

# A Study of Different Features and Classification of Histopathological Image

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## ABSTRACT

Breast cancer is the second largest cause of cancer deaths among women. However, detecting this cancer in its first stages helps in saving lives because it is easier to treat and prevent the tumor from expanded. It has two states, known as benign and malignant. The research focuses on identifying malignancy in histopathological images of breast. In this process, it includes three phases viz: i) Image processing ii) Feature Extraction iii) classification. The proposed work gives complete and automated detection of malignancy using both image processing techniques and classification methods.

**Keywords:** Breast Cancer, histopathological images, Image Processing, image features, classification techniques

## I. INTRODUCTION

Breast Cancer (BC) is one of the most common type of cancer among female population in the whole world. Death rate for BC is higher than other types of cancer. Diagnosis of Breast Cancer (BC) depends on the visual aspects of tissue or cells removed from a patient and then step by step evaluation are specimen preparation, selection of tumour cell nuclei, image pre-processing, feature extraction according to size, shape, texture and so on [1].

Proper diagnosis can help a patient to get rid of BC risk if the state of cancer type is benign (localized and non - invading) or malignant (invading and life threatening). For diagnosis, different methods like mammograms, CT scan, histopathological image analysis (biopsy image) are commonly used. If there is a positive result of mammograms about BC, then diagnosis with histopathological imaging can be done. A histology image analysis system generally has a combination of hardware and software and it can be divided into two consecutive subsystem tissue preparation and image production and then Image processing analysis. To reduce the death rate among

women two things are very important that is education about BC and proper screening that means diagnosis [3].

Human body is made by number of cells and each cell have its own function when the cell is loss it's ability and growth then we can clearly say that Something is happen in cell of human body. The extra cell from a mass of tissue is call tumor or storm [7]. Detection of BC in different medical images takes a lot of time because it directly deals with human life. We can improve the methodology and techniques that can be use for finding the Breast Cancer. Reducing the false negative rate we can improve the different techniques and methods for detection of Breast Cancer. we can create the good software for checking the part of the human life.

The different method use for detection of breast tumor we can always try to give the high accuracy and false negative rate must be low. And it is not easy to obtain this kind of results. So the main concept is to minimize the human error as much as possible check by doctor. Since currently there are

no widely accepted methods, therefore automatic and reliable methods for tumor detection are of great need and interest.

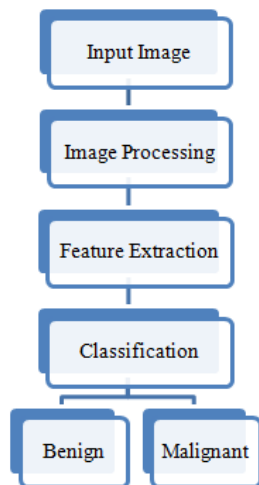


Figure 1. Tumor classification system

1. Image preprocessing - in these process it enhance the picture quality and removes the unwanted noise and background information.
2. Feature Extraction - After Image preprocessing, positive region will be extraction using the different feature.
3. Classification - After identifying the cancerous nodule classifies the tumor types.

### HISTOPATHOLOGICAL IMAGE

Histopathology refers to the examination of tissue in order to study the manifestations of disease. The name Histopathology is derived from the Greek word for tissue = Histos, disease = Pathos and Logos = the study of Histopathology generally involves samples of tissue, in contrast to cytopathology, which studies samples of free cells or tissue fragments. Histopathology can also often yield a more comprehensive view of the disease since the underlying tissue architecture is preserved. histopathological evaluation of tissue samples is critical to many applications, e.g., discovery of biomarkers, treatment planning in a clinical practice, or cancer research. Characterization and quantification of biomarkers within the tissue plays a major role in that evaluation [18].

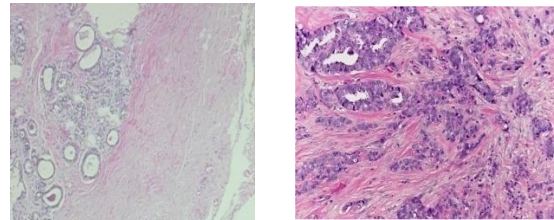


Figure 2. Histopathological Image

## II. TYPES OF TUMOR

### A. BENIGN TUMOR

A **benign tumor** (benign neoplasm) cannot metastasize - it cannot spread. "Benign" means it is non-progressive, it remains as it is. Most benign tumors are not harmful to human health. Even though they are not cancerous, some may press against nerves or blood vessels and cause pain or other negative effects. Benign tumors of endocrine tissues may result in the excessive production of some hormones. Tumors that aren't cancerous are called non-cancerous tumors. Non-cancerous tumors:

- ✓ stay in one place and don't spread to other parts of the body
- ✓ don't usually come back after they are removed
- ✓ Tend to have a regular and smooth shape and have a covering called a capsule.

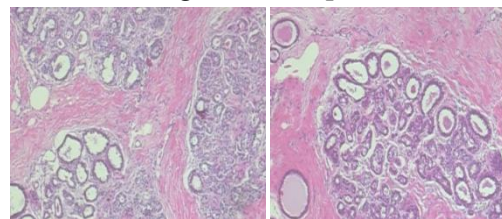


Figure 3. Benign tumor [9]

### B. MALIGNANT TUMOR

**Malignant tumors** are **cancerous** tumor, they tend to become progressively worse, and can potentially result in death. Unlike benign tumors, malignant ones grow fast, they are ambitious, they seek out new territory, and they spread (metastasize) The abnormal cells that form a malignant tumor multiply at a faster rate. Experts say that there is no clear dividing line between cancerous, precancerous and non-cancerous tumors - sometimes determining which is which may be arbitrary, especially if the

tumor is in the middle of the spectrum. Some benign tumors eventually become premalignant, and then malignant. Cancer can start in any part of the body. When cancer cells form a lump or growth, it is called a cancerous tumor. A tumor is cancerous when it:

- ✓ grows into nearby tissues
- ✓ has cells that can break away and travel through the blood or lymphatic system and spread to lymph nodes and distant parts of the body

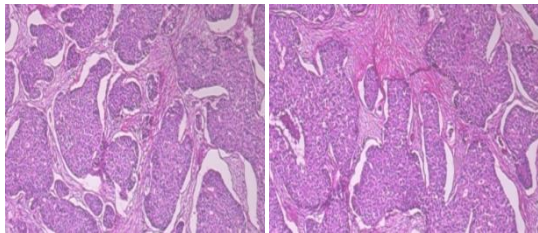


Figure 4. Malignant tumor [9]

Table 1. Difference between benign and malignant tumor

Benign Tumor	Malignant Tumor
Non cancerous	Cancerous
Slow growth	Fast growth
Non invasive	Invasive
Spherical or ovoid shape	Irregular shape

### III. IMAGE FEATURES

Image feature is the one pieces of information. In the image feature extraction is the process of transfer arbitrary data like image to the relevant numeric data. This numeric data used in the classification process. Following table describes different shape features.

Table 2. Features description

No.	Feature	Description
1	Center	The x- coordinates of the point farthest away from any identified nucleus edge.
2	Mass Displacement	The distance between the centers of gravity of the nucleus in the image. The mass displacement is calculated by taking a weighted average of the pixels in both X and Y.
3	Mean Intensity Edge	Mean of edge pixel intensity values of the nucleus.
4	Mean Intensity	Mean of pixel intensity values within the nucleus.
5	Min Intensity	Minimum of pixel intensity values within the nucleus.
6	Standard Intensity	The standard deviation of the edge pixel intensities of a nucleus.
7	Area	The size of a surface. The amount of space inside the boundary of a nucleus.

8	Radius	The distance from the center to the circumference of a nucleus.
9	Major axis length	The longest diameter of a nucleus.
10	Minor axis length	The shortest diameter of a nucleus.
11	Perimeter	The distance around a two-dimensional shape.

## I. CLASSIFICATION TECHNIQUES

Classification defined as the task categorizes the any of given objects within a given category called class. Following table describes classification techniques with its advantages and disadvantages, which taken from survey.

**Table 3.** Image classification method with advantages and disadvantages

No.	Technique	Advantages	Disadvantages
1	Support vector machine[1,3]	Maximize the margin between two classes in the feature space <ul style="list-style-type: none"> <li>characterized by a kernel function</li> </ul>	Difficult to incorporate background knowledge. <ul style="list-style-type: none"> <li>Sensitive to outlier.</li> </ul>
2	Neural network[1,8,9,14]	<ul style="list-style-type: none"> <li>Easy to conceptualize.</li> <li>Provide high speed of calculation.</li> </ul> Can solve any machine learning algorithm.	Neural networks are too much of black box this makes them difficult to train. <ul style="list-style-type: none"> <li>Not probabilistic.</li> </ul>
3	Fuzzy logic[1,16]	<ul style="list-style-type: none"> <li>Allows for modeling and inclusion of contradiction in a knowledge base</li> </ul>	In a high complex system, use of fuzzy logic may become an obstacle to verification of system reliability.
4	Random forest[13,16]	<ul style="list-style-type: none"> <li>One of the most accurate learning algorithms available for most data set fairly efficiently on large data sets</li> </ul>	Random forest has been observed to over fit for some datasets with noisy classification task. Large number of trees may make the algorithm slow for real time prediction

5	Bayesian Network[16]	Bayesian methods have support of probability theory Have well defined semantics for decision making	They require significant amount of probability data to construct a knowledge base.
6	Decision tree[16]	<ul style="list-style-type: none"> <li>• Easy to understand.</li> <li>• Easy to generate rules.</li> </ul>	<ul style="list-style-type: none"> <li>• May suffer from over fitting.</li> <li>• Classifies by rectangular partitioning</li> </ul>

#### IV. CONCLUSION AND FUTURE WORK

Early detection of breast cancer is very important. This paper provides various Image Features and various classification techniques with advantages and disadvantages would give satisfactory results and help patient and pathologist for proper diagnosis of breast cancer and ultimately save a lot of lives.

Furthermore, we intended do survey of optimization algorithms and select suitable one and will be implementing through appropriate software. To increase accuracy of implemented algorithm, it will be optimize with suitable optimization technique.

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