
This two-volume set LNCS 11383 and 11384 constitutes revised selected papers from the 4th International MICCAI Brainlesion Workshop, BrainLes 2018, as well as the International Multimodal Brain Tumor Segmentation, BrainTS, Ischemic Stroke Lesion Segmentation, ISLES, MIBRAIN Image Segmentation, MIBRAIN18, Computational Precision Medicine, CPM, and Stroke Workshop on Imaging and Treatment Challenges, SWITCH, which were held jointly at the Medial Image Computing for Computer Assisted Intervention Conference, MICCAI, in Granada, Spain, in September 2018. The 92 papers presented in this volume were carefully reviewed and selected from 95 submissions. They were organized in topical sections named: brain lesion image analysis; brain tumor image segmentation; ischemic stroke lesion segmentation; grand challenge on MR brain segmentation; computational precision medicine; stroke workshop on imaging and treatment challenges. The Handbook of Medical Image Processing and Analysis is a comprehensive compilation of concepts and techniques used for processing and analyzing medical images after they have been generated or digitized. The Handbook is organized into six sections that relate to the main functions: enhancement, segmentation, quantification, registration, visualization, and compression, storage and communication. The second edition is extensively revised throughout, reflecting new technology and research, and includes new chapters on: higher order statistics for tissue segmentation; tumor growth modeling in oncological image analysis; analysis of cell nuclear features in fluorescence microscopy images; imaging and communication in medical and public health informatics; and dynamic mammogram retrieval from web-based image libraries. For those looking to explore advanced concepts and access essential information, this second edition of Handbook of Medical Image Processing and Analysis is an invaluable resource. It remains the most complete single volume reference for biomedical engineers, researchers, professionals and those working in medical imaging and medical image processing.

Dr. Isaac N. Bankman is the supervisor of a group that specializes on imaging, laser and sensor systems, modeling, algorithms and testing at the Johns Hopkins University Applied Physics Laboratory. He received his BSc degree in Electrical Engineering from Bogazici University, Turkey, in 1977, the MSc degree in Electronics from University of Wales, Britain, in 1979, and a PhD in Biomedical Engineering from the Israel Institute of Technology, Israel, in 1983. He is a member of SPIE. Includes contributions from internationally renowned authors from leading institutions NEW! 35 of 56 chapters have been revised and updated. Additionally, five new chapters have been added on important topics including Nonlinear 3D Boundary Detection, Adaptive Algorithms for Cancer Cytological Diagnosis, Dynamic Mammogram Retrieval from Web-Based Image Libraries, Imaging and Communication in Health Informatics and Tumor Growth Modelling in Oncological Image Analysis. Provides a complete collection of algorithms in computer processing of medical images Contains over 60 pages of stunning, four-color images. Posterior Fossa (PF) is a type of brain tumor located in or near brain stem and cerebellum. About 55% - 70% pediatric brain tumors arise in the posterior fossa, compared with only 15% - 20% of adult tumors. For segmenting PF tumors we should have features to study the characteristics of tumors. In literature, different types of texture features such as Fractal Dimension (FD) and Multifractional Brownian Motion (mBm) have been exploited for measuring randomness associated with brain and tumor tissues structures, and the varying appearance of tissues in magnetic resonance images (MRI). For selecting best features techniques such as neural network and boosting methods have been exploited. However, neural network cannot describe about the properties of texture features. We explore methods such as information theoretic methods which can perform feature selection based on properties of texture features. The primary contribution of this dissertation is investigating efficacy of different image features such as intensity, fractal texture, and level - set shape in segmentation of PF tumor for pediatric patients. We explore effectiveness of using four different feature selection and three different segmentation techniques respectively to discriminate tumor regions from normal tissue in multimodal brain MRI. Our research suggest Kullback - Leibler Divergence (KLD) measure for feature ranking and selection and Expectation Maximization (EM) algorithm for
feature fusion and tumor segmentation offer the best performance for the patient data in this study. To improve segmentation accuracy, we need to consider abnormalities such as cyst, edema and necrosis which surround tumors. In this work, we exploit features which describe properties of cyst and technique which can be used to segment it. To achieve this goal, we extend the two class KLD techniques to multiclass feature selection techniques, so that we can effectively select features for tumor, cyst and non tumor tissues. We compute segmentation accuracy by computing number of pixels segmented to total number of pixels for the best features. For automated process we integrate the inhomogeneity correction, feature selection using KLD and segmentation in an integrated EM framework. To validate results we have used similarity coefficients for computing the robustness of segmented tumor and cyst. This book gathers the proceedings of the 6th International Conference on Robot Intelligence Technology and Applications (RITA 2018). Reflecting the conference’s main theme, “Robotics and Machine Intelligence: Building Blocks for Industry 4.0,” it features relevant and current research investigations into various aspects of these building blocks. The areas covered include: Instrumentation and Control, Automation, Aeronautics, Space Systems, Internet of Things (IoT), Big Data and Cloud Computing and Advanced Intelligent Power Electronics and Drives. The main emphasis of the book is on medical image processing and its segmentation is an active and interesting area for researchers. It has reached at the tremendous place in diagnosing tumors after the discovery of CT and MRI. MRI is an useful tool to detect the brain tumor and segmentation is performed to carry out the useful portion from an image. The purpose of this paper is to provide an overview of different image segmentation methods like watershed algorithm, morphological operations, neutrosophic sets, thresholding, K-means clustering, Fuzzy C-means etc using MR images. This book gathers selected papers presented at the 2nd International Conference on Smart Energy and Communication (ICSEC 2020), held at Poornima Institute of Engineering and Technology, Jaipur, India, on March 20-21, 2020. It covers a range of topics in electronics and communication engineering and electrical engineering, including analog circuit design, image processing, wireless and microwave communication, optoelectronics and photonic devices, nano-electronics, renewable energy, smart grid, power systems and industry applications. A framework is proposed for the segmentation of brain tumors from MRI. Instead of training on pathology, the proposed method trains exclusively on healthy tissue. The algorithm attempts to recognize deviations from normality in order to compute a fitness map over the image associated with the presence of pathology. The resulting fitness map may then be used by conventional image segmentation techniques for honing in on boundary delineation. Such an approach is applicable to structures that are too irregular, in both shape and texture, to permit construction of comprehensive training sets. We develop the method of diagonalized nearest neighbor pattern recognition, and we use it to demonstrate that recognizing deviations from normality requires a rich understanding of context. Therefore, we propose a framework for a Contextual Dependency Network (CDN) that incorporates context at multiple levels: voxel intensities, neighborhood coherence, intra-structure properties, inter-structure relationships, and user input. Information flows bi-directionally between the layers via multi-level Markov random fields or iterated Bayesian classification. A simple instantiation of the framework has been implemented to perform preliminary experiments on synthetic and MRI data. The two-volume set LNCS 11992 and 11993 constitutes the thoroughly refereed proceedings of the 5th International MICCAI Brainlesion Workshop, BrainLes 2019, the International Multimodal Brain Tumor Segmentation (BraTS) challenge, the Computational Precision Medicine: Radiology-Pathology Challenge on Brain Tumor Classification (CPM-RadPath) challenge, as well as the tutorial session on Tools Allowing Clinical Translation of Image Computing Algorithms (TACTICAL). These were held jointly at the Medical Image Computing for Computer Assisted Intervention Conference, MICCAI, in Shenzhen, China, in October 2019. The revised selected papers presented in these volumes were organized in the following topical sections: brain lesion image analysis (12 selected papers from 32 submissions); brain tumor image segmentation (57 selected papers from 102 submissions); combined MRI and pathology brain tumor classification (4 selected papers from 5 submissions); tools allowing clinical translation of image computing algorithms (2 selected papers from 3 submissions). This volume describes concurrent engineering developments that affect or are expected to influence future development of digital diagnostic imaging. It also covers current developments in Picture Archiving and Communications System (PACS) technology, with particular emphasis on integration of emerging imaging technologies into the hospital environment. This two-volume set LNCS 12658 and 12659 constitutes the thoroughly refereed proceedings of the 6th International MICCAI Brainlesion Workshop, BrainLes 2020, the International Multimodal Brain Tumor Segmentation (BraTS) challenge, and the Computational Precision Medicine: Radiology-Pathology Challenge on Brain Tumor Classification (CPM-RadPath) challenge. These were held jointly at the 23rd Medical Image Computing for Computer Assisted Intervention Conference, MICCAI 2020, in Lima, Peru, in October 2020. The revised selected papers presented in these volumes were organized in the following topical sections: brain lesion image analysis (16 selected papers from 21 submissions); brain tumor image segmentation (69 selected papers from 75 submissions); and computational precision medicine: radiology-pathology challenge on brain tumor classification (6 selected papers from 6 submissions). The workshop and challenges were held virtually. This project describes the detection of cancerous tumors in an MRI of the human brain through the process of image segmentation using clustering. The MRI data is segmented using the K-means clustering algorithm. The algorithm is validated on an MRI database of a normal brain and the results are compared with the existing methods. The proposed method is found to be superior in terms of accuracy and speed. The framework is extendable to multiclass segmentation and can be used for various applications in medical imaging.
Precision Medicine: Radiology-Pathology Challenge on Brain Tumor Classification (CPM-RadPath) challenge. These were held jointly at the 23rd Medical Image Computing for Computer Assisted Intervention Conference, MICCAI 2020, in Lima, Peru, in October 2020.* The revised selected papers presented in these volumes were organized in the following topical sections: brain lesion image analysis (16 selected papers from 21 submissions); brain tumor image segmentation (69 selected papers from 75 submissions); and computational precision medicine: radiology-pathology challenge on brain tumor classification (6 selected papers from 6 submissions).* The workshop and challenges were held virtually. This book constitutes the thoroughly refereed post-workshop proceedings of the International Workshop on Brain Lesion (BrainLes), Brain Tumor Segmentation (BRATS) and Ischemic Stroke Lesion Segmentation (ISLES), held in Munich, Germany, on October 5, 2015, in conjunction with the International Conference on Medical Image Computing and Computer-Assisted Intervention, MICCAI 2015. The 25 papers presented in this volume were carefully reviewed and selected from 28 submissions. They are grouped around the following topics: brain lesion image analysis; brain tumor image segmentation; ischemic stroke lesion image segmentation.** The thesis presents a generalized framework for the detection of lesions and segmentation of tumors in brain magnetic resonance imaging (MRI) using fully convolutional neural networks (FCNs). The FCN framework is chosen due to its capacity to model multi-resolution context in the image domain and yield consistent semantic segmentation results. This thesis extends the FCN framework to better suit the task of brain lesion segmentation and detection by including convolutions to capture the full context of MRI volumes, a curriculum on the label weights to handle class imbalance, and a multi-scale loss to promote the modeling of context in the label domain. The proposed method is evaluated on two distinct tasks: multiple sclerosis (MS) lesion detection, and brain tumor segmentation. It is shown that this method performs at a high level for both tasks even though no fundamental changes to architecture, objective function, or optimization strategy are made. For the task of MS lesion detection, the trained model achieves a true positive rate of 0.82 at a false detection rate of 0.23 on an independent test set. The method was also submitted to the 2017 MICCAI Brain Tumor Segmentation (BraTS) Challenge, where it placed in the top five out of nearly one-hundred entrants, achieving independently evaluated dice scores of 0.860 and 0.783 for segmenting tumor and tumor core on unseen test data.** Magnetic Resonance Imaging (MRI) is a key medical imaging technology. Through in vivo soft tissue imaging, MRI allows clinicians and researchers to make diagnoses and evaluations that were previously possible only through biopsy or autopsy. However, analysis of MR images by domain experts can be time-consuming, complex, and subject to bias. The development of automatic segmentation techniques that make use of robust statistical methods allows for fast and unbiased analysis of MR images. In this dissertation, I propose segmentation methods that fall into two classes—(a) segmentation via optimization of a parametric boundary, and (b) segmentation by multistep, spatially constrained intensity classification. These two approaches are applicable in different segmentation scenarios. Parametric boundary segmentation is useful and necessary for segmentation of noisy images where the tissue of interest has predictable shape but poor boundary delineation, as in the case of lung with heavy or diffuse tumor. Spatially constrained intensity classification is appropriate for segmentation of noisy images with moderate contrast between tissue regions, where the areas of interest have unpredictable shapes, as is the case in spinal injury and brain tumor. The proposed automated segmentation techniques address the need for MR image analysis in three specific applications: (1) preclinical rodent studies of primary and metastatic lung cancer (approach (a)), (2) preclinical rodent studies of spinal cord lesion (approach (b)), and (3) postclinical analysis of human brain cancer (approach (b)). In preclinical rodent studies of primary and metastatic lung cancer, respiratory-gated MRI is used to quantitatively measure lung tumor burden and monitor the time-course progression of individual tumors. I validate a method for measuring tumor burden based upon average lung-image intensity. The method requires accurate lung segmentation; toward this end, I propose an automated lung segmentation method that works for varying tumor burden levels. The method includes development of a novel, two-dimensional parametric model of the mouse lungs and a multifaceted cost function to optimally fit the model parameters to each image. Results demonstrate a strong correlation (0.93), comparable with that of fully manual expert segmentation, between the automated method's tumor-burden metric and the tumor burden measured by lung weight. In preclinical rodent studies of spinal cord lesion, MRI is used to quantify tissues in control and injured mouse spinal cords. For this application, I propose a novel, multistep, multidimensional approach, utilizing the Classification Expectation Maximization (CEM) algorithm, for automatic segmentation of spinal cord tissues. In contrast to previous methods, my proposed method incorporates prior knowledge of cord geometry and the distinct information contained in the different MR images gathered. Unlike previous approaches, the algorithm is shown to remain accurate for whole spinal cord, white matter, and hemorrhage segmentation, even in the presence of significant injury. The results of the method are shown to be on par with expert manual segmentation. In postclinical analysis of human brain cancer, access to large collections of MRI data enables scientifically rigorous study of cancers like glioblastoma multiforme, the most common form of malignant primary brain tumor. For this application, I propose a method for segmenting brain lesions. I also show sample results demonstrating the ECEM algorithm's ability to segment MR images of glioblastoma. Computer vision and machine learning allows the image data to be seen by a computer or machine as a person would see it. This is a complex concept for a computer to comprehend since computers do not understand the three-dimensional perspective as a person views and understands it. Computer vision has variety of applications in industry, medicine, surveillance systems, video analysis, robotic, and etc. Image segmentation is one of the most challenging topics in computer vision and machine learning. As an application of image segmentation in biomedical research is to localize some specific cells and tissues, e.g., tumor or stroke in magnetic resonance images (MRI). Medical image segmentation helps physicians to find these lesions more accurately, and it can be great source of information in emergency cases that specialist is not available. Therefore, it is an important process in computerized medical imaging. Automated segmentation of brain lesions in MRI is a difficult procedure due to the variability and complexity of the location, size, shape, and texture of these lesions. This study presents four algorithms for brain lesion detection and segmentation using MR images. This book constitutes the thoroughly refereed post-workshop proceedings of the International Workshop on Brain Lesion, as well as the challenges on Brain
Brain Tumor MRI Image Segmentation Using Deep Learning Techniques offers a description of deep learning approaches used for the segmentation of brain tumors. The book demonstrates core concepts of deep learning algorithms by using diagrams, data tables and examples to illustrate brain tumor segmentation. A feature introducing basic concepts of deep learning-based brain tumor segmentation, sections cover techniques for modeling, segmentation and properties. A focus is placed on the application of different types of convolutional neural networks, like single path, multi path, fully convolutional network, cascade convolutional neural networks, Long Short-Term Memory - Recurrent Neural Network and Gated Recurrent Units, and more. The book also highlights the importance of using deep neural networks to address new questions and protocols, as well as improve upon existing challenges in brain tumor segmentation. Provides readers with an understanding of deep learning-based approaches in the field of brain tumor segmentation, including preprocessing techniques that integrate recent advancements in the field, including the transformation of low-resolution brain tumor images into super-resolution images using deep learning-based methods, single path Convolutional Neural Network based brain tumor segmentation, and much more. Includes coverage of Long Short-Term Memory (LSTM) based Recurrent Neural Network (RNN), Gated Recurrent Units (GRU) based Recurrent Neural Network (RNN), Generative Adversarial Networks (GAN), Auto Encoder based brain tumor segmentation, and Ensemble deep learning based brain tumor segmentation. Covers research issues and the future of deep learning-based brain tumor segmentation. The book discusses the impact of machine learning and computational intelligence on medical image data processing, and introduces the latest trends in machine learning technologies and computational intelligence for intelligent medical image analysis. The topics covered include automated region of interest detection of magnetic resonance images based on center of gravity; brain tumor detection through low-level features detection; automatic MRI image segmentation for brain tumor detection using the multi-level sigmoid activation function; and computer-aided detection of mammographic lesions using convolutional neural networks. Digital images and digital image processing were widely researched in the past decades and specific place in this field have medical images. Magnetic resonance images are a very important class of medical images and their enhancement is very significant for diagnostic process. In this paper we presented an algorithm for improving magnetic resonance images of the brain. Common degradation of the magnetic resonance images is caused by the noise. We tested adjusted non-local means filter for removing random noise in the magnetic resonance images of the brain. Several evolution metrics were used to prove the quality of the proposed method. A bstract: an improved segmentation approach based on Neutrosophic sets (NS) and Modified Nonlocal Fuzzy c-means clustering (NLFCM) is proposed. The brain tumor MRI image is transformed into NS domain, which is described using three subsets namely: the percentage of truth in a subset T%, the percentage of indeterminacy in a subset I%, and the percentage of falsity in a subset F%. The entropy in NS is defined and employed to evaluate the indeterminacy. Brain tumor classification is a challenging task in the field of medical image processing. The present study proposes a hybrid method using Neutrosophy and Convolutional Neural Network (NS-CNN). It aims to classify tumor region areas that are segmented from brain images of meningioma and malignant. In the first stage, MRI images were segmented using the neutrosophic set - expert maximum fuzzy-sure entropy (NS-EMFSE) approach. The aim of this dissertation is to develop an automatic segmentation of brain tumors from MRI volume based on the technique of "level sets". The term "automatic" uses the fact that the normal brain is symmetrical and the localization of asymmetrical regions permits to estimate the initial contour of the tumor. The first step is preprocessing, which is to correct the intensity inhomogeneity of volume MRI and spatially realign the MRI volumes of the same patient at different moments. The plan hemispherical brain is then calculated by maximizing the degree of similarity between the half of the volume and his reflexion. The initial contour of the tumor can be extracted from the asymmetry between the two hemispheres. This initial contour is evolved and refined by the technique "level set" in order to find the real contour of the tumor. The criteria for stopping the evolution have been proposed and based on the properties of the tumor. Finally, the contour of the tumor is projected onto the adjacent images to form the new initial contours. This process is iterated on all slices to obtain the segmentation of the tumor in 3D. The proposed system is designed to follow up patients throughout the medical treatment period, with examinations every four months, allowing the physician to monitor the state of development of the tumor and evaluate the effectiveness of the therapy. The method was quantitatively evaluated by comparison with manual tracings experts. Good results are obtained on real MRI images. "Provides a current review of computer processing algorithms for the identification of lesions, abnormal masses, cancer, and disease in medical images. Presents useful examples from numerous imaging modalities for increased recognition of anomalies in MRI, CT, SPECT and digital/film X-Ray. "The proposed brain tumor detection and localization framework comprises following steps: (i) Image acquisition, (ii) Preprocessing, (iii) Edge detection, (iv) Morphological operations. After thresholding operations, tumors appear as pure white color on pure black backgrounds. The algorithm has two stages, the first is pre-processing of given MRI image and after that segmentation is done. Image acquisition (gathering of MRI scanned images). Images stored in MATLAB in form of 2-D matrix. Preprocessing is done (i) Image acquisition (gathering of MRI scanned images). (ii) Edge detection through median filtering. (iii) Image dilation Processing stage it includes analysis on 2-D image through MATLAB commands, extraction of tumor portion is done with the help of segmentation methods. "Brain lesion segmentation is a critical application of computer vision to biomedical image analysis. The difficulty is derived from the great variance between instances, and the high computational cost of processing three-dimensional data. We introduce DenseNet-MD, a neural network
for brain tumor semantic segmentation that parses their internal structures and is capable of processing volumetric data from multiple MRI modalities simultaneously. As a result, the method is able to learn from small training datasets. We expand the state-of-the-art methods ResNeXt [1] and DenseNet [2] to process three-dimensional information, and combine them in a new DenseNext block. We introduce an architecture with a pathway consisting of four DenseNext Blocks that analyzes patches from multiple MRI modalities, using at the end fully-connected layers to combine the information and obtain a semantic segmentation of the brain tumor. * -- Tomado del Formato de Documento de Grado. The process of accurate detection of edges of MRI images of a brain is always a challenging but interesting problem. An accurate detection is very important and critical for the generation of correct diagnosis. The major problem that comes across while analyzing MRI images of a brain is inaccurate data. The process of segmentation of brain MRI image involves the problem of searching anatomical regions of interest, which can help radiologists to extract shapes, appearance, and other structural features for diagnosis of diseases or treatment evaluation. The brain image segmentation is composed of many stages. During the last few years, preprocessing algorithms, techniques, and operators have emerged as a powerful tool for efficient extraction of regions of interest, performing basic algebraic operations on images, enhancing specific image features, and reducing data on both resolution and brightness. Edge detection is one of the techniques of image segmentation. Here from image segmentation, tumor is located. Finally, we try to retrieve tumor from MRI image of a brain in the form of edge more accurately and efficiently, by enhancing the performance of different kinds of edge detectors using fuzzy approach. This book discusses new cognitive informatics tools, algorithms and methods that mimic the mechanisms of the human brain which lead to an impending revolution in understating a large amount of data generated by various smart applications. The book is a collection of peer-reviewed best selected research papers presented at the International Conference on Data Intelligence and Cognitive Informatics (ICDICICI 2020), organized by SCAD College of Engineering and Technology, Tirunelveli, India, during 8-9 July 2020. The book includes novel work in data intelligence domain which combines with the increasing efforts of artificial intelligence, machine learning, deep learning and cognitive science to study and develop a deeper understanding of the information processing systems. The two-volume set LNCS 11992 and 11993 constitutes the thoroughly refereed proceedings of the 5th International MICCAI BrainLesion Workshop, BrainLES 2019, the International Multimodal Brain Tumor Segmentation (BrainTS) challenge, the Computational Precision Medicine: Radiology-Pathology Challenge on Brain Tumor Classification (CPM-RadPath) challenge, as well as the tutorial session on Tools Allowing Clinical Translation of Image Computing Algorithms (TACTICAL). These were held jointly at the Medical Image Computing and Computer Assisted Intervention Conference, MICCAI, in Shenzhen, China, in October 2019. The revised selected papers presented in these volumes were organized in the following topical sections: brain lesion image analysis (12 selected papers from 32 submissions); brain tumor image segmentation (57 selected papers from 102 submissions); combined MRI and pathology brain tumor classification (4 selected papers from 5 submissions); tools allowing clinical translation of image computing algorithms (2 selected papers from 3 submissions). Early detection of the brain tumor in the brain magnetic resonance imaging is important because physician needs to quantify and classify the tumor and its area. The computer and image processing techniques can provide great help in analyzing the tumor area and its type by classification. On the other side, computer-aided detection (CAD) has been developing fast in the last two decades. The main idea of CAD is to assist radiologists in interpreting medical images by using dedicated computer systems to provide a correct system. Studies on CAD systems and technology show that CAD can help to improve diagnostic accuracy of radiologists, lighten the burden of increasing workload, reduce cancer missed due to fatigue, overlooked or data overloaded and improve inter- and intra-reader variability. The final medical decision is made by the radiologists. Consequently, radiologists expect that CAD systems can improve their diagnostic abilities based on synergistic effects between the radiologist and the computer with medical image analysis and machine learning techniques. This book deals with adaptive techniques that proposed to detect and extract the tumor regions in MRI brain images for different patient cases. As well as, many adaptive techniques were proposed to extract the brain tissues from other extra cortical tissues by a process called skull stripping. Many segmentation methods are adopted in this book to segment the MRI brain images in order to extract the tumor regions, some of these methods are adaptive ones. In addition, three dimensions image of the extracted tumor regions of many successive sliced images was constructed. Besides rendered images of two patients’ head, that the MRI brain images belong to, was generated by utilizing simple functions. All the algorithms that implemented in this work are built in MatLab. The MRI brain images that adopted in this work are acquired from local hospitals in Iraq and from internet websites. There are multiple types of Brain Tumors, which can be difficult to evaluate that leads to unpleasant result for the patient. Thus, detection and treatment planning of the brain tumor is the most important factor in the process. Magnetic resonance imaging (MRI) is broadly used technique to evaluate the brain tumors. A manual segmentation of brain tumor from MRI consumes more time and depends on the experience of the machinist. Thus, automated techniques for the segmentation are required to ease the treatment planning. Even in the automated methods for the segmentation is not so easy because of the various types of the brain tumors. Thus, it is necessary to have reliable method for brain tumor segmentation which can measure the tumors efficiently and less time consuming. In this paper, we propose a technique for brain tumor segmentation which is created using U-Net based convolutional neural network. The technique was evaluated on datasets called Multimodal Brain Tumor Image Segmentation (BRAT5 2019). This dataset contains more than 76 cases of low-grade tumor and 259 cases of high-grade tumor. Magnetic resonance imaging (MRI) is widely used medical technology for diagnosis of various tissue abnormalities, detection of tumors. The active development in the computerized medical image segmentation has played a vital role in scientific research. This helps the doctors to take necessary treatment in an easy manner with fast decision making. Brain tumor segmentation is a hot topic in the research field of Information technology with biomedical engineering. The brain tumor segmentation is motivated by assessing tumor growth, treatment responses, computer-based surgery, treatment of radiation therapy, and developing tumor growth models. Therefore, computer-aided diagnostic system is meaningful in medical treatments to reducing the workload of doctors and giving the accurate results. This chapter explains the causes, awareness of brain tumor segmentation and its classification, MRI scanning process and its operation, brain tumor classifications, and different segmentation methodologies. Dr. Ahmet M esrur Halefoğlu mostly deals with research fields in body imaging and neuroradiology with multidetector computed tomography and high-resolution magnetic resonance imaging. He has served as postdoctoral research fellow at Johns Hopkins Hospital. Currently, he is working as an associate professor of radiology in Istanbul, Turkey. He has more than 50 high-impact-factor publications and has written 3
book chapters. He is a member of Turkish Society of Radiology and European Society of Radiology. During the recent years, there have been major breakthroughs in MRI due to developments in scanner technology and pulse sequencing. These important achievements have led to remarkable improvements in neuroimaging and advanced techniques, including diffusion imaging, diffusion tensor imaging, perfusion imaging, magnetic resonance spectroscopy, and functional MRI. These advanced neuroimaging techniques have enabled us to achieve invaluable insights into tissue microstructure, microvasculature, metabolism, and brain connectivity. In this book the fully automatic generation of semantic annotations for medical imaging data by means of medical image segmentation and labeling is addressed. In particular, the focus is on the segmentation of the human brain and related structures from magnetic resonance imaging (MRI) data. Three novel probabilistic methods from the field of database-guided knowledge-based medical image segmentation are presented. Each of the methods is applied to one of three MRI segmentation scenarios: 1) 3-D MRI brain tissue classification and intensity non-uniformity correction, 2) pediatric brain cancer segmentation in multi-spectral 3-D MRI, and 3) 3-D MRI anatomical brain structure segmentation. All the newly developed methods make use of domain knowledge encoded by probabilistic boosting-trees (PBT), which is a recent machine learning technique. For all the methods uniform probabilistic formalisms are presented that group the methods into the broader context of probabilistic modeling for the purpose of image segmentation. It is shown by comparison with other methods from the literature that in all the scenarios the newly developed algorithms in most cases give more accurate results and have a lower computational cost. Evaluation on publicly available benchmarking data sets ensures reliable comparability of the results to those of other current and future methods. One of the methods successfully participated in the ongoing online caudate segmentation challenge (www.cause07.org), where it ranks among the top five methods for this particular segmentation scenario. The main aim of this book is to introduce to a system which can detect brain tumor using brain Magnetic Resonance Imaging segmentation. Automated MRI (Magnetic Resonance Imaging) brain tumor segmentation is a difficult task due to the variance and complexity of tumors. In this work, a statistical structure analysis based brain tissue segmentation scheme is presented, which focuses on the structural analysis on both abnormal and normal tissues. As the local textures in the images can reveal the typical “regularities” of biological structures, textural features have been extracted using co-occurrence matrix approach. By the analysis of level of correlation the number of features can be reduced to the significant components. Feed forward back propagation neural network is used for classification. Proposed techniques of analysis and classification are used to investigate the differences of texture features among macroscopic lesion white matter (LWM) and normal appearing white matter (NAWM) in magnetic resonance images (MRI) from patients with normal and abnormal white matter.