

Development of computer-aided approach for brain tumor detection using random forest classifier

R. Anitha¹  | D. Siva Sundhara Raja²

¹Faculty of Electronics and Communication Engineering, Adhi College of Engineering and Technology, Chennai, Tamil Nadu, India

²Faculty of Electronics and Communication Engineering, SACS MAVMM Engineering College, Tamil Nadu, India

Correspondence

Faculty of Electronics and Communication Engineering, Adhi College of Engineering and Technology, Chennai, Tamil Nadu, India.
Email: anithagodavarthy@gmail.com

Abstract

The nonlinear development of cells in brain region forms the abnormal patterns in brain in the form of tumors. It is necessary to detect and diagnose the brain tumors in an automated manner using computer-aided approaches at large population areas. The noises in brain magnetic resonance image is detected and reduced as preprocessing steps and then grey level co-occurrence matrix are now extracted from the preprocessed brain image. In this article, random forest classifier-based brain tumor detection and segmentation methodology is proposed to classify the brain image into normal or abnormal. The proposed brain tumor detection and segmentation system is analyzed in terms of sensitivity, specificity, false-positive rate, false-negative rate, likelihood ratio positive, and likelihood ratio negative.

KEYWORDS

abnormal patterns, brain tumors, classification, diagnose, segmentation

1 | INTRODUCTION

The cells in brain grow as much as possible during the development of brain at an adult stage. The rate of development of cells in brain is linearly proportional to the age of the persons. If it fails, then the cells in brain grow in an uncontrolled manner which further forms the abnormal patterns in brain. These abnormal patterns in brain are called as *tumor*. The tumor may be formed in one region or many regions in brain. World Health Organization (WHO) predicted that the formation of tumors in humans will be 5% increased every year in and around the world. Many researchers are researching the causes of brain tumors in the adult stage of humans. In developing countries, there may be large population and the medical access for everyone is not possible. There is a lack of physicians or medical experts in the developing countries. Moreover, there is a shortage of medical and screening devices for identifying the tumors in the brain image of the patients. Hence, a fully automated technique is preferred in large population countries to detect and segment the abnormal patterns in brain image with the help of advanced medical and screening devices as stated in Thirumurugan et al.¹³ In this regard, this article proposes a fully automated screening technique for identifying the abnormal patterns in brain

image. The abnormal patterns in brain image are classified as benign and malignant. The cells in benign will not grow and it can be cured by medications. The cells in malignant grows as much as possible, which also affects the other cells in brain region as depicted in Amira Ben Rabeh et al.¹⁴ These abnormal cells can be treated by radiation technique. The brain tissues in brain are classified as grey matter (GM), white matter (WM), and cerebrospinal fluid (CSF). The growth rate of the WM is high when compared with the growth rate of GM and CSF. Hence, there may be high possibility for the formation of abnormal patterns in WM tissues in brain MR image. The brain tumors can be categorized into glioma brain tumors and meningioma brain tumors. These tumors can be differentiated with the aid of their size and development cells rate. The cells growth rate and size of the tumor region is high in meningioma when compared with the glioma brain tumors. Figure 1A shows the glioma brain image and Figure 1B shows the meningioma brain image.

2 | LITERATURE SURVEY

Dandil et al.¹ utilized the concept of hybrid clustering approach to detect the abnormal patterns in brain MR