



Image Classification Using Content Based Image Retrieval

N Colangelo



Image Classification Using Content Based Image Retrieval:

Semantic and Interactive Content-based Image Retrieval Björn Barz, 2020-12-23 Content based Image Retrieval CBIR ist ein Verfahren zum Auffinden von Bildern in großen Datenbanken wie z.B. dem Internet anhand ihres Inhalts. Ausgehend von einem vom Nutzer bereitgestellten Anfragebild gibt das System eine sortierte Liste ähnlicher Bilder zurück. Der Großteil moderner CBIR Systeme vergleicht Bilder ausschließlich anhand ihrer visuellen Ähnlichkeit, d.h. dem Vorhandensein ähnlicher Texturen, Farbkompositionen etc. Jedoch impliziert visuelle Ähnlichkeit nicht zwangsläufig auch semantische Ähnlichkeit. Zum Beispiel können Bilder von Schmetterlingen und Raupen als ähnlich betrachtet werden, weil sich die Raupe irgendwann in einen Schmetterling verwandelt. Optisch haben sie jedoch nicht viel gemeinsam. Die vorliegende Arbeit stellt eine Methode vor, welche solches menschliches Vorwissen über die Semantik der Welt in Deep Learning Verfahren integriert. Als Quelle für dieses Wissen dienen Taxonomien, die für eine Vielzahl von Domänen verfügbar sind und hierarchische Beziehungen zwischen Konzepten kodieren, z.B. ein Pudel ist ein Hund ist ein Tier etc. Diese hierarchiebasierten semantischen Bildmerkmale verbessern die semantische Konsistenz der CBIR Ergebnisse im Vergleich zu herkömmlichen Repräsentationen und Merkmalen erheblich. Darüber hinaus werden drei verschiedene Mechanismen für interaktives Image Retrieval präsentiert, welche die den Anfragebildern inhärente semantische Ambiguität durch Einbezug von Benutzerfeedback auflösen. Eine der vorgeschlagenen Methoden reduziert das erforderliche Feedback mithilfe von Clustering auf einen einzigen Klick während eine andere den Nutzer kontinuierlich involviert, indem das System aktiv nach Feedback zu denjenigen Bildern fragt, von denen der größte Erkenntnisgewinn bezuglich des Relevanzmodells erwartet wird. Die dritte Methode ermöglicht dem Benutzer die Auswahl besonders interessanter Bildbereiche zur Fokussierung der Ergebnisse. Diese Techniken liefern bereits nach wenigen Feedbackrunden deutlich relevantere Ergebnisse, was die Gesamtmenge der abgerufenen Bilder reduziert, die der Benutzer überprüfen muss, um relevante Bilder zu finden. Content based image retrieval CBIR aims for finding images in large databases such as the internet based on their content. Given an exemplary query image provided by the user, the retrieval system provides a ranked list of similar images. Most contemporary CBIR systems compare images solely by means of their visual similarity, i.e. the occurrence of similar textures and the composition of colors. However, visual similarity does not necessarily coincide with semantic similarity. For example, images of butterflies and caterpillars can be considered as similar because the caterpillar turns into a butterfly at some point in time. Visually, however, they do not have much in common. In this work, we propose to integrate such human prior knowledge about the semantics of the world into deep learning techniques. Class hierarchies serve as a source for this knowledge, which are readily available for a plethora of domains and encode relationships, e.g. a poodle is a dog is an animal etc. Our hierarchy based semantic embeddings improve the semantic consistency of CBIR results substantially compared to conventional image representations and features. We furthermore present three different mechanisms for interactive image retrieval by incorporating user feedback to resolve the inherent

semantic ambiguity present in the query image One of the proposed methods reduces the required user feedback to a single click using clustering while another keeps the human in the loop by actively asking for feedback regarding those images which are expected to improve the relevance model the most The third method allows the user to select particularly interesting regions in images These techniques yield more relevant results after a few rounds of feedback which reduces the total amount of retrieved images the user needs to inspect to find relevant ones

Content-based Image Retrieval Using Deep Learning Anshuman Vikram Singh,2015 A content based image retrieval CBIR system works on the low level visual features of a user input query image which makes it difficult for the users to formulate the query and also does not give satisfactory retrieval results In the past image annotation was proposed as the best possible system for CBIR which works on the principle of automatically assigning keywords to images that help image retrieval users to query images based on these keywords Image annotation is often regarded as the problem of image classification where images are represented by some low level features an teh mapping between low level features and high level concepts class labels is done by supervised learning algorithms In a CBIR system learning of effective feature representations and similarity measures is very important for the retrieval performance Semantic gap has been the key challenge for this problem A semantic gap exists between low level image pixels captured by machines and the high level semantics perceived by humans The recent successes of deep learning techniques especially Convolutional Neural Networks CNN in solving computer vision applications has inspired me to work on this thesis so as to solve teh problem of CBIR using a dataset of annotated images

Abstract

From

Content-based to Semantic Image Retrieval Aamer Saleh Sahel Mohamed,2010 Digital image archiving urgently requires advanced techniques for more efficient storage and retrieval methods because of the increasing amount of digital Although JPEG supply systems to compress image data efficiently the problems of how to organize the image database structure for efficient indexing and retrieval how to index and retrieve image data from DCT compressed domain and how to interpret image data semantically are major obstacles for further development of digital image database system In content based image image analysis is the primary step to extract useful information from image databases The difficulty in content based image retrieval is how to summarize the low level features into high level or semantic descriptors to facilitate the retrieval procedure Such a shift toward a semantic visual data learning or detection of semantic objects generates an urgent need to link the low level features with semantic understanding of the observed visual information To solve such a semantic gap problem an efficient way is to develop a number of classifiers to identify the presence of semantic image components that can be connected to semantic descriptors Among various semantic objects the human face is a very important example which is usually also the most significant element in many images and photos The presence of faces can usually be correlated to specific scenes with semantic inference according to a given ontology Therefore face detection can be an efficient tool to annotate images for semantic descriptors In this thesis a paradigm to process analyze and interpret digital images is

proposed In order to speed up access to desired images after accessing image data image features are presented for analysis This analysis gives not only a structure for content based image retrieval but also the basic units ii for high level semantic image interpretation Finally images are interpreted and classified into some semantic categories by semantic object detection categorization algorithm

Artificial Intelligence for Maximizing Content Based Image Retrieval Ma, Zongmin,2009-01-31 Discusses major aspects of content based image retrieval CBIR using current technologies and applications within the artificial intelligence AI field Transactions on Computational Science XXV Marina L. Gavrilova,C.J. Kenneth Tan,Khalid Saeed,Nabendu Chaki,Soharab Hossain Shaikh,2015-04-27 The LNCS journal Transactions on Computational Science reflects recent developments in the field of Computational Science conceiving the field not as a mere ancillary science but rather as an innovative approach supporting many other scientific disciplines The journal focuses on original high quality research in the realm of computational science in parallel and distributed environments encompassing the facilitating theoretical foundations and the applications of large scale computations and massive data processing It addresses researchers and practitioners in areas ranging from aerospace to biochemistry from electronics to geosciences from mathematics to software architecture presenting verifiable computational methods findings and solutions and enabling industrial users to apply techniques of leading edge large scale high performance computational methods This the 25th issue of the Transactions on Computational Science journal consists of two parts Part I which is guest edited by Khalid Saeed Nabendu Chaki and Soharab Hossain Shaikh covers the areas of computer vision image processing for biometric security information fusion and Kinect activity recognition The papers in Part II focus on optimization through novel methods for data fusion clustering in WSN fault tolerance probability weight assignment and risk analysis

Pervasive Computing and Social Networking G. Ranganathan,Robert Bestak,Ram Palanisamy,Álvaro Rocha,2022-01-01 The book features original papers from International Conference on Pervasive Computing and Social Networking ICPCSN 2021 organized by NSIT Salem India during 19 20 march 2021 It covers research works on conceptual constructive empirical theoretical and practical implementations of pervasive computing and social networking methods for developing more novel ideas and innovations in the growing field of information and communication technologies

Intelligent Computing and Networking Valentina Emilia Balas,Vijay Bhaskar Semwal,Anand Khandare,2022-02-08 This book gathers high quality peer reviewed research papers presented at the International Conference on Intelligent Computing and Networking IC ICN 2021 organized by the Computer Department Thakur College of Engineering and Technology in Mumbai Maharashtra India on February 26 27 2021 The book includes innovative and novel papers in the areas of intelligent computing artificial intelligence machine learning deep learning fuzzy logic natural language processing human machine interaction big data mining data science and mining applications of intelligent systems in health care finance agriculture and manufacturing high performance computing computer networking sensor and wireless networks Internet of Things IoT software defined networks cryptography mobile

computing digital forensics and blockchain technology

Diabetes and Fundus OCT Ayman S. El-Baz, Jasjit Suri, 2020-04-03 Diabetes and Fundus OCT brings together a stellar cast of authors who review the computer aided diagnostic CAD systems developed to diagnose non proliferative diabetic retinopathy in an automated fashion using Fundus and OCTA images Academic researchers bioengineers new investigators and students interested in diabetes and retinopathy need an authoritative reference to bring this multidisciplinary field together to help reduce the amount of time spent on source searching and instead focus on actual research and the clinical application This reference depicts the current clinical understanding of diabetic retinopathy along with the many scientific advances in understanding this condition As the role of optical coherence tomography OCT in the assessment and management of diabetic retinopathy has become significant in understanding the vitreoretinal relationships and the internal architecture of the retina this information is more critical than ever

Deep Learning for Biomedical Data Analysis Mourad Elloumi, 2021-07-13 This book is the first overview on Deep Learning DL for biomedical data analysis It surveys the most recent techniques and approaches in this field with both a broad coverage and enough depth to be of practical use to working professionals This book offers enough fundamental and technical information on these techniques approaches and the related problems without overcrowding the reader's head It presents the results of the latest investigations in the field of DL for biomedical data analysis The techniques and approaches presented in this book deal with the most important and or the newest topics encountered in this field They combine fundamental theory of Artificial Intelligence AI Machine Learning ML and DL with practical applications in Biology and Medicine Certainly the list of topics covered in this book is not exhaustive but these topics will shed light on the implications of the presented techniques and approaches on other topics in biomedical data analysis The book finds a balance between theoretical and practical coverage of a wide range of issues in the field of biomedical data analysis thanks to DL The few published books on DL for biomedical data analysis either focus on specific topics or lack technical depth The chapters presented in this book were selected for quality and relevance The book also presents experiments that provide qualitative and quantitative overviews in the field of biomedical data analysis The reader will require some familiarity with AI ML and DL and will learn about techniques and approaches that deal with the most important and or the newest topics encountered in the field of DL for biomedical data analysis He she will discover both the fundamentals behind DL techniques and approaches and their applications on biomedical data This book can also serve as a reference book for graduate courses in Bioinformatics AI ML and DL The book aims not only at professional researchers and practitioners but also graduate students senior undergraduate students and young researchers This book will certainly show the way to new techniques and approaches to make new discoveries

Twin Support Vector Machines Jayadeva, Reshma Khemchandani, Suresh Chandra, 2016-10-12 This book provides a systematic and focused study of the various aspects of twin support vector machines TWSVM and related developments for classification and regression In addition to presenting most of the basic

models of TWSVM and twin support vector regression TWSVR available in the literature it also discusses the important and challenging applications of this new machine learning methodology A chapter on Additional Topics has been included to discuss kernel optimization and support tensor machine topics which are comparatively new but have great potential in applications It is primarily written for graduate students and researchers in the area of machine learning and related topics in computer science mathematics electrical engineering management science and finance

Image Retrieval Based on Region Classification, 2004 In this thesis a Content Based Image Retrieval CBIR system to query the objects in an image database is proposed Images are represented as collections of regions after being segmented with Normalized Cuts algorithm MPEG 7 content descriptors are used to encode regions in a 239 dimensional feature space User of the proposed CBIR system decides which objects to query and labels exemplar regions to train the system using a graphical interface Fuzzy ARTMAP algorithm is used to learn the mapping between feature vectors and binary coded class identification numbers Preliminary recognition experiments prove the power of fuzzy ARTMAP as a region classifier After training features of all regions in the database are extracted and classified Simple index files enabling fast access to all regions from a given class are prepared to be used in the querying phase To retrieve images containing a particular object user opens an image and selects a query region together with a label in the graphical interface of our system Then the system ranks all regions in the indexed set of the query class with respect to their L2 Euclidean distance to the query region and displays resulting images During retrieval experiments comparable class precisions with respect to exhaustive searching of the database are maintained which demonstrates effectiveness of the classifier in narrowing down the search space

Proceedings of the ... Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, 2003

Automatic Medical Image Classification for Content-based Image Retrieval Systems, 2007 In hospitals today medical images are normally processed and saved digitally in Picture Archiving and Communication Systems PACS along with some text descriptions within Digital Communication DICOM standards Additional information saved with the image could include a doctor's name patient identification etc This information is used to retrieve medical images but text query statements frequently ask for information that is not a part of these text descriptors or labels This situation will obviously have a negative effect on the result of a query submitted to retrieve the image Low level image features should help avoid this problem Low level features are those that are measurable and can be automatically extracted from an image These features include color shape and texture This research project investigated a method to link low level features that can be automatically extracted from the image to high level features that are represented in the textual Image Retrieval for Medical Application IRMA code included in test collection of images provided for this project The second project goal was to use semantic types included in the IRMA codes e.g plain radiography from image modality reproductive system form biological system facet to expand text queries so a content based image retrieval system can respond more effectively to specific

queries We used a machine learning approach to identify the link between low level features and text descriptions to automatically assign the semantic types from IRMA We used a standard dataset of images released by the ImageCLEF2005 conference to participating groups We indexed the whole dataset of 9 000 images using the GNU Image Finding Tool GIFT and extracted images features using the same application We used image features as well as the manually assigned IRMA classification code to train a multi class support vector machine SVM Multi class Our results showed that some medical images are easily classified using low level features These results also showed that the performance of the classifier was affected by the uneven distribution of images in each class of the ImageCLEF2005 campaign dataset Where the images were unique in any one of the four main facets of the IRMA code the classifier identified them correctly

Computers and Their Applications Narayan C. Debnath,1998 **Advances in Mechatronics, Robotics and Automation II** Prasad Yarlagadda,2014-04-04 Selected peer reviewed papers from the 2014 2nd International Conference on Mechatronics Robotics and Automation ICMRA 2014 March 8 9 2014 Zhuhai China *Advances in Computer-assisted Recognition* Robert J. Mericsko,1999 This collection of papers from the 27th AIPR Workshop on Advances in Computer Assisted Recognition covers a wide range of relevant issues and topics **Proceedings** ,2001 *Proceedings, ACM Multimedia ...* ,2002

Neurocomputing Research Developments Hugo A. Svensson,2007 Neurocomputing is at the centre of multidisciplinary research which involves computations by biological neural networks and those by artificial neural networks Topics include vision signal and pattern processing learning neurodynamics associative memory hardware and so on in the networks This important book presents new research in the field Storage and Retrieval for Media Databases ,2001

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