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***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***

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***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***

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***vision with the goal being to  
bridge the gap between  
thetheory and the practical  
implementation of computer  
vision. Thebook will explain how  
to use the relevant OpenCV  
library routinesand will be***

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***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***

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***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***

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***asultrasound, 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***

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***more intuitive and interact with us in more intelligent ways.***

***Explains the theory behind basic computer vision and provides abridge from the theory to practical implementation using the industry standard OpenCV***



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***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***

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***semester course in  
computervision at senior  
undergraduate and Masters  
levels Includes the basics of  
cameras and images and image  
processingto remove noise,  
before moving on to topics such***

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***as image histogramming; binary  
imaging; video processing to  
detect and model moving objects;  
geometric operations & camera  
models; edge detection; features  
detection; recognition in images  
Contains a large number of***

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***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***

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**enhanced eBook**

***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***

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***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***

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***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***

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***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***



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***knowledge of C++ is required.  
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***

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***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***

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***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***

***A practical guide to  
understanding the core machine***

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***learning and deep learning  
algorithms, and implementing  
them to create intelligent image  
processing systems using  
OpenCV 4 Key Features Gain  
insights into machine learning  
algorithms, and implement them***

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***using OpenCV 4 and scikit-learn  
Get up to speed with Intel  
OpenVINO and its integration  
with OpenCV 4 Implement high-  
performance machine learning  
models with helpful tips and best  
practices***  
**Book Description**

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***OpenCV is an open source library for building computer vision apps. The latest release, OpenCV 4, offers a plethora of features and platform improvements that are covered comprehensively in this up-to-date second edition.***

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***You'll start by understanding the new features and setting up OpenCV 4 to build your computer vision applications. You will explore the fundamentals of machine learning and even learn to design***

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***different algorithms that can be  
used for image processing.***

***Gradually, the book will take you  
through supervised and  
unsupervised machine learning.***

***You will gain hands-on  
experience using scikit-learn in***



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***Python for a variety of machine learning applications. Later chapters will focus on different machine learning algorithms, such as a decision tree, support vector machines (SVM), and Bayesian learning, and how they***

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***can be used for object detection  
computer vision operations. You  
will then delve into deep learning  
and ensemble learning, and  
discover their real-world  
applications, such as  
handwritten digit classification***

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***and gesture recognition. Finally,  
you'll get to grips with the latest  
Intel OpenVINO for building an  
image processing system. By the  
end of this book, you will have  
developed the skills you need to  
use machine learning for***

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***building intelligent computer  
vision applications with OpenCV  
4. What you will learn Understand  
the core machine learning  
concepts for image  
processing Explore the theory  
behind machine learning and***

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***deep learning algorithm  
design Discover effective  
techniques to train your deep  
learning models Evaluate  
machine learning models to  
improve the performance of your  
models Integrate algorithms such***

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***as support vector machines and  
Bayes classifier in your  
computer vision applications Use  
OpenVINO with OpenCV 4 to  
speed up model inference Who  
this book is for This book is for  
Computer Vision professionals,***

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***machine learning developers, or  
anyone who wants to learn  
machine learning algorithms and  
implement them using OpenCV  
4. If you want to build real-world  
Computer Vision and image  
processing applications powered***

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***by machine learning, then this  
book is for you. Working  
knowledge of Python  
programming is required to get  
the most out of this book.  
OpenCV 3 Computer Vision with  
Python Cookbook***



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***Get to grips with tools,  
techniques, and algorithms for  
computer vision and machine  
learning, 3rd Edition  
A practical guide covering topics  
from image processing,  
augmented reality to deep***

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***learning with OpenCV 4 and  
Python 3.7***

***Android Application***

***Programming with OpenCV***

***Build visually appealing,  
multithreaded, cross-platform  
computer vision applications***

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***Six end-to-end projects built using machine learning with OpenCV, Python, and TensorFlow***

OpenCV 4 Computer Vision Application Programming CookbookBuild complex

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computer vision applications with OpenCV and C++, 4th Edition Packt Publishing Ltd Blend the power of Qt with OpenCV to build cross-platform computer vision applications Key Features ? Start creating robust

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applications with the power of OpenCV and Qt combined ? Learn from scratch how to develop cross-platform computer vision applications ? Accentuate your OpenCV applications by developing them with Qt Book

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Description Developers have been using OpenCV library to develop computer vision applications for a long time. However, they now need a more effective tool to get the job done and in a much better and modern way. Qt is

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one of the major frameworks available for this task at the moment. This book will teach you to develop applications with the combination of OpenCV 3 and Qt5, and how to create cross-platform computer vision

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applications. We'll begin by introducing Qt, its IDE, and its SDK. Next you'll learn how to use the OpenCV API to integrate both tools, and see how to configure Qt to use OpenCV. You'll go on to build a full-fledged



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computer vision application throughout the book. Later, you'll create a stunning UI application using the Qt widgets technology, where you'll display the images after they are processed in an efficient way. At the end

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of the book, you'll learn how to convert OpenCV Mat to Qt QImage. You'll also see how to efficiently process images to filter them, transform them, detect or track objects as well as analyze video. You'll become

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better at developing OpenCV applications. What you will learn ? Get an introduction to Qt IDE and SDK ? Be introduced to OpenCV and see how to communicate between OpenCV and Qt ? Understand how to create UI using Qt

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Widgets ? Learn to develop  
cross-platform applications  
using OpenCV 3 and Qt 5 ?  
Explore the multithreaded  
application development  
features of Qt5 ? Improve  
OpenCV 3 application  
development using Qt5 ?

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Build, test, and deploy Qt and OpenCV apps, either dynamically or statically ? See Computer Vision technologies such as filtering and transformation of images, detecting and matching objects, template

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matching, object tracking, video and motion analysis, and much more ? Be introduced to QML and Qt Quick for iOS and Android application development Who this book is for This book is for readers interested in

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building computer vision applications. Intermediate knowledge of C++ programming is expected. Even though no knowledge of Qt5 and OpenCV 3 is assumed, if you're familiar with these frameworks, you'll benefit.

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Over 50 recipes to help you  
build computer vision  
applications in C++ using  
the OpenCV library In Detail  
OpenCV Computer Vision  
Application Programming  
Cookbook Second Edition is  
your guide to the



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development of computer vision applications. The book shows you how to install and deploy the OpenCV library to write an effective computer vision application. Different techniques for image

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enhancement, pixel manipulation, and shape analysis will be presented. You will also learn how to process video from files or cameras and detect and track moving objects. You will also be introduced to recent

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approaches in machine learning and object classification. This book is a comprehensive reference guide that exposes you to practical and fundamental computer vision concepts, illustrated by extensive

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examples. 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

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extract meaningful objects  
Apply image filters to  
enhance image content  
Exploit image geometry in  
order to relate different  
views of a pictured scene  
Calibrate the camera from  
different image observations

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Detect faces and people in  
images using machine  
learning techniques

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computer vision with Python  
using OpenCV About This Book-  
Create impressive  
applications with OpenCV and  
Python- Familiarize yourself  
with advanced machine  
learning concepts- Harness



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the power of computer vision  
with this easy-to-follow  
guideWho This Book Is  
ForIntended for novices to  
the world of OpenCV and  
computer vision, as well as  
OpenCV veterans that want to  
learn about what's new in

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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

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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

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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

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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

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own computer vision real-  
life applicationIn  
DetailOpenCV 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

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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

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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.



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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

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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

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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

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networks, along with the development of a handwritten digits recognition application. Style and approach This book is a comprehensive guide to the brand new OpenCV 3 with Python to develop real-life

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computer vision

applications.

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with Python

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applications About This Book Use  
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capture video, manipulate images,  
and track objects Learn about the

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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



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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

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Install OpenCV and related software such as Python, NumPy, SciPy, OpenNI, and SensorKinect - all on Windows, Mac or Ubuntu Apply

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"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

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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

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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

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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

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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.

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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



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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

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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

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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

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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

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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

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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

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expected to have a mobile device running Android 2.2 (Froyo) or greater and it must have a camera.

A practical, project-based tutorial for Python developers and hobbyists who want to get started with computer vision with OpenCV and

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Python.OpenCV Computer Vision with Python is written for Python developers who are new to computer vision and want a practical guide to teach them the essentials. Some understanding of image data (for example, pixels and color channels)



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would be beneficial. At a minimum you will need access to at least one webcam. Certain exercises require additional hardware like a second webcam, a Microsoft Kinect or an OpenNI-compliant depth sensor such as the Asus Xtion PRO.

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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

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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.

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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

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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

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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

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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



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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

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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

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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.

A comprehensive guide to building

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computer vision and image

processing applications with C++,  
3rd Edition

Build complex computer vision  
applications with OpenCV and C++,  
4th Edition

Using Free Tools for Photographers

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Learn Computer Vision Using  
OpenCV

Learning OpenCV 4 Computer  
Vision with Python 3

Computer Vision with OpenCV 3  
and Qt5

**Over 100 recipes to help you build**

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**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

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**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 imagesWho  
This Book Is ForOpenCV 3**

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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**



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**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**

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**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**

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**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**

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**observations\*Detect faces and  
people in images using machine  
learning techniquesIn DetailMaking  
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**

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**correctly identify the members of  
One Direction, or even help you find  
the right colors for your  
re-decoration. OpenCV 3 Computer  
Vision Application Programming  
Cookbook Third Edition provides a  
complete introduction to the**

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GPUs for accelerations and can be  
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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.

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cloud. It would be helpful  
to have some familiarity  
with basic mathematical  
concepts such as vectors,  
matrices, and so on. What  
You Will Learn Apply***

Page 214/350

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***geometric  
transformations to  
images, perform image  
filtering, and convert an  
image into a cartoon-like  
image Detect and track  
various body parts such***

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***as the face, nose, eyes,  
ears, and mouth Stitch  
multiple images of a  
scene together to create a  
panoramic image Make  
an object disappear from  
an image Identify***



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***different shapes, segment  
an image, and track an  
object in a live video***

***Recognize an object in an  
image and build a visual  
search engine***

***Reconstruct a 3D map***

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***from images Build an  
augmented reality  
application In Detail  
Computer vision is found  
everywhere in modern  
technology. OpenCV for  
Python enables us to run***

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***computer vision***

***algorithms in real time.***

***With the advent of***

***powerful machines, we***

***are getting more***

***processing power to work***

***with. Using this***

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***technology, we can  
seamlessly integrate our  
computer vision  
applications into the  
cloud. Web developers  
can develop complex  
applications without***

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***having to reinvent the wheel. This book will walk you through all the building blocks needed to build amazing computer vision applications with ease. We start off with***

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***applying geometric  
transformations to  
images. We then discuss  
affine and projective  
transformations and see  
how we can use them to  
apply cool geometric***

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*effects to photos. We will  
then cover techniques  
used for object  
recognition, 3D  
reconstruction, stereo  
imaging, and other  
computer vision*

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***applications. This book  
will also provide clear  
examples written in  
Python to build OpenCV  
applications. The book  
starts off with simple  
beginner's level tasks***



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***such as basic processing  
and handling images,  
image mapping, and  
detecting images. It also  
covers popular OpenCV  
libraries with the help of  
examples. The book is a***

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***practical tutorial that  
covers various examples  
at different levels,  
teaching you about the  
different functions of  
OpenCV and their actual  
implementation. Style***

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***and approach This is a  
conversational-style book  
filled with hands-on  
examples that are really  
easy to understand. Each  
topic is explained very  
clearly and is followed by***

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***a programmatic  
implementation so that  
the concept is solidified.  
Each topic contributes to  
something bigger in the  
following chapters, which  
helps you understand how***

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***to piece things together  
to build something big  
and complex.***

***Discover interesting  
recipes to help you  
understand the concepts  
of object detection, image***

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***processing, and facial  
detection Key Features***

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

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*effective, robust, and fail-  
safe vision for your  
applications Build  
computer vision  
algorithms with machine  
learning capabilities Book  
Description OpenCV is an*

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***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***



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***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***

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***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***

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***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***

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***advance through the  
chapters, you'll get to  
grips with estimating  
projective relations in  
images, reconstructing  
3D scenes, processing  
video sequences, and***

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***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***

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***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***

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***program using the  
OpenCV library Segment  
images into homogenous  
regions and extract  
meaningful objects Apply  
image filters to enhance  
image content Exploit***

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***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***

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***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***

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***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***

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by learning OpenCV.  
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Programming Cookbook  
is appropriate for novice***

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***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***

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*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.*

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reference for graduate  
students and researchers  
in image processing and  
computer vision.***

***OpenCV 3.0 Computer  
Vision with Java is a***

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***practical tutorial guide  
that explains fundamental  
tasks from computer  
vision while focusing on  
Java development. This  
book will teach you how  
to set up OpenCV for Java***



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***and handle matrices  
using the basic  
operations of image  
processing such as  
filtering and image  
transforms. It will also  
help you learn how to use***

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***Haar cascades for tracking faces and to detect foreground and background regions with the help of a Kinect device. It will even give you insights into server-***

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***side OpenCV. Each chapter is presented with several projects that are ready to use. The functionality of these projects is found in many classes that allow***

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***developers to understand  
computer vision  
principles and rapidly  
extend or customize the  
projects for their needs.  
With Deep Learning  
CNNs and RNNs***

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Practical Computer Vision  
Projects***

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***Computer Vision Projects***

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Mastering OpenCV 4 with  
Python***

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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*

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*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*

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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*

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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*



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*facial landmarks and apply  
masks to faces Create an app  
to extract text from scanned  
documents and photos Train  
and use cascade classifiers  
and DL models for object  
detection Build an app to  
measure the distance between*

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*detected objects Implement 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*

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*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*

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*codes in this book.*

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advanced machine learning  
and explore Python's  
powerful tools for  
extracting data from images  
and videos Key*

*FeaturesImplement image*

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*classification and object  
detection using machine  
learning and deep  
learningPerform image  
classification, object  
detection, image  
segmentation, and other  
Computer Vision tasksCrisp*

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approach to solving real-  
world problems in Computer  
Vision*  
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programming language for  
rapidly prototyping and  
developing production-grade*

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*images using Google's  
Tesseract software, and  
tracking human body poses  
using DeeperCut within  
TensorFlow. By the end of  
this book, you will have the  
expertise required to build  
your own Computer Vision*

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Apply powerful support vector machines for simple digit

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vision algorithms with  
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*Description OpenCV is an  
image and video processing  
library used for all types  
of image and video analysis.*

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*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,*

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*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*

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*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*

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*range of 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*

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*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*



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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*

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*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*

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how to process an image by  
manipulating pixels and  
analyze an image using  
histograms. Then, we'll show  
you how to apply image  
filters to enhance image*



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Who

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than the competition, then  
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*Projects with Python*

*Unleash the Power of*

*Computer Vision with Python*

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Explore OpenCV 4 to create  
visually appealing cross-platform  
computer vision applications Key

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Features Understand basic OpenCV

4 concepts and algorithms Grasp

advanced OpenCV techniques such

as 3D reconstruction, machine

learning, and artificial neural

networks Work with Tesseract OCR,

an open-source library to recognize

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Create CMake scripts to compile your C++



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application Understand basic image  
matrix formats and filters Explore  
segmentation and feature extraction  
techniques Remove backgrounds  
from static scenes to identify  
moving objects for  
surveillance Employ various

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techniques to track objects in a live  
video Work with new OpenCV  
functions for text detection and  
recognition with Tesseract Get  
acquainted with important deep  
learning tools for image  
classification Who this book is for If

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their expertise.

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reconstruction, stereo imaging,  
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computer vision applications as you  
follow clear examples written in  
Python. Programming Computer  
Vision with Python explains  
computer vision in broad terms that



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applications Work with image  
mappings and transforms, such as

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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

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for images based on visual content

Use algorithms to classify image  
content and recognize objects

Access the popular OpenCV library  
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Projects

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*vision tasks such as image processing and manipulation, feature and object detection, and image restoration to build real-life computer vision applications*

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*Perform computer vision tasks such as image processing and*

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**Book Description** Raspberry Pi is one of the popular single-board computers of our generation. All the major image processing and computer



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*successfully design and implement your own OpenCV, Raspberry Pi, and Python-based computer vision projects. At the start, you'll learn the basics of Python 3, and the fundamentals of single-board computers and NumPy. Next, you'll discover how to install OpenCV 4 for Python 3 on Raspberry Pi, before*

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*covering major techniques and algorithms in image processing, manipulation, and computer vision. By working through the steps in each chapter, you'll understand essential OpenCV features. Later sections will take you through creating graphical user interface (GUI) apps with GPIO and OpenCV. You'll also learn to use the new*

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*computer vision library, Mahotas, to perform various image processing operations. Finally, you'll explore the Jupyter Notebook and how to set up a Windows computer and Ubuntu for computer vision. By the end of this book, you'll be able to confidently build and deploy computer vision apps. What you*

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*will learn Set up a Raspberry Pi for computer vision applications Perform basic image processing with libraries such as NumPy, Matplotlib, and OpenCV Demonstrate arithmetical, logical, and other operations on images Work with a USB webcam and the Raspberry Pi Camera Module Implement*

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*low-pass and high-pass filters and understand their applications in image processing*  
*Cover advanced techniques such as histogram equalization and morphological transformations*  
*Create GUI apps with Python 3 and OpenCV*  
*Perform machine learning with K-means clustering and image*

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*quantization Who this book is for This book is for beginners as well as experienced Raspberry Pi and Python 3 enthusiasts who are looking to explore the amazing world of computer vision. Working knowledge of the Python 3 programming language is assumed. If you are a Java and Android developer*

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computer vision projects to capture high-*



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*quality image data, detect and track  
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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*

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Is For This book is ideal for you if you  
aspire to build computer vision systems  
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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*

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*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*

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*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*

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*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*

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*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,*

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*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*

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*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*



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*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*

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*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*

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*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,*

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*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  
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***Beginning Digital Image Processing***

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