

# An Automatic Brain Tumor Detection And Segmentation Using

This book focuses on the core areas of computing and their applications in the real world. Presenting papers from the Computing Conference 2020 covers a diverse range of research areas, describing various detailed techniques that have been developed and implemented. The Computing Conference 2020, which provided a venue for academic and industry practitioners to share new ideas and development experiences, attracted a total of 514 submissions from pioneering academic researchers, scientists, industrial engineers and students from around the globe. Following a double-blind, peer-review process, 160 papers (including 15 poster papers) were selected to be included in these proceedings. Featuring state-of-the-art intelligent methods and techniques for solving real-world problems, the book is a valuable resource and will inspire further research and technological improvements in this important area.

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 is a collection of selected high-quality research papers presented at the International

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Conference on Computing in Engineering and Technology (ICCET 2021), organized by Dr. Babasaheb Ambedkar Technological University, Lonere, India, during January 30-31, 2021. Focusing on frontier topics and next-generation technologies, it presents original and innovative research from academics, scientists, students and engineers alike. The theme of the conference is Applied Information Processing System.

This book introduces a variety of advanced machine learning approaches covering the areas of neural networks, fuzzy logic, and hybrid intelligent systems for the determination and diagnosis of cancer. Moreover, the tactical solutions of machine learning have proved its vast range of significance and, provided novel solutions in the medical field for the diagnosis of disease. This book also explores the distinct deep learning approaches that are capable of yielding more accurate outcomes for the diagnosis of cancer. In addition to providing an overview of the emerging machine and deep learning approaches, it also enlightens an insight on how to evaluate the efficiency and appropriateness of such techniques and analysis of cancer data used in the cancer diagnosis. Therefore, this book focuses on the recent advancements in the machine learning and deep learning approaches used in the diagnosis of different types of cancer along with their research challenges and future directions for the targeted audience including scientists, experts, Ph.D. students, postdocs, and anyone interested in the subjects discussed. .

This book includes high-quality research papers presented at the Third International Conference on Innovative Computing and Communication (ICICC 2020), which is held at the Shaheed Sukhdev College of Business Studies, University of Delhi, Delhi, India, on 21-23 February, 2020. Introducing the innovative works of scientists, professors, research scholars,

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students and industrial experts in the field of computing and communication, the book promotes the transformation of fundamental research into institutional and industrialized research and the conversion of applied exploration into real-time applications.

Medical imaging has transformed the ways in which various conditions, injuries, and diseases are identified, monitored, and treated. As various types of digital visual representations continue to advance and improve, new opportunities for their use in medical practice will likewise evolve. *Medical Imaging: Concepts, Methodologies, Tools, and Applications* presents a compendium of research on digital imaging technologies in a variety of healthcare settings. This multi-volume work contains practical examples of implementation, emerging trends, case studies, and technological innovations essential for using imaging technologies for making medical decisions. This comprehensive publication is an essential resource for medical practitioners, digital imaging technologists, researchers, and medical students.

This book is a collection of the best research papers presented at the 8th International Conference on Innovations in Electronics and Communication Engineering at Guru Nanak Institutions Hyderabad, India. Featuring contributions by researchers, technocrats and experts, the book covers various areas of communication engineering, like signal processing, VLSI design, embedded systems, wireless communications, and electronics and communications in general, as well as cutting-edge technologies. As such, it is a valuable reference resource for young researchers.

This book contains works on mathematical and simulation modeling of processes in various domains: ecology and geographic information systems, IT, industry, and project management. The development of complex multicomponent systems requires an increase in accuracy,

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efficiency, and adequacy while reducing the cost of their creation. The studies presented in the book are useful to specialists who are involved in the development of real events models: analog, management and decision-making models, production models, and software products. Scientists can get acquainted with the latest research in various decisions proposed by leading scholars and identify promising directions for solving complex scientific and practical problems. The chapters of this book contain the contributions presented on the 15th International Scientific-Practical Conference, MODS, June 29–July 01, 2020, Chernihiv, Ukraine.

"This edited book will start with an introduction to feature engineering and then move onto recent concepts, methods and applications with the use of various data types that includes: text, image, streaming data, social network data, financial data, biomedical data, bioinformatics etc. to help readers gain insight into how features can be extracted and transformed from raw data"--

While doctors and physicians are more than capable of detecting diseases of the brain, the most agile human mind cannot compete with the processing power of modern technology. Utilizing algorithmic systems in healthcare in this way may provide a way to treat neurological diseases before they happen. Early Detection of Neurological Disorders Using Machine Learning Systems provides innovative insights into implementing smart systems to detect neurological diseases at a faster rate than by normal means. The topics included in this book are artificial intelligence, data analysis, and biomedical informatics. It is designed for clinicians, doctors, neurologists, physiotherapists, neurorehabilitation specialists, scholars, academics, and students interested in topics centered on biomedical engineering, bio-electronics, medical electronics, physiology, neurosciences, life sciences, and physics.

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This book emphasizes the emerging building block of image processing domain, which is known as capsule networks for performing deep image recognition and processing for next-generation imaging science. Recent years have witnessed the continuous development of technologies and methodologies related to image processing, analysis and 3D modeling which have been implemented in the field of computer and image vision. The significant development of these technologies has led to an efficient solution called capsule networks [CapsNet] to solve the intricate challenges in recognizing complex image poses, visual tasks, and object deformation. Moreover, the breakneck growth of computation complexities and computing efficiency has initiated the significant developments of the effective and sophisticated capsule network algorithms and artificial intelligence [AI] tools into existence. The main contribution of this book is to explain and summarize the significant state-of-the-art research advances in the areas of capsule network [CapsNet] algorithms and architectures with real-time implications in the areas of image detection, remote sensing, biomedical image analysis, computer communications, machine vision, Internet of things, and data analytics techniques.

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The volume contains latest research work presented at International Conference on Computing and Communication Systems (I3CS 2016) held at North Eastern Hill University (NEHU), Shillong, India. The book presents original research results, new ideas and practical development experiences which concentrate on both theory and practices. It includes papers from all areas of information technology, computer science, electronics and communication engineering written by researchers, scientists, engineers and scholar students and experts

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from India and abroad.

This book presents select proceedings of the International Conference on Advances in Electrical Control and Signal Systems (AECSS) 2019. The focus is on the current developments in control and signal systems in electrical engineering, and covers various topics such as power systems, energy systems, micro grid, smart grid, networks, fuzzy systems and their control. The book also discusses various properties and performance of signal systems and their applications in different fields. The contents of this book can be useful for students, researchers as well as professionals working in power and energy systems, and other related fields.

Recent advancements in the technology of medical imaging, such as CT and MRI scanners, are making it possible to create more detailed 3D and 4D images. These powerful images require vast amounts of digital data to help with the diagnosis of the patient. Artificial intelligence (AI) must play a vital role in supporting with the analysis of this medical imaging data, but it will only be viable as long as healthcare professionals and AI interact to embrace deep thinking platforms such as automation in the identification of diseases in patients. AI Innovation in Medical Imaging Diagnostics is an essential reference source that examines AI applications in medical imaging that can transform hospitals to become more efficient in the management of patient treatment plans through the production of faster imaging and the reduction of radiation dosages through the PET and SPECT imaging modalities. The book also explores how data clusters from these images can be translated into small data packages that can be accessed by healthcare departments to give a real-time insight into patient care and required interventions. Featuring research on topics such as assistive healthcare, cancer

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detection, and machine learning, this book is ideally designed for healthcare administrators, radiologists, data analysts, computer science professionals, medical imaging specialists, diagnosticians, medical professionals, researchers, and students.

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 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.

This volume contains 69 papers presented at ICICT 2015: International Congress on Information and Communication Technology. The conference was held during 9th and 10th October, 2015, Udaipur, India and organized by CSI Udaipur Chapter, Division IV, SIG-WNS, SIG-e-Agriculture in association with ACM Udaipur Professional Chapter, The Institution of Engineers (India), Udaipur Local Centre and Mining Engineers Association of India, Rajasthan Udaipur Chapter. This volume contains papers mainly focused on ICT for Managerial Applications, E-governance, IOT and e-Mining.

The book presents the latest advances and research findings in the fields of computational science and communication. The areas covered include smart innovation; systems and technologies; embedded knowledge and intelligence; innovation and sustainability; advanced computing; and networking and informatics. It also focuses on the knowledge-transfer

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methodologies and the innovation strategies employed to make these effective. This fascinating compilation appeals to researchers, academics and engineers around the globe. The book discusses the impact of machine learning and computational intelligent algorithms 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. This book presents the papers included in the proceedings of the 5th International Conference of Reliable Information and Communication Technology 2020 (IRICT 2020) that was held virtually on December 21-22, 2020. The main theme of the book is Innovative Systems for Intelligent Health Informatics. A total of 140 papers were submitted to the conference, but only 111 papers were published in this book. The book presents several hot research topics which include health informatics, bioinformatics, information retrieval, artificial intelligence, soft computing, data science, big data analytics, Internet of things (IoT), intelligent communication systems, information security, information systems, and software engineering. . 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

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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 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, BraTS, Ischemic Stroke Lesion Segmentation, ISLES, MR Brain Image Segmentation, MRBrainS18, Computational Precision Medicine, CPM, and Stroke Workshop on Imaging and Treatment Challenges, SWITCH, which were held jointly at the Medical 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 image segmentation; grand challenge on MR brain segmentation; computational precision medicine; stroke workshop on imaging and treatment challenges.

This paper discusses and presents an improved form of DWT for feature extraction, called Slantlet transform (SLT) along with neutrosophy, a generalization of fuzzy logic, which is a relatively new logic. Thus, a novel composite NS-SLT model has been suggested as a source to derive statistical texture features that used to identify the malignancy of brain tumor.

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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. Manual segmentation of brain tumor from MRI consumes more time and depended 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 (BRATS 2019). This dataset contains more than 76 cases of low-grade tumor and 259 cases of high-grade tumor.

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

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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 proceedings of the 13th International Conference on Modeling Decisions for Artificial Intelligence, MDAI 2016, held in Sant Julià de Lòria, Andorra, in September 2016. The 22 revised full papers presented together with three invited talks were carefully reviewed and selected from 36 submissions. Providing a forum for researchers to discuss models for decision and information fusion (aggregation operators) and their applications to AI, the papers address topics such as decision making, information fusion, social networks, data mining, and related subjects. Applications to data science and privacy technologies, as well as to real world problems are also discussed.

This book constitutes the refereed proceedings of the Workshops held at the 8th IFIP WG 12.5 International Conference on Artificial Intelligence Applications and Innovations, AIAI 2012, in Halkidiki, Greece, in September 2012. The book includes a total of 66 interesting and innovative research papers from the

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following 8 workshops: the Second Artificial Intelligence Applications in Biomedicine Workshop (AIAB 2012), the First AI in Education Workshop: Innovations and Applications (AIeIA 2012), the Second International Workshop on Computational Intelligence in Software Engineering (CISE 2012), the First Conformal Prediction and Its Applications Workshop (COPA 2012), the First Intelligent Innovative Ways for Video-to-Video Communication in Modern Smart Cities Workshop (IIVC 2012), the Third Intelligent Systems for Quality of Life Information Services Workshop (ISQL 2012), the First Mining Humanistic Data Workshop (MHDW 2012), and the First Workshop on Algorithms for Data and Text Mining in Bioinformatics (WADTMB 2012).

This book explores various applications of deep learning to the diagnosis of cancer, while also outlining the future face of deep learning-assisted cancer diagnostics. As is commonly known, artificial intelligence has paved the way for countless new solutions in the field of medicine. In this context, deep learning is a recent and remarkable sub-field, which can effectively cope with huge amounts of data and deliver more accurate results. As a vital research area, medical diagnosis is among those in which deep learning-oriented solutions are often employed. Accordingly, the objective of this book is to highlight recent advanced applications of deep learning for diagnosing different types of cancer. The target

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audience includes scientists, experts, MSc and PhD students, postdocs, and anyone interested in the subjects discussed. The book can be used as a reference work to support courses on artificial intelligence, medical and biomedical education.

This book constitutes the proceedings of the First International Conference on Computational Intelligence and Information Technology, CIIT 2011, held in Pune, India, in November 2011. The 58 revised full papers, 67 revised short papers, and 32 poster papers presented were carefully reviewed and selected from 483 initial submissions. The papers are contributed by innovative academics and industrial experts in the field of computer science, information technology, computational engineering, mobile communication and security and offer a stage to a common forum, where a constructive dialog on theoretical concepts, practical ideas and results of the state of the art can be developed.

This volume presents the proceedings of the International Conference on Medical and Biological Engineering held from 16 to 18 March 2017 in Sarajevo, Bosnia and Herzegovina. Focusing on the theme of 'Pursuing innovation. Shaping the future', it highlights the latest advancements in Biomedical Engineering and also presents the latest findings, innovative solutions and emerging challenges in this field. Topics include: - Biomedical Signal Processing - Biomedical Imaging and

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Image Processing - Biosensors and Bioinstrumentation - Bio-Micro/Nano Technologies - Biomaterials - Biomechanics, Robotics and Minimally Invasive Surgery - Cardiovascular, Respiratory and Endocrine Systems Engineering - Neural and Rehabilitation Engineering - Molecular, Cellular and Tissue Engineering - Bioinformatics and Computational Biology - Clinical Engineering and Health Technology Assessment - Health Informatics, E-Health and Telemedicine - Biomedical Engineering Education - Pharmaceutical Engineering

Automated segmentation of brain lesions in magnetic resonance images (MRI) is a difficult procedure due to the variability and complexity of the location, size, shape, and texture of these lesions. In this study, four algorithms for brain lesion detection and segmentation using MRI are proposed. In the first algorithm, an automatic algorithm for brain stroke lesion detection and segmentation using single-spectral MRI is proposed, which is called histogram-based gravitational optimization algorithm (HGOA). HGOA is a novel intensity-based segmentation technique that applies enhanced gravitational optimization algorithm on histogram analysis results to segment the brain lesion. The ischemic stroke lesions are segmented with 91.5% accuracy and tumor lesions are segmented with 88% accuracy. Since histogram analysis limits the extracted information to the number of pixels in specific gray levels and does not include any region-

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based information, the accuracy of a histogram-based method is limited. In the second algorithm, in order to increase the accuracy of brain tumor segmentation, a texture-based automated approach is presented. The experimental results on T1-weighted, T2-weighted, and fluid-attenuated inversion recovery (FLAIR) images on both simulated and real brain MRI data prove the efficacy of our technique in successfully segmentation of brain tumor tissues with high accuracy ( $95.9 \pm 0.4\%$  for database of simulated MR images, and  $93.2 \pm 0.3\%$  for database of real MR images). In order to reduce the computational complexity and expedite the segmentation algorithm, and also to improve the system performance, some modifications are applied in the algorithm presented in previous algorithm. In the third algorithm, a fully automatic tumor system, which is combination of texture-based and contour-based algorithms is presented. Skippy greedy snake algorithm is capable of segmenting the tumor area; however, the algorithm's accuracy and performance depends significantly on its initial points. Here, we modify the previous algorithm to automatically find proper initial points, which not only obviates the requirement of manual interference, but also increase the accuracy and speed of optimization convergence. Comparing with previous method, this method achieves higher accuracy in tumor segmentation ( $96.8 \pm 0.3\%$  for database of simulated MR images, and  $93.8 \pm 0.1\%$  for database of real

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MR images) and lower computational complexity. The intensity similarities between brain lesions and some normal tissues result in confusion within segmentation algorithms, especially in the database of real MR images. In order to improve the system performance for this database, a multi-spectral approach based on feature-level fusion is presented in forth algorithm. Even though using multi-spectral MRI has several drawbacks and limitations, since it makes use of complementary information, it increases the accuracy of the system. Here, a feature-level fusion technique based on canonical correlation analysis (CCA) is proposed. It is worth mentioning that for the first time CCA is applied for combining MRI sequences in order to segment tumors. Even though data fusion increases computational complexity of the segmentation algorithm, it results in a higher accuracy ( $95.8 \pm 0.2\%$  for database of real MR images).

Recent advancements in imaging techniques and image analysis has broadened the horizons for their applications in various domains. Image analysis has become an influential technique in medical image analysis, optical character recognition, geology, remote sensing, and more. However, analysis of images under constrained and unconstrained environments require efficient

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representation of the data and complex models for accurate interpretation and classification of data. Deep learning methods, with their hierarchical/multilayered architecture, allow the systems to learn complex mathematical models to provide improved performance in the required task.

The **Handbook of Research on Deep Learning-Based Image Analysis Under Constrained and Unconstrained Environments** provides a critical examination of the latest advancements, developments, methods, systems, futuristic approaches, and algorithms for image analysis and addresses its challenges. Highlighting concepts, methods, and tools including convolutional neural networks, edge enhancement, image segmentation, machine learning, and image processing, the book is an essential and comprehensive reference work for engineers, academicians, researchers, and students.

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 as benign and malignant. In the first stage,

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MRI images were segmented using the neutrosophic set – expert maximum fuzzy-  
sure entropy (NS-EMFSE) approach.

This book presents selected peer-reviewed papers from the International Conference on Artificial Intelligence and Data Engineering (AIDE 2019). The topics covered are broadly divided into four groups: artificial intelligence, machine vision and robotics, ambient intelligence, and data engineering. The book discusses recent technological advances in the emerging fields of artificial intelligence, machine learning, robotics, virtual reality, augmented reality, bioinformatics, intelligent systems, cognitive systems, computational intelligence, neural networks, evolutionary computation, speech processing, Internet of Things, big data challenges, data mining, information retrieval, and natural language processing. Given its scope, this book can be useful for students, researchers, and professionals interested in the growing applications of artificial intelligence and data engineering.

This book presents best selected papers presented at the 4th International Conference on Smart Computing and Informatics (SCI 2020), held at the Department of Computer Science and Engineering, Vasavi College of Engineering (Autonomous), Hyderabad, Telangana, India. It presents advanced and multi-disciplinary research towards the design of smart computing and

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informatics. The theme is on a broader front which focuses on various innovation paradigms in system knowledge, intelligence and sustainability that may be applied to provide realistic solutions to varied problems in society, environment and industries. The scope is also extended towards the deployment of emerging computational and knowledge transfer approaches, optimizing solutions in various disciplines of science, technology and health care.

This book is a compendium of the proceedings of the International Conference on Big-Data and Cloud Computing. The papers discuss the recent advances in the areas of big data analytics, data analytics in cloud, smart cities and grid, etc. This volume primarily focuses on the application of knowledge which promotes ideas for solving problems of the society through cutting-edge big-data technologies. The essays featured in this proceeding provide novel ideas that contribute for the growth of world class research and development. It will be useful to researchers in the area of advanced engineering sciences.

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