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Super-Resolution Imaging **Image Super-Resolution and Applications Iterative-Interpolation Super-Resolution Image Reconstruction Label-Free Super-Resolution Microscopy Motion-Free Super-Resolution** *Super-Resolution Imaging in Biomedicine* Super Resolution of Images and Video Super-Resolution Imaging Super Resolution of Images and Video **Optical Superresolution** Image Mosaicing and Super-resolution **Example-Based Super Resolution Image Super-Resolution and Applications Computational Intelligence Methods for Super-Resolution in Image Processing Applications Super Resolution Optical Imaging and Microscopy Super-Resolution Imaging in Biomedicine** *Super-Resolution Microscopy for Material Science* **Recent Advances in Fluorescent Probes for Super-Resolution Microscopy Plasmonics and Super-Resolution Imaging Digital Heritage Reconstruction Using Super-resolution and Inpainting Single Molecule Tools, Part B: Super-Resolution, Particle Tracking, Multiparameter, and Force Based Methods Super-Resolution Microscopy** *Image Mosaicing and Super-resolution* **High-Resolution Microwave Imaging Computer Vision -- ECCV 2014** *Multi-Frame Super-Resolution Techniques and Applications* **Plasmonics and Super-Resolution Imaging** *Advances in Pattern Recognition ICAPR2003* **Signal Processing and Performance Analysis for Imaging Systems Super-Resolution Microscopy Techniques in the Neurosciences** Advances in Intelligent Information Hiding and Multimedia Signal Processing Deep Learning for Computer Vision **Deep Learning for Image Processing Applications Advances in Multimedia Information Processing - PCM 2009** Biometric Recognition **Pattern Recognition** Nonlinear Super-Resolution Nano-Optics and Applications Hybrid Intelligent Systems *Proceedings of ELM-2015 Volume 2 Super-Resolution for Remote Sensing Applications Using Deep Learning Techniques*

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Optical microscopy is one of the most frequently used tools in chemistry and the life sciences. However, its limited resolution hampers the use of optical imaging to many other relevant problems in different disciplines. Super-Resolution Microscopy (SRM) is a new technique that allows the resolution of objects down to a few billionth of meters (nanometers), ten times better than classical microscopes, opening up opportunities to use this tool in new fields. This book describes the theory, principles, and practice of super-resolution microscopy in the field of materials science and nanotechnology. There is a growing interest in the applications of SRM beyond biology as new synthetic materials, such as nanoscale sensors and catalysts, nanostructured materials, functional polymers, and nanoparticles, have nanoscopic features that are challenging to visualize with traditional imaging methods. SRM has the potential to be used to image and understand these cutting-edge man-made objects and guide the design of materials for novel applications. This book is an ideal guide for researchers in the fields of microscopy and materials science and chemistry as well as graduate students studying physics, materials science, biomedical engineering, and chemistry. Key Features: Contains practical guidance on Super-Resolution Microscopy (SRM), an exciting and growing tool that was awarded the Nobel Prize for chemistry in 2014 Provides a new perspective targeting materials science, unlike existing books which target readers in chemistry, life science, and biology Targets students in its core chapters, while offering more advanced material for professionals and researchers in later chapters This book contains some selected papers from the International Conference on Extreme Learning Machine 2015, which was held in Hangzhou, China, December 15-17, 2015. This conference brought together researchers and engineers to share and exchange R&D experience on both theoretical studies and practical applications of the Extreme Learning Machine (ELM) technique and brain learning. This book covers theories, algorithms ad applications of ELM. It gives readers a glance of the most recent advances of ELM. To my wife, Mitu - Vivek Bannore Preface Preface In many imaging systems, under-sampling and aliasing occurs frequently leading to degradation of image quality. Due to the limited number of sensors available on the digital cameras, the quality of images captured is also limited. Factors such as optical or atmospheric blur and sensor noise can also contribute further to the d- radation of image

quality. Super-Resolution is an image reconstruction technique that enhances a sequence of low-resolution images or video frames by increasing the spatial resolution of the images. Each of these low-resolution images contain only incomplete scene information and are geometrically warped, aliased, and - der-sampled. Super-resolution technique intelligently fuses the incomplete scene information from several consecutive low-resolution frames to reconstruct a hi- resolution representation of the original scene. In the last decade, with the advent of new technologies in both civil and mi- tary domain, more computer vision applications are being developed with a demand for high-quality high-resolution images. In fact, the demand for high- resolution images is exponentially increasing and the camera manufacturing te- nology is unable to cope up due to cost efficiency and other practical reasons. This book comprehensively describes high-resolution microwave imaging and super-resolution information processing technologies and discusses new theories, methods and achievements in the high-resolution microwave imaging fields. Its chapters, which include abundant research results and examples, systematically summarize the authors' main research findings in recent years. The book is intended for researchers, engineers and postgraduates in the fields of electronics systems, signal information processing and data analysis, microwave remote sensing and microwave imaging radar, as well as space technology, especially in the microwave remote sensing and airborne or space-borne microwave imaging radar fields. Super Resolution Optical Imaging and Microscopy Extremely comprehensive resource containing cutting-edge and practical knowledge of super-resolution optical imaging This book covers both the basic principles and specific technical details of super-resolution microscopy techniques. It covers the criteria to choose different fluorophores for various SRM methods and critically assesses the nitty-gritty of associated problems that are often encountered in practical applications. A progressive guide to designing the next generation of advanced fluorophores to meet the goal of advanced SR imaging studies is also put forward. Written by two well-qualified authors, the book contains exclusive content to enhance readers' understanding on innovation of newer SRM technologies. Sample topics covered in the book include: Optical techniques, fluorescent probe design, and algorithm development Recent highlight and breakthroughs in biology using SRM methods The overall success of SRM in biological inventions The future direction and scope of the field This book is an invaluable resource for chemists and researchers/scientists involved in designing newer fluorescent materials for SRM studies. It can also assist biologists engaged in advanced biological studies using SRM by guiding them through sample preparation, image processing, and precautions to be taken in practical imaging studies. The Distinguished Dissertation Series is published on behalf of the Conference of Professors and Heads of Computing and the British Computer Society, who annually select the best British PhD dissertations in computer science for publication. The dissertations are selected on behalf of the CPHC by a panel of eight academics. Each dissertation chosen makes a noteworthy contribution to the subject and reaches a high standard of exposition, placing all results clearly in the context of computer science as a whole. In this way computer scientists with significantly different interests are able to grasp the essentials - or even find a means of entry - to an unfamiliar research topic. This book investigates how information contained in multiple, overlapping images of a scene may be combined to produce images of superior quality. This offers possibilities such as noise reduction, extended field of view, blur removal, increased spatial resolution and improved dynamic range. Potential applications cover fields as diverse as forensic video restoration, remote sensing, video compression and digital video editing. The book covers two aspects that have attracted particular attention in recent years: image mosaicing, whereby multiple images are aligned to produce a large composite; and super-resolution, which permits restoration at an increased resolution of poor quality video sequences by modelling and removing imaging degradations including noise, blur and spacial-sampling. It contains a comprehensive coverage and analysis of existing techniques, and describes in detail novel, powerful and automatic algorithms (based on a robust, statistical framework) for applying mosaicing and super-resolution. The algorithms may be implemented directly from the descriptions given here. A particular feature of the techniques is that it is not necessary to know the camera parameters (such as position and focal length) in order to apply

them. Throughout the book, examples are given on real image sequences, covering a variety of applications including: the separation of latent marks in forensic images; the automatic creation of 360 panoramic mosaics; and super-resolution restoration of various scenes, text, and faces in lw-quality video. This book focuses on the super resolution of images and video. The authors' use of the term super resolution (SR) is used to describe the process of obtaining a high resolution (HR) image, or a sequence of HR images, from a set of low resolution (LR) observations. This process has also been referred to in the literature as resolution enhancement (RE). SR has been applied primarily to spatial and temporal RE, but also to hyperspectral image enhancement. This book concentrates on motion based spatial RE, although the authors also describe motion free and hyperspectral image SR problems. Also examined is the very recent research area of SR for compression, which consists of the intentional downsampling, during pre-processing, of a video sequence to be compressed and the application of SR techniques, during post-processing, on the compressed sequence. It is clear that there is a strong interplay between the tools and techniques developed for SR and a number of other inverse problems encountered in signal processing (e.g., image restoration, motion estimation). SR techniques are being applied to a variety of fields, such as obtaining improved still images from video sequences (video printing), high definition television, high performance color Liquid Crystal Display (LCD) screens, improvement of the quality of color images taken by one CCD, video surveillance, remote sensing, and medical imaging. The authors believe that the SR/RE area has matured enough to develop a body of knowledge that can now start to provide useful and practical solutions to challenging real problems and that SR techniques can be an integral part of an image and video codec and can drive the development of new coder-decoders (codecs) and standards. This book investigates sets of images consisting of many overlapping viewsofa scene, and how the information contained within them may be combined to produce single images of superior quality. The generic name for such techniques is frame fusion. Using frame fusion, it is possible to extend the fieldof view beyond that ofany single image, to reduce noise, to restore high-frequency content, and even to increase spatial resolution and dynamic range. The aim in this book is to develop efficient, robust and automated frame fusion algorithms which may be applied to real image sequences. An essential step required to enable frame fusion is image registration: computing the point-to-point mapping between images in their overlapping region. This sub problem is considered in detail, and a robust and efficient solution is proposed and its accuracy evaluated. Two forms of frame fusion are then considered: image mosaic ing and super-resolution. Image mosaicing is the alignment of multiple images into a large composition which represents part of a 3D scene. Super-resolution is a more sophisticated technique which aims to restore poor-quality video sequences by mod elling and removing the degradations inherent in the imaging process, such as noise, blur and spatial-sampling. A key element in this book is the assumption of a completely uncalibrated cam era. No prior knowledge of the camera parameters, its motion, optics or photometric characteristics is assumed. The power of the methods is illustrated with many real image sequence examples. This book highlights the recent research on hybrid intelligent systems and their various practical applications. It presents 97 selected papers from the 22nd International Conference on Hybrid Intelligent Systems (HIS 2022) and 26 papers from the 18th International Conference on Information Assurance and Security, which was held online, from 13 to 15 December 2022. A premier conference in the field of artificial intelligence and machine learning applications, HIS–IAS 2022, brought together researchers, engineers and practitioners whose work involves intelligent systems, network security and their applications in industry. Including contributions by authors from over 35 countries, the book offers a valuable reference guide for all researchers, students and practitioners in the fields of Computer Science and Engineering. This book is devoted to the issue of image super-resolution—obtaining high-resolution images from single or multiple low-resolution images. Although there are numerous algorithms available for image interpolation and super-resolution, there's been a need for a book that establishes a common thread between the two processes. Filling this need, Image Super-Resolution and Applications presents image interpolation as a building block in the super-resolution reconstruction process. Instead of approaching

image interpolation as either a polynomial-based problem or an inverse problem, this book breaks the mold and compares and contrasts the two approaches. It presents two directions for image super-resolution: super-resolution with a priori information and blind super-resolution reconstruction of images. It also devotes chapters to the two complementary steps used to obtain high-resolution images: image registration and image fusion. Details techniques for color image interpolation and interpolation for pattern recognition Analyzes image interpolation as an inverse problem Presents image registration methodologies Considers image fusion and its application in image super resolution Includes simulation experiments along with the required MATLAB® code Supplying complete coverage of image-super resolution and its applications, the book illustrates applications for image interpolation and super-resolution in medical and satellite image processing. It uses MATLAB® programs to present various techniques, including polynomial image interpolation and adaptive polynomial image interpolation. MATLAB codes for most of the simulation experiments supplied in the book are included in the appendix. The authors explore the ways to improve the classical resolution limits of an imaging system, and provide novel approaches for achieving better results than would otherwise be possible with current imaging technology. The book begins by presenting the theoretical foundations, background information, and terminology of super resolution, and then discusses methods and systems used to achieve the super resolution effect. Various approaches to dealing with and exceeding the limitations of the lens aperture, the pixel size of the camera, and the noise generated at the detector are presented and analyzed. The last chapter illustrates several industry-related examples and potential applications to real industrial electro-optical systems. This book is intended for graduate students or researchers in academia or industry, and anyone else looking to improve the performance of their electro-optical system design. Image Resolution is the most important quality factor of videos and images. Multi-frame Super-resolution (SR) is the process of creating a higher resolution image with finer details, by using the information of multiple low-resolution images taken from almost the same scene. In recent years images with higher resolution became the most primary requirement in many of the image processing applications, such as scientific applications, medical imaging, robotics, video sequences and satellite imaging. This book aimed at providing a good guide in analyzing the most appropriate multi-frame super-resolution methods based on spatial and frequency domain. It also presents an optimized method which can be used for many image enhancement applications. With the exponential increase in computing power and broad proliferation of digital cameras, super-resolution imaging is poised to become the next "killer app." The growing interest in this technology has manifested itself in an explosion of literature on the subject. Super-Resolution Imaging consolidates key recent research contributions from eminent scholars and practitioners in this area and serves as a starting point for exploration into the state of the art in the field. It describes the latest in both theoretical and practical aspects of direct relevance to academia and industry, providing a base of understanding for future progress. Features downloadable tools to supplement material found in the book Recent advances in camera sensor technology have led to an increasingly larger number of pixels being crammed into ever-smaller spaces. This has resulted in an overall decline in the visual quality of recorded content, necessitating improvement of images through the use of post-processing. Providing a snapshot of the cutting edge in super-resolution imaging, this book focuses on methods and techniques to improve images and video beyond the capabilities of the sensors that acquired them. It covers: History and future directions of super-resolution imaging Locally adaptive processing methods versus globally optimal methods Modern techniques for motion estimation How to integrate robustness Bayesian statistical approaches Learning-based methods Applications in remote sensing and medicine Practical implementations and commercial products based on super-resolution The book concludes by concentrating on multidisciplinary applications of super-resolution for a variety of fields. It covers a wide range of super-resolution imaging implementation techniques, including variational, feature-based, multi-channel, learning-based, locally adaptive, and nonparametric methods. This versatile book can be used as the basis for short courses for engineers and scientists, or as part of graduate-level courses in image processing. This book constitutes the

refereed proceedings of the 7th Chinese Conference on Biometric Recognition, CCBR 2012, held in Guangzhou, China, in December 2012. The 46 revised full papers were carefully reviewed and selected from 80 submissions. The papers address the problems in face, iris, hand biometrics, speaker, handwriting, gait, soft biometrics, security and other related topics, and contribute new ideas to research and development of reliable and practical solutions for biometric authentication. The book presents selected papers from the 18th International Conference on Intelligent Information Hiding and Multimedia Signal Processing, held on December 16–18, 2022, in Kitakyushu, Japan. It is divided into two volumes and discusses latest research outcomes in the field of Information Technology (IT) including but not limited to information hiding, multimedia signal processing, big data, data mining, bioinformatics, database, industrial and internet of things, and their applications. Authors Katsaggelos, Molina, and Mateos present in a systematic way the building blocks of the Bayesian framework, which is also used as a reference in reviewing and comparing Super Resolution (SR) approaches which have appeared in the literature. This work should serve as a reference to the graduate student who would like to work in this area, to the practicing engineer, and scientists applying some of the tools and results to other related problems.The authors present a case that there is a strong relationship between the tools and techniques developed for SR and a number of other inverse problems encountered in signal processing (e.g., image restoration, and motion estimation). SR techniques can also be an integral part of an image and video codec and they can drive the development of new coder-decoders (codecs) and standards. This book constitutes the refereed proceedings of the 30th Symposium of the German Association for Pattern Recognition, DAGM 2008, held in Munich, Germany, in June 2008. The 53 revised full papers were carefully reviewed and selected from 136 submissions. The papers are organized in topical sections on learning and classification, tracking, medical image processing and segmentation, audio, speech and handwriting recognition, multiview geometry and 3D-reconstruction, motion and matching, and image analysis. Deep learning and image processing are two areas of great interest to academics and industry professionals alike. The areas of application of these two disciplines range widely, encompassing fields such as medicine, robotics, and security and surveillance. The aim of this book, 'Deep Learning for Image Processing Applications', is to offer concepts from these two areas in the same platform, and the book brings together the shared ideas of professionals from academia and research about problems and solutions relating to the multifaceted aspects of the two disciplines. The first chapter provides an introduction to deep learning, and serves as the basis for much of what follows in the subsequent chapters, which cover subjects including: the application of deep neural networks for image classification; hand gesture recognition in robotics; deep learning techniques for image retrieval; disease detection using deep learning techniques; and the comparative analysis of deep data and big data. The book will be of interest to all those whose work involves the use of deep learning and image processing techniques. This book constitutes the proceedings of the 10th Pacific Rim Conference on Multimedia, held in Bangkok, Thailand during December 15-18, 2009. The papers presented in the volume were carefully reviewed and selected from 171 submissions. The topics covered are exploring large-scale videos:automatic content genre classification, repair, enhancement and authentication, human behavior classification and recognition, image and video coding perceptual quality improvement, image annotation, retrieval, and classification, object detection and tracking, networking technologies, audio processing, 3DTV and mulit-view video, image watermarking, multimedia document search and retrieval, intelligent multimedia security and forensics, multimedia content management, image analysis and matching, coding, advanced image processing techniques, multimedia compressioin and optimization, multimedia security rights and management. Super-Resolution Imaging serves as an essential reference for both academicians and practicing engineers. It can be used both as a text for advanced courses in imaging and as a desk reference for those working in multimedia, electrical engineering, computer science, and mathematics. The first book to cover the new research area of super-resolution imaging, this text includes work on the following groundbreaking topics: Image zooming based on wavelets and generalized interpolation; Super-resolution from sub-pixel shifts; Use of blur as a cue; Use of warping

in super-resolution; Resolution enhancement using multiple apertures; Super-resolution from motion data; Super-resolution from compressed video; Limits in super-resolution imaging. Written by the leading experts in the field, Super-Resolution Imaging presents a comprehensive analysis of current technology, along with new research findings and directions for future work. Motion-Free Super-Resolution is a compilation of very recent work on various methods of generating super-resolution (SR) images from a set of low-resolution images. The current literature on this topic deals primarily with the use of motion cues for the purpose of generating SR images. These cues have, it is shown, their advantages and disadvantages. In contrast, this book shows that cues other than motion can also be used for the same purpose, and addresses both the merits and demerits of these new techniques. Motion-Free Super-Resolution supersedes much of the lead author's previous edited volume, "Super-Resolution Imaging," and includes an up-to-date account of the latest research efforts in this fast-moving field. This sequel also features a style of presentation closer to that of a textbook, with an emphasis on teaching and explanation rather than scholarly presentation. This book explores the application of deep learning techniques within a particularly difficult computational type of computer vision (CV) problem – super-resolution (SR). The authors present and discuss ways to apply computational intelligence (CI) methods to SR. The volume also explores the possibility of using different kinds of CV techniques to develop and enhance the tools/processes related to SR. The application areas covered include biomedical engineering, healthcare applications, medicine, histology, and material science. The book will be a valuable reference for anyone concerned with multiple multimodal images, especially professionals working in remote sensing, nanotechnology and immunology at research institutes, healthcare facilities, biotechnology institutions, agribusiness services, veterinary facilities, and universities. This book presents today's most powerful signal processing techniques together with methods for assessing imaging system performance when each of these techniques is applied. This multi-use book helps you make the most of sensor hardware through software enhancement, and evaluate system and algorithm performance. You also learn how to make the best hardware/software decisions in developing the next-generation of image acquisition and analysis systems. Example-Based Super Resolution provides a thorough introduction and overview of example-based super resolution, covering the most successful algorithmic approaches and theories behind them with implementation insights. It also describes current challenges and explores future trends. Readers of this book will be able to understand the latest natural image patch statistical models and the performance limits of example-based super resolution algorithms, select the best state-of-the-art algorithmic alternative and tune it for specific use cases, and quickly put into practice implementations of the latest and most successful example-based super-resolution methods. Provides detailed coverage of techniques and implementation details that have been successfully introduced in diverse and demanding real-world applications Covers a wide variety of machine learning approaches, ranging from cross-scale self-similarity concepts and sparse coding, to the latest advances in deep learning Presents a statistical interpretation of the subspace of natural image patches that transcends super resolution and makes it a valuable source for any researcher on image processing or low-level vision The seven-volume set comprising LNCS volumes 8689-8695 constitutes the refereed proceedings of the 13th European Conference on Computer Vision, ECCV 2014, held in Zurich, Switzerland, in September 2014. The 363 revised papers presented were carefully reviewed and selected from 1444 submissions. The papers are organized in topical sections on tracking and activity recognition; recognition; learning and inference; structure from motion and feature matching; computational photography and low-level vision; vision; segmentation and saliency; context and 3D scenes; motion and 3D scene analysis; and poster sessions. This book is devoted to the issue of image super-resolution-obtaining high-resolution images from single or multiple low-resolution images. Although there are numerous algorithms available for image interpolation and super-resolution, there's been a need for a book that establishes a common thread between the two processes. Filling this need, Image This book encompasses the full breadth of the super-resolution imaging field, representing modern techniques that exceed the traditional diffraction limit, thereby opening up new applications in biomedicine. It

shows readers how to use the new tools to increase resolution in sub-nanometer-scale images of living cells and tissue, which leads to new information about molecules, pathways and dynamics. The book highlights the advantages and disadvantages of the techniques, and gives state-of-the-art examples of applications using microscopes currently available on the market. It covers key techniques such as stimulated emission depletion (STED), structured illumination microscopy (SSIM), photoactivated localization microscopy (PALM), and stochastic optical reconstruction microscopy (STORM). It will be a useful reference for biomedical researchers who want to work with super-resolution imaging, learn the proper technique for their application, and simultaneously obtain a solid footing in other techniques. Plasmonics is an emerging field mainly developed within the past two decades. Due to its unique capabilities to manipulate light at deep subwavelength scales, plasmonics has been commonly treated as the most important part of nanophotonics. Plasmonic-assisted optical microscopy techniques, especially super-resolution microscopy, have shown tremendous potential and attracted much attention. This book aims to collect cutting-edge studies in various optical imaging technologies with advanced performances that are enabled or enhanced by plasmonics. The basic working principles, development details, and potential future direction and perspectives are discussed. Edited by Zhaowei Liu, a prominent researcher in the field of super-resolution microscopy, this book will be an excellent reference for anyone in the field of nanophotonics, plasmonics, and optical microscopy. This book presents the advances in super-resolution microscopy in physics and biomedical optics for nanoscale imaging. In the last decade, super-resolved fluorescence imaging has opened new horizons in improving the resolution of optical microscopes far beyond the classical diffraction limit, leading to the Nobel Prize in Chemistry in 2014. This book represents the first comprehensive review of a different type of super-resolved microscopy, which does not rely on using fluorescent markers. Such label-free super-resolution microscopy enables potentially even broader applications in life sciences and nanoscale imaging, but is much more challenging and it is based on different physical concepts and approaches. A unique feature of this book is that it combines insights into mechanisms of label-free super-resolution with a vast range of applications from fast imaging of living cells to inorganic nanostructures. This book can be used by researchers in biological and medical physics. Due to its logically organizational structure, it can be also used as a teaching tool in graduate and upper-division undergraduate-level courses devoted to super-resolved microscopy, nanoscale imaging, microscopy instrumentation, and biomedical imaging. This book covers many advances in the subjects of nano-optics and nano photonics. The author describes the principle and technical schematics of common methods for breaking through the optical diffraction limit and focuses on realizing optical super-resolution with nonlinear effects of thin film materials. The applications of nonlinear optical super-resolution effects in nano-data storage, nanolithography, and nano-imaging are also presented. This book is useful to graduate students majoring in optics and nano science and also serves as a reference book for academic researchers, engineers, technical professionals in the fields of super-resolution optics and laser techniques, nano-optics and nano photonics, nano-data storage, nano imaging, micro/nanofabrication and nanolithography and nonlinear optics. Plasmonics is an emerging field mainly developed within the past two decades. Due to its unique capabilities to manipulate light at deep subwavelength scales, plasmonics has been commonly treated as the most important part of nanophotonics. Plasmonic-assisted optical microscopy techniques, especially super-resolution microscopy, have shown tremendous potential and attracted much attention. This book aims to collect cutting-edge studies in various optical imaging technologies with advanced performances that are enabled or enhanced by plasmonics. The basic working principles, development details, and potential future direction and perspectives are discussed. Edited by Zhaowei Liu, a prominent researcher in the field of super-resolution microscopy, this book will be an excellent reference for anyone in the field of nanophotonics, plasmonics, and optical microscopy. Single molecule tools have begun to revolutionize the molecular sciences, from biophysics to chemistry to cell biology. They hold the promise to be able to directly observe previously unseen molecular heterogeneities, quantitatively dissect complex reaction kinetics, ultimately miniaturize enzyme assays, image components of

spatially distributed samples, probe the mechanical properties of single molecules in their native environment, and "just look at the thing" as anticipated by the visionary Richard Feynman already half a century ago. Single Molecule Tools, Part B: Super-Resolution, Particle Tracking, Multiparameter, and Force Based Methods captures a snapshot of this vibrant, rapidly expanding field, presenting articles from pioneers in the field intended to guide both the newcomer and the expert through the intricacies of getting single molecule tools. Includes time-tested core methods and new innovations applicable to any researcher employing single molecule tools Methods included are useful to both established researchers and newcomers to the field Relevant background and reference information given for procedures can be used as a guide to developing protocols in a number of disciplines This unique book on super-resolution microscopy techniques presents comparative, in-depth analyses of the strengths and weaknesses of the individual approaches. It was written for non-experts who need to understand the principles of super-resolution or who wish to use recently commercialized instruments as well as for professionals who plan to realize novel microscopic devices. Explaining the practical requirements in terms of hardware, software and sample preparation, the book offers a wealth of hands-on tips and practical tricks to get a setup running, provides invaluable help and support for successful data acquisition and specific advice in the context of data analysis and visualization. Furthermore, it addresses a wide array of transdisciplinary fields of applications. The author begins by outlining the joint efforts that have led to achieving super-resolution microscopy combining advances in single-molecule photo-physics, fluorophore design and fluorescent labeling, instrument design and software development. The following chapters depict and compare current main standard techniques such as structured illumination microscopy, single-molecule localization, stimulated emission depletion microscopy and multi-scale imaging including light-sheet and expansion microscopy. For each individual approach the experimental setups are introduced, the imaging protocols are provided and the various applications illustrated. The book concludes with a discussion of future challenges addressing issues of routine applications and further commercialization of the available methods. Guiding users in how to make choices for the design of their own experiments from scratch to promising application, this one-stop resource is intended for researchers in the applied sciences, from chemistry to biology and medicine to physics and engineering. This book encompasses the full breadth of the super-resolution imaging field, representing modern techniques that exceed the traditional diffraction limit, thereby opening up new applications in biomedicine. It shows readers how to use the new tools to increase resolution in sub-nanometer-scale images of living cells and tissue, which leads to new information about molecules, pathways and dynamics. The book highlights the advantages and disadvantages of the techniques, and gives state-of-the-art examples of applications using microscopes currently available on the market. It covers key techniques such as stimulated emission depletion (STED), structured illumination microscopy (SSIM), photoactivated localization microscopy (PALM), and stochastic optical reconstruction microscopy (STORM). It will be a useful reference for biomedical researchers who want to work with super-resolution imaging, learn the proper technique for their application, and simultaneously obtain a solid footing in other techniques. Super-Resolution Microscopy Techniques in the Neurosciences serves as a comprehensive description of current super-resolution techniques, including the physical principles that allowed for their development, some of the most recent neurobiological applications and selected information for the practical use of these technologies. Written for the Neuromethods series, this detailed work contains contributions from experts in the field and provides key implementation advice to ensure successful results in the lab. Authoritative and cutting-edge, Super-Resolution Microscopy Techniques in the Neurosciences is an ideal guide for researchers aiming to continue increasing the resolution in the imaging capabilities of neuroscientists and thereby changing the perspective in which cellular biology processes are understood at the nanometer scale. Learn how to model and train advanced neural networks to implement a variety of Computer Vision tasks Key Features Train different kinds of deep learning model from scratch to solve specific problems in Computer Vision Combine the power of Python, Keras, and TensorFlow to build deep learning models for object detection, image

classification, similarity learning, image captioning, and more Includes tips on optimizing and improving the performance of your models under various constraints Book Description Deep learning has shown its power in several application areas of Artificial Intelligence, especially in Computer Vision. Computer Vision is the science of understanding and manipulating images, and finds enormous applications in the areas of robotics, automation, and so on. This book will also show you, with practical examples, how to develop Computer Vision applications by leveraging the power of deep learning. In this book, you will learn different techniques related to object classification, object detection, image segmentation, captioning, image generation, face analysis, and more. You will also explore their applications using popular Python libraries such as TensorFlow and Keras. This book will help you master state-of-the-art, deep learning algorithms and their implementation. What you will learn Set up an environment for deep learning with Python, TensorFlow, and Keras Define and train a model for image and video classification Use features from a pre-trained Convolutional Neural Network model for image retrieval Understand and implement object detection using the real-world Pedestrian Detection scenario Learn about various problems in image captioning and how to overcome them by training images and text together Implement similarity matching and train a model for face recognition Understand the concept of generative models and use them for image generation Deploy your deep learning models and optimize them for high performance Who this book is for This book is targeted at data scientists and Computer Vision practitioners who wish to apply the concepts of Deep Learning to overcome any problem related to Computer Vision. A basic knowledge of programming in Python—and some understanding of machine learning concepts—is required to get the best out of this book. Satellite image processing is crucial in detecting vegetation, clouds, and other atmospheric applications. Due to sensor limitations and pre-processing, remotely sensed satellite images may have interpretability concerns as to specific portions of the image, making it hard to recognise patterns or objects and posing the risk of losing minute details in the image. Existing imaging processors and optical components are expensive to counterfeit, have interpretability issues, and are not necessarily viable in real applications. This book exploits the usage of deep learning (DL) components in feature extraction to boost the minute details of images and their classification implications to tackle such problems. It shows the importance of super-resolution in improving the spatial details of images and aiding digital aerial photography in pan-sharpening, detecting signatures correctly, and making precise decisions with decision-making tools. Heritage sites across the world have witnessed a number of natural calamities, sabotage and damage from visitors, resulting in their present ruined condition. Many sites are now restricted to reduce the risk of further damage. Yet these masterpieces are significant cultural icons and critical markers of past civilizations that future generations need to see. A digitally reconstructed heritage site could diminish further harm by using immersive navigation or walkthrough systems for virtual environments. An exciting key element for the viewer is observing fine details of the historic work and viewing monuments in their undamaged form. This book presents image super-resolution methods and techniques for automatically detecting and inpainting damaged regions in heritage monuments, in order to provide an enhanced visual experience. The book presents techniques to obtain higher resolution photographs of the digitally reconstructed monuments, and the resulting images can serve as input to immersive walkthrough systems. It begins with the discussion of two novel techniques for image super-resolution and an approach for inpainting a user-supplied region in the given image, followed by a technique to simultaneously perform super-resolution and inpainting of given missing regions. It then introduces a method for automatically detecting and repairing the damage to dominant facial regions in statues, followed by a few approaches for automatic crack repair in images of heritage scenes. This book is a giant step toward ensuring that the iconic sites of our past are always available, and will never be truly lost.

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