

Chapter 46

Mammogram Classification Using Support Vector Machine

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ABSTRACT

Among the objectives of artificial intelligence techniques, we find computer-aided diagnosis systems that support preventive medical check-ups and perform detection, recognition, and classification patterns. Recently these techniques are emerged in different areas particularly in medical imaging. Medical image is an important source of information, and a golden tool for the diagnosis and assessment of a pathological analysis process. In this chapter Computer-Aided Diagnosis (CAD) system is proposed in detection and diagnosis of breast cancer, it is mainly composed of the following steps: preprocessing mammographic image, segmentation of suspect region on the mammographic image using Chan Vese model, extraction of global and local descriptors and then image classification into malignant and benign mammograms using Support Vector Machine (SVM) classifier. The analysis of mammographic images proposed system with a choice of the subset of local descriptors after tumor segmentation leads to a classification of malignant and benign mammograms. System proposed achieves 92% for accuracy.

INTRODUCTION

In women population, number of cancer deaths is mainly due to breast cancer. Breast cancer is considered as the largest cancer killer of women around the globe. In America, a study developed by National cancer institute (NCI) estimates that 21.9 in 100.000 women died per year with breast cancer and 12,3% developed breast cancer in their lifetime (NCI, 2008-2012). According to the same source, it estimated 231.840 new cases of breast cancer in 2015.

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In Morocco, 821.000 women have benefited from breast cancer screening, 44.500 women had reported suspicious symptoms after screening, additional tests performed confirmed 710 breast cancer cases in 2013 (Fondation Lalla Salma, 2013). Screening is a set of test and exam used to find a disease like cancer in people who do not have signs or symptoms.

In the last decades, digital imaging has dramatically invaded all areas ranging from astrophysics, meteorology, geophysics, and chemistry to biology and medicine (Zharkova & Jain, 2007).

Medical imaging is a precious tool used to assist radiologists in their routine detection and diagnosis.

Screening mammography is an efficient tool for early detection breast cancer after self-palpable techniques. Mammography uses a low level dose x-ray procedure that makes visualization of the internal structure of volume breast. Note that there are other complementary techniques such as breast ultrasound, and magnetic resonance imaging (MRI) that the radiologist recourses if mammography is not effective to make the decision (Rangayyan, 2005).

Mammography offers the possibility of reducing the cost of treatment and increases the chance of survival and decreases number of women death (Lee, 2002). However, even the most experienced radiologists can make errors, and in 70% of cases the cancer was visible in examinations before its discovery (Yankaskas, Schell, Bird, & Desrochers, 2001). Mammographic images acquisition can be analog or digital, so digital image mammographic offers enormous advantages in the detection and diagnosis of breast lesions using computer vision analysis techniques and therefore several breast pathologies can be detected. In addition, Computer vision systems support the efficient acquisition, storage, manipulation and transmission of visual information.

In general, computer vision techniques can be adequate for many image analysis tasks, for which an objective measure is important as indicator of the disease such as size tumor or volume.

Screening mammography and advanced acquisition techniques require the radiologist intervention to analyze and interpret a large number of complex mammographic images.

This requires a synergy among the following areas: medical physics, radiology, and medical imaging.

Computer aided detection and diagnosis based on classical and new techniques for image analysis. These techniques continue to grow through the emergence of powerful machines. However, the high rate of false positives and false negatives encourage radiologists to use them these techniques in their daily practices.

The Problem of pattern recognition is one of the significant interests of the computer vision community. Recent analysis techniques, learning, and classification have contributed to a revolution in artificial intelligence field and promise a recognition performance.

The aim of pattern recognition is to convert images that are understandable by human visual system into a code interpretable by computer. A suspicious region on a mammographic image can be characterized by the shape or by gray levels or by texture which is always different from the surrounding tissue.

Data analysis and classification methods aim to bring together in homogeneous classes a set of observations (Bouveyron, 2006).

A class is a set of similar objects without necessarily being identical; in addition, it must have a high intra-class similarity and low inter-class similarity (Suzuki, Sato, Hayase, 1999). Although classification result made by expert is still insufficient but using technique machine learning such as classification algorithm is another way which could be sufficient and improve classification accuracy.

Due to increasing applications in pattern recognition and classification there is a need to develop new methods and algorithms for the accurate and fast results. In this context, the challenge for researchers in breast cancer is to design systems that perform automatic classification of malignant and benign

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