

# Distributed Deep Neural Networks Over The Cloud The Edge

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## CONRAD KOCH

[Edge Learning for Distributed Big Data Analytics](#) Springer Nature

This book highlights new trends and challenges in research on agents and the new digital and knowledge economy. It includes papers on business process management, agent-based modeling and simulation and anthropic-oriented computing that were originally presented at the 17th International KES Conference on Agents and Multi-Agent Systems: Technologies and Applications (KES-AMSTA 2023), held in Rome, Italy, in June 14–16, 2023. The respective papers cover topics such as software agents, multi-agent systems, agent modeling, mobile and cloud computing, big data analysis, business intelligence, artificial intelligence, social systems, computer embedded systems and nature-inspired manufacturing, all of which contribute to the modern digital economy. [Ultra-Low-Latency Distributed Deep Neural Network Over Hierarchical Mobile Networks](#) Academic Press

This book presents the basics and recent advancements in natural language processing and information retrieval in a single volume. It will serve as an ideal reference text for graduate students and academic researchers in interdisciplinary areas of electrical engineering, electronics engineering, computer engineering, and information technology. This text emphasizes the existing problem domains and possible new directions in natural language processing and information retrieval. It discusses the importance of information retrieval with the integration of machine learning, deep learning, and word embedding. This approach supports the quick evaluation of real-time data. It covers important topics including rumor detection techniques, sentiment analysis using graph-based techniques, social media data analysis, and language-independent text mining. Features: • Covers aspects of information retrieval in different areas including healthcare, data analysis, and machine translation • Discusses recent advancements in language- and domain-independent information extraction from textual and/or multimodal data • Explains models including decision making, random walk, knowledge graphs, word embedding, n-grams, and frequent pattern mining • Provides integrated approaches of machine learning, deep learning, and word embedding for natural language processing • Covers latest datasets for natural language processing and information retrieval for social media like Twitter The text is primarily written for graduate students and academic researchers in interdisciplinary areas of electrical engineering, electronics engineering, computer engineering, and information technology.

[Apache Spark Deep Learning Cookbook](#) Packt Publishing Ltd

This book provides a comprehensive introduction to current state-of-the-art auto-segmentation approaches used in radiation oncology for auto-delineation of organs-of-risk for thoracic radiation treatment planning. Containing the latest, cutting edge technologies and treatments, it explores deep-learning methods, multi-atlas-based methods, and model-based methods that are currently being developed for clinical radiation oncology applications. Each chapter focuses on a specific aspect of algorithm choices and discusses the impact of the different algorithm modules to the algorithm performance as well as the implementation issues for clinical use (including data curation challenges and auto-contour evaluations). This book is an ideal guide for radiation oncology centers looking to learn more about potential auto-segmentation tools for their clinic in addition to medical physicists commissioning auto-segmentation for clinical use. Features: Up-to-date with the latest technologies in the field Edited by leading authorities in the area, with chapter contributions from subject area specialists All approaches presented in this book are validated using a standard benchmark dataset established by the Thoracic Auto-segmentation Challenge held as an event of the 2017 Annual Meeting of American Association of Physicists in Medicine

[Scalable and Distributed Machine Learning and Deep Learning Patterns](#) Cambridge University Press

Mobile Edge Computing (MEC) provides cloud-like subscription-oriented services at the edge of mobile network. For low latency and high bandwidth services, edge computing assisted IoT (Internet of Things) has become the pillar for the development of smart environments and their applications such as smart home, smart health, smart traffic management, smart agriculture, and smart city. This book covers the fundamental concept of the MEC and its real-time applications. The book content is organized into three parts: Part A covers the architecture and working model of MEC, Part B focuses on the systems, platforms, services and issues of MEC, and Part C emphasizes on various applications of MEC. This book is targeted for graduate students, researchers, developers, and service providers interested in learning about the state-of-the-art in MEC technologies, innovative applications, and future research directions.

Springer

[Distributed Deep Learning with Apache Spark](#)

[Auto-Segmentation for Radiation Oncology](#) Springer Nature

Implement TensorFlow's offerings such as TensorBoard, TensorFlow.js, TensorFlow Probability, and TensorFlow Lite to build smart automation projects Key FeaturesUse machine learning and deep learning principles to build real-world projectsGet to grips with TensorFlow's impressive range of module offeringsImplement projects on GANs, reinforcement learning, and capsule networkBook Description TensorFlow has transformed the way machine learning is perceived. TensorFlow Machine Learning Projects teaches you how to exploit the benefits—simplicity, efficiency, and flexibility—of using TensorFlow in various real-world projects. With the help of this book, you'll not only learn how to build advanced projects using different datasets but also be able to tackle common challenges using a range of libraries from the TensorFlow ecosystem. To start with, you'll get to grips with using TensorFlow for machine learning projects; you'll explore a wide range of projects using TensorForest and TensorBoard for detecting exoplanets, TensorFlow.js for sentiment analysis, and TensorFlow Lite for digit classification. As you make your way through the book, you'll build projects in various real-world domains, incorporating natural language processing (NLP), the Gaussian process, autoencoders, recommender systems, and Bayesian neural networks, along with trending areas such as Generative Adversarial Networks (GANs), capsule networks, and reinforcement learning. You'll learn how to use the TensorFlow on Spark API and GPU-accelerated computing with TensorFlow to detect objects, followed by how to train and develop a recurrent neural network (RNN) model to generate book scripts. By the end of this book, you'll have gained the required expertise to build full-fledged machine learning projects at work. What you will learnUnderstand the TensorFlow ecosystem using various datasets and techniquesCreate recommendation systems for quality product recommendationsBuild projects using CNNs, NLP, and Bayesian neural networksPlay Pac-Man using deep reinforcement learningDeploy scalable TensorFlow-based machine learning systemsGenerate your own book script using RNNsWho this book is for TensorFlow Machine Learning Projects is for you if you are a data analyst, data scientist, machine learning professional, or deep learning enthusiast with basic knowledge of TensorFlow. This book is also for you if you want to build end-to-end projects in the machine learning domain using supervised, unsupervised, and reinforcement learning techniques

[Edge AI](#) Springer Nature

With the development of technologies, the increasing number of mobile devices are used all around the world. Wearable sensors can provide quantitative assessments for fall-based movements. Detecting falls from multiple intelligent wearable sensors have aroused wide attention through academia and industry, because falls are the common incidents among human beings and lead to some serious consequences. Wearable sensors can provide quantitative assessments for human movements. Automatic fall detection systems with the wearable sensors are becoming popular in recent years. In this manuscript, a novel data acquisition method is proposed in the fall detection system through the wearable gait lab including a smartwatch, a smartphone, and two smart insoles.

Deep learning has shown great potential for performing automatic fall detection. The proposed system applying a distributed hierarchical neural network (DHNN) architecture over a cloud server and mobile devices based on machine learning algorithms. The system enables multiple mobile devices to train a shared consensus model collaboratively and takes advantage of the abundant computational resources on a cloud server to minimize the limitation of the computational and storage resource on mobile devices. The patients' privacy is protected as well. Both quantitative and qualitative analysis are implemented through well-designed experiments.

#### **Deep Learning with Keras** Apress

This book presents the proceedings of the Computing Conference 2019, providing a comprehensive collection of chapters focusing on core areas of computing and their real-world applications. Computing is an extremely broad discipline, encompassing a range of specialized fields, each focusing on particular areas of technology and types of application, and the conference offered pioneering researchers, scientists, industrial engineers, and students from around the globe a platform to share new ideas and development experiences. Providing state-of-the-art intelligent methods and techniques for solving real-world problems, the book inspires further research and technological advances in this important area.

#### **Deep Learning with Hadoop** Springer Nature

A solution-based guide to put your deep learning models into production with the power of Apache Spark Key Features Discover practical recipes for distributed deep learning with Apache Spark Learn to use libraries such as Keras and TensorFlow Solve problems in order to train your deep learning models on Apache Spark Book Description With deep learning gaining rapid mainstream adoption in modern-day industries, organizations are looking for ways to unite popular big data tools with highly efficient deep learning libraries. As a result, this will help deep learning models train with higher efficiency and speed. With the help of the Apache Spark Deep Learning Cookbook, you'll work through specific recipes to generate outcomes for deep learning algorithms, without getting bogged down in theory. From setting up Apache Spark for deep learning to implementing types of neural net, this book tackles both common and not so common problems to perform deep learning on a distributed environment. In addition to this, you'll get access to deep learning code within Spark that can be reused to answer similar problems or tweaked to answer slightly different problems. You will also learn how to stream and cluster your data with Spark. Once you have got to grips with the basics, you'll explore how to implement and deploy deep learning models, such as Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) in Spark, using popular libraries such as TensorFlow and Keras. By the end of the book, you'll have the expertise to train and deploy efficient deep learning models on Apache Spark. What you will learn Set up a fully functional Spark environment Understand practical machine learning and deep learning concepts Apply built-in machine learning libraries within Spark Explore libraries that are compatible with TensorFlow and Keras Explore NLP models such as Word2vec and TF-IDF on Spark Organize dataframes for deep learning evaluation Apply testing and training modeling to ensure accuracy Access readily available code that may be reusable Who this book is for If you're looking for a practical and highly useful resource for implementing efficiently distributed deep learning models with Apache Spark, then the Apache Spark Deep Learning Cookbook is for you. Knowledge of the core machine learning concepts and a basic understanding of the Apache Spark framework is required to get the best out of this book. Additionally, some programming knowledge in Python is a plus.

#### *Artificial Intelligence in Medicine* Springer

This book constitutes the refereed proceedings of the 19th International Conference on Embedded Computer Systems: Architectures, Modeling, and Simulation, SAMOS 2019, held in Pythagorion, Samos, Greece, in July 2019. The 21 regular papers presented were carefully reviewed and selected from 55 submissions. The papers are organized in topical sections on system design space exploration; deep learning optimization; system security; multi/many-core scheduling; system energy and heat management; many-core communication; and electronic system-level design and verification. In addition there are 13 papers from three special sessions which were organized on topics of current interest: insights from negative results; machine learning implementations; and European projects.

#### Advances in Distributed Computing and Machine Learning Createspace Independent Publishing Platform

Speed up the design and implementation of deep learning solutions using Apache Spark Key Features Explore the world of distributed deep learning with Apache Spark Train neural networks with deep learning libraries such as BigDL and TensorFlow Develop Spark deep learning applications to intelligently handle large and complex datasets Book Description Deep learning is a subset of machine learning where datasets with several layers of complexity can be processed. Hands-On Deep Learning with Apache Spark addresses the sheer complexity of technical and analytical parts and the speed at which deep learning solutions can be implemented on Apache Spark. The book starts with the fundamentals of Apache Spark and deep learning. You will set up Spark for deep learning, learn principles of distributed modeling, and understand different types of neural nets. You will then implement deep learning models, such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and long short-term memory (LSTM) on Spark. As you progress through the book, you will gain hands-on experience of what it takes to understand the complex datasets you are dealing with. During the course of this book, you will use popular deep learning frameworks, such as TensorFlow, Deeplearning4j, and Keras to train your distributed models. By the end of this book, you'll have gained experience with the implementation of your models on a variety of use cases. What you will learn Understand the basics of deep learning Set up Apache Spark for deep learning Understand the principles of distribution modeling and different types of neural networks Obtain an understanding of deep learning algorithms Discover textual analysis and deep learning with Spark Use popular deep learning frameworks, such as Deeplearning4j, TensorFlow, and Keras Explore popular deep learning algorithms Who this book is for If you are a Scala developer, data scientist, or data analyst who wants to learn how to use Spark for implementing efficient deep learning models, Hands-On Deep Learning with Apache Spark is for you. Knowledge of the core machine learning concepts and some exposure to Spark will be helpful.

#### *Natural Language Processing and Information Retrieval* Springer Nature

Deep neural networks have become popular for solving machine learning problems in the field of computer vision. Although computers have reached parity in the task of image classification in machine learning competitions, the task of mining massive training data often takes expensive hardware a long time to process. Distributed protocol for model training can be attractive because less powerful distributed nodes are cheaper to operate than specialized high-performance cluster. Stochastic gradient descent (SGD) is a popular optimizer at the heart of many deep learning systems. To investigate the performance of distributed asynchronous SGD, Tensorflow deep learning framework was tested with Downpour SGD and Delay Compensated SGD to see effect of model training in typical commercial environments. Experimental results show that both Downpour and Delay Compensated SGD are viable protocols for distributed deep learning.

#### **Deep Learning for Robot Perception and Cognition** Springer

This book features the outcomes of the 16th International Conference on Distributed Computing and Artificial Intelligence 2019 (DCAI 2019), which is a forum to present applications of innovative

techniques for studying and solving complex problems in artificial intelligence and computing. The exchange of ideas between scientists and technicians from both the academic and industrial sectors is essential to facilitate the development of systems that can meet the ever-increasing demands of today's society. This book brings together lessons learned, current work and promising future trends associated with distributed computing, artificial intelligence and their application to provide efficient solutions to real-world problems. The book includes 29 high-quality and diverse contributions in established and emerging areas of research presented at the symposium organized by the Osaka Institute of Technology, Hiroshima University, University of Granada and University of Salamanca, which was held in Ávila, Spain, from 26th-28th June 2019

#### *TensorFlow Machine Learning Projects* Springer Nature

This book contains of 39 scientific papers which include the results of research regarding the current directions in the fields of data mining, machine learning and decision-making. This book is devoted to current problems of artificial and computational intelligence including decision-making systems. Collecting, analysis and processing information are the current directions of modern computer science. Development of new modern information and computer technologies for data analysis and processing in various fields of data mining and machine learning create the conditions for increasing effectiveness of the information processing by both the decrease of time and the increase of accuracy of the data processing. The papers are divided in terms of their topic into three sections. The first section "Analysis and Modeling of Hybrid Systems and Processes" contains of 11 papers, and the second section "Theoretical and Applied Aspects of Decision-Making Systems" contains of 11 ones too. There are 17 papers in the third section "Data Engineering, Computational Intelligence and Inductive Modeling". The book is focused to scientists and developers in the fields of data mining, machine learning and decision-making systems.

#### **Lecture Notes in Data Engineering, Computational Intelligence, and Decision Making**

##### Springer

Build, scale, and deploy deep neural network models using the star libraries in Python Key Features Delve into advanced machine learning and deep learning use cases using Tensorflow and Keras Build, deploy, and scale end-to-end deep neural network models in a production environment Learn to deploy TensorFlow on mobile, and distributed TensorFlow on GPU, Clusters, and Kubernetes Book Description TensorFlow is the most popular numerical computation library built from the ground up for distributed, cloud, and mobile environments. TensorFlow represents the data as tensors and the computation as graphs. This book is a comprehensive guide that lets you explore the advanced features of TensorFlow 1.x. Gain insight into TensorFlow Core, Keras, TF Estimators, TFLearn, TF Slim, Pretty Tensor, and Sonnet. Leverage the power of TensorFlow and Keras to build deep learning models, using concepts such as transfer learning, generative adversarial networks, and deep reinforcement learning. Throughout the book, you will obtain hands-on experience with varied datasets, such as MNIST, CIFAR-10, PTB, text8, and COCO-Images. You will learn the advanced features of TensorFlow 1.x, such as distributed TensorFlow with TF Clusters, deploy production models with TensorFlow Serving, and build and deploy TensorFlow models for mobile and embedded devices on Android and iOS platforms. You will see how to call TensorFlow and Keras API within the R statistical software, and learn the required techniques for debugging when the TensorFlow API-based code does not work as expected. The book helps you obtain in-depth knowledge of TensorFlow, making you the go-to person for solving artificial intelligence problems. By the end of this guide, you will have mastered the offerings of TensorFlow and Keras, and gained the skills you need to build smarter, faster, and efficient machine learning and deep learning systems. What you will learn Master advanced concepts of deep learning such as transfer learning, reinforcement learning, generative models and more, using TensorFlow and Keras Perform supervised (classification and regression) and unsupervised (clustering) learning to solve machine learning tasks Build end-to-end deep learning (CNN, RNN, and Autoencoders) models with TensorFlow Scale and deploy production models with distributed and high-performance computing on GPU and clusters Build TensorFlow models to work with multilayer perceptrons using Keras, TFLearn, and R Learn the functionalities of smart apps by building and deploying TensorFlow models on iOS and Android devices Supercharge TensorFlow with distributed training and deployment on Kubernetes and TensorFlow Clusters Who this book is for This book is for data scientists, machine learning engineers, artificial intelligence engineers, and for all TensorFlow users who wish to upgrade their TensorFlow knowledge and work on various machine learning and deep learning problems. If you are looking for an easy-to-follow guide that underlines the intricacies and complex use cases of machine learning, you will find this book extremely useful. Some basic understanding of TensorFlow is required to get the most out of the book.

#### *High Performance Computing* Packt Publishing Ltd

Mobile Edge Artificial Intelligence: Opportunities and Challenges presents recent advances in wireless technologies and nonconvex optimization techniques for designing efficient edge AI systems. The book includes comprehensive coverage on modeling, algorithm design and theoretical analysis. Through typical examples, the powerfulness of this set of systems and algorithms is demonstrated, along with their abilities to make low-latency, reliable and private intelligent decisions at network edge. With the availability of massive datasets, high performance computing platforms, sophisticated algorithms and software toolkits, AI has achieved remarkable success in many application domains. As such, intelligent wireless networks will be designed to leverage advanced wireless communications and mobile computing technologies to support AI-enabled applications at various edge mobile devices with limited communication, computation, hardware and energy resources. Presents advanced key enabling techniques, including model compression, wireless MapReduce and wireless cooperative transmission Provides advanced 6G wireless techniques, including over-the-air computation and reconfigurable intelligent surface Includes principles for designing communication-efficient edge inference systems, communication-efficient training systems, and communication-efficient optimization algorithms for edge machine learning

#### **Agents and Multi-agent Systems: Technologies and Applications 2023** IGI Global

This book constitutes the proceedings of the 24th International Conference on Discovery Science, DS 2021, which took place virtually during October 11-13, 2021. The 36 papers presented in this volume were carefully reviewed and selected from 76 submissions. The contributions were organized in topical sections named: applications; classification; data streams; graph and network mining; machine learning for COVID-19; neural networks and deep learning; preferences and recommender systems; representation learning and feature selection; responsible artificial intelligence; and spatial, temporal and spatiotemporal data.

#### Hands-On Deep Learning with Apache Spark Springer Nature

Over the recent years, Deep Neural Networks (DNNs) have surpassed human-level intelligence in recognizing and interpreting complex patterns in data. Ever since the ImageNet competition in 2012, Deep Learning (DL) has become a promising approach for solving numerous problems in the field of Computer Science. However, the neuroscience community is not able to utilize the DL algorithms effectively because the brain imaging datasets are huge in terms of size, and the current sequential training techniques do not scale up well for such big datasets. Without the proper amount of training data, training DNN models to competitive accuracies is quite challenging. Even with powerful GPUs or TPUs, the training performance can still be unsatisfactory if each data sample itself is large, as in

the case of the brain imaging datasets. One solution is to parallelize the training process instead of training in a sequential mini-batch fashion. However, the currently available distributed training techniques suffer from several problems like computation bottleneck and model divergence. In this thesis, we discuss a novel training technique that can overcome these problems by distributing the model training across multiple GPUs on different nodes asynchronously and updating the gradients synchronously during the backward pass (backpropagation) in a Ring manner. We explore how to build such systems and train models efficiently using model replication and data parallelism techniques with very minimal changes to the existing code. We perform a comparative performance analysis of the proposed technique, training several Convolutional Neural Network (CNN) models on single-GPU, multi-GPU systems, and a Multi-node Multi-GPU cluster. Our analysis provides conclusive support that the proposed training technique can significantly out-perform the traditional sequential training approach.

**Artificial Intelligence and Security** Academic Press

Deep Learning for Robot Perception and Cognition introduces a broad range of topics and methods in deep learning for robot perception and cognition together with end-to-end methodologies. The book provides the conceptual and mathematical background needed for approaching a large number of robot perception and cognition tasks from an end-to-end learning point-of-view. The book is suitable for students, university and industry researchers and practitioners in Robotic Vision, Intelligent Control, Mechatronics, Deep Learning, Robotic Perception and Cognition tasks. Presents deep learning principles and methodologies Explains the principles of applying end-to-end learning in robotics applications Presents how to design and train deep learning models Shows how to apply deep learning in robot vision tasks such as object recognition, image classification, video analysis, and more Uses robotic simulation environments for training deep learning models Applies deep learning methods for different tasks ranging from planning and navigation to biosignal analysis

**Mobile Edge Artificial Intelligence** Springer Nature

Build and deploy powerful neural network models using the latest Java deep learning libraries Key

Features Understand DL with Java by implementing real-world projects Master implementations of various ANN models and build your own DL systems Develop applications using NLP, image classification, RL, and GPU processing Book Description Java is one of the most widely used programming languages. With the rise of deep learning, it has become a popular choice of tool among data scientists and machine learning experts. Java Deep Learning Projects starts with an overview of deep learning concepts and then delves into advanced projects. You will see how to build several projects using different deep neural network architectures such as multilayer perceptrons, Deep Belief Networks, CNN, LSTM, and Factorization Machines. You will get acquainted with popular deep and machine learning libraries for Java such as Deeplearning4j, Spark ML, and RankSys and you'll be able to use their features to build and deploy projects on distributed computing environments. You will then explore advanced domains such as transfer learning and deep reinforcement learning using the Java ecosystem, covering various real-world domains such as healthcare, NLP, image classification, and multimedia analytics with an easy-to-follow approach. Expert reviews and tips will follow every project to give you insights and hacks. By the end of this book, you will have stepped up your expertise when it comes to deep learning in Java, taking it beyond theory and be able to build your own advanced deep learning systems. What you will learn Master deep learning and neural network architectures Build real-life applications covering image classification, object detection, online trading, transfer learning, and multimedia analytics using DL4J and open-source APIs Train ML agents to learn from data using deep reinforcement learning Use factorization machines for advanced movie recommendations Train DL models on distributed GPUs for faster deep learning with Spark and DL4J Ease your learning experience through 69 FAQs Who this book is for If you are a data scientist, machine learning professional, or deep learning practitioner keen to expand your knowledge by delving into the practical aspects of deep learning with Java, then this book is what you need! Get ready to build advanced deep learning models to carry out complex numerical computations. Some basic understanding of machine learning concepts and a working knowledge of Java are required.

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