>amul4Min08</td>
<td>img 3</td>
<td>52.15</td>
</tr>
<tr>
<td>10</td>
<td>amul4Mirror</td>
<td>img 4</td>
<td>42.73</td>
</tr>
<tr>
<td>11</td>
<td>amul4Rainbow16</td>
<td>img 2</td>
<td>51.17</td>
</tr>
<tr>
<td>12</td>
<td>amul4Region16</td>
<td>img 4</td>
<td>24.84</td>
</tr>
<tr>
<td>13</td>
<td>amul4Spectrum16</td>
<td>img 2</td>
<td>62.55</td>
</tr>
<tr>
<td>14</td>
<td>amul4Stars16</td>
<td>img 3</td>
<td>53.70</td>
</tr>
<tr>
<td>15</td>
<td>amul4Warmmetal16</td>
<td>img 3</td>
<td>40.20</td>
</tr>
<tr>
<td>16</td>
<td>amul4Xray16</td>
<td>img 1</td>
<td>58.40</td>
</tr>
</tbody>
</table>
### AMUL 4

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density value</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>amul4_-90</td>
<td>img 3</td>
<td>43.18</td>
</tr>
<tr>
<td>18</td>
<td>amul4_+90</td>
<td>img 3</td>
<td>42.41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No</th>
<th>Clustered image</th>
<th>No of occurrence</th>
<th>Total Density</th>
<th>Avg Density</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>3</td>
<td>147.10</td>
<td>49.03</td>
<td>1.45</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
<td>162.16</td>
<td>54.05</td>
<td>1.70</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>6</td>
<td>267.47</td>
<td>44.58</td>
<td>1.23</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>6</td>
<td>165.98</td>
<td>27.66</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Table 44: Occurrence of average density and cancer level from Amul image 4

According to the occurrence, the cluster index of 3 and 4 is high occurrence value of 6 modes and the index 1 and 2 is low occurrence of 3. As per the calculated average value of affected density 54.05 is high value. As per the computed and presented above table of patient amul4, the processed image shows that her cancer density level is maximum of 54.05 with the stage index of 1.70 lies to the cancer stage of 2.

Based on the above table the cancer level is computed finally with the below table
<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AMUL1</td>
<td>1.64</td>
</tr>
<tr>
<td>2</td>
<td>AMUL2</td>
<td>1.76</td>
</tr>
<tr>
<td>3</td>
<td>AMUL3</td>
<td>1.62</td>
</tr>
<tr>
<td>4</td>
<td>AMUL4</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>1.68</td>
</tr>
</tbody>
</table>

As per the table, Amul patient is belong to stage 2 and it is also of invasive type of cancer. The value is ceiling from 168 to 2. The sub level classification is ignored at this level of computing.

5.6.2 Multiple Attribute Computed average density values for Amutha

For each property, high density value and the corresponding image index is presented.

Table 45: High Density of Amutha 1

<table>
<thead>
<tr>
<th>Amutha-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sno</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>Sno</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>18</td>
</tr>
</tbody>
</table>
Table 46: Occurrence of Average density and cancer level from Amutha image 1

<table>
<thead>
<tr>
<th>Sno</th>
<th>Clustered image</th>
<th>No.of occurrence</th>
<th>Tot.density</th>
<th>Avg</th>
<th>Index Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>1</td>
<td>58.59</td>
<td>58.59</td>
<td>1.93</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>5</td>
<td>214.89</td>
<td>42.98</td>
<td>1.15</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>11</td>
<td>524.16</td>
<td>47.65</td>
<td>1.38</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>1</td>
<td>25.01</td>
<td>25.01</td>
<td>0.25</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 3 is high occurrence value of 11 mode and the index 4 and index 0 is low occurrence of 1. As per the calculated average value of affected density 58.59 is high value. As per the computed and presented above table of patient amutha1, the processed image shows that her cancer density level is maximum of 58.59 with the stage index of 1.93 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.

Table 47: High Density of Amutha 2

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Name of the image</th>
<th>Cluster image</th>
<th>High density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amutha2_ascedingred16</td>
<td>img 4</td>
<td>35.88</td>
</tr>
<tr>
<td>2</td>
<td>amutha2_auxctq16</td>
<td>img 2</td>
<td>59.84</td>
</tr>
<tr>
<td>S.NO</td>
<td>Name of the image</td>
<td>Cluster image</td>
<td>High density</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>3</td>
<td>amutha2_bwlnvlog16</td>
<td>img4</td>
<td>18.24</td>
</tr>
<tr>
<td>4</td>
<td>amutha2_correction16</td>
<td>img 4</td>
<td>25.74</td>
</tr>
<tr>
<td>5</td>
<td>amutha2_cyclic16</td>
<td>img 3</td>
<td>14.79</td>
</tr>
<tr>
<td>6</td>
<td>amutha2_grays16</td>
<td>img1</td>
<td>44.59</td>
</tr>
<tr>
<td>7</td>
<td>amutha2_grayscale16</td>
<td>img 4</td>
<td>43.26</td>
</tr>
<tr>
<td>8</td>
<td>amutha2_heart16</td>
<td>img 3</td>
<td>59.29</td>
</tr>
<tr>
<td>9</td>
<td>amutha2_hotbody16</td>
<td>img 1</td>
<td>19.98</td>
</tr>
<tr>
<td>10</td>
<td>amutha2_hotmetal16</td>
<td>img 3</td>
<td>71.09</td>
</tr>
<tr>
<td>11</td>
<td>amutha2_invertgrayscale16</td>
<td>img 1</td>
<td>24.94</td>
</tr>
<tr>
<td>12</td>
<td>amutha2_mag125</td>
<td>img 4</td>
<td>37.37</td>
</tr>
<tr>
<td>13</td>
<td>amutha2_min08</td>
<td>img 3</td>
<td>64.43</td>
</tr>
<tr>
<td>14</td>
<td>amutha2_mirror</td>
<td>img 3</td>
<td>42.76</td>
</tr>
<tr>
<td>15</td>
<td>amutha2_parathyroid16</td>
<td>img 1</td>
<td>56.82</td>
</tr>
<tr>
<td>16</td>
<td>amutha2_rainbow16</td>
<td>img 3</td>
<td>31.24</td>
</tr>
<tr>
<td>17</td>
<td>amutha2_-90</td>
<td>img 4</td>
<td>44.45</td>
</tr>
<tr>
<td>18</td>
<td>amutha2_+90</td>
<td>img 4</td>
<td>43.40</td>
</tr>
</tbody>
</table>
Table 48: Occurrence of Average density and cancer level from Amutha image 2

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Clustered image</th>
<th>No.of occurrence</th>
<th>Tot.density</th>
<th>Avg</th>
<th>Index Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>4</td>
<td>146.34</td>
<td>48.78</td>
<td>1.44</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>1</td>
<td>59.84</td>
<td>59.84</td>
<td>1.99</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>6</td>
<td>283.6</td>
<td>47.27</td>
<td>1.36</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>7</td>
<td>248.34</td>
<td>35.48</td>
<td>0.77</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 4 is high occurrence value of 7 modes and the index 2 is low occurrence of 1. As per the calculated average value of affected density 59.84 is high value. As per the computed and presented above table of patient amutha2 , the processed image shows that her cancer density level is maximum of 59.84 with the stage index of 1.99 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.

Table 49: High Density of Amutha 3

<table>
<thead>
<tr>
<th></th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the image</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.NO</td>
<td>Name of the image</td>
<td>Clustered image</td>
</tr>
<tr>
<td>1</td>
<td>Amutha3-ascending red16</td>
<td>img 4</td>
</tr>
<tr>
<td>2</td>
<td>amutha3_auxctq16</td>
<td>img 1</td>
</tr>
<tr>
<td>S.NO</td>
<td>Name of the image</td>
<td>Clustered image</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>3</td>
<td>amutha3_bwnvlog16</td>
<td>img 4</td>
</tr>
<tr>
<td>4</td>
<td>Amutha3_correction16</td>
<td>img 4</td>
</tr>
<tr>
<td>5</td>
<td>amutha3_cyclic16</td>
<td>img 3</td>
</tr>
<tr>
<td>6</td>
<td>amutha3_grays16</td>
<td>img 3</td>
</tr>
<tr>
<td>7</td>
<td>Amutha3_grayscale16</td>
<td>img 4</td>
</tr>
<tr>
<td>8</td>
<td>amutha3_heart16</td>
<td>img2</td>
</tr>
<tr>
<td>9</td>
<td>amutha3_hotmetal16</td>
<td>img 3</td>
</tr>
<tr>
<td>10</td>
<td>amutha3_mag125</td>
<td>img 4</td>
</tr>
<tr>
<td>11</td>
<td>amutha3_mini08</td>
<td>img 4</td>
</tr>
<tr>
<td>12</td>
<td>amutha3_mirror</td>
<td>img 4</td>
</tr>
<tr>
<td>13</td>
<td>amutha3_parathyroid16</td>
<td>img 2</td>
</tr>
<tr>
<td>14</td>
<td>amutha3_rainbow16</td>
<td>img 3</td>
</tr>
<tr>
<td>15</td>
<td>amutha3_spectrum16</td>
<td>img 2</td>
</tr>
<tr>
<td>16</td>
<td>amutha3_stars16</td>
<td>img 2</td>
</tr>
<tr>
<td>17</td>
<td>amutha3_-90</td>
<td>img 3</td>
</tr>
<tr>
<td>18</td>
<td>amutha3_+90</td>
<td>img 4</td>
</tr>
</tbody>
</table>
Table 50: Occurrence of Average density and cancer level from Amutha image 3

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Clustered image</th>
<th>No of occurrence</th>
<th>Tot.density</th>
<th>Avg</th>
<th>Indexvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>1</td>
<td>57.65</td>
<td>57.65</td>
<td>1.88</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>4</td>
<td>177.82</td>
<td>44.46</td>
<td>1.22</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>5</td>
<td>171.82</td>
<td>34.36</td>
<td>0.72</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>8</td>
<td>348.04</td>
<td>43.51</td>
<td>1.18</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 4 is high occurrence value of 8 modes and the index 1 is low occurrence of 1. As per the calculated average value of affected density 57.65 is high value. As per the computed and presented above table of patient amutha3, the processed image shows that her cancer density level is maximum of 57.65 with the stage index of 1.88 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.

Table 51: High Density of Amutha 4

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>High density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amutha4_ascendingred16</td>
<td>img 3</td>
<td>36.53</td>
</tr>
<tr>
<td>S.NO.</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>High density</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------------------</td>
<td>-----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>2</td>
<td>amutha4_auxctq16</td>
<td>img 1</td>
<td>43.02</td>
</tr>
<tr>
<td>3</td>
<td>amutha4_bwlnvlog16</td>
<td>img 4</td>
<td>16.57</td>
</tr>
<tr>
<td>4</td>
<td>amutha4_correction16</td>
<td>img 4</td>
<td>21.95</td>
</tr>
<tr>
<td>5</td>
<td>amutha4_grays16</td>
<td>img 3</td>
<td>194.79</td>
</tr>
<tr>
<td>6</td>
<td>amutha4_heart16</td>
<td>img 3</td>
<td>78.85</td>
</tr>
<tr>
<td>7</td>
<td>amutha4_invertgrayscale16</td>
<td>img 0</td>
<td>32.93</td>
</tr>
<tr>
<td>8</td>
<td>amutha4_mag125</td>
<td>img 3</td>
<td>39.60</td>
</tr>
<tr>
<td>9</td>
<td>amutha4_microdeltahotmetal16</td>
<td>img 3</td>
<td>13.92</td>
</tr>
<tr>
<td>10</td>
<td>amutha4_mini08</td>
<td>img 3</td>
<td>38.28</td>
</tr>
<tr>
<td>11</td>
<td>amutha4_mirror</td>
<td>img 3</td>
<td>48.24</td>
</tr>
<tr>
<td>12</td>
<td>amutha4_parathyroid16</td>
<td>img 1</td>
<td>50.68</td>
</tr>
<tr>
<td>13</td>
<td>amutha4_rainbow16</td>
<td>img 3</td>
<td>29.75</td>
</tr>
<tr>
<td>14</td>
<td>amutha4_spectrum16</td>
<td>img 2</td>
<td>43.02</td>
</tr>
<tr>
<td>15</td>
<td>amutha4_stars16</td>
<td>img 2</td>
<td>36.66</td>
</tr>
<tr>
<td>16</td>
<td>amutha4_warmmetal16</td>
<td>img 3</td>
<td>51.57</td>
</tr>
<tr>
<td>17</td>
<td>amutha4_-90</td>
<td>img 4</td>
<td>32.59</td>
</tr>
<tr>
<td>18</td>
<td>amutha4_+90</td>
<td>img 3</td>
<td>47.65</td>
</tr>
</tbody>
</table>
Table 52: Occurrence of Average density and cancer level from Amutha image 4

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Clustered image</th>
<th>No.of occurrence</th>
<th>Tot.density</th>
<th>Avg</th>
<th>Index value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>1</td>
<td>32.93</td>
<td>32.93</td>
<td>0.65</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>2</td>
<td>93.71</td>
<td>46.85</td>
<td>1.34</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>2</td>
<td>79.69</td>
<td>43.02</td>
<td>1.15</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>10</td>
<td>579.2</td>
<td>57.92</td>
<td>1.9</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>3</td>
<td>71.11</td>
<td>23.7</td>
<td>0.19</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 3 is high occurrence value of 10 modes and the index 0 is low occurrence of 1. As per the calculated average value of affected density 57.92 is high value. As per the computed and presented above table of patient amutha4, the processed image shows that her cancer density level is maximum of 57.92 with the stage index of 1.9 lies to the cancer stage of 2.

Based on the above table the cancer level is computed finally with the below table

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Name of image</th>
<th>Level of Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amutha1</td>
<td>1.93</td>
</tr>
<tr>
<td>2</td>
<td>Amutha2</td>
<td>1.99</td>
</tr>
<tr>
<td>3</td>
<td>Amutha3</td>
<td>1.88</td>
</tr>
</tbody>
</table>
As per the table, Amutha patient is belonging to stage 2. The value is ceiling from 1.93 to 2. The sub level classification is ignored at this level of computing.

Computed average density values for Antonyammal is presented below:

5.6.3 Multiple Attributes computed average density values for Antonyammal(Antony)

For each property, high density value and the corresponding image index is presented.

Table 53: High Density of Antonyammal 1

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>clustered image</th>
<th>density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antonyammal_ascendingred16</td>
<td>img 4</td>
<td>73.06</td>
</tr>
<tr>
<td>2</td>
<td>Antonyammal 1_auxctq16</td>
<td>img 3</td>
<td>29.43</td>
</tr>
<tr>
<td>3</td>
<td>Antonyammal 1_bwlnvlog16</td>
<td>img 2</td>
<td>35.17</td>
</tr>
<tr>
<td>4</td>
<td>Antonyammal 1_bwparabolic</td>
<td>img 3</td>
<td>7.71</td>
</tr>
<tr>
<td>5</td>
<td>Antonyammal 1_correction16</td>
<td>img 4</td>
<td>30.82</td>
</tr>
<tr>
<td>6</td>
<td>Antonyammal 1_cyclic16</td>
<td>img 2</td>
<td>27.41</td>
</tr>
<tr>
<td>7</td>
<td>Antonyammal 1_grays16</td>
<td>img 2</td>
<td>46.62</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>clustered image</td>
<td>density</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>8</td>
<td>Antonyammal 1_heart16</td>
<td>img 4</td>
<td>18.37</td>
</tr>
<tr>
<td>9</td>
<td>Antonyammal 1_hotbody16</td>
<td>img 2</td>
<td>14.03</td>
</tr>
<tr>
<td>10</td>
<td>Antonyammal 1_mag125</td>
<td>img 4</td>
<td>38.95</td>
</tr>
<tr>
<td>11</td>
<td>Antonyammal 1_min08</td>
<td>img 4</td>
<td>39.80</td>
</tr>
<tr>
<td>12</td>
<td>Antonyammal 1_mirror</td>
<td>img 4</td>
<td>40.55</td>
</tr>
<tr>
<td>13</td>
<td>Antonyammal 1_random16</td>
<td>img 4</td>
<td>21.57</td>
</tr>
<tr>
<td>14</td>
<td>Antonyammal 1_red16</td>
<td>img 4</td>
<td>42.31</td>
</tr>
<tr>
<td>15</td>
<td>Antonyammal 1_region16</td>
<td>img 4</td>
<td>44.93</td>
</tr>
<tr>
<td>16</td>
<td>Antonyammal 1_stars16</td>
<td>img 3</td>
<td>34.38</td>
</tr>
<tr>
<td>17</td>
<td>Antony1_-90</td>
<td>img 4</td>
<td>63.44</td>
</tr>
<tr>
<td>18</td>
<td>Antony1_+90</td>
<td>img 4</td>
<td>60.63</td>
</tr>
</tbody>
</table>

Table 54: Occurrence of Average density and cancer level from Antonyammal image 1

<table>
<thead>
<tr>
<th>SNO</th>
<th>Clustered image</th>
<th>No.of.occurences</th>
<th>Total</th>
<th>Avg</th>
<th>level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>4</td>
<td>123.23</td>
<td>30.81</td>
<td>0.54</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 4 is high occurrence value of 11 modes and the index 3 is low occurrence of 3. As per the calculated average value of affected density 43.13 is high value. As per the computed and presented above table of patient antony1, the processed image shows that her cancer density level is maximum of 43.13 with the stage index of 1.16 lies to the cancer stage of 1.

For each property, high density value and the corresponding image index is presented.

Table 55: High Density of Antonyammal 2

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>antonyammal2Ascendingred16</td>
<td>img 4</td>
<td>50.59</td>
</tr>
<tr>
<td>2</td>
<td>antonyammal2Bwlog16</td>
<td>img 2</td>
<td>28.77</td>
</tr>
<tr>
<td>3</td>
<td>antonyammal2Correction16</td>
<td>img 4</td>
<td>24.43</td>
</tr>
<tr>
<td>4</td>
<td>antonyammal2Grayscale16</td>
<td>img 4</td>
<td>38.79</td>
</tr>
<tr>
<td>5</td>
<td>antonyammal2Heart16</td>
<td>img 3</td>
<td>20.16</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>6</td>
<td>antonyammal2_hotbody16</td>
<td>img 2</td>
<td>9.67</td>
</tr>
<tr>
<td>7</td>
<td>antonyammal2_hotmetal16</td>
<td>img 1</td>
<td>32.60</td>
</tr>
<tr>
<td>8</td>
<td>antonyammal2_mini08</td>
<td>img 4</td>
<td>75.37</td>
</tr>
<tr>
<td>9</td>
<td>antonyammal2_mirror</td>
<td>img 4</td>
<td>38.61</td>
</tr>
<tr>
<td>10</td>
<td>antonyammal2_rainbow16</td>
<td>img 1</td>
<td>35.99</td>
</tr>
<tr>
<td>11</td>
<td>antonyammal2_random16</td>
<td>img 4</td>
<td>21.02</td>
</tr>
<tr>
<td>12</td>
<td>antonyammal2_spectrum16</td>
<td>img 2</td>
<td>45.75</td>
</tr>
<tr>
<td>13</td>
<td>antonyammal2_stars16</td>
<td>img 3</td>
<td>32.09</td>
</tr>
<tr>
<td>14</td>
<td>antonyammal2_SUV_75_16</td>
<td>img 1</td>
<td>15.76</td>
</tr>
<tr>
<td>15</td>
<td>antonyammal2_warmmetal16</td>
<td>img 3</td>
<td>22.83</td>
</tr>
<tr>
<td>16</td>
<td>antonyammal2_xray16</td>
<td>img 2</td>
<td>73.52</td>
</tr>
<tr>
<td>17</td>
<td>antonyammal2_-90</td>
<td>img 4</td>
<td>56.15</td>
</tr>
<tr>
<td>18</td>
<td>antonyammal2_+90</td>
<td>img 4</td>
<td>75.86</td>
</tr>
</tbody>
</table>

Table 56: Occurrence of Average density and cancer level from Antonyammal image 2

<table>
<thead>
<tr>
<th>SNO</th>
<th>Clustered image</th>
<th>No.of.occurrences</th>
<th>Total</th>
<th>Average</th>
<th>Level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 4 is high occurrence value of 8 modes and the index 3 and index 1 is low occurrence of 3. As per the calculated average value of affected density 47.60 is high value. As per the computed and presented above table of patient Antony2, the processed image shows that her cancer density level is maximum of 47.60 with the stage index of 1.38 lies to the cancer stage of 1.

For each property, high density value and the corresponding image index is presented.

**Table 57 : High Density of Antonyammal 3**

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antonyammal 3_ascendingred16</td>
<td>img 4</td>
<td>77.316</td>
</tr>
<tr>
<td>2</td>
<td>Antonyammal 3_auxctq16</td>
<td>img 3</td>
<td>20.6811</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td>3</td>
<td>Antonyammal 3_bwlog16</td>
<td>img 4</td>
<td>33.7614</td>
</tr>
<tr>
<td>4</td>
<td>Antonyammal 3_correction16</td>
<td>img 4</td>
<td>31.3605</td>
</tr>
<tr>
<td>5</td>
<td>Antonyammal 3_cyclic16</td>
<td>img 2</td>
<td>19.4726</td>
</tr>
<tr>
<td>6</td>
<td>Antonyammal 3_grays16</td>
<td>img 2</td>
<td>42.2846</td>
</tr>
<tr>
<td>7</td>
<td>Antonyammal 3_heart16</td>
<td>img 4</td>
<td>24.6413</td>
</tr>
<tr>
<td>8</td>
<td>Antonyammal 3_hotmetal16</td>
<td>img 3</td>
<td>22.5345</td>
</tr>
<tr>
<td>9</td>
<td>Antonyammal 3_mag125</td>
<td>img 4</td>
<td>44.1661</td>
</tr>
<tr>
<td>10</td>
<td>Antonyammal 3_min08</td>
<td>img 4</td>
<td>52.906</td>
</tr>
<tr>
<td>11</td>
<td>Antonyammal 3_mirror</td>
<td>img 4</td>
<td>44.5012</td>
</tr>
<tr>
<td>12</td>
<td>Antonyammal 3_rainbow16</td>
<td>img 2</td>
<td>40.7184</td>
</tr>
<tr>
<td>13</td>
<td>Antonyammal 3_random16</td>
<td>img 4</td>
<td>21.4356</td>
</tr>
<tr>
<td>14</td>
<td>Antonyammal 3_red16</td>
<td>img 4</td>
<td>26.8036</td>
</tr>
<tr>
<td>15</td>
<td>Antonyammal 3_stars16</td>
<td>img 3</td>
<td>25.3596</td>
</tr>
<tr>
<td>16</td>
<td>Antonyammal 3_xray16</td>
<td>img 2</td>
<td>43.3747</td>
</tr>
<tr>
<td>17</td>
<td>Antonyammal 3_-90</td>
<td>img 4</td>
<td>44.3967</td>
</tr>
<tr>
<td>18</td>
<td>Antonyammal 3_+90</td>
<td>img 4</td>
<td>44.7529</td>
</tr>
</tbody>
</table>
Table 58: Occurrence of Average density and cancer level from Antonyammal image 3

<table>
<thead>
<tr>
<th>SNO</th>
<th>Clustered image</th>
<th>Frequency</th>
<th>Total density</th>
<th>Average</th>
<th>Level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>4</td>
<td>145.85</td>
<td>36.46</td>
<td>0.82</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>3</td>
<td>68.58</td>
<td>22.86</td>
<td>0.14</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>11</td>
<td>446.04</td>
<td>40.55</td>
<td>1.03</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 4 is high occurrence value of 11 modes and the index 3 and index1 is low occurrence of 3. As per the calculated average value of affected density 40.55 is high value. As per the computed and presented above table of patient antony3, the processed image shows that her cancer density level is maximum of 40.55 with the stage index of 1.03 lies to the cancer stage of 1.

For each property, high density value and the corresponding image index is presented.

Table 59: High Density of Antonyammal 4

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>High density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>antonyammal 4_ascendingred16</td>
<td>img 4</td>
<td>71.25</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>High density</td>
</tr>
<tr>
<td>-----</td>
<td>------------------</td>
<td>-----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>2</td>
<td>antonyammal 4_auxctq16</td>
<td>img 3</td>
<td>33.90</td>
</tr>
<tr>
<td>3</td>
<td>antonyammal 4_bwlnvlog16</td>
<td>img 2</td>
<td>7.55</td>
</tr>
<tr>
<td>4</td>
<td>antonyammal 4_correction16</td>
<td>img 4</td>
<td>35.60</td>
</tr>
<tr>
<td>5</td>
<td>antonyammal 4_cyclic16</td>
<td>img 3</td>
<td>14.41</td>
</tr>
<tr>
<td>6</td>
<td>antonyammal 4_grayscale16</td>
<td>img 4</td>
<td>43.34</td>
</tr>
<tr>
<td>7</td>
<td>antonyammal 4_heart16</td>
<td>img 2</td>
<td>20.61</td>
</tr>
<tr>
<td>8</td>
<td>antonyammal 4_hotbody16</td>
<td>img 2</td>
<td>6.42</td>
</tr>
<tr>
<td>9</td>
<td>antonyammal 4_hotmetal16</td>
<td>img 3</td>
<td>29.86</td>
</tr>
<tr>
<td>10</td>
<td>antonyammal 4_isocount16</td>
<td>img 4</td>
<td>33.79</td>
</tr>
<tr>
<td>11</td>
<td>antonyammal 4_mag125</td>
<td>img 4</td>
<td>39.35</td>
</tr>
<tr>
<td>12</td>
<td>antonyammal 4_mini08</td>
<td>img 4</td>
<td>42.35</td>
</tr>
<tr>
<td>13</td>
<td>antonyammal 4_mirror</td>
<td>img 4</td>
<td>42.96</td>
</tr>
<tr>
<td>14</td>
<td>antonyammal 4_red16</td>
<td>img 4</td>
<td>37.36</td>
</tr>
<tr>
<td>15</td>
<td>antonyammal 4_xray16</td>
<td>img 3</td>
<td>29.21</td>
</tr>
<tr>
<td>16</td>
<td>antonyammal 4_grays16</td>
<td>img 3</td>
<td>29.79</td>
</tr>
<tr>
<td>17</td>
<td>antonyammal 4_-90</td>
<td>img 4</td>
<td>43.46</td>
</tr>
<tr>
<td>18</td>
<td>antonyammal 4_+90</td>
<td>img 4</td>
<td>43.55</td>
</tr>
</tbody>
</table>
Table 60: Occurrence of Average density and cancer level from Antonyammal image 4

<table>
<thead>
<tr>
<th>S.No</th>
<th>Clustered image</th>
<th>Frequency</th>
<th>Total density</th>
<th>Average</th>
<th>Level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>3</td>
<td>34.59</td>
<td>11.53</td>
<td>0.58</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>5</td>
<td>137.17</td>
<td>27.43</td>
<td>1.37</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>10</td>
<td>433.03</td>
<td>43.30</td>
<td>1.17</td>
</tr>
</tbody>
</table>

According to the occurrence, the cluster index of 4 is high occurrence value of 10 modes and the index 2 and index 1 is low occurrence of 3. As per the calculated average value of affected density 43.30 is high value. As per the computed and presented above table of patient Antony, the processed image shows that her cancer density level is maximum of 43.30 with the stage index of 1.17 lies to the cancer stage of 1. Based on the above table the cancer level is computed finally with the below table

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antonyammal1</td>
<td>1.16</td>
</tr>
<tr>
<td>2</td>
<td>Antonyammal2</td>
<td>1.38</td>
</tr>
<tr>
<td>3</td>
<td>Antonyammal3</td>
<td>1.03</td>
</tr>
<tr>
<td>4</td>
<td>Antonyammal4</td>
<td>1.17</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>1.18</strong></td>
</tr>
</tbody>
</table>
As per the table, Antonyammal patient is belong to stage 1 and is invasive type of cancer. The sub level classification is ignored at this level of computing.

Computed average density values for anjali is presented below:

5.6.4 Multiple Attributes Computed average density values for Anjali 1

For each property, high density value and the corresponding image index is presented.

Table 61 : High Density of Anjali1 1

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjali1_ascending red16</td>
<td>img 4</td>
<td>68.46</td>
</tr>
<tr>
<td>2</td>
<td>Anjali-Auxctq16</td>
<td>img 3</td>
<td>48.31</td>
</tr>
<tr>
<td>3</td>
<td>Anjali1_bwlnvlog16</td>
<td>img 3</td>
<td>25.16</td>
</tr>
<tr>
<td>4</td>
<td>Anjali1_correction16</td>
<td>img 2</td>
<td>33.88</td>
</tr>
<tr>
<td>5</td>
<td>Anjali1_cyclic16</td>
<td>img 3</td>
<td>20.99</td>
</tr>
<tr>
<td>6</td>
<td>Anjali1_grays16</td>
<td>img 1</td>
<td>36.51</td>
</tr>
<tr>
<td>7</td>
<td>Anjali1_grayscale16</td>
<td>img 3</td>
<td>61.47</td>
</tr>
<tr>
<td>8</td>
<td>Anjali1_heart16</td>
<td>img 2</td>
<td>16.19</td>
</tr>
<tr>
<td>9</td>
<td>Anjali1_hotbody16</td>
<td>img 3</td>
<td>13.44</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td>10</td>
<td>Anjali1_invertgrayscale16</td>
<td>img 3</td>
<td>50.60</td>
</tr>
<tr>
<td>11</td>
<td>Anjali1_mag125</td>
<td>img 4</td>
<td>62.50</td>
</tr>
<tr>
<td>12</td>
<td>Anjali1_mini08</td>
<td>img 4</td>
<td>40.64</td>
</tr>
<tr>
<td>13</td>
<td>Anjali1_mirror</td>
<td>img 4</td>
<td>61.14</td>
</tr>
<tr>
<td>14</td>
<td>Anjali1_parathyroid16</td>
<td>img 2</td>
<td>72.63</td>
</tr>
<tr>
<td>15</td>
<td>Anjali1_rainbow16</td>
<td>img 2</td>
<td>54.62</td>
</tr>
<tr>
<td>16</td>
<td>Anjali1_warmmetal16</td>
<td>img 3</td>
<td>45.18</td>
</tr>
<tr>
<td>17</td>
<td>Anjali1_-90</td>
<td>img 3</td>
<td>60.89</td>
</tr>
<tr>
<td>18</td>
<td>Anjali1_+90</td>
<td>img 3</td>
<td>60.62</td>
</tr>
</tbody>
</table>

Table 62: Occurrence of Average density and cancer level from Anjali image 1

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>No.of occurrence</th>
<th>total</th>
<th>Average</th>
<th>level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
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<td>img0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>img1</td>
<td>1</td>
<td>36.51</td>
<td>36.51</td>
<td>0.83</td>
</tr>
<tr>
<td>3</td>
<td>img2</td>
<td>4</td>
<td>177.33</td>
<td>44.33</td>
<td>1.22</td>
</tr>
<tr>
<td>4</td>
<td>img3</td>
<td>9</td>
<td>386.68</td>
<td>42.96</td>
<td>1.15</td>
</tr>
<tr>
<td>5</td>
<td>img4</td>
<td>4</td>
<td>232.75</td>
<td>58.19</td>
<td>1.91</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 3 is high occurrence value of 9 modes and the index 1 and index 1 is low occurrence of 1. As per the calculated average value of affected density 58.19 is high value. As per the computed and presented above table of patient anjali1, the processed image shows that her cancer density level is maximum of 58.19 with the stage index of 1.91 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.

### Table 63: High Density of Anjali 2

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjali2_ascedingred16</td>
<td>img 4</td>
<td>45.62</td>
</tr>
<tr>
<td>2</td>
<td>Anjali2_auxctq16</td>
<td>img 2</td>
<td>21.50</td>
</tr>
<tr>
<td>3</td>
<td>Anjali2_bwlnvlog16</td>
<td>img 1</td>
<td>52.84</td>
</tr>
<tr>
<td>4</td>
<td>Anjali2_bwlog16</td>
<td>img 4</td>
<td>14.05</td>
</tr>
<tr>
<td>5</td>
<td>Anjali2_bwparabolic16</td>
<td>img 1</td>
<td>9.57</td>
</tr>
<tr>
<td>6</td>
<td>Anjali2_cyclic16</td>
<td>img 2</td>
<td>12.49</td>
</tr>
<tr>
<td>7</td>
<td>Anjali2_mag125</td>
<td>img 4</td>
<td>48.01</td>
</tr>
<tr>
<td>8</td>
<td>Anjali2_mini08</td>
<td>img 4</td>
<td>64.64</td>
</tr>
<tr>
<td>9</td>
<td>Anjali2_mirror</td>
<td>img 4</td>
<td>61.30</td>
</tr>
<tr>
<td>10</td>
<td>Anjali2_red16</td>
<td>img 3</td>
<td>20.30</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>11</td>
<td>Anjali2_region16</td>
<td>img 2</td>
<td>74.35</td>
</tr>
<tr>
<td>12</td>
<td>Anjali2_spectrum16</td>
<td>img 3</td>
<td>29.55</td>
</tr>
<tr>
<td>13</td>
<td>Anjali2_stars16</td>
<td>img 2</td>
<td>52.15</td>
</tr>
<tr>
<td>14</td>
<td>Anjali2_SUV_100_16</td>
<td>img 1</td>
<td>48.02</td>
</tr>
<tr>
<td>15</td>
<td>Anjali2_warmmetal16</td>
<td>img 2</td>
<td>32.30</td>
</tr>
<tr>
<td>16</td>
<td>Anjali2_xray16</td>
<td>img 1</td>
<td>21.71</td>
</tr>
<tr>
<td>17</td>
<td>Anjali2_-90</td>
<td>img 4</td>
<td>61.29</td>
</tr>
<tr>
<td>18</td>
<td>Anjali2_+90</td>
<td>img 4</td>
<td>61.87</td>
</tr>
</tbody>
</table>

Table 64: Occurrence of Average density and cancer level from Anjali image 2

<table>
<thead>
<tr>
<th>SNO</th>
<th>clustered image</th>
<th>No.of.occurance</th>
<th>Total density</th>
<th>Average</th>
<th>Level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>4</td>
<td>132.14</td>
<td>33.03</td>
<td>0.65</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>5</td>
<td>192.78</td>
<td>38.56</td>
<td>0.93</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>2</td>
<td>49.85</td>
<td>24.92</td>
<td>0.25</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>7</td>
<td>356.76</td>
<td>50.97</td>
<td>1.55</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 4 is high occurrence value of 7 modes and the index 3 and index 1 is low occurrence of 2. As per the calculated average value of affected density 50.97 is high value. As per the computed and presented above table of patient Antony2, the processed image shows that her cancer density level is maximum of 50.97 with the stage index of 1.55 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.

**Table 65: High Density of Anjali 3**

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjali_3 ascendingred16</td>
<td>img 4</td>
<td>45.98</td>
</tr>
<tr>
<td>2</td>
<td>Anjali3Auxctq16</td>
<td>img 3</td>
<td>35.29</td>
</tr>
<tr>
<td>3</td>
<td>Anjali3_bwlnvlog16</td>
<td>img 2</td>
<td>12.03</td>
</tr>
<tr>
<td>4</td>
<td>Anjali3_bwparabolic16</td>
<td>img 4</td>
<td>9.34</td>
</tr>
<tr>
<td>5</td>
<td>Anjali3_correction16</td>
<td>img 1</td>
<td>37.75</td>
</tr>
<tr>
<td>6</td>
<td>Anjali3_cyclic16</td>
<td>img 2</td>
<td>10.48</td>
</tr>
<tr>
<td>7</td>
<td>Anjali3_grays16</td>
<td>img 2</td>
<td>64.66</td>
</tr>
<tr>
<td>8</td>
<td>Anjali3_grayscale16</td>
<td>img 4</td>
<td>44.94</td>
</tr>
<tr>
<td>9</td>
<td>Anjali3_heart16</td>
<td>img 2</td>
<td>18.59</td>
</tr>
<tr>
<td>10</td>
<td>Anjali3_hotbody16</td>
<td>img 2</td>
<td>15.30</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>11</td>
<td>Anjali3_hotmetal16</td>
<td>img 2</td>
<td>35.57</td>
</tr>
<tr>
<td>12</td>
<td>Anjali3_invertgrayscale16</td>
<td>img 1</td>
<td>11.90</td>
</tr>
<tr>
<td>13</td>
<td>Anjali3_isocount16</td>
<td>img 4</td>
<td>50.94</td>
</tr>
<tr>
<td>14</td>
<td>Anjali3_mag125</td>
<td>img 3</td>
<td>52.07</td>
</tr>
<tr>
<td>15</td>
<td>Anjali3_min08</td>
<td>img 4</td>
<td>74.46</td>
</tr>
<tr>
<td>16</td>
<td>Anjali3_mirror</td>
<td>img 4</td>
<td>61.14</td>
</tr>
<tr>
<td>17</td>
<td>Anjali3_-90</td>
<td>img 4</td>
<td>58.44</td>
</tr>
<tr>
<td>18</td>
<td>Anjali3_+90</td>
<td>img 4</td>
<td>57.91</td>
</tr>
</tbody>
</table>

**Table 66 : Occurrence of Average density and cancer level from Anjali image 3**

<table>
<thead>
<tr>
<th>SNO</th>
<th>Clustered image</th>
<th>No.of occurences</th>
<th>total</th>
<th>Average</th>
<th>level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>2</td>
<td>49.65</td>
<td>24.82</td>
<td>0.24</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>6</td>
<td>156.65</td>
<td>26.11</td>
<td>0.31</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>2</td>
<td>87.36</td>
<td>43.68</td>
<td>1.18</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>8</td>
<td>403.14</td>
<td>50.39</td>
<td>1.52</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 4 is high occurrence value of 8 modes and the index 1 and index 3 is low occurrence of 2. As per the calculated average value of affected density 50.39 is high value. As per the computed and presented above table of patient Antony3, the processed image shows that her cancer density level is maximum of 50.39 with the stage index of 1.52 lies to the cancer stage of 2.

For each property, high density value and the corresponding image index is presented.

Table 67: High Density of Anjali 4

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>Clustered image</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjali4_isocount16</td>
<td>img 4</td>
<td>59.28</td>
</tr>
<tr>
<td>2</td>
<td>Anjali4_mag125</td>
<td>img 4</td>
<td>46.37</td>
</tr>
<tr>
<td>3</td>
<td>Anjali4_microdeltahotmetal16</td>
<td>img 3</td>
<td>11.11</td>
</tr>
<tr>
<td>4</td>
<td>Anjali4_min08</td>
<td>img 4</td>
<td>58.90</td>
</tr>
<tr>
<td>5</td>
<td>Anjali4_mirror</td>
<td>img 4</td>
<td>59.46</td>
</tr>
<tr>
<td>6</td>
<td>Anjali4_parathyroid16</td>
<td>img 2</td>
<td>28.66</td>
</tr>
<tr>
<td>7</td>
<td>Anjali4_PET_rainbow16</td>
<td>img 2</td>
<td>42.15</td>
</tr>
<tr>
<td>8</td>
<td>Anjali4_rainbow16</td>
<td>img 1</td>
<td>20.92</td>
</tr>
<tr>
<td>9</td>
<td>Anjali4_random16</td>
<td>img 4</td>
<td>14.34</td>
</tr>
<tr>
<td>10</td>
<td>Anjali4_red16</td>
<td>img 3</td>
<td>27.03</td>
</tr>
<tr>
<td>SNO</td>
<td>Name of the image</td>
<td>Clustered image</td>
<td>Density</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>11</td>
<td>Anjali4_spectrum10step16</td>
<td>img 3</td>
<td>26.80</td>
</tr>
<tr>
<td>12</td>
<td>Anjali4_spectrum16</td>
<td>img 3</td>
<td>29.25</td>
</tr>
<tr>
<td>13</td>
<td>Anjali4_stars16</td>
<td>img 3</td>
<td>30.68</td>
</tr>
<tr>
<td>14</td>
<td>Anjali4_SUV_75_16</td>
<td>img 2</td>
<td>43.16</td>
</tr>
<tr>
<td>15</td>
<td>Anjali4_SUV_100_16</td>
<td>img 2</td>
<td>14.94</td>
</tr>
<tr>
<td>16</td>
<td>Anjali4_warmmetal16</td>
<td>img 2</td>
<td>41.52</td>
</tr>
<tr>
<td>17</td>
<td>Anjali4_-90</td>
<td>img 4</td>
<td>58.98</td>
</tr>
<tr>
<td>18</td>
<td>Anjali4_+90</td>
<td>img 4</td>
<td>59.15</td>
</tr>
</tbody>
</table>

Table 68 : Occurrence of Average density and cancer level from Anjali image 4

<table>
<thead>
<tr>
<th>SNO</th>
<th>Clustered image</th>
<th>No of occurrences</th>
<th>Total</th>
<th>Avg</th>
<th>level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>img 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>img 1</td>
<td>1</td>
<td>20.92</td>
<td>20.92</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>img 2</td>
<td>5</td>
<td>170.42</td>
<td>34.08</td>
<td>0.70</td>
</tr>
<tr>
<td>4</td>
<td>img 3</td>
<td>5</td>
<td>124.87</td>
<td>24.97</td>
<td>0.25</td>
</tr>
<tr>
<td>5</td>
<td>img 4</td>
<td>7</td>
<td>356.48</td>
<td>50.93</td>
<td>1.55</td>
</tr>
</tbody>
</table>
According to the occurrence, the cluster index of 4 is high occurrence value of 7 modes and the index 1 and index 1 is low occurrence of 1. As per the calculated average value of affected density 50.93 is high value. As per the computed and presented above table of patient anjali 4, the processed image shows that her cancer density level is maximum of 50.93 with the stage index of 1.55 lies to the cancer stage of 2.

Based on the above table the cancer level is computed finally with the below table

<table>
<thead>
<tr>
<th>SNO</th>
<th>Name of the image</th>
<th>level of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjali 1</td>
<td>1.91</td>
</tr>
<tr>
<td>2</td>
<td>Anjali 2</td>
<td>1.55</td>
</tr>
<tr>
<td>3</td>
<td>Anjali 3</td>
<td>1.52</td>
</tr>
<tr>
<td>4</td>
<td>Anjali 4</td>
<td>1.55</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>1.63</td>
</tr>
</tbody>
</table>

As per the table, Anjali patient is belong to stage 2 and it is invasive type of cancer. The value is ceiling from 1.63 to 2. The sub level classification is ignored at this level of computing.

5.7 DISCUSSION ON COMMON AND MULTIPLE ATTRIBUTE RESULTS

This research work analyzed determination of cancer stage using mammographic analysis. The analysis is made around four patients with four images. The images are processed according geomantic preprocessing from that four attributes selected for the
common attributes and 16 attributes selected for the multiple attributes. The four attributes are clustered into 5 clusters each for four images. The individual patient’s image is processed 4x 4 x 5 = 80 for the common attributes. There are 16 multiple attributes are selected and it’s also processed as similar to the common attributes. 16 x 4 x 5 = 320 image analysis. In each cluster there are five stages are analyzed there for the analysis result obtained from 400 x 4 = 1600 data set for the individual patients. The obtained density values are presented as a table.

<table>
<thead>
<tr>
<th>Patients Name</th>
<th>Common Attributes (CA)</th>
<th>Multiple Attributes(MA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SI1</td>
<td>SI2</td>
</tr>
<tr>
<td>Amul</td>
<td>69.76</td>
<td>65.78</td>
</tr>
<tr>
<td>Amtha</td>
<td>55.75</td>
<td>64.42</td>
</tr>
<tr>
<td>Antony</td>
<td>51.10</td>
<td>61.5</td>
</tr>
<tr>
<td>Anjali</td>
<td>60.76</td>
<td>62.27</td>
</tr>
</tbody>
</table>

From the obtained density ratio of the affected pixels the stage are determined and summarized in the table below.

<table>
<thead>
<tr>
<th>Patients Name</th>
<th>Common Attributes (CA)</th>
<th>Multiple Attributes(MA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SI1</td>
<td>SI2</td>
</tr>
<tr>
<td>Amul</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Amtha</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Antony</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Anjali</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
According to the observation there is difference in the computed results of the common attribute stages are differ but the multiple attribute stages are same. The support is computed as below

<table>
<thead>
<tr>
<th>Patients Name</th>
<th>Common Attributes (CA)</th>
<th>Multiple Attributes(MA)</th>
<th>CA</th>
<th>MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amul</td>
<td>2 2 2 1</td>
<td>2 2 2 2</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Amtha</td>
<td>2 2 2 1</td>
<td>2 2 2 2</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Antony</td>
<td>2 2 1 1</td>
<td>1 1 1 1</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Anjali</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

As presented in the session 2.4 the support if calculated depends on the number of level the expected results are obtained similar. Out of four results three are same with reference to the medical experts for the common attributes therefore it is 75% the multiple attributes has full results.

As per the confirmation of the medical expert, it is confirmed that the result obtained from Amul, Amutha and Anjali and Antonyammal was correct. Amul, Amutha and Anjali all are having the stage of 2. The Antonyammal is having the Stage of 1.

As per the result, the common attributes has the support of 75 % but the multiple attributes has 100 % to obtain the stages results in accuracy.
5.8 SUMMARY

This chapter produced the selection of common and multiple attributes to cluster the given patients mammographic to determine the density ratio of the affected pixels with the stage. The research process results are obtained in the analysis of 6400 data set analysis. Each common attribute stage is processed from the 80 data set analysis and the multiple attribute results are 320 data set analysis process. The common attributes are not same because the images are fetched from different direction and the properties are considered. The obtained results of the determination of stage using univariate classification are discussed in the next chapter.