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**OpenCV 3 Computer Vision Application Programming Cookbook - Third Edition** *OpenCV 4 Computer Vision Application Programming Cookbook* **OpenCV Computer Vision Application Programming Cookbook Second Edition** *OpenCV 3 Computer Vision Application Programming Cookbook* **OpenCV Computer Vision Application Programming Cookbook** *Opencv Computer Vision Application Programming Cookbook* **OpenCV 2 Computer Vision Application Programming Cookbook** **Android Application Programming with OpenCV** *Learning OpenCV 4 Computer Vision with Python 3* **OpenCV 4 Computer Vision Application Programming Cookbook** *Qt 5 and OpenCV 4 Computer Vision Projects* *Building Computer Vision Applications Using Artificial Neural Networks* **Mastering Opencv Android Application Programming** **Microsoft Computer Vision APIs Distilled** *Android Application Programming with Opencv 3* **Learning OpenCV 3 Computer Vision with Python Programming** **Computer Vision with Python Learning** **OpenCV 3 Application Development Deep Learning for Computer Vision Machine Vision Algorithms and Applications** **Building Computer Vision Projects with OpenCV 4 and C++** *OpenCV 3 Blueprints* **IOS Application Development with OpenCV 3** *Mastering Computer Vision with TensorFlow 2.x* *Qt 5 and OpenCV 4 Computer Vision Projects* **Evolutionary Computer Vision A Practical Introduction to Computer Vision with OpenCV** *Fundamentals of Computer Vision* **Mastering OpenCV Android Application Programming** **Mastering OpenCV 3 Practical Computer Vision with SimpleCV** *Learn Computer Vision Using OpenCV* **OpenVX Programming Guide** **Modern Computer Vision with PyTorch** **Arduino Computer Vision Programming** **Pro Processing for Images and Computer Vision with OpenCV** **Machine Vision Algorithms in Java** *Computer Vision for the Web* **OpenCV: Computer Vision Projects with Python** *OpenCV 4 for Secret Agents*

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The second edition of this successful machine vision textbook is completely updated, revised and expanded by 35% to reflect the developments of recent years in the fields of image acquisition, machine vision algorithms and applications. The new content includes, but is not limited to, a discussion of new camera and image acquisition interfaces, 3D sensors and technologies, 3D reconstruction, 3D object recognition and state-of-the-art classification algorithms. The authors retain their balanced approach with sufficient coverage of the theory and a strong focus on applications. All examples are based on the latest version of the machine vision software HALCON 13. Dive headfirst into Microsoft's Computer Vision APIs through sample-driven scenarios! Imagine an app that describes to the visually impaired the objects around them, or reads the Sunday paper, a favorite magazine, or a street sign. Or an app that is capable of monitoring what is happening inside an area without human control, and then makes a decision based on interpreting an occurrence detected with a live camera. This book teaches developers Microsoft's Computer Vision APIs, a service capable of understanding and interpreting the content of any image. Author Del Sole begins by providing a succinct "need to know" overview of the service with descriptions. You then learn from hands-on demonstrations that show how basic C# code examples can be re-used across platforms. From there you will be guided through two different kinds of applications that interact with the service in two different ways: the more common means of calling a REST service to get back JSON data, and via the .NET libraries that Microsoft has been building to simplify the job (this latter one with Xamarin). What You'll Learn Understand AI's role and how devices and applications use sophisticated algorithms to improve people's lives and business tasks. Analyze images for Optical Character Recognition to detect written words and sentences Think about the next-generation applications in relation to your customers' needs Get up-to-speed on the latest version of the Computer Vision service, which now comes through Azure Set up an Azure subscription in order to access the Cognitive Services within the portal After reading this book, you will be able to get started with AI services from Microsoft in order to begin building powerful new apps for your company or customers. Who This Book Is For Developers just getting familiar with artificial intelligence. A minimal knowledge of C# is required. Delve into practical computer vision and image processing projects and get up to speed with advanced object detection techniques and machine learning algorithms Key FeaturesDiscover best practices for engineering and maintaining OpenCV projectsExplore important deep learning tools for image classificationUnderstand basic image matrix formats and filtersBook Description OpenCV is one of the best open source libraries available and can help you focus on constructing complete projects on image processing, motion detection, and image segmentation. This Learning Path is your guide to understanding OpenCV concepts and algorithms through real-world examples and activities. Through various projects, you'll also discover how to use complex computer vision and machine learning algorithms and face detection to extract the maximum amount of information from images and videos. In later chapters, you'll learn to enhance your videos and images with optical flow analysis and background subtraction. Sections in the Learning Path will help you get to grips with text segmentation and recognition, in addition to guiding you through the basics of the new and improved deep learning modules. By the end of this Learning Path, you will have mastered commonly used computer vision techniques to build OpenCV projects from scratch. This Learning Path includes content from the following Packt books: Mastering OpenCV 4 - Third Edition by Roy Shilkrot and David Millán EscriváLearn OpenCV 4 By Building Projects - Second Edition by David Millán Escrivá, Vinicius G. Mendonça, and Prateek JoshiWhat you will learnStay up-to-date with algorithmic design approaches for complex computer vision tasksWork with OpenCV's most up-to-date API through various projectsUnderstand 3D scene reconstruction and Structure from Motion (SfM)Study camera calibration and overlay augmented reality (AR) using the ArUco moduleCreate CMake scripts to compile your C++ applicationExplore segmentation and feature extraction techniquesRemove backgrounds from static scenes to identify moving objects for surveillanceWork with new OpenCV functions to detect and recognize text with TesseractWho this book is for If you are a software developer with a basic understanding of computer vision and image processing and want to develop interesting computer vision applications with OpenCV, this Learning Path is for you. Prior knowledge of C++ and familiarity with mathematical concepts will help you better understand the concepts in this Learning Path. A step-by-step tutorial to help you master computer vision and mobile app development.This book is for Java developers who are new to computer vision and who would like to learn about how it is used in relation to application development. It is assumed that you have previous experience in Java, but not necessarily Android. A basic understanding of image data (for example pixels and color channels) would be helpful too. You are expected to have a mobile device running Android 2.2 (Froyo) or greater and it must have a camera. If you are a Java and Android developer looking to enhance your skills by learning the latest features of OpenCV Android application programming, then this book is for you. 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. Expand your knowledge of computer vision by building amazing projects with OpenCV 3 About This Book Build computer vision projects to capture high-quality image data, detect and track objects, process the actions of humans or animals, and much more Discover practical and interesting innovations in computer vision while building atop a mature open-source library, OpenCV 3 Familiarize yourself with multiple approaches and theories wherever critical decisions need to be made Who This Book Is For This book is ideal for you if you aspire to build computer vision systems that are smarter, faster, more complex, and more practical than the competition. This is an advanced book intended for those who already have some experience in setting up an OpenCV development environment and building applications with OpenCV. You should be comfortable with computer vision concepts, object-oriented programming, graphics programming, IDEs, and the command line. What You Will Learn Select and configure camera systems to see invisible light, fast motion, and distant objects Build a "camera trap", as used by nature photographers, and process photos to create beautiful effects Develop a facial expression recognition system with various feature extraction techniques and machine learning methods Build a panorama Android application using the OpenCV stitching module in C++ with NDK support Optimize your object detection model, make it rotation invariant, and apply scene-specific constraints to make it faster and more robust Create a person identification and registration system based on biometric properties of that person, such as their fingerprint, iris, and face Fuse data from videos and gyroscopes to stabilize videos shot from your mobile phone and create hyperlapse style videos In Detail Computer vision is becoming accessible to a large audience of software developers who can leverage mature libraries such as OpenCV. However, as they move beyond their first experiments in computer vision, developers may struggle to ensure that their solutions are sufficiently well optimized, well trained, robust, and adaptive in real-world conditions. With sufficient knowledge of OpenCV, these developers will have enough confidence to go about creating projects in the field of computer vision. This book will help you tackle increasingly challenging computer vision problems that you may face in your careers. It makes use of OpenCV 3 to work around some interesting projects. Inside these pages, you will find practical and innovative approaches that are battle-tested in the authors' industry experience and research. Each chapter covers the theory and practice of multiple complementary approaches so that you will be able to choose wisely in your future projects. You will also gain insights into the architecture and algorithms that underpin OpenCV's functionality. We begin by taking a critical look at inputs in order to decide which kinds of light, cameras, lenses, and image formats are best suited to a given purpose. We proceed to consider the finer aspects of computational photography as we build an automated camera to assist nature photographers. You will gain a deep understanding of some of the most widely applicable and reliable techniques in object detection, feature selection, tracking, and even biometric recognition. We will also build Android projects in which we explore the complexities of camera motion: first in panoramic image stitching and then in video stabilization. By the end of the book, you will have a much richer understanding of imaging, motion, machine learning, and the architecture of computer vision libraries and applications! Style and approach This book covers a combination of theory and practice. We examine blueprints for specific

projects and discuss the principles behind these blueprints, in detail. OpenVX is the computer vision API adopted by many high-performance processor vendors. It is quickly becoming the preferred way to write fast and power-efficient code on embedded systems. OpenVX Programming Guidebook presents definitive information on OpenVX 1.2 and 1.3, the Neural Network, and other extensions as well as the OpenVX Safety Critical standard. This book gives a high-level overview of the OpenVX standard, its design principles, and overall structure. It covers computer vision functions and the graph API, providing examples of usage for the majority of the functions. It is intended both for the first-time user of OpenVX and as a reference for experienced OpenVX developers. Get to grips with the OpenVX standard and gain insight why various options were chosen Start developing efficient OpenVX code instantly Understand design principles and use them to create robust code Develop consumer and industrial products that use computer vision to understand and interact with the real world Create image processing, object detection and face recognition apps by leveraging the power of machine learning and deep learning with OpenCV 4 and Qt 5 Key FeaturesGain practical insights into code for all projects covered in this bookUnderstand modern computer vision concepts such as character recognition, image processing and modificationLearn to use a graphics processing unit (GPU) and its parallel processing power for filtering images quicklyBook Description OpenCV and Qt have proven to be a winning combination for developing cross-platform computer vision applications. By leveraging their power, you can create robust applications with both an intuitive graphical user interface (GUI) and high-performance capabilities. This book will help you learn through a variety of real-world projects on image processing, face and text recognition, object detection, and high-performance computing. You'll be able to progressively build on your skills by working on projects of increasing complexity. You'll begin by creating an image viewer application, building a user interface from scratch by adding menus, performing actions based on key-presses, and applying other functions. As you progress, the book will guide you through using OpenCV image processing and modification functions to edit an image with filters and transformation features. In addition to this, you'll explore the complex motion analysis and facial landmark detection algorithms, which you can use to build security and face detection applications. Finally, you'll learn to use pretrained deep learning models in OpenCV and GPUs to filter images quickly. By the end of this book, you will have learned how to effectively develop full-fledged computer vision applications with OpenCV and Qt. What you will learnCreate an image viewer with all the basic requirementsConstruct an image editor to filter or transform imagesDevelop a security app to detect movement and secure homesBuild an app to detect facial landmarks and apply masks to facesCreate an app to extract text from scanned documents and photosTrain and use cascade classifiers and DL models for object detectionBuild an app to measure the distance between detected objectsImplement high-speed image filters on GPU with Open Graphics Library (OpenGL)Who this book is for This book is for engineers and developers who are familiar with both Qt and OpenCV frameworks and are capable of creating simple projects using them, but want to build their skills to create professional-level projects using them. Familiarity with the C++ language is a must to follow the example source codes in this book. Discover interesting recipes to help you understand the concepts of object detection, image processing, and facial detection Key Features Explore the latest features and APIs in OpenCV 4 and build computer vision algorithms Develop effective, robust, and fail-safe vision for your applications Build computer vision algorithms with machine learning capabilities Book Description OpenCV is an image and video processing library used for all types of image and video analysis. Throughout the book, you'll work through recipes that implement a variety of tasks, such as facial recognition and detection. With 70 self-contained tutorials, this book examines common pain points and best practices for computer vision (CV) developers. Each recipe addresses a specific problem and offers a proven, best-practice solution with insights into how it works, so that you can copy the code and configuration files and modify them to suit your needs. This book begins by setting up OpenCV, and explains how to manipulate pixels. You'll understand how you can process images with classes and count pixels with histograms. You'll also learn detecting, describing, and matching interest points. As you advance through the chapters, you'll get to grips with estimating projective relations in images, reconstructing 3D scenes, processing video sequences, and tracking visual motion. In the final chapters, you'll cover deep learning concepts such as face and object detection. By the end of the book, you'll be able to confidently implement a range to computer vision algorithms to meet the technical requirements of your complex CV projects What you will learn Install and create a program using the OpenCV library Segment images into homogenous regions and extract meaningful objects Apply image filters to enhance image content Exploit image geometry to relay different views of a pictured scene Calibrate the camera from different image observations Detect people and objects in images using machine learning techniques Reconstruct a 3D scene from images Explore face detection using deep learning Who this book is for If you're a CV developer or professional who already uses or would like to use OpenCV for building computer vision software, this book is for you. You'll also find this book useful if you're a C++ programmer looking to extend your computer vision skillset by learning OpenCV. Explains the theory behind basic computer vision and provides a bridge from the theory to practical implementation using the industry standard OpenCV libraries Computer Vision is a rapidly expanding area and it is becoming progressively easier for developers to make use of this field due to the ready availability of high quality libraries (such as OpenCV2). This text is intended to facilitate the practical use of computer vision with the goal being to bridge the gap between the theory and the practical implementation of computer vision. The book will explain how to use the relevant OpenCV library routines and will be accompanied by a full working program including the code snippets from the text. This textbook is a heavily illustrated, practical introduction to an exciting field, the applications of which are becoming almost ubiquitous. We are now surrounded by cameras, for example cameras on computers & tablets/ cameras built into our mobile phones/ cameras in games consoles; cameras imaging difficult modalities (such as ultrasound, X-ray, MRI) in hospitals, and surveillance cameras. This book is concerned with helping the next generation of computer developers to make use of all these images in order to develop systems which are more intuitive and interact with us in more intelligent ways. Explains the theory behind basic computer vision and provides a bridge from the theory to practical implementation using the industry standard OpenCV libraries Offers an introduction to computer vision, with enough theory to make clear how the various algorithms work but with an emphasis on practical programming issues Provides enough material for a one semester course in computer vision at senior undergraduate and Masters levels Includes the basics of cameras and images and image processing to remove noise, before moving on to topics such as image histogramming; binary imaging; video processing to detect and model moving objects; geometric operations & camera models; edge detection; feature detection; recognition in images Contains a large number of vision application problems to provide students with the opportunity to solve real problems. Images or videos for these problems are provided in the resources associated with this book which include an enhanced eBook Design and develop real-world computer vision applications with the powerful combination of OpenCV and Arduino About This Book- Load and run the applications in Arduino to develop intelligent systems- Design and implement detection, classification, and recognition algorithms for computer vision applications- Explore the best practices of computer vision development including state of the art algorithms and hands-on example projects Who This Book Is For If you are a consumer and hobbyist who has familiarity with the basics of Arduino and wish to learn computer vision programming with Arduino to create intelligent systems, then this book is for you. No knowledge of computer vision programming is required. What You Will Learn- Understand the design blocks and the generic architecture of computer vision systems by learning an efficient approach to modelling- Build up your skill set of computer vision system design using OpenCV by learning fundamentals, camera selection, data acquisition, filtering, processing, feature extraction and recognition for any specific problem- Learn the wired and wireless communication capabilities of Arduino and comprehensive best practices to connect it to the OpenCV environment in a platform-independent way- Discover how to use Arduino to elegantly interact with real life via physical actions- Solidify everything you've learnt by designing and building a computer vision-enabled practical robot from scratch In details Most technologies are developed with an inspiration of human capabilities. Most of the time, the hardest to implement capability is vision. Development of highly capable computer vision applications in an easy way requires a generic approach. In this approach, Arduino is a perfect tool for interaction with the real world. Moreover, the combination of OpenCV and Arduino boosts the level and quality of practical computer vision applications. Computer vision is the next level of sensing the environment. The purpose of this book is to teach you how to develop Arduino-supported computer vision systems that can interact with real life by seeing it. This book will combine the powers of Arduino and computer vision in a generalized, well-defined, and applicable way. The practices and approaches in the book can be used for any related problems and on any platforms. At the end of the book, you should be able to solve any types of real life vision problems with all its components by using the presented approach. Each component will extend your vision with the best practices on the topic. In each chapter, you will find interesting real life practical application examples about the topics in the chapter. To make it grounded, we will build a vision-enabled robot step by step towards the end of the book. You will observe that, even though the contexts of the problems are very different, the approaches to solve them are the same and very easy! Style and approach This book is a step-by-step guide that explains each topic sequentially by using best practices and useful tips to build computer-vision applications with OpenCV and Arduino. All the information in the book is combined in a real life all-in-one example application. Apply the Processing language to tasks involved in computer vision--tasks such as edge and corner detection, recognition of motion between frames in a video, recognition of objects, matching of feature points and shapes in different frames for tracking purposes, and more. You will manipulate images through creative effects, geometric transformation, blending of multiple images, and so forth. Examples are provided. Pro Processing for Images and Computer Vision with OpenCV is a step-by-step training tool that guides you through a series of worked examples in linear order. Each chapter begins with a basic demonstration, including the code to recreate it on your own system. Then comes a creative challenge by which to engage and develop mastery of the chapter's topic. The book also includes hints and tips relating to visual arts, interaction design, and industrial best practices. This book is intended for any developer of artistic and otherwise visual applications, such as in augmented reality and digital effects, with a need to manipulate images, and to recognize and manipulate objects within those images. The book is specifically targeted at those making use of the Processing language that is common in artistic fields, and to Java programmers because of Processing's easy integration into the Java programming environment. What You'll Learn Make use of OpenCV, the open source library for computer vision in the Processing environment Capture live video streams and examine them frame-by-frame for objects in motion Recognize shapes and objects through techniques of detecting lines, edges, corners, and more Transform images by scaling, translating, rotating, and additionally through various distortion effects Apply techniques such as background subtraction to isolate motion of objects in live video streams Detect and track human faces and other objects by matching feature points in different images or video frames Who This Book Is For Media artists, designers, and creative coders Unleash the power of computer vision with Python using OpenCV About This Book- Create impressive applications with OpenCV and Python- Familiarize yourself with advanced machine learning concepts- Harness the power of computer vision with this easy-to-follow guide Who This Book Is For Intended for novices to the world of OpenCV and computer vision, as well as OpenCV veterans that want to learn about what's new in OpenCV 3, this book is useful as a reference for experts and a training manual for beginners, or for anybody who wants to familiarize themselves with the concepts of object classification and detection in simple and understandable terms. Basic knowledge about Python and programming concepts is required, although the book has an easy learning curve both from a theoretical and coding point of view. What You Will Learn- Install and familiarize yourself with OpenCV 3's Python API- Grasp the basics of image processing and video analysis- Identify and recognize objects in images and videos- Detect and recognize faces using OpenCV- Train and use your own object classifiers- Learn about machine learning concepts in a computer vision context- Work with artificial neural networks using OpenCV- Develop your own computer vision real-life application In Detail OpenCV 3 is a state-of-the-art computer vision library that allows a great variety of image and video processing operations. Some of the more spectacular and futuristic features such as face recognition or object tracking are easily achievable with OpenCV 3. Learning the basic concepts behind computer vision algorithms, models, and OpenCV's API will enable the development of all sorts of real-world applications, including security and surveillance. Starting with basic image processing operations, the book will take you through to advanced computer vision concepts. Computer vision is a rapidly evolving science whose applications in the real world are exploding, so this book will appeal to computer vision novices as well as experts of the subject wanting to learn the brand new OpenCV 3.0.0. You will build a theoretical foundation of image processing and video analysis, and progress to the concepts of classification through machine learning, acquiring the technical know-how that will allow you to create and use object detectors and classifiers, and even track objects in movies or video camera feeds. Finally, the journey will end in the world of artificial neural networks, along with the development of a hand-written digits recognition application. Style and approach This book is a comprehensive guide to the brand new OpenCV 3 with Python to develop real-life computer vision applications. Get savvy with OpenCV and actualize cool computer vision applications About This Book- Use OpenCV's Python bindings to capture video, manipulate images, and track objects- Learn about the different functions of OpenCV and their actual implementations.- Develop a series of intermediate to advanced projects using OpenCV and Python Who This Book Is For This learning path is for someone who has a working knowledge of Python and wants to try out OpenCV. This Learning Path will take you from a beginner to an expert in computer vision applications using OpenCV. OpenCV's application are humongous and this Learning Path is the best resource to get yourself acquainted thoroughly with OpenCV. What You Will Learn- Install OpenCV and related software such as Python, NumPy, SciPy, OpenNI, and SensorKinect - all on Windows, Mac or Ubuntu- Apply "curves" and other color transformations to simulate the look of old photos, movies, or video games- Apply geometric transformations to images, perform image filtering, and convert an image into a cartoon-like image- Recognize hand gestures in real time and perform hand-shape analysis based on the output of a Microsoft Kinect sensor- Reconstruct a 3D real-world scene from 2D camera motion and common camera reprojection techniques- Detect and recognize street signs using a cascade classifier and support vector machines (SVMs)- Identify emotional expressions in human faces using convolutional neural networks (CNNs) and SVMs- Strengthen your OpenCV2 skills and learn how to use new OpenCV3 features In Detail OpenCV is a state-of-art computer vision library that allows a great variety of image and video processing operations. OpenCV for Python enables us to run computer vision algorithms in real time. This learning path proposes to teach the following topics. First, we will learn how to get started with OpenCV and OpenCV3's Python API, and develop a computer vision application that tracks body parts. Then, we will build amazing intermediate-level computer vision applications such as making an object disappear from an image, identifying different shapes, reconstructing a 3D map from images, and building an augmented reality application. Finally, we'll move to more advanced projects such as hand gesture recognition, tracking visually salient objects, as well as recognizing traffic signs and emotions on faces using support vector machines and multi-layer perceptrons respectively. This Learning Path combines some of the best that Packt has to offer in one complete, curated package. It includes content from the following Packt products:- OpenCV Computer Vision with Python by Joseph Howse - OpenCV with Python By Example by Prateek Joshi- OpenCV with Python Blueprints by Michael Beyeler Style and approach This course aims to create a smooth learning path that will teach you how to get started with will learn how to get started with OpenCV and OpenCV 3's Python API, and develop superb computer vision applications. Through this comprehensive course, you'll learn to create computer vision applications from scratch to finish and more!. This book presents key machine vision techniques and algorithms, along with the associated Java source code. Special features include a complete self-contained treatment of all topics and techniques essential to the understanding and implementation of machine vision; an introduction to object-oriented programming and to the Java programming language, with particular reference to its imaging capabilities; Java source code for a wide range of real-world image processing and analysis functions; an introduction to the Java 2D imaging and Java Advanced Imaging (JAI) API; and a wide range of illustrative examples. Apply computer vision and machine learning concepts in developing business and industrial applications using a practical, step-by-step approach. The book comprises four main sections starting with setting up your programming environment and configuring your computer with all the prerequisites to run the code examples. Section 1 covers the basics of image and video processing with code examples of how to manipulate and extract useful information from the images. You will mainly use OpenCV with Python to work with examples in this section. Section 2 describes machine learning and neural network concepts as applied to computer vision. You will learn different algorithms of the neural network, such as convolutional neural network (CNN), region-based convolutional neural network (R-CNN), and YOLO. In this section, you will also learn how to train, tune, and manage neural networks for computer vision. Section 3 provides step-by-step examples of developing business and industrial applications, such as facial recognition in video surveillance and surface defect detection in manufacturing. The final section is about training neural networks involving a large number of images on cloud infrastructure, such as Amazon AWS, Google Cloud Platform, and Microsoft Azure. It walks you through the process of training distributed neural networks for computer vision on GPU-based cloud infrastructure. By the time you finish reading Building Computer Vision Applications Using Artificial Neural Networks and working through the code examples, you will have developed some real-world use cases of computer vision with deep learning. What You Will Learn · Employ

image processing, manipulation, and feature extraction techniques · Work with various deep learning algorithms for computer vision · Train, manage, and tune hyperparameters of CNNs and object detection models, such as R-CNN, SSD, and YOLO · Build neural network models using Keras and TensorFlow · Discover best practices when implementing computer vision applications in business and industry · Train distributed models on GPU-based cloud infrastructure Who This Book Is For Data scientists, analysts, and machine learning and software engineering professionals with Python programming knowledge. This book explains the theory and application of evolutionary computer vision, a new paradigm where challenging vision problems can be approached using the techniques of evolutionary computing. This methodology achieves excellent results for defining fitness functions and representations for problems by merging evolutionary computation with mathematical optimization to produce automatic creation of emerging visual behaviors. In the first part of the book the author surveys the literature in concise form, defines the relevant terminology, and offers historical and philosophical motivations for the key research problems in the field. For researchers from the computer vision community, he offers a simple introduction to the evolutionary computing paradigm. The second part of the book focuses on implementing evolutionary algorithms that solve given problems using working programs in the major fields of low-, intermediate- and high-level computer vision. This book will be of value to researchers, engineers, and students in the fields of computer vision, evolutionary computing, robotics, biologically inspired mechatronics, electronics engineering, control, and artificial intelligence. If you want a basic understanding of computer vision's underlying theory and algorithms, this hands-on introduction is the ideal place to start. You'll learn techniques for object recognition, 3D reconstruction, stereo imaging, augmented reality, and other computer vision applications as you follow clear examples written in Python. Programming Computer Vision with Python explains computer vision in broad terms that won't bog you down in theory. You get complete code samples with explanations on how to reproduce and build upon each example, along with exercises to help you apply what you've learned. This book is ideal for students, researchers, and enthusiasts with basic programming and standard mathematical skills. Learn techniques used in robot navigation, medical image analysis, and other computer vision applications Work with image mappings and transforms, such as texture warping and panorama creation Compute 3D reconstructions from several images of the same scene Organize images based on similarity or content, using clustering methods Build efficient image retrieval techniques to search for images based on visual content Use algorithms to classify image content and recognize objects Access the popular OpenCV library through a Python interface This is a cookbook that shows results obtained on real images with detailed explanations and the relevant screenshots. The recipes contain code accompanied with suitable explanations that will facilitate your learning. If you are a novice C++ programmer who wants to learn how to use the OpenCV library to build computer vision applications, then this cookbook is appropriate for you. It is also suitable for professional software developers wishing to be introduced to the concepts of computer vision programming. It can be used as a companion book in university-level computer vision courses. It constitutes an excellent reference for graduate students and researchers in image processing and computer vision. The book provides a good combination of basic to advanced recipes. Basic knowledge of C++ is required. Unleash the power of the Computer Vision algorithms in JavaScript to develop vision-enabled web content About This Book Explore the exciting world of image processing, and face and gesture recognition, and implement them in your website Develop wonderful web projects to implement Computer Vision algorithms in an effective way A fast-paced guide to help you deal with real-world Computer Vision applications using JavaScript libraries Who This Book Is For If you have an interest in Computer Vision or wish to apply Computer Vision algorithms such as face, custom object, and gesture recognition for an online application, then this book is ideal for you. Prior understanding of the JavaScript language and core mathematical concepts is recommended. What You Will Learn Apply complex Computer Vision algorithms in your applications using JavaScript Put together different JavaScript libraries to discover objects in photos Get to grips with developing simple computer vision applications on your own Understand when and why you should use different computer vision methods Apply various image filters to images and videos Recognize and track many different objects, including face and face particles using powerful face recognition algorithms Explore ways to control your browser without touching the mouse or keyboard In Detail JavaScript is a dynamic and prototype-based programming language supported by every browser today. JavaScript libraries boast outstanding functionalities that enable you to furnish your own Computer Vision projects, making it easier to develop JavaScript-based applications, especially for web-centric technologies. It makes the implementation of Computer Vision algorithms easier as it supports scheme-based functional programming. This book will give you an insight into controlling your applications with gestures and head motion and readying them for the web. Packed with real-world tasks, it begins with a walkthrough of the basic concepts of Computer Vision that the JavaScript world offers us, and you'll implement various powerful algorithms in your own online application. Then, we move on to a comprehensive analysis of JavaScript functions and their applications. Furthermore, the book will show you how to implement filters and image segmentation, and use tracking.js and jsfeat libraries to convert your browser into Photoshop. Subjects such as object and custom detection, feature extraction, and object matching are covered to help you find an object in a photo. You will see how a complex object such as a face can be recognized by a browser as you move toward the end of the book. Finally, you will focus on algorithms to create a human interface. By the end of this book, you will be familiarized with the application of complex Computer Vision algorithms to develop your own applications, without spending much time learning sophisticated theory. Style and approach This book is an easy-to-follow project-based guide that throws you directly into the excitement of the Computer Vision theme. A "more in less" approach is followed by important concepts explained in a to-the-point, easy-to-understand manner. Build practical applications of computer vision using the OpenCV library with Python. This book discusses different facets of computer vision such as image and object detection, tracking and motion analysis and their applications with examples. The author starts with an introduction to computer vision followed by setting up OpenCV from scratch using Python. The next section discusses specialized image processing and segmentation and how images are stored and processed by a computer. This involves pattern recognition and image tagging using the OpenCV library. Next, you'll work with object detection, video storage and interpretation, and human detection using OpenCV. Tracking and motion is also discussed in detail. The book also discusses creating complex deep learning models with CNN and RNN. The author finally concludes with recent applications and trends in computer vision. After reading this book, you will be able to understand and implement computer vision and its applications with OpenCV using Python. You will also be able to create deep learning models with CNN and RNN and understand how these cutting-edge deep learning architectures work. What You Will Learn Understand what computer vision is, and its overall application in intelligent automation systems Discover the deep learning techniques required to build computer vision applications Build complex computer vision applications using the latest techniques in OpenCV, Python, and NumPy Create practical applications and implementations such as face detection and recognition, handwriting recognition, object detection, and tracking and motion analysis Who This Book Is For Those who have a basic understanding of machine learning and Python and are looking to learn computer vision and its applications. If you are a Java developer who is new to computer vision and would like to learn through application development, then this book is for you. You are expected to have a mobile device running Android 2.2 (Froyo) or greater, including a camera. Experience in Java is a must. Recipes to help you build computer vision applications that make the most of the popular C++ library OpenCV 3 About This Book Written to the latest, gold-standard specification of OpenCV 3 Master OpenCV, the open source library of the computer vision community Master fundamental concepts in computer vision and image processing Learn about the important classes and functions of OpenCV with complete working examples applied to real images Who This Book Is For OpenCV 3 Computer Vision Application Programming Cookbook Third Edition is appropriate for novice C++ programmers who want to learn how to use the OpenCV library to build computer vision applications. It is also suitable for professional software developers who wish to be introduced to the concepts of computer vision programming. It can also be used as a companion book for university-level computer vision courses. It constitutes an excellent reference for graduate students and researchers in image processing and computer vision. What You Will Learn Install and create a program using the OpenCV library Process an image by manipulating its pixels Analyze an image using histograms Segment images into homogenous regions and extract meaningful objects Apply image filters to enhance image content Exploit the image geometry in order to relay different views of a pictured scene Calibrate the camera from different image observations Detect people and objects in images using machine learning techniques Reconstruct a 3D scene from images In Detail Making your applications see has never been easier with OpenCV. With it, you can teach your robot how to follow your cat, write a program to correctly identify the members of One Direction, or even help you find the right colors for your redecoration. OpenCV 3 Computer Vision Application Programming Cookbook Third Edition provides a complete introduction to the OpenCV library and explains how to build your first computer vision program. You will be presented with a variety of computer vision algorithms and exposed to important concepts in image and video analysis that will enable you to build your own computer vision applications. This book helps you to get started with the library, and shows you how to install and deploy the OpenCV library to write effective computer vision applications following good programming practices. You will learn how to read and write images and manipulate their pixels. Different techniques for image enhancement and shape analysis will be presented. You will learn how to detect specific image features such as lines, circles or corners. You will be introduced to the concepts of mathematical morphology and image filtering. The most recent methods for image matching and object recognition are described, and you'll discover how to process video from files or cameras, as well as how to detect and track moving objects. Techniques to achieve camera calibration and perform multiple-view analysis will also be explained. Finally, you'll also get acquainted with recent approaches in machine learning and object classification. Style and approach This book will arm you with the basics you need to start writing world-aware applications right from a pixel level all the way through to processing video sequences. Over 100 recipes to help you build computer vision applications that make the most of the popular C library OpenCV 3 About This Book \*Written to the latest, gold-standard specification of OpenCV 3\* Master OpenCV, the open source library of the computer vision community \*Master fundamental concepts in computer vision and image processing\* Learn about the important classes and functions of OpenCV with complete working examples applied to real images Who This Book Is For OpenCV 3 Computer Vision Application Programming Cookbook Third Edition is appropriate for novice C++ programmers who want to learn how to use the OpenCV library to build computer vision applications. It is also suitable for professional software developers who wish to be introduced to the concepts of computer vision programming. It can also be used as a companion book for university-level computer vision courses. It constitutes an excellent reference for graduate students and researchers in image processing and computer vision. What You Will Learn \*Install and create a program using the OpenCV library\* Process an image by manipulating its pixels \*Analyze an image using histograms\* Segment images into homogenous regions and extract meaningful objects \*Apply image filters to enhance image content\* Exploit the image geometry in order to relay different views of a pictured scene \*Calibrate the camera from different image observations\* Detect faces and people in images using machine learning techniques In Detail Making your applications see has never been easier with OpenCV. With it, you can teach your robot how to follow your cat, write a program to correctly identify the members of One Direction, or even help you find the right colors for your redecoration. OpenCV 3 Computer Vision Application Programming Cookbook Third Edition provides a complete introduction to the OpenCV library and explains how to build your first computer vision program. You will be presented with a variety of computer vision algorithms and exposed to important concepts in image and video analysis that will enable you to build your own computer vision applications. This book helps you to get started with the library, and shows you how to install and deploy the OpenCV library to write effective computer vision applications following good programming practices. You will learn how to read and write images and manipulate their pixels. Different techniques for image enhancement and shape analysis will be presented. You will learn how to detect specific image features such as lines, circles or corners. You will be introduced to the concepts of mathematical morphology and image filtering. The most recent methods for image matching and object recognition are described, and you'll discover how to process video from files or cameras, as well as how to detect and track moving objects. Techniques to achieve camera calibration and perform multiple-view analysis will also be explained. Finally, you'll also get acquainted with recent approaches in machine learning and object classification. Practical Computer Vision Projects About This Book Updated for OpenCV 3, this book covers new features that will help you unlock the full potential of OpenCV 3 Written by a team of 7 experts, each chapter explores a new aspect of OpenCV to help you make amazing computer-vision aware applications Project-based approach with each chapter being a complete tutorial, showing you how to apply OpenCV to solve complete problems Who This Book Is For This book is for those who have a basic knowledge of OpenCV and are competent C++ programmers. You need to have an understanding of some of the more theoretical/mathematical concepts, as we move quite quickly throughout the book. What You Will Learn Execute basic image processing operations and cartoonify an image Build an OpenCV project natively with Raspberry Pi and cross-compile it for Raspberry Pi. text Extend the natural feature tracking algorithm to support the tracking of multiple image targets on a video Use OpenCV 3's new 3D visualization framework to illustrate the 3D scene geometry Create an application for Automatic Number Plate Recognition (ANPR) using a support vector machine and Artificial Neural Networks Train and predict pattern-recognition algorithms to decide whether an image is a number plate Use POSIT for the six degrees of freedom head pose Train a face recognition database using deep learning and recognize faces from that database In Detail As we become more capable of handling data in every kind, we are becoming more reliant on visual input and what we can do with those self-driving cars, face recognition, and even augmented reality applications and games. This is all powered by Computer Vision. This book will put you straight to work in creating powerful and unique computer vision applications. Each chapter is structured around a central project and deep dives into an important aspect of OpenCV such as facial recognition, image target tracking, making augmented reality applications, the 3D visualization framework, and machine learning. You'll learn how to make AI that can remember and use neural networks to help your applications learn. By the end of the book, you will have created various working prototypes with the projects in the book and will be well versed with the new features of OpenCV3. Style and approach This book takes a project-based approach and helps you learn about the new features by putting them to work by implementing them in your own projects. Get to grips with deep learning techniques for building image processing applications using PyTorch with the help of code notebooks and test questions Key Features Implement solutions to 50 real-world computer vision applications using PyTorch Understand the theory and working mechanisms of neural network architectures and their implementation Discover best practices using a custom library created especially for this book Book Description Deep learning is the driving force behind many recent advances in various computer vision (CV) applications. This book takes a hands-on approach to help you to solve over 50 CV problems using PyTorch1.x on real-world datasets. You'll start by building a neural network (NN) from scratch using NumPy and PyTorch and discover best practices for tweaking its hyperparameters. You'll then perform image classification using convolutional neural networks and transfer learning and understand how they work. As you progress, you'll implement multiple use cases of 2D and 3D multi-object detection, segmentation, human-pose-estimation by learning about the R-CNN family, SSD, YOLO, U-Net architectures, and the Detectron2 platform. The book will also guide you in performing facial expression swapping, generating new faces, and manipulating facial expressions as you explore autoencoders and modern generative adversarial networks. You'll learn how to combine CV with NLP techniques, such as LSTM and transformer, and RL techniques, such as Deep Q-learning, to implement OCR, image captioning, object detection, and a self-driving car agent. Finally, you'll move your NN model to production on the AWS Cloud. By the end of this book, you'll be able to leverage modern NN architectures to solve over 50 real-world CV problems confidently. What you will learn Train a NN from scratch with NumPy and PyTorch Implement 2D and 3D multi-object detection and segmentation Generate digits and DeepFakes with autoencoders and advanced GANs Manipulate images using CycleGAN, Pix2PixGAN, StyleGAN2, and SRGAN Combine CV with NLP to perform OCR, image captioning, and object detection Combine CV with reinforcement learning to build agents that play pong and self-drive a car Deploy a deep learning model on the AWS server using FastAPI and Docker Implement over 35 NN architectures and common OpenCV utilities Who this book is for This book is for beginners to PyTorch and intermediate-level machine learning practitioners who are looking to get well-versed with computer vision techniques using deep learning and PyTorch. If you are just getting started with neural networks, you'll find the use cases accompanied by notebooks in GitHub present in this book useful. Basic knowledge of the Python programming language and machine learning is all you need to get started with this book. Updated for OpenCV 4 and Python 3, this book covers the latest on depth cameras, 3D tracking, augmented reality, and deep neural networks, helping you solve real-world computer vision problems with practical code Key Features Build powerful computer vision applications in concise code with OpenCV 4 and Python 3 Learn the fundamental concepts of image processing, object classification, and 2D and 3D tracking Train, use, and understand machine learning models such as Support Vector Machines (SVMs) and neural networks Book Description Computer vision is a rapidly evolving science, encompassing diverse applications and techniques. This book will not only help those who are getting started with computer vision but also experts in the domain. You'll be able to put theory into practice

by building apps with OpenCV 4 and Python 3. You'll start by understanding OpenCV 4 and how to set it up with Python 3 on various platforms. Next, you'll learn how to perform basic operations such as reading, writing, manipulating, and displaying still images, videos, and camera feeds. From taking you through image processing, video analysis, and depth estimation and segmentation, to helping you gain practice by building a GUI app, this book ensures you'll have opportunities for hands-on activities. Next, you'll tackle two popular challenges: face detection and face recognition. You'll also learn about object classification and machine learning concepts, which will enable you to create and use object detectors and classifiers, and even track objects in movies or video camera feed. Later, you'll develop your skills in 3D tracking and augmented reality. Finally, you'll cover ANNs and DNNs, learning how to develop apps for recognizing handwritten digits and classifying a person's gender and age. By the end of this book, you'll have the skills you need to execute real-world computer vision projects. What you will learn

Install and familiarize yourself with OpenCV 4's Python 3 bindings

Understand image processing and video analysis basics

Use a depth camera to distinguish foreground and background regions

Detect and identify objects, and track their motion in videos

Train and use your own models to match images and classify objects

Detect and recognize faces, and classify their gender and age

Build an augmented reality application to track an image in 3D

Work with machine learning models, including SVMs, artificial neural networks (ANNs), and deep neural networks (DNNs)

Who this book is for

If you are interested in learning computer vision, machine learning, and OpenCV in the context of practical real-world applications, then this book is for you. This OpenCV book will also be useful for anyone getting started with computer vision as well as experts who want to stay up-to-date with OpenCV 4 and Python 3. Although no prior knowledge of image processing, computer vision or machine learning is required, familiarity with basic Python programming is a must. Discover interesting recipes to help you understand the concepts of object detection, image processing, and facial detection

Key Features

Explore the latest features and APIs in OpenCV 4 and build computer vision algorithms

Develop effective, robust, and fail-safe vision for your applications

Build computer vision algorithms with machine learning capabilities

Book Description

OpenCV is an image and video processing library used for all types of image and video analysis. Throughout the book, you'll work through recipes that implement a variety of tasks, such as facial recognition and detection. With 70 self-contained tutorials, this book examines common pain points and best practices for computer vision (CV) developers. Each recipe addresses a specific problem and offers a proven, best-practice solution with insights into how it works, so that you can copy the code and configuration files and modify them to suit your needs. This book begins by setting up OpenCV, and explains how to manipulate pixels. You'll understand how you can process images with classes and count pixels with histograms. You'll also learn detecting, describing, and matching interest points. As you advance through the chapters, you'll get to grips with estimating projective relations in images, reconstructing 3D scenes, processing video sequences, and tracking visual motion. In the final chapters, you'll cover deep learning concepts such as face and object detection. By the end of the book, you'll be able to confidently implement a range to computer vision algorithms to meet the technical requirements of your complex CV projects

What you will learn

Install and create a program using the OpenCV library

Segment images into homogenous regions and extract meaningful objects

Apply image filters to enhance image content

Exploit image geometry to relay different views of a pictured scene

Calibrate the camera from different image observations

Detect people and objects in images using machine learning techniques

Reconstruct a 3D scene from images

Explore face detection using deep learning

Who this book is for

If you're a CV developer or professional who already uses or would like to use OpenCV for building computer vision software, this book is for you. You'll also find this book useful if you're a C++ programmer looking to extend your computer vision skillset by learning OpenCV. OpenCV 3 Computer Vision Application Programming Cookbook is appropriate for novice C++ programmers who want to learn how to use the OpenCV library to build computer vision applications. It is also suitable for professional software developers wishing to be introduced to the concepts of computer vision programming. It can also be used as a companion book in a university-level computer vision courses. It constitutes an excellent reference for graduate students and researchers in image processing and computer vision. Create four mobile apps and explore the world through photography and computer vision

About This Book

Efficiently harness iOS and OpenCV to capture and process high-quality images at high speed

Develop photographic apps and augmented reality apps quickly and easily

Detect, recognize, and morph faces and objects

Who This Book Is For

If you want to do computational photography and computer vision on Apple's mobile devices, then this book is for you. No previous experience with app development or OpenCV is required. However, basic knowledge of C++ or Objective-C is recommended.

What You Will Learn

Use Xcode and Interface Builder to develop iOS apps

Obtain OpenCV's standard modules and build extra modules from source

Control all the parameters of the iOS device's camera

Capture, save, and share photos and videos

Analyze colors, shapes, and textures in ordinary and specialized photographs

Blend and compare images to create special photographic effects and augmented reality tools

Detect faces and morph facial features

Classify coins and other objects

In Detail

iOS Application Development with OpenCV 3 enables you to turn your smartphone camera into an advanced tool for photography and computer vision. Using the highly optimized OpenCV library, you will process high-resolution images in real time. You will locate and classify objects, and create models of their geometry. As you develop photo and augmented reality apps, you will gain a general understanding of iOS frameworks and developer tools, plus a deeper understanding of the camera and image APIs.

After completing the book's four projects, you will be a well-rounded iOS developer with valuable experience in OpenCV.

Style and approach

The book is practical, creative, and precise. It shows you the steps to create and customize five projects that solve important problems for beginners in mobile app development and computer vision. Complete source code and numerous visual aids are included in each chapter. Experimentation is an important part of the book. You will use computer vision to explore the real world, and then you will refine the projects based on your findings. Build, create, and deploy your own computer vision applications with the power of OpenCV

About This Book

This book provides hands-on examples that cover the major features that are part of any important Computer Vision application

It explores important algorithms that allow you to recognize faces, identify objects, extract features from images, help your system make meaningful predictions from visual data, and much more

All the code examples in the book are based on OpenCV 3.1 – the latest version

Who This Book Is For

This is the perfect book for anyone who wants to dive into the exciting world of image processing and computer vision. This book is aimed at programmers with a working knowledge of C++. Prior knowledge of OpenCV or Computer Vision/Machine Learning is not required. What You Will Learn

Explore the steps involved in building a typical computer vision/machine learning application

Understand the relevance of OpenCV at every stage of building an application

Harness the vast amount of information that lies hidden in images into the apps you build

Incorporate visual information in your apps to create more appealing software

Get acquainted with how large-scale and popular image editing apps such as Instagram work behind the scenes by getting a glimpse of how the image filters in apps can be recreated using simple operations in OpenCV

Appreciate how difficult it is for a computer program to perform tasks that are trivial for human beings

Get to know how to develop applications that perform face detection, gender detection from facial images, and handwritten character (digit) recognition

In Detail

Computer vision and machine learning concepts are frequently used in practical computer vision based projects. If you're a novice, this book provides the steps to build and deploy an end-to-end application in the domain of computer vision using OpenCV/C++. At the outset, we explain how to install OpenCV and demonstrate how to run some simple programs. You will start with images (the building blocks of image processing applications), and see how they are stored and processed by OpenCV. You'll get comfortable with OpenCV-specific jargon (Mat Point, Scalar, and more), and get to know how to traverse images and perform basic pixel-wise operations. Building upon this, we introduce slightly more advanced image processing concepts such as filtering, thresholding, and edge detection. In the latter parts, the book touches upon more complex and ubiquitous concepts such as face detection (using Haar cascade classifiers), interest point detection algorithms, and feature descriptors. You will now begin to appreciate the true power of the library in how it reduces mathematically non-trivial algorithms to a single line of code! The concluding sections touch upon OpenCV's Machine Learning module. You will witness not only how OpenCV helps you pre-process and extract features from images that are relevant to the problems you are trying to solve, but also how to use Machine Learning algorithms that work on these features to make intelligent predictions from visual data!

Style and approach

This book takes a very hands-on approach to developing an end-to-end application with OpenCV. To avoid being too theoretical, the description of concepts are accompanied simultaneously by the development of applications. Throughout the course of the book, the projects and practical, real-life examples are explained and developed step by step in sync with the theory.

OpenCV 3 Computer Vision Application Programming Cookbook is appropriate for novice C++ programmers who want to learn how to use the OpenCV library to build computer vision applications. It is also suitable for professional software developers wishing to be introduced to the concepts of computer vision programming. It can also be used as a companion book in a university-level computer vision courses. It constitutes an excellent reference for graduate students and researchers in image processing and computer vision. Computer vision has widespread and growing application including robotics, autonomous vehicles, medical imaging and diagnosis, surveillance, video analysis, and even tracking for sports analysis. This book equips the reader with crucial mathematical and algorithmic tools to develop a thorough understanding of the underlying components of any complete computer vision system and to design such systems. These components include identifying local features such as corners or edges in the presence of noise, edge preserving smoothing, connected component labeling, stereopsis, thresholding, clustering, segmentation, and describing and matching both shapes and scenes. The extensive examples include photographs of faces, cartoons, animal footprints, and angiograms, and each chapter concludes with homework exercises and suggested projects. Intended for advanced undergraduate and beginning graduate students, the text will also be of use to practitioners and researchers in a range of applications. Apply neural network architectures to build state-of-the-art computer vision applications using the Python programming language

Key Features

Gain a fundamental understanding of advanced computer vision and neural network models in use today

Cover tasks such as low-level vision, image classification, and object detection

Develop deep learning models on cloud platforms and optimize them using TensorFlow Lite and the OpenVINO toolkit

Book Description

Computer vision allows machines to gain human-level understanding to visualize, process, and analyze images and videos. This book focuses on using TensorFlow to help you learn advanced computer vision tasks such as image acquisition, processing, and analysis. You'll start with the key principles of computer vision and deep learning to build a solid foundation, before covering neural network architectures and understanding how they work rather than using them as a black box. Next, you'll explore architectures such as VGG, ResNet, Inception, R-CNN, SSD, YOLO, and MobileNet. As you advance, you'll learn to use visual search methods using transfer learning. You'll also cover advanced computer vision concepts such as semantic segmentation, image inpainting with GAN's, object tracking, video segmentation, and action recognition. Later, the book focuses on how machine learning and deep learning concepts can be used to perform tasks such as edge detection and face recognition. You'll then discover how to develop powerful neural network models on your PC and on various cloud platforms. Finally, you'll learn to perform model optimization methods to deploy models on edge devices for real-time inference. By the end of this book, you'll have a solid understanding of computer vision and be able to confidently develop models to automate tasks. What you will learn

Explore methods of feature extraction and image retrieval and visualize different layers of the neural network model

Use TensorFlow for various visual search methods for real-world scenarios

Build neural networks or adjust parameters to optimize the performance of models

Understand TensorFlow DeepLab to perform semantic segmentation on images and DCGAN for image inpainting

Evaluate your model and optimize and integrate it into your application to operate at scale

Get up to speed with techniques for performing manual and automated image annotation

Who this book is for

This book is for computer vision professionals, image processing professionals, machine learning engineers and AI developers who have some knowledge of machine learning and deep learning and want to build expert-level computer vision applications. In addition to familiarity with TensorFlow, Python knowledge will be required to get started with this book. Turn futuristic ideas about computer vision and machine learning into demonstrations that are both functional and entertaining

Key Features

Build OpenCV 4 apps with Python 2 and 3 on desktops and Raspberry Pi, Java on Android, and C# in Unity

Detect, classify, recognize, and measure real-world objects in real-time

Work with images from diverse sources, including the web, research datasets, and various cameras

Book Description

OpenCV 4 is a collection of image processing functions and computer vision algorithms. It is open source, supports many programming languages and platforms, and is fast enough for many real-time applications. With this handy library, you'll be able to build a variety of impressive gadgets. OpenCV 4 for Secret Agents features a broad selection of projects based on computer vision, machine learning, and several application frameworks. To enable you to build apps for diverse desktop systems and Raspberry Pi, the book supports multiple Python versions, from 2.7 to 3.7. For Android app development, the book also supports Java in Android Studio, and C# in the Unity game engine. Taking inspiration from the world of James Bond, this book will add a touch of adventure and computer vision to your daily routine. You'll be able to protect your home and car with intelligent camera systems that analyze obstacles, people, and even cats. In addition to this, you'll also learn how to train a search engine to praise or criticize the images that it finds, and build a mobile app that speaks to you and responds to your body language. By the end of this book, you will be equipped with the knowledge you need to advance your skills as an app developer and a computer vision specialist. What you will learn

Detect motion and recognize gestures to control a smartphone game

Detect car headlights and estimate their distance

Detect and recognize human and cat faces to trigger an alarm

Amplify motion in a real-time video to show heartbeats and breaths

Make a physics simulation that detects shapes in a real-world drawing

Build OpenCV 4 projects in Python 3 for desktops and Raspberry Pi

Develop OpenCV 4 Android applications in Android Studio and Unity

Who this book is for

If you are an experienced software developer who is new to computer vision or machine learning, and wants to study these topics through creative projects, then this book is for you. The book will also help existing OpenCV users who want upgrade their projects to OpenCV 4 and new versions of other libraries, languages, tools, and operating systems. General familiarity with object-oriented programming, application development, and usage of operating systems (OS), developer tools, and the command line is required. OpenCV is a famous computer vision library, used to analyze and transform copious amounts of image data, even in real time and on a mobile device. This book focuses on leveraging mobile platforms to build interactive and useful applications. The book starts off with an introduction to OpenCV and Android and how they interact with each other using OpenCV's Java API. You'll also discover basic image processing techniques such as erosion and dilation of images, before walking through how to build more complex applications, such as object detection, image stitching, and face detection. As you progress, you will be introduced to OpenCV's machine learning framework, enabling you to make your applications smarter. The book ends with a short chapter covering useful Android tips and tricks and some common errors and solutions that people might face while building an application. By the end of the book, readers will have gained more expertise in building their own OpenCV projects for the Android platform and integrating OpenCV application programming into existing projects. SimpleCV is a cross platform (Windows, Macintosh, Linux) framework in Python that makes writing computer vision applications quick and easy.