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A Guide to Convolutional Neural Networks for Computer Vision-Salman Khan 2018-02-13

Computer vision has become increasingly important and effective in recent years due to its wide-ranging applications in areas as diverse as smart surveillance and monitoring, health and medicine, sports and recreation, robotics, drones, and self-driving cars. Visual recognition tasks, such as image classification, localization, and detection, are the core building blocks of many of these applications, and recent developments in Convolutional Neural Networks (CNNs) have led to outstanding performance in these state-of-the-art visual recognition tasks and systems. As a result, CNNs now form the crux of deep learning algorithms in computer vision. This self-contained guide will benefit those who seek to both understand the theory behind CNNs and to gain hands-on experience on the application of CNNs in computer vision. It provides a comprehensive introduction to CNNs starting with the essential concepts behind neural networks: training, regularization, and optimization of CNNs. The book also discusses a wide range of loss functions, network layers, and popular CNN architectures, reviews the different techniques for the evaluation of CNNs, and presents some popular CNN tools and libraries that are commonly used in computer vision.

Further, this text describes and discusses case studies that are related to the application of CNN in computer vision, including image classification, object detection, semantic segmentation, scene understanding, and image generation. This book is ideal for undergraduate and graduate students, as no prior background knowledge in the field is required to follow the material, as well as new researchers, developers, engineers, and practitioners who are interested in gaining a quick understanding of CNN models.

Images as Data for Social Science Research-Nora Webb Williams 2020-08-31

Images play a crucial role in shaping and reflecting political life. Digitization has vastly increased the presence of such images in daily life, creating valuable new research opportunities for social scientists. We show how recent innovations in computer vision methods can substantially lower the costs of using images as data. We introduce readers to the deep learning algorithms commonly used for object recognition, facial recognition, and visual sentiment analysis. We then provide guidance and specific instructions for scholars interested in using these methods in their own research.

Convolutional Neural Networks in Python-Anthony Williams 2017-07-25

Convolutional Neural Networks in Python (2nd Edition) Deep learning has been a great part of various scientific fields and since this is my third book regarding this topic, you already know the great significance of deep learning in comparison to traditional methods. At this point, you are also familiar with types of neural networks and their wide range of applications including image and speech recognition, natural language processing, video game development and other. On the other hand, this book is all about convolutional neural networks and how to use these neural networks
in various tasks of automatic image and speech recognition in Python. You will also get a better insight into the architecture of convolutional layers as we are going deeper into this subject. Deep learning is pretty complex subject, but since you already have a fundamental knowledge of this topic, getting to know convolutional neural networks better is next logical step. What you will learn in Convolutional Neural Networks in Python: Architecture of convolutional neural networks Solving computer vision tasks using convolutional neural networks Python and computer vision Automatic image and speech recognition Theano and TensorFlow image recognition How to use MNIST vision dataset What are commonly used convolutional filters Get this book today and learn more about Convolutional Neural Networks in Python!! PS: Get the Paperback and get this Ebook for FREE!!

**Practical Convolutional Neural Networks**
Mohit Sewak 2018-02-27 One stop guide to implementing award-winning, and cutting-edge CNN architectures Key Features Fast-paced guide with use cases and real-world examples to get well versed with CNN techniques Implement CNN models on image classification, transfer learning, Object Detection, Instance Segmentation, GANs and more Implement powerful use-cases like image captioning, reinforcement learning for hard attention, and recurrent attention models Book Description Convolutional Neural Network (CNN) is revolutionizing several application domains such as visual recognition systems, self-driving cars, medical discoveries, innovative eCommerce and more. You will learn to create innovative solutions around image and video analytics to solve complex machine learning and computer vision related problems and implement real-life CNN models. This book starts with an overview of deep neural networks with the example of image classification and walks you through building your first CNN for human face detector. We will learn to use concepts like transfer learning with CNN, and Auto-Encoders to build very powerful models, even when not much of supervised training data of labeled images is available. Later we build upon the learning achieved to build advanced vision related algorithms for object detection, instance segmentation, generative adversarial networks, image captioning, attention mechanisms for vision, and recurrent models for vision. By the end of this book, you should be ready to implement advanced, effective and efficient CNN models at your professional project or personal initiatives by working on complex image and video datasets. What you will learn From CNN basic building blocks to advanced concepts understand practical areas they can be applied to Build an image classifier CNN model to understand how different components interact with each other, and then learn how to optimize it Learn different algorithms that can be applied to Object Detection, and Instance Segmentation Learn advanced concepts like attention mechanisms for CNN to improve prediction accuracy Understand transfer learning and implement award-winning CNN architectures like AlexNet, VGG, GoogLeNet, ResNet and more Understand the working of generative adversarial networks and how it can create new, unseen images Who this book is for This book is for data scientists, machine learning and deep learning practitioners, Cognitive and Artificial Intelligence enthusiasts who want to move one step further in building Convolutional Neural Networks. Get hands-on experience with extreme datasets and different CNN architectures to build efficient and smart ConvNet models. Basic knowledge of deep learning concepts and Python programming language is expected.

**Advanced Applied Deep Learning**
Umberto Michelucci 2019-09-28 Develop and optimize deep learning models with advanced architectures. This book teaches you the intricate details and subtleties of the algorithms that are at the core of convolutional neural networks. In Advanced Applied Deep Learning, you will study advanced topics on CNN and object detection using Keras and TensorFlow. Along the way, you will look at the fundamental operations in CNN, such as convolution and pooling, and then look at more advanced architectures such as inception networks, resnets, and many more. While the book discusses theoretical topics, you will discover how to work efficiently with Keras with many tricks and tips, including how to customize logging in Keras with custom callback classes, what is eager execution, and how to use it in your models. Finally, you will study how object detection works, and build a complete implementation of the YOLO (you only look once) algorithm in Keras and TensorFlow. By the end of the book you will have implemented various models in Keras and learned many advanced tricks that will bring your skills to the next level. What You Will Learn See how convolutional...
neural networks and object detection work. Save weights and models on disk, pause training, and restart it at a later stage. Use hardware acceleration (GPUs) in your code. Work with the Dataset TensorFlow abstraction and use pre-trained models and transfer learning. Remove and add layers to pre-trained networks to adapt them to your specific project. Apply pre-trained models such as Alexnet and VGG16 to new datasets. Who This Book Is For: Scientists and researchers with intermediate-to-advanced Python and machine learning know-how. Additionally, intermediate knowledge of Keras and TensorFlow is expected.

**Hands-On Convolutional Neural Networks with TensorFlow** - iffat Zafar 2018-08-28 Learn how to apply TensorFlow to a wide range of deep learning and Machine Learning problems with this practical guide on training CNNs for image classification, image recognition, object detection, and many computer vision challenges. Key Features: Learn the fundamentals of Convolutional Neural Networks. Harness Python and TensorFlow to train CNNs. Build scalable deep learning models that can process millions of items. Book Description: Convolutional Neural Networks (CNN) are one of the most popular architectures used in computer vision apps. This book is an introduction to CNNs through solving real-world problems in deep learning while teaching you their implementation in popular Python library - TensorFlow. By the end of the book, you will be training CNNs in no time! We start with an overview of popular machine learning and deep learning models, and then get you set up with a TensorFlow development environment. This environment is the basis for implementing and training deep learning models in later chapters. Then, you will use Convolutional Neural Networks to work on problems such as image classification, object detection, and semantic segmentation. After that, you will use transfer learning to see how these models can solve other deep learning problems. You will also get a taste of implementing generative models such as autoencoders and generative adversarial networks. Later on, you will see useful tips on machine learning best practices and troubleshooting. Finally, you will learn how to apply your models on large datasets of millions of images. What you will learn: Train popular deep learning models. Fine-tune a neural network to improve the quality of results with transfer learning. Build TensorFlow models that can scale to large datasets and systems. Who this book is for: This book is for Software Engineers, Data Scientists, or Machine Learning practitioners who want to use CNNs for solving real-world problems. Knowledge of basic machine learning concepts, linear algebra and Python will help.

**Introduction to Graph Neural Networks** - Zhiyuan Liu 2020-03-20 Graphs are useful data structures in complex real-life applications such as modeling physical systems, learning molecular fingerprints, controlling traffic networks, and recommending friends in social networks. However, these tasks require dealing with non-Euclidean graph data that contains rich relational information between elements and cannot be well handled by traditional deep learning models (e.g., convolutional neural networks (CNNs) or recurrent neural networks (RNNs)). Nodes in graphs usually contain useful feature information that cannot be well addressed in most unsupervised representation learning methods (e.g., network embedding methods). Graph neural networks (GNNs) are proposed to combine the feature information and the graph structure to learn better representations on graphs via feature propagation and aggregation. Due to its convincing performance and high interpretability, GNN has recently become a widely applied graph analysis tool. This book provides a comprehensive introduction to the basic concepts, models, and applications of graph neural networks. It starts with the introduction of the vanilla GNN model. Then several variants of the vanilla model are introduced such as graph convolutional networks, graph recurrent networks, graph attention networks, graph residual networks, and several general frameworks. Variants for different graph types and advanced training methods are also included. As for the applications of GNNs, the book categorizes them into structural, non-structural, and other scenarios, and then it introduces several typical models on solving these tasks. Finally, the closing chapters provide GNN open resources and the outlook of several future directions.

**Deep Learning for Computer Vision** - Jason

**Introduction to Deep Learning** Sandro Skansi 2018-02-04 This textbook presents a concise, accessible and engaging first introduction to deep learning, offering a wide range of connectionist models which represent the current state-of-the-art. The text explores the most popular algorithms and architectures in a simple and intuitive style, explaining the mathematical derivations in a step-by-step manner. The content coverage includes convolutional networks, LSTMs, Word2vec, RBMs, DBNs, neural Turing machines, memory networks and autoencoders. Numerous examples in working Python code are provided throughout the book, and the code is also supplied separately at an accompanying website. Topics and features: introduces the fundamentals of machine learning, and the mathematical and computational prerequisites for deep learning; discusses feed-forward neural networks, and the modifications to these which can be applied to any neural network; examines convolutional neural networks, and the recurrent connections to a feed-forward neural network; describes the notion of distributed representations, the concept of the autoencoder, and the ideas behind language processing with deep learning; presents a brief history of artificial intelligence and neural networks, and reviews interesting open research problems in deep learning and connectionism. This clearly written and lively primer on deep learning is essential reading for graduate and advanced undergraduate students of computer science, cognitive science and mathematics, as well as fields such as linguistics, logic, philosophy, and psychology.

**Practical Computer Vision Applications Using Deep Learning with CNNs** Ahmed Fawzy Gad 2018-12-05 Deploy deep learning applications into production across multiple platforms. You will work on computer vision applications that use the convolutional neural network (CNN) deep learning model and Python. This book starts by explaining the traditional machine-learning pipeline, where you will analyze an image dataset. Along the way you will cover artificial neural networks (ANNs), building one from scratch in Python, before optimizing it using genetic algorithms. For automating the process, the book highlights the limitations of traditional hand-crafted features for computer vision and why the CNN deep-learning model is the state-of-art solution. CNNs are discussed from scratch to demonstrate how they are different and more efficient than the fully connected ANN (FCNN). You will implement a CNN in Python to give you a full understanding of the model. After consolidating the basics, you will use TensorFlow to build a practical image-recognition model that you will deploy to a web server using Flask, making it accessible over the Internet. Using Kivy and NumPy, you will create cross-platform data science applications with low overheads. This book will help you apply deep learning and computer vision concepts from scratch, step-by-step from conception to production. What You Will Learn Understand how ANNs and CNNs work Create computer vision applications and CNNs from scratch using Python Follow a deep learning project from conception to production using TensorFlow Use NumPy with Kivy to build cross-platform data science applications Who This Book Is For Data scientists, machine learning and deep learning engineers, software developers.

**Introduction to Deep Learning** Eugene Charniak 2019-02-19 A project-based guide to the basics of deep learning. This concise, project-driven guide to deep learning takes readers through a series of program-writing tasks that introduce them to the use of deep learning in such areas of artificial intelligence as computer vision, natural-language processing, and reinforcement learning. The author, a longtime artificial intelligence researcher specializing in natural-language processing, covers feed-forward neural nets, convolutional neural nets, word embeddings, recurrent neural nets, sequence-to-sequence learning, deep reinforcement learning, unsupervised models, and other fundamental concepts and techniques. Students and practitioners learn the basics of deep learning by working through programs in Tensorflow, an open-source machine learning framework. “I find I learn computer science material best by sitting down and writing programs,” the author writes, and the book reflects this approach. Each chapter includes a programming project, exercises, and references for further reading. An early chapter is devoted to Tensorflow and its interface with Python, the widely used programming language. Familiarity with linear
algebra, multivariate calculus, and probability and statistics is required, as is a rudimentary knowledge of programming in Python. The book can be used in both undergraduate and graduate courses; practitioners will find it an essential reference.

Convolutional Neural Networks in Visual Computing - Ragav Venkatesan 2017-10-23 This book covers the fundamentals in designing and deploying techniques using deep architectures. It is intended to serve as a beginner’s guide to engineers or students who want to have a quick start on learning and/or building deep learning systems. This book provides a good theoretical and practical understanding and a complete toolkit of basic information and knowledge required to understand and build convolutional neural networks (CNN) from scratch. The book focuses explicitly on convolutional neural networks, filtering out other material that co-occur in many deep learning books on CNN topics.

Deep Learning With Python - Jason Brownlee 2016-05-13 Deep learning is the most interesting and powerful machine learning technique right now. Top deep learning libraries are available on the Python ecosystem like Theano and TensorFlow. Tap into their power in a few lines of code using Keras, the best-of-breed applied deep learning library. In this Ebook, learn exactly how to get started and apply deep learning to your own machine learning projects.

Learning TensorFlow - Tom Hope 2017-08-09 Roughly inspired by the human brain, deep neural networks trained with large amounts of data can solve complex tasks with unprecedented accuracy. This practical book provides an end-to-end guide to TensorFlow, the leading open source software library that helps you build and train neural networks for computer vision, natural language processing (NLP), speech recognition, and general predictive analytics. Authors Tom Hope, Yehezkel Resheff, and Itay Lieder provide a hands-on approach to TensorFlow fundamentals for a broad technical audience—from data scientists and engineers to students and researchers. You’ll begin by working through some basic examples in TensorFlow before diving deeper into topics such as neural network architectures, TensorBoard visualization, TensorFlow abstraction libraries, and multithreaded input pipelines. Once you finish this book, you’ll know how to build and deploy production-ready deep learning systems in TensorFlow. Get up and running with TensorFlow, rapidly and painlessly Learn how to use TensorFlow to build deep learning models from the ground up. Train popular deep learning models for computer vision and NLP. Use extensive abstraction libraries to make development easier and faster. Learn how to scale TensorFlow, and use clusters to distribute model training Deploy TensorFlow in a production setting.

Grokking Machine Learning - Serrano G. Luis 2020-11-24 It's time to dispel the myth that machine learning is difficult. Grokking Machine Learning teaches you how to apply ML to your projects using only standard Python code and high school-level math. No specialist knowledge is required to tackle the hands-on exercises using readily-available machine learning tools! In Grokking Machine Learning, expert machine learning engineer Luis Serrano introduces the most valuable ML techniques and teaches you how to make them work for you. Practical examples illustrate each new concept to ensure you’re grocking as you go. You’ll build models for spam detection, language analysis, and image recognition as you lock in each carefully-selected skill. Packed with easy-to-follow Python-based exercises and mini-projects, this book sets you on the path to becoming a machine learning expert. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications.

Neural Networks and Deep Learning - Charu C. Aggarwal 2018-08-25 This book covers both classical and modern models in deep learning. The primary focus is on the theory and algorithms of deep learning. The theory and algorithms of neural networks are particularly important for understanding important concepts, so that one can understand the important design concepts of neural architectures in different applications. Why do neural networks work? When do they work better than off-the-shelf machine-learning models? When is depth useful? Why is training neural networks so hard? What are the pitfalls? The book is also rich in discussing different applications in order to give the practitioner a flavor of how neural
architectures are designed for different types of problems. Applications associated with many different areas like recommender systems, machine translation, image captioning, image classification, reinforcement-learning based gaming, and text analytics are covered. The chapters of this book span three categories: The basics of neural networks: Many traditional machine learning models can be understood as special cases of neural networks. An emphasis is placed in the first two chapters on understanding the relationship between traditional machine learning and neural networks. Support vector machines, linear/logistic regression, singular value decomposition, matrix factorization, and recommender systems are shown to be special cases of neural networks. These methods are studied together with recent feature engineering methods like word2vec. Fundamentals of neural networks: A detailed discussion of training and regularization is provided in Chapters 3 and 4. Chapters 5 and 6 present radial-basis function (RBF) networks and restricted Boltzmann machines. Advanced topics in neural networks: Chapters 7 and 8 discuss recurrent neural networks and convolutional neural networks. Several advanced topics like deep reinforcement learning, neural Turing machines, Kohonen self-organizing maps, and generative adversarial networks are introduced in Chapters 9 and 10. The book is written for graduate students, researchers, and practitioners. Numerous exercises are available along with a solution manual to aid in classroom teaching. Where possible, an application-centric view is highlighted in order to provide an understanding of the practical uses of each class of techniques.

Convolutional Neural Networks in Python
Frank Millstein 2018-03-07 Convolutional Neural Networks in Python This book covers the basics behind Convolutional Neural Networks by introducing you to this complex world of deep learning and artificial neural networks in a simple and easy to understand way. It is perfect for any beginner out there looking forward to learning more about this machine learning field. This book is all about how to use convolutional neural networks for various image, object and other common classification problems in Python. Here, we also take a deeper look into various Keras layer used for building CNNs we take a look at different activation functions and much more, which will eventually lead you to creating highly accurate models able of performing great task results on various image classification, object classification and other problems. Therefore, at the end of the book, you will have a better insight into this world, thus you will be more than prepared to deal with more complex and challenging tasks on your own. Here Is a Preview of What You’ll Learn In This Book...
Convolutional neural networks structure How convolutional neural networks actually work Convolutional neural networks applications The importance of convolution operator Different convolutional neural networks layers and their importance Arrangement of spatial parameters How and when to use stride and zero-padding Method of parameter sharing Matrix multiplication and its importance Pooling and dense layers Introducing non-linearity relu activation function How to train your convolutional neural network models using backpropagation How and why to apply dropout CNN model training process How to build a convolutional neural network Generating predictions and calculating loss functions How to train and evaluate your MNIST classifier How to build a simple image classification CNN And much, much more!

An Introduction to Neural Networks
Kevin Gurney 2018-10-08 Though mathematical ideas underpin the study of neural networks, the author presents the fundamentals without the full mathematical apparatus. All aspects of the field are tackled, including artificial neurons as models of their real counterparts; the geometry of network action in pattern space; gradient descent methods, including back-propagation; associative memory and Hopfield nets; and self-organization and feature maps. The traditionally difficult topic of adaptive resonance theory is clarified within a hierarchical description of its operation. The book also includes several real-world examples to provide a concrete focus. This should enhance its appeal to those involved in the design, construction and management of networks in commercial environments and who wish to improve their understanding of network simulator packages. As a comprehensive and highly accessible introduction to one of the most important topics in cognitive and computer science, this volume should interest a wide range of readers, both students and professionals, in cognitive science, psychology, computer science and electrical engineering.
Machine Learning and Deep Learning in Real-Time Applications - Mahrishi, Mehul

2020-04-24 Artificial intelligence and its various components are rapidly engulfing almost every professional industry. Specific features of AI that have proven to be vital solutions to numerous real-world issues are machine learning and deep learning. These intelligent agents unlock higher levels of performance and efficiency, creating a wide span of industrial applications. However, there is a lack of research on the specific uses of machine/deep learning in the professional realm. Machine Learning and Deep Learning in Real-Time Applications provides emerging research exploring the theoretical and practical aspects of machine learning and deep learning and their implementations as well as their ability to solve real-world problems within several professional disciplines including healthcare, business, and computer science. Featuring coverage on a broad range of topics such as image processing, medical improvements, and smart grids, this book is ideally designed for researchers, academicians, scientists, industry experts, scholars, IT professionals, engineers, and students seeking current research on the multifaceted uses and implementations of machine learning and deep learning across the globe.

Introduction to Convolutional Neural Networks - Nemanja Milosevic 2020

In this video course, you will learn the basic principles of neural networks that are used to build models. You'll start by seeing machine learning, neurons, activations, activation functions, weights, and how everything works under the hood. Next, you'll cover the basics of the learning loop including how backpropagation and gradient descent work. Further, you will learn about convolutions, how they are inspired by the animal visual cortex, and how we use them in neural networks. One of the focuses of the course is image classification and detecting common objects in images. This has many uses in your day-to-day projects. We will be using the PyTorch open-source neural network library here. The course will also cover current state-of-the-art neural network models and show how to use them even on smaller hardware. The video concludes by showing some common tricks with hyperparameter settings and regularization techniques, and how to use neural networks in production environments. What You Will Learn: Discover the basics of neural networks and how they function. Work with convolutional neural networks. Use CNNs in your day-to-day work for image classification and other tasks. Who This Video Is For: Data scientists and machine learning and deep learning engineers.

Interpretable Machine Learning - Christoph Molnar 2019

Deep Learning with Python - François Chollet

2017-11-30 Summary: Deep Learning with Python introduces the field of deep learning using the Python language and the powerful Keras library. Written by Keras creator and Google AI researcher François Chollet, this book builds your understanding through intuitive explanations and practical examples. Purchase of the print book includes a free eBook in PDF, Kindle, and ePUB formats from Manning Publications. About the Technology: Machine learning has made remarkable progress in recent years. We went from near-unusable speech and image recognition, to near-human accuracy. We went from machines that couldn't beat a serious Go player, to defeating a world champion. Behind this progress is deep learning—a combination of engineering advances, best practices, and theory that enables a wealth of previously impossible smart applications. About the Book: Deep Learning with Python introduces the field of deep learning using the Python language and the powerful Keras library. Written by Keras creator and Google AI researcher François Chollet, this book builds your understanding through intuitive explanations and practical examples. You'll explore challenging concepts and practice with applications in computer vision, natural-language processing, and generative models. By the time you finish, you'll have the knowledge and hands-on skills to apply deep learning in your own projects. What's Inside: Deep learning from first principles: Setting up your own deep-learning environment. Image-classification models: Deep learning for text and sequences. Neural style transfer, text generation, and image generation. About the Reader: Readers need intermediate Python skills. No previous experience with Keras, TensorFlow, or machine learning is required. About the Author: François Chollet works on deep learning at Google in Mountain View, CA. He is the creator of the Keras deep-learning library, as well as a contributor to the TensorFlow machine-learning framework. He also does deep-learning research, with a focus on computer vision and...
the application of machine learning to formal reasoning. His papers have been published at major conferences in the field, including the Conference on Computer Vision and Pattern Recognition (CVPR), the Conference and Workshop on Neural Information Processing Systems (NIPS), the International Conference on Learning Representations (ICLR), and others.

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Appendix A - Installing Keras and its dependencies on Ubuntu Appendix B - Running Jupyter notebooks on an EC2 GPU instance

Guide to Convolutional Neural Networks: Hamed Habibi Aghdam 2017-06-21

This must-read text/reference introduces the fundamental concepts of convolutional neural networks (ConvNets), offering practical guidance on using libraries to implement ConvNets in applications of traffic sign detection and classification. The work presents techniques for optimizing the computational efficiency of ConvNets, as well as visualization techniques to better understand the underlying processes. The proposed models are also thoroughly evaluated from different perspectives, using exploratory and quantitative analysis. Topics and features: explains the fundamental concepts behind training linear classifiers and feature learning; discusses the wide range of loss functions for training binary and multi-class classifiers; illustrates how to derive ConvNets from fully connected neural networks, and reviews different techniques for evaluating neural networks; presents a practical library for implementing ConvNets, explaining how to use a Python interface for the library to create and assess neural networks; describes two real-world examples of the detection and classification of traffic signs using deep learning methods; examines a range of varied techniques for visualizing neural networks, using a Python interface; provides self-study exercises at the end of each chapter, in addition to a helpful glossary, with relevant Python scripts supplied at an associated website. This self-contained guide will benefit those who seek to both understand the theory behind deep learning, and to gain hands-on experience in implementing ConvNets in practice. As no prior background knowledge in the field is required to follow the material, the book is ideal for all students of computer vision and machine learning, and will also be of great interest to practitioners working on autonomous cars and advanced driver assistance systems.

Deep Learning for Data Analytics: Himansu Das 2020-05-29

Deep learning, a branch of Artificial Intelligence and machine learning, has led to new approaches to solving problems in a variety of domains including data science, data analytics and biomedical engineering. Deep Learning for Data Analytics: Foundations, Biomedical Applications and Challenges provides readers with a focused approach for the design and implementation of deep learning concepts using data analytics techniques in large scale environments. Deep learning algorithms are based on artificial neural network models to cascade multiple layers of nonlinear processing, which aids in feature extraction and learning in supervised and unsupervised ways, including classification and pattern analysis. Deep learning transforms data through a cascade of layers, helping systems analyze and process complex data sets. Deep learning algorithms extract high level complex data and process these complex sets to relatively simpler ideas formulated in the preceding level of the hierarchy. The authors of this book focus on suitable data analytics methods to solve complex real world problems such as medical image recognition, biomedical engineering, and object tracking using deep learning methodologies. The book provides a pragmatic direction for researchers who wish to analyze large volumes of data for business, engineering, and biomedical applications. Deep learning architectures including deep neural networks, recurrent neural networks, and deep belief networks can be used to help resolve problems in applications such as natural language processing, speech recognition, computer vision, bioinformatics, audio recognition, drug design, and medical image analysis. Presents the latest advances in Deep Learning for data analytics and biomedical engineering applications. Discusses Deep Learning techniques as they are being applied in the real world of biomedical engineering and data science, including Deep Learning networks, deep feature learning, deep learning toolboxes, performance evaluation, Deep Learning optimization, deep auto-encoders, and deep

**Deep Learning**-Ian Goodfellow 2016-11-10 An introduction to a broad range of topics in deep learning, covering mathematical and conceptual background, deep learning techniques used in industry, and research perspectives. “Written by three experts in the field, Deep Learning is the only comprehensive book on the subject.” —Elon Musk, cochair of OpenAI; cofounder and CEO of Tesla and SpaceX Deep learning is a form of machine learning that enables computers to learn from experience and understand the world in terms of a hierarchy of concepts. Because the computer gathers knowledge from experience, there is no need for a human computer operator to formally specify all the knowledge that the computer needs. The hierarchy of concepts allows the computer to learn complicated concepts by building them out of simpler ones; a graph of these hierarchies would be many layers deep. This book introduces a broad range of topics in deep learning. The text offers mathematical and conceptual background, covering relevant concepts in linear algebra, probability theory and information theory, numerical computation, and machine learning. It describes deep learning techniques used by practitioners in industry, including deep feedforward networks, regularization, optimization algorithms, convolutional networks, sequence modeling, and practical methodology; and it surveys such applications as natural language processing, speech recognition, computer vision, online recommendation systems, bioinformatics, and videogames. Finally, the book offers research perspectives, covering such theoretical topics as linear factor models, autoencoders, representation learning, structured probabilistic models, Monte Carlo methods, the partition function, approximate inference, and deep generative models. Deep Learning can be used by undergraduate or graduate students planning careers in either industry or research, and by software engineers who want to begin using deep learning in their products or platforms. A website offers supplementary material for both readers and instructors.

**From Natural to Artificial Intelligence**-Ricardo Lopez-Ruiz 2018-12-12

**Practical Deep Learning**-Ron Kneusel 2021-03-16 Practical Deep Learning teaches total beginners how to build the datasets and models needed to train neural networks for your own DL projects. If you’ve been curious about machine learning but didn’t know where to start, this is the book you’ve been waiting for. Focusing on the subfield of machine learning known as deep learning, it explains core concepts and gives you the foundation you need to start building your own models. Rather than simply outlining recipes for using existing toolkits, Practical Deep Learning teaches you the why of deep learning and will inspire you to explore further. All you need is basic familiarity with computer programming and high school math—the book will cover the rest. After an introduction to Python, you’ll move through key topics like how to build a good training dataset, work with the scikit-learn and Keras libraries, and evaluate your models’ performance. You’ll also learn: • How to use classic machine learning models like k-Nearest Neighbors, Random Forests, and Support Vector Machines • How neural networks work and how they’re trained • How to use convolutional neural networks • How to develop a successful deep learning model from scratch You’ll conduct experiments along the way, building to a final case study that incorporates everything you’ve learned. The perfect introduction to this dynamic, ever-expanding field, Practical Deep Learning will give you the skills and confidence to dive into your own machine learning projects.

**Advanced Deep Learning with Python**-Ivan Vasilev 2019-12-12 Gain expertise in advanced deep learning domains such as neural networks, meta-learning, graph neural networks, and memory augmented neural networks using the Python ecosystem Key Features Get to grips with building faster and more robust deep learning architectures Investigate and train convolutional neural network (CNN) models with GPU-accelerated libraries such as TensorFlow and PyTorch Apply deep neural networks (DNNs) to computer vision problems, NLP, and GANs Book Description In order to build robust deep
learning systems, you’ll need to understand everything from how neural networks work to training CNN models. In this book, you’ll discover newly developed deep learning models, methodologies used in the domain, and their implementation based on areas of application. You’ll start by understanding the building blocks and the math behind neural networks, and then move on to CNNs and their advanced applications in computer vision. You’ll also learn to apply the most popular CNN architectures in object detection and image segmentation. Further on, you’ll focus on variational autoencoders and GANs. You’ll then use neural networks to extract sophisticated vector representations of words, before going on to cover various types of recurrent networks, such as LSTM and GRU. You’ll even explore the attention mechanism to process sequential data without the help of recurrent neural networks (RNNs). Later, you’ll use graph neural networks for processing structured data, along with covering meta-learning, which allows you to train neural networks with fewer training samples. Finally, you’ll understand how to apply deep learning to autonomous vehicles. By the end of this book, you’ll have mastered key deep learning concepts and the different applications of deep learning models in the real world. What you will learn Cover advanced and state-of-the-art neural network architectures Understand the theory and math behind neural networks Train DNNs and apply them to modern deep learning problems Use CNNs for object detection and image segmentation Implement generative adversarial networks (GANs) and variational autoencoders to generate new images Solve natural language processing (NLP) tasks, such as machine translation, using sequence-to-sequence models Understand DL techniques, such as meta-learning and graph neural networks Who this book is for This book is for data scientists, deep learning engineers and researchers, and AI developers who want to further their knowledge of deep learning and build innovative and unique deep learning projects. Anyone looking to get to grips with advanced use cases and methodologies adopted in the deep learning domain using real-world examples will also find this book useful. Basic understanding of deep learning concepts and working knowledge of the Python programming language is assumed.

Deep Learning and Convolutional Neural Networks for Medical Image Computing-Le Lu 2017-07-12 This book presents a detailed review of the state of the art in deep learning approaches for semantic object detection and segmentation in medical image computing, and large-scale radiology database mining. A particular focus is placed on the application of convolutional neural networks, with the theory supported by practical examples. Features: highlights how the use of deep neural networks can address new questions and protocols, as well as improve upon existing challenges in medical image computing; discusses the insightful research experience of Dr. Ronald M. Summers; presents a comprehensive review of the latest research and literature; describes a range of different methods that make use of deep learning for object or landmark detection tasks in 2D and 3D medical imaging; examines a varied selection of techniques for semantic segmentation using deep learning principles in medical imaging; introduces a novel approach to interleaved text and image deep mining on a large-scale radiology image database.

Applied Deep Learning-Umberto Michelucci 2018-09-07 Work with advanced topics in deep learning, such as optimization algorithms, hyper-parameter tuning, dropout, and error analysis as well as strategies to address typical problems encountered when training deep neural networks. You’ll begin by studying the activation functions mostly with a single neuron (ReLu, sigmoid, and Swish), seeing how to perform linear and logistic regression using TensorFlow, and choosing the right cost function. The next section talks about more complicated neural network architectures with several layers and neurons and explores the problem of random initialization of weights. An entire chapter is dedicated to a complete overview of neural network error analysis, giving examples of solving problems originating from variance, bias, overfitting, and datasets coming from different distributions. Applied Deep Learning also discusses how to implement logistic regression completely from scratch without using any Python library except NumPy, to let you appreciate how libraries such as TensorFlow allow quick and efficient experiments. Case studies for each method are included to put into practice all theoretical information. You’ll discover tips and tricks for writing optimized Python code (for example vectorizing loops with NumPy). What You Will Learn Implement advanced techniques in the right way in Python
and TensorFlow Debug and optimize advanced methods (such as dropout and regularization) Carry out error analysis (to realize if one has a bias problem, a variance problem, a data offset problem, and so on) Set up a machine learning project focused on deep learning on a complex dataset Who This Book Is For Readers with a medium understanding of machine learning, linear algebra, calculus, and basic Python programming.

Introduction to Deep Learning Using R- Taweh Beysolow II 2017-07-19 Understand deep learning, the nuances of its different models, and where these models can be applied. The abundance of data and demand for superior products/services have driven the development of advanced computer science techniques, among them image and speech recognition. Introduction to Deep Learning Using R provides a theoretical and practical understanding of the models that perform these tasks by building upon the fundamentals of data science through machine learning and deep learning. This step-by-step guide will help you understand the disciplines so that you can apply the methodology in a variety of contexts. All examples are taught in the R statistical language, allowing students and professionals to implement these techniques using open source tools. What You’ll Learn Understand the intuition and mathematics that power deep learning models Utilize various algorithms using the R programming language and its packages Use best practices for experimental design and variable selection Practice the methodology to approach and effectively solve problems as a data scientist Evaluate the effectiveness of algorithmic solutions and enhance their predictive power Who This Book Is For Students, researchers, and data scientists who are familiar with programming using R. This book also is also of use for those who wish to learn how to appropriately deploy these algorithms in applications where they would be most useful.

Introduction to Deep Learning Business Applications for Developers- Armando Vieira 2018-05-02 Discover the potential applications, challenges, and opportunities of deep learning from a business perspective with technical examples. These applications include image recognition, segmentation and annotation, video processing and annotation, voice recognition, intelligent personal assistants, automated translation, and autonomous vehicles. An Introduction to Deep Learning Business Applications for Developers covers some common DL algorithms such as content-based recommendation algorithms and natural language processing. You’ll explore examples, such as video prediction with fully convolutional neural networks (FCNN) and residual neural networks (ResNets). You will also see applications of DL for controlling robotics, exploring the DeepQ learning algorithm with Monte Carlo Tree search (used to beat humans in the game of Go), and modeling for financial risk assessment. There will also be mention of the powerful set of algorithms called Generative Adversarial Neural networks (GANs) that can be applied for image colorization, image completion, and style transfer. After reading this book you will have an overview of the exciting field of deep neural networks and an understanding of most of the major applications of deep learning. The book contains some coding examples, tricks, and insights on how to train deep learning models using the Keras framework. What You Will Learn Find out about deep learning and why it is so powerful Work with the major algorithms available to train deep learning models See the major breakthroughs in terms of applications of deep learning Run simple examples with a selection of deep learning libraries Discover the areas of impact of deep learning in business Who This Book Is For Data scientists, entrepreneurs, and business developers.

TensorFlow Machine Learning Cookbook- Nick McClure 2017-02-14 Explore machine learning concepts using the latest numerical computing library — TensorFlow — with the help of this comprehensive cookbook About This Book Your quick guide to implementing TensorFlow in your day-to-day machine learning activities Learn advanced techniques that bring more accuracy and speed to machine learning Upgrade your knowledge to the second generation of machine learning with this guide on TensorFlow Who This Book Is For This book is ideal for data scientists who are familiar with C++ or Python and perform machine learning activities on a day-to-day basis. Intermediate and advanced machine learning implementers who need a quick guide they can easily navigate will find it useful. What You Will Learn Become familiar with the basics of the TensorFlow machine learning library Get to know Linear Regression techniques with
TensorFlow Learn SVMs with hands-on recipes
Implement neural networks and improve predictions Apply NLP and sentiment analysis to your data Master CNN and RNN through practical recipes Take TensorFlow into production In Detail TensorFlow is an open source software library for Machine Intelligence. The independent recipes in this book will teach you how to use TensorFlow for complex data computations and will let you dig deeper and gain more insights into your data than ever before. You'll work through recipes on training models, model evaluation, sentiment analysis, regression analysis, clustering analysis, artificial neural networks, and deep learning – each using Google's machine learning library TensorFlow. This guide starts with the fundamentals of the TensorFlow library which includes variables, matrices, and various data sources. Moving ahead, you will get hands-on experience with Linear Regression techniques with TensorFlow. The next chapters cover important high-level concepts such as neural networks, CNN, RNN, and NLP. Once you are familiar and comfortable with the TensorFlow ecosystem, the last chapter will show you how to take it to production. Style and approach This book takes a recipe-based approach where every topic is explicated with the help of a real-world example.

Information and Communication Technology for Intelligent Systems-Tomonobu Senjyu
2020-10-21 This book gathers papers addressing state-of-the-art research in all areas of information and communication technologies and their applications in intelligent computing, cloud storage, data mining and software analysis. It presents the outcomes of the Fourth International Conference on Information and Communication Technology for Intelligent Systems, which was held in Ahmedabad, India. Divided into two volumes, the book discusses the fundamentals of various data analysis techniques and algorithms, making it a valuable resource for researchers and practitioners alike.

Fundamentals of Deep Learning-Nikhil Buduma
2017-05-25 With the reinvigoration of neural networks in the 2000s, deep learning has become an extremely active area of research, one that’s paving the way for modern machine learning. In this practical book, author Nikhil Buduma provides examples and clear explanations to guide you through major concepts of this complicated field. Companies such as Google, Microsoft, and Facebook are actively growing in-house deep-learning teams. For the rest of us, however, deep learning is still a pretty complex and difficult subject to grasp. If you’re familiar with Python, and have a background in calculus, along with a basic understanding of machine learning, this book will get you started. Examine the foundations of machine learning and neural networks Learn how to train feed-forward neural networks Use TensorFlow to implement your first neural network Manage problems that arise as you begin to make networks deeper Build neural networks that analyze complex images Perform effective dimensionality reduction using autoencoders Dive deep into sequence analysis to examine language Learn the fundamentals of reinforcement learning

A Guide to Convolutional Neural Networks for Computer Vision-Salman Khan
2018-02-13 Computer vision has become increasingly important and effective in recent years due to its wide-ranging applications in areas as diverse as smart surveillance and monitoring, health and medicine, sports and recreation, robotics, drones, and self-driving cars. Visual recognition tasks, such as image classification, localization, and detection, are the core building blocks of many of these applications, and recent developments in Convolutional Neural Networks (CNNs) have led to outstanding performance in these state-of-the-art visual recognition tasks and systems. As a result, CNNs now form the crux of deep learning algorithms in computer vision. This self-contained guide will benefit those who seek to both understand the theory behind CNNs and to gain hands-on experience on the application of CNNs in computer vision. It provides a comprehensive introduction to CNNs starting with the essential concepts behind neural networks: training, regularization, and optimization of CNNs. The book also discusses a wide range of loss functions, network layers, and popular CNN architectures, reviews the different techniques for the evaluation of CNNs, and presents some popular CNN tools and libraries that are commonly used in computer vision. Further, this text describes and discusses case studies that are related to the application of CNN in computer vision, including image classification, object detection, semantic segmentation, scene understanding, and image generation. This book is ideal for undergraduate...
and graduate students, as no prior background knowledge in the field is required to follow the material, as well as new researchers, developers, engineers, and practitioners who are interested in gaining a quick understanding of CNN models.

**Deep Learning with R**-Abhijit Ghatak

2019-04-13 Deep Learning with R introduces deep learning and neural networks using the R programming language. The book builds on the understanding of the theoretical and mathematical constructs and enables the reader to create applications on computer vision, natural language processing and transfer learning. The book starts with an introduction to machine learning and moves on to describe the basic architecture, different activation functions, forward propagation, cross-entropy loss and backward propagation of a simple neural network. It goes on to create different code segments to construct deep neural networks. It discusses in detail the initialization of network parameters, optimization techniques, and some of the common issues surrounding neural networks such as dealing with NaNs and the vanishing/exploding gradient problem. Advanced variants of multilayered perceptrons namely, convolutional neural networks and sequence models are explained, followed by application to different use cases. The book makes extensive use of the Keras and TensorFlow frameworks.

**TensorFlow for Deep Learning**-Bharath Ramsundar

2018-03-01 Learn how to solve challenging machine learning problems with TensorFlow, Google’s revolutionary new software library for deep learning. If you have some background in basic linear algebra and calculus, this practical book introduces machine-learning fundamentals by showing you how to design systems capable of detecting objects in images, understanding text, analyzing video, and predicting the properties of potential medicines. TensorFlow for Deep Learning teaches concepts through practical examples and helps you build knowledge of deep learning foundations from the ground up. It’s ideal for practicing developers with experience designing software systems, and useful for scientists and other professionals familiar with scripting but not necessarily with designing learning algorithms. Learn TensorFlow fundamentals, including how to perform basic computation Build simple learning systems to understand their mathematical foundations Dive into fully connected deep networks used in thousands of applications Turn prototypes into high-quality models with hyperparameter optimization Process images with convolutional neural networks Handle natural language datasets with recurrent neural networks Use reinforcement learning to solve games such as tic-tac-toe Train deep networks with hardware including GPUs and tensor processing units.

**Deep Learning with PyTorch**-Luca Pietro Giovanni Antiga

2020-07-01 “We finally have the definitive treatise on PyTorch! It covers the basics and abstractions in great detail. I hope this book becomes your extended reference document.” —Soumith Chintala, co-creator of PyTorch Key Features Written by PyTorch’s creator and key contributors Develop deep learning models in a familiar Pythonic way Use PyTorch to build an image classifier for cancer detection Diagnose problems with your neural network and improve training with data augmentation Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About The Book Every other day we hear about new ways to put deep learning to good use: improved medical imaging, accurate credit card fraud detection, long range weather forecasting, and more. PyTorch puts these superpowers in your hands. Instantly familiar to anyone who knows Python data tools like NumPy and Scikit-learn, PyTorch simplifies deep learning without sacrificing advanced features. It’s great for building quick models, and it scales smoothly from laptop to enterprise. Deep Learning with PyTorch teaches you to create deep learning and neural network systems with PyTorch. This practical book gets you to work right away building a tumor image classifier from scratch. After covering the basics, you’ll learn best practices for the entire deep learning pipeline, tackling advanced projects as your PyTorch skills become more sophisticated. All code samples are easy to explore in downloadable Jupyter notebooks. What You Will Learn Understanding deep learning data structures such as tensors and neural networks Best practices for the PyTorch Tensor API, loading data in Python, and visualizing results Implementing modules and loss functions Utilizing pretrained models from PyTorch Hub Methods for training networks with limited inputs Sifting through unreliable results to diagnose and fix problems in your neural network Improve your results with augmented
data, better model architecture, and fine tuning
This Book Is Written For Python programmers with an interest in machine learning. No experience with PyTorch or other deep learning frameworks is required. About The Authors Eli Stevens has worked in Silicon Valley for the past 15 years as a software engineer, and the past 7 years as Chief Technical Officer of a startup making medical device software. Luca Antiga is co-founder and CEO of an AI engineering company located in Bergamo, Italy, and a regular contributor to PyTorch. Thomas Viehmann is a Machine Learning and PyTorch speciality trainer and consultant based in Munich, Germany and a PyTorch core developer.

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