**Literature Review:**

**Etta D. Pisano et al. (2008)** carried out a study on “Image Processing Algorithms for Digital Mammography: A Pictorial Essay”. The study suggests, Digital mammography systems allow manipulation of fine differences in image contrast by means of image processing algorithms. Different display algorithms have advantages and disadvantages for the specific tasks required in breast imaging—diagnosis and screening.

**Per Skaane and Arunlf Skjennald (2006)** carried out a study on “Screen-Film Mammography versus Full-Field Digital Mammography with Soft-Copy Reading: Randomized Trial in a Population-based Screening Program—The Oslo II Study1”. The study suggests, Mammography is the primary tool for the early detection of breast cancer. The depiction of fine micro-calcifications and subtle soft-tissue masses on mammograms is key to the detection of early breast cancer.

**Sheshadri Holalu Seenappa and Arumugam Kandaswamy (2006)** studied on “Breast Tissue classification Using Statistical Feature Extraction of Mammogram”. In this paper authors have made an attempt to classify the breast tissue based on the intensity level of histogram of a mammogram, Statistical features of a mammogram are extracted using simple image processing techniques. The proposed scheme uses texture models to capture the mammographic appearance within the breast. The statistical features extracted are the mean, standard deviation, smoothness, third moment, uniformity and entropy which signify the important texture features of breast tissue. Based on the values of these features of a digital mammogram, the authors have made an attempt to classify the breast tissue in to four basic categories like fatty, uncompressed fatty, dense and high density.

**Silva W. R. and D. Menotti (2008)** studied on “Classification of Mammograms by the Breast Composition”. In this study they state that Breast cancer produces a high rate of mortality worldwide. Early diagnosis is essential for treatment, however it is difficult to analyse high density breast tissues. Computer aided diagnosis systems have been proposed to classify the density of mammograms, having as a major challenge to define the features that better represent the images to be classified.

under three categories of normal, lesion benign, and malignant. The proposed technique consists of six subsequent stages; namely, pre-processing, seeded region growing segmentation, connected component labelling (CCL), feature extraction, feature Dimension Reduction, and classification.

**Chris A. Cocosco et al.,(2003)** on their study on “A fully automatic and robust brain MRI tissue classification method” (ISSN:513-527) states that A novel, fully automatic, adaptive, robust procedure for brain tissue classification from 3D magnetic resonance head images (MRI) is described in this paper. The classification procedure is robust against variability in the image quality through a non-parametric implementation: no assumptions are made about the tissue intensity distributions.

**Mehdi Jafari et al., (2013)** worked on research paper titled “ A Neural network-based approach for Brain Tissues classification using GA”(ISSN: 2322-2441). Their study presents a hybrid approach for classification of brain tissues, such as white matter (WM), gray matter (GM), cerebral spinal fluid (CSF), background (BKG) and tumour tissues, in MRI based on Artificial neural Networks and Genetic Algorith (GA). In the proposed technique after seeded region growing segmentation and connected component labelling, two texture and intensity feature sets are taken as input. First set consists statistical features such as: Entropy, Kurtosis, Skewness, Mean, Energy, Momentum, correlation and second feature sets, are derived from wavelet transformation.

**Mostafa Langarizadeh and Rozi Mahmud (2012)** worked on “Breast Density classification using histogram-based features”. The paper states the risk of having cancer in dense breast on mammogram is higher compared to those who have less. This is due to presence of glandular cells in the breast parenchyma. Therefore, it is important for radiologists to pay more attention to denser breasts in order to detect abnormalities. The suggested method works based on the statistical parameters including kurtosis, skewness, median and mean. The system evaluated 180 mammogram images and it was found to be 92.8% accurate with a strong correlation between the system and radiologists’ estimation (K=0.87, p=0.0001).

**Telmo Amarala et al., (2008)** studied on “Classification of breast tissue-microarray spots using texton histograms”. The study states that Breast-tissue microarrays facilitate the survey of very large numbers of tumours but their scoring by pathologists is time consuming, typically highly quantised and not without error. This paper proposes a computationally efficient approach that approximates the density of colour and local invariant features by clusters in the feature space, and characterises each spot by a frequency histogram of nearest cluster centres. Spots are classified into four main types based on their histograms.
Devenderan Pillai Perumal (2009) worked on research title “CLASSIFICATION OF BREAST CANCER TUMOR BASED ON ULTRASOUND IMAGES”. This research primarily focuses on the predictive technology of identifying the state of tumors in the breast tissues. In breast cancer diagnosis, patients are forced to undergo a series of biopsies just to identify and confirm on the state of tumour, as whether malignant or benign. In this research however, an algorithm will be developed using MATLAB Image Processing Toolbox to indentify the state of a tumor solely based on ultrasound images. Ultrasound images of breast tumors are imported into MATLAB and are passed through a set of filters to remove background noise. Next, the filtered images are run through a set of edge detection algorithms which identifies and defines the region of interest. The results are compared with the actual biopsy results from the IIUM Breast Cancer Research Institute, Kuantan and all the analyzed results matched the biopsy results.

Maitra Indra Kanta et al.(2011) worked on “Identification of abnormal masses in Digital Mammography images”. The study shows that Mammography is at present one of the available method for early detection of masses or abnormalities which is related to breast cancer. The most common abnormalities that may indicate breast cancer are masses and calcifications. Breast cancer is diagnosed at advanced stages with the help of the digital mammogram image. In this paper, a method has been developed to make a supporting tool.

Chris A. Cocosco et al., (2003) studied on “A Fully Automatic and Robust Brain MRI Tissue Classification Method”. Their study is based on a novel, fully automatic, adaptive, robust procedure for brain tissue classification from 3D magnetic resonance head images (MRI) is described in this paper. Starting from a set of samples generated from prior tissue probability maps in a standard, brain-based coordinate system, the method first reduces the fraction of incorrectly labelled samples in this set by using a minimum spanning tree graph-theoretic approach.

Pei-Chun Chen et al.,(2008) worked on a project based on “Cancerous Tissue Classification using Microarray Gene Expression”. The study on this project is based on machine learning techniques to perform tumour vs. normal tissue classification using gene expression microarray data, which was proven to be useful for early-stage cancer diagnosis and cancer subtype identification. We compare the results of both supervised learning (k-nearest-neighbours, SVMs, boosting) and unsupervised learning (k-means clustering, hierarchical clustering) routines on three datasets.
Joshi Snehal K. (2014) studied on “On Application of Image Processing: Study of Digital Image Processing Techniques for Concrete Mixture Images and Its Composition”. The research is based on analysis of composition of concrete mixture digital image. The concrete mixture is combination of various Cement, Air-voids and Aggregates. To analyze the compositions of the concrete mixture, the X-ray CT images are used. Digital image processing algorithm is applied to analyze the obtained image. Using this Digital image processing algorithm the obtained image is processed and filtered. The resultant image is compared with the X-ray CT image and the measured and predicted mixture proportions are compared to analyze the absolute errors. The threshold range T1 and T2 were found for aggregates, cement materials and air-voids.

Noel T Goldsmith (2000). In his research paper states the spatial transverse resolution is a function of the wavelength and numerical aperture. The depth resolution is another function of these parameters. The factors that enable the detection of fine detail make the sharp focusing of more than a thin slice of the depth in an object impossible. When the examination of fracture surfaces is attempted using light reflection microscopy, the roughness will often restrict the in-focus parts of an image to a small portion of the field of view.

H.M. Zelelew et al. (2008) in their work on “Application of Digital Image Processing Techniques for Asphalt Concrete Mixture Images” states that an automated digital image processing (DIP) algorithm called Volumetric based Global Minima (VGM) thresholding algorithm for processing asphalt concrete (AC) X-ray computed tomography (CT) images. It utilizes known volumetric properties of AC mixtures as the main criterion for establishing the air-mastic and mastic-aggregate gray scale boundary thresholds. Several DIP techniques were utilized to characterize the AC microstructure.

Michail Kulesh et. al. (2009) in their study on “Inverse Problems and Parameter Identification” states that many problems in imaging are actually inverse problems. One reason for this is that conditions and parameters of the physical processes underlying the actual image acquisition are usually not known. Material parameters in geological structures as unknown parameters for the simulation of seismic wave propagation with sparse measurement on the surface, or temporal changes in movie sequences given by intensity changes or moving image edges and resulting from deformation, growth and transport processes with unknown fluxes.

Prabhsharan Kaur et al. (2013) on their study on “Image Registration in Digital Image Processing” concludes that Image registration is the fundamental task used to match two or more partially overlapping images taken. It is a fundamental image processing technique and
is very useful in integrating information from different sensors, finding changes in images
taken at different times, inferring three-dimensional information from stereo images, and
recognizing model-based objects.

**Matthias Kirchner and Jessica Fridrich(2011)** found in their study on “Detection of
Median Filtering in Digital Images” that In digital image forensics, it is generally accepted
that intentional manipulations of the image content are most critical and hence numerous
forensic methods focus on the detection of such `malicious' post-processing. The researcher
presented a simple yet effective technique to detect median filtering in digital images a
widely used de-noising and smoothing operator.

**Eli Pell (1999)** in the study of “Display nonlinearity in digital image processing for visual
communications” concludes that The luminance emitted from a cathode ray rube (CRT)
display is a nonlinear function (the gamma function) of the input video signal voltage. In
most analogy video systems, compensation for this nonlinear transfer function is
implemented in the camera amplifiers.

**Ingrid Scholl, Till Ach et al.(2011)** studied on Challenges of Medical Image Processing.
They discussed on Kilo- to Terabyte challenges regarding (i) medical image management and
image data mining, (ii) bio imaging, (iii) virtual reality in medical visualizations and (iv)
neuro-imaging. Due to the increasing amount of data, image processing and visualization
algorithms have to be adjusted. Scalable algorithms and advanced parallelization techniques
using graphical processing units have been developed. They are summarized in this paper.

**Sigurd Angenent et al.,(2006)** studied “Mathematical methods in Medical Image
processing”. They described some central mathematical problems in medical imaging. The
subject has been undergoing rapid changes driven by better hardware and software. Much of
the software is based on novel methods utilizing geometric partial differential equations in
conjunction with standard signal/image processing techniques as well as computer graphics
facilitating man/machine interactions.

describes CT scanner, Ultrasound and Magnetic Resonance Imaging took over x-ray imaging
by making the doctors to look at the body's elusive third dimension. With the CT Scanner,
body's interior can be bared with ease and the diseased areas can be identified without
causing either discomfort or pain to the patient.

**Doru Ciota and Cristion Iacob et al. (2001)** in their study on Medical Image processing
describes the use of digital image processing and digital integrated systems in medicine,
highlighting the advantages offered. It is proposed a complete system that can be
implemented in the medical domain. In particular we present a well known image processing algorithm, unsharp mask. A demonstration of the enhancement capabilities of the unsharp mask algorithm is done by applying it on a blurry magnetic resonance obtained image. The result is an image with sharpened edges, clearer details and lower level of noise.

**Elzbieta Kaczmarek et al.,(2003)** studied on “Digital Image Analysis in Dental Research Applied for Treatment of Fissures on Occlusal Surfaces of Premolars”. They studied on quantitatively assess caries changes of teeth by using digital analysis. They studied on the digital images of stained sections of crowns of teeth were acquired with a computer-assisted light microscope. In these images, they found spots representing the main and total demineralization of enamel were segmented to determine their area. The area of total demineralization was significantly different between premolars with sealed fissures and unprotected premolars as indicated by the Mann–Whitney test.

**Reddy M.V.Bramhananda et al., (2012)** studied on “Dental X-Ray Image Analysis by Using Image Processing Techniques.” Their study is on Classification of dental caries is important for the diagnosis and treatment planning of the dental disease, which has been affecting a very large population throughout the globe. It is also helpful for conducting detailed study and investigations about the nature of the dental disease. Dental caries are, clearly visible in the x-ray changes and it can be detected from the caries lesion present in the radiographs.

**Agrawal Richa(2013),** states in her study on"A Comparative Study of Various Brain Tumor Detection Algorithms", medical image researches for brain tumor detection are attaining more curiosity since the augmented need for efficient and objective evaluation of large amounts of data. Medically, tumours are also known as neoplasms, which are an abnormal mass of tissue resulting from uncontrolled proliferation or division of cells happening in the human body.

**Tiwari R.B. (2011)** carried out their study on “x-ray clinical medical image”. The study suggests that the use of LoG filter for contrast improvement process in place of methods discussed in. An adaptive technique is suggested to improve the contrast quality of dental X-ray image using the Laplacian-of-a-Gaussian (LoG) Filter. Biologically, LoG Filter has a similar profile to the response of the receptive fields in the Human Visual System (HVS).

**PO-Whei Huang et al.(2010)** studied on “ An Effective Tooth Isolation Method for Bitewing Dental X-Ray Images”. The study focus on tooth isolation technique. This study highlights a very effective and fully automatic tooth isolation method for bitewing dental X-
ray images. As per their study, upper-lower jaw separation mechanism is based on gray-scale integral projection to avoid possible information loss and incorporates with angle adjustment to handle skewed images. In single tooth isolation, the study proposes an adaptive windowing scheme for locating gap valleys to improve the accuracy.

Devis Tuia and Gustavo Camps-Valls (2011) studied on “Recent advances on Remote sensing Image Processing.” The study is based on techniques developed in the field allow many real-life applications with great societal value. For example, urban monitoring, fire detection or flood prediction can have a great impact on economical and environmental issues. From a machine learning and signal/image processing point of view, all the applications are tackled under specific formalisms, such as classification and clustering, regression and function approximation, image coding, restoration and enhancement, source un mixing, data fusion or feature selection and extraction.

Sangeet Saha et al. (2008) studied on “Image processing and cryptography”. The study focus on Improvement of pictorial information for betterment of human perception like de-blurring, de-noising in several fields such as satellite imaging, medical imaging etc are renewed research thrust. Specifically we would like to elaborate our experience on the significance of computer vision as one of the domains where hardware implemented algorithms performs far better than those implemented through software.

N. Mokhtar et al. (2010) studied on “One dimensional image processing for eye tracking using derivative dynamic time warping.” The study shows that one dimensional image processing for eye tracking approach is presented using a low cost webcam. It was found that the algorithm is resistant to illumination variation and is able to track eyes of users with and without glasses in multiple orientations. The size and location of the region of interest (ROI), which contains both eyes, is adaptive.

Yinpeng Jin et al. (2006) studied on “Wavelets in Medical Image Processing: De-noising, Segmentation, and Registration.” The study shows that Wavelet transforms and other multi-scale analysis functions have been used for compact signal and image representations in de-noising, compression and feature detection processing problems for about twenty years. Numerous research works have proven that space-frequency and space-scale expansions with this family of analysis functions provided a very efficient framework for signal or image data. The wavelet transform itself offers great design flexibility.

Karol Mikula et al. (2008) studied on “Morphological Image sequence processing.” The study presented morphological multi-scale method for image sequence processing, which results in a truly coupled spatio-temporal anisotropic diffusion. The aim of the method is not
to smooth the level-sets of single frames but to de-noise the whole sequence while retaining geometric features such as spatial edges and highly accelerated motions. This is obtained by an anisotropic spatio-temporal level-set evolution, where the additional artificial time variable serves as the multi-scale parameter.

**James G. Haran et al. (2004)** studied on “Real time Image Processing Algorithms for the Detection of Road and Environmental Conditions” The study depicts image processing algorithms for the recognition of environmental and road conditions from real-time camera images. This study addresses various implementation techniques for and considerations of the implementation of algorithms to extrapolate various features from images taken by stationary traffic cameras.

**Vitaliy Fadeyev and Carl Haber (2003)** shows in their study on “Reconstruction of mechanically Recorded Sound by Image Processing”. The study shows Audio information stored in the undulations of grooves in a medium such as a phonograph record may be reconstructed, with no or minimal contact, by measuring the groove shape using precision metrology methods and digital image processing. The effects of damage, wear, and contamination may be compensated, in many cases, through image processing and analysis methods.

**Steffen Klupsch et al. (2002)** study depicts “Real Time Image Processing based on Reconfigurable Hardware Acceleration”. The research is concerned with a substantial speed up of image processing methods on 2D and 3D images making use of modern FPGA (Field programmable Gate Array) technology. The applications of this class of methods ranges from 2D and 3D image de-noising and restoration, segmentation, morphological shape recovery and matching to vector field visualization and simulation.

**Hazem Ali Abd Al Faleh Al Hiary (2008)** studied on “Paper-based Watermark Extraction with Image Processing”. The study presents frameworks for the digitisation, localisation, extraction and graphical representation of paper-based watermark designs embedded in paper texture. These operations determine a suitable configuration of parameters to allow optimal content processing, in addition to the detection and extraction of chain lines. The second approach uses a model of the back-lighting effect to locate a watermark in pages of archaic documents. It removes recto information, and highlights remaining ‘hidden’ data, and then presents a statistical approach to locate watermarks from a known lexicon.

**M.Umadevi et al. (2010)** in their study on “A Survey of Image Processing Techniques for Identification of Printing Technology in Document Forensic Perspective” discusses about various image processing techniques and tools which are available for identification of
printing technologies. Printing technology identification and associated problems in document forensics have been projected as challenges in image processing application. Various image processing approaches based on textures, spatial variation, HSV colour space, spatial correlation, and feature based on histogram and some of the pattern recognition methods, like gray level co-occurrence matrix, roughness of the text, perimeter of edge are highlighted.

**Yong Rui and Thomas S. Huang (1999)** studied on “Image Retrieval: Current Techniques, Promising Directions, and Open Issues”. The research depicts a comprehensive survey of the technical achievements in the research area of image retrieval, especially content-based image retrieval, an area that has been so active and prosperous in the past few years. Based on the state-of-the-art technology available now and the demand from real-world applications, open research issues are identified and future promising research directions are suggested.

**Ilya Pollak et al. (2000)** studied on “Image Segmentation and Edge Enhancement with Stabilized Inverse Diffusion Equations”. This research work introduce a family of first-order multidimensional ordinary differential equations (ODE’s) with discontinuous right-hand sides and demonstrate their applicability in image processing. An equation belonging to this family is an inverse diffusion everywhere except at local extrema, where some stabilization is introduced.

**D.Snyers A. and Y.Petillot (1995)** studied on “Image processing optimization by genetic algorithm with a new coding scheme”. The study shows that an original coding scheme is introduced to take advantage of the two-dimensional structural information of images within the genetic algorithm framework. Results are presented showing that this new technique outperforms classical optimization methods for the optimization of 32 × 32 and 128 x 128 holograms.