Neural Network Training Using Genetic Algorithms Series In Machine Perception And Artificial Intelligence

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AVA LENNON

The Decision Maker's Handbook to Data Science CRC Press
The International Conference of Computational Methods in Sciences and Engineering (ICCMSE) is unique in its kind. It regroups original contributions from all fields of the traditional Sciences, Mathematics, Physics, Chemistry, Biology, Medicine and all branches of Engineering. The aim of the conference is to bring together computational scientists from several disciplines in order to share methods and ideas. More than 370 extended abstracts have been submitted for consideration for presentation in ICCMSE 2004. From these, 289 extended abstracts have been selected after international peer review by at least two independent reviewers.
NEURAL NETWORKS, FUZZY LOGIC AND GENETIC ALGORITHM Springer Science & Business Media
Abstract: "In this paper, we present a neurogenetic learning algorithm which is an integrated method of designing and training neural networks using gentic [sic] algorithms. The proposed scheme provides an integrated means to design and train neural networks, and use the gradient- descend approach for fine-tuning of the network weights and biases. The salient characteristics of the neurogenetic learning is that designing of the network structure and the weight tuning is performed simultaneously. This is a clear distinction from other combination [sic] of GA and neural network proposed in the past.

Experimental results demonstrate that the method provides a magnitude of speed up in convergence than current methods, and exhibits far better scaling property."
Automatic Generation of Neural Network Architecture Using Evolutionary Computation Springer Science & Business Media
This open access book presents the first comprehensive overview of general methods in Automated Machine Learning (AutoML), collects descriptions of existing systems based on these methods, and discusses the first series of international challenges of AutoML systems. The recent success of commercial ML applications and the rapid growth of the field has created a high demand for off-the-shelf ML methods that can be used easily and without expert knowledge. However, many of the recent machine learning successes crucially rely on human experts, who manually select appropriate ML architectures (deep learning architectures or more traditional ML workflows) and their hyperparameters. To overcome this problem, the field of AutoML targets a progressive automation of machine learning, based on principles from optimization and machine learning itself. This book serves as a point of entry into this quickly-developing field for researchers and advanced students alike, as well as providing a reference for practitioners aiming to use AutoML in their work.
Evolutionary Approach to Machine Learning and Deep Neural Networks Springer Science & Business Media
This is the only book to apply neural nets, genetic algorithms, and fuzzy set theory to the fast growing field of machine learning. Placing particular emphasis on neural networks, it explores how to integrate them with other technologies to improve their performance. Examples are included for each system discussed.
Intelligent Hybrid Systems Springer
This book constitutes the refereed proceedings of the Second Hellenic Conference on Artificial Intelligence, SETN 2002, held in Thessaloniki, Greece, in April 2002. The 42 revised full papers presented together with two invited contributions were carefully reviewed and selected for inclusion in the book. The papers are organized in topical sections on knowledge representation and reasoning, logic programming and constraint satisfaction, planning and scheduling, natural language processing, human-computer interaction, machine learning, intelligent Internet and multiagent systems, and intelligent applications.
Machine Learning Proceedings 1994 World Scientific Publishing Company Incorporated
This book and software package complements the traditional data analysis tools already widely available. It presents an introduction to the analysis of data using neural network functions such as multilayer feed-forward networks using error back propagation, genetic algorithm-neural network hybrids, generalised regression neural networks, learning quantizer networks, and self-organising feature maps. In an easy-to-use, Windows-based environment it offers a wide range of data analytic tools which are not usually found together: genetic algorithms, probabilistic networks, as well as a

number of related techniques that support these. Readers are assumed to have a basic understanding of computers and elementary mathematics, allowing them to quickly conduct sophisticated hands-on analyses of data sets.

Artificial Neural Nets and Genetic Algorithms

Apress

From the contents: Neural networks – theory and applications: NNs (= neural networks) classifier on continuous data domains– quantum associative memory – a new class of neuron-like discrete filters to image processing – modular NNs for improving generalisation properties – presynaptic inhibition modelling for image processing application – NN recognition system for a curvature primal sketch – NN based nonlinear temporal-spatial noise rejection system – relaxation rate for improving Hopfield network – Oja's NN and influence of the learning gain on its dynamics Genetic algorithms – theory and applications: transposition: a biological-inspired mechanism to use with GAs (= genetic algorithms) – GA for decision tree induction – optimising decision classifications using GAs – scheduling tasks with intertask communication onto multiprocessors by GAs – design of robust networks with GA – effect of degenerate coding on GAs – multiple traffic signal control using a GA – evolving musical harmonisation – niched-penalty approach for constraint handling in GAs – GA with dynamic population size – GA with dynamic niche clustering for multimodal function optimisation Soft computing and uncertainty: self-adaptation of evolutionary constructed decision trees by information spreading – evolutionary programming of near optimal NNs

Neural Network Data Analysis Using SimulnetTM Springer Science & Business Media

This book provides a unified framework that describes how genetic learning can be used to design pattern recognition and learning systems. It examines how a search technique, the genetic algorithm, can be used for pattern classification mainly through approximating decision boundaries. Coverage also demonstrates the effectiveness of the genetic classifiers vis-à-vis several widely used classifiers, including neural networks.

An Anytime Approach to Connectionist Theory Refinement

Springer

Breast cancer, as the most-regularly diagnosed cancer in women, can be controlled effectively by early-stage tumour diagnosis. Clinical specialists use Computer-Aided Diagnosis (CAD) systems to help aid in their diagnosis, as accurate as possible. Deep learning techniques, such as Convolutional Neural Network (CNN), due to their classification capabilities, have been widely adopted in CAD systems. The parameters of the network, including the weights of the convolution filters, and the weights of the fully connected layers play a crucial role in classification accuracy. Back-propagation technique is the most frequently used approach for training CNN. However, this technique has some disadvantages, such as getting stuck in local minima. In this thesis, we propose to optimize the weights of the CNN using Genetic Algorithm (GA). The work consists of: designing a

CNN model to facilitate the classification process, training the model using three different optimizer (mini-batch gradient descent, Adam, and GA), and evaluating the model through various experiments on BreakHis dataset. We show that the CNN model trained through GA performs as well as the Adam optimizer with a classification accuracy of 85%.

Evolutionary Algorithms and Neural Networks World Scientific

Abstract: "This paper reports several experimental results on the speed of convergence of neural network training and designing using genetic algorithms. Recent excitement regarding genetic search lead [sic] some researchers to apply it to training and designing neural networks. There are reports on both successful and faulty results, and, unfortunately, no systematic evaluation has been made. This paper reports results of systematic experiments designed to judge utility of genetic algorithms for neural network training and designing. As for the training task, we carried out a set of experiments to answer a question that [sic] whether use of genetic algorithm provides any gain in neural network training over existing methods.

Genetic Algorithms for Machine Learning Springer Science & Business Media

"Deep Learning networks are a new type of neural network that discovers important object features. These networks determine features without supervision, and are adept at learning high level abstractions about their data sets. These networks are useful for a variety of tasks, but are difficult to train. This difficulty is compounded when multiple networks are trained in a layered fashion, which results in increased solution complexity as well as increased training time. This paper examines the use of Genetic Algorithms as a training mechanism for Deep Learning networks, with emphasis on training networks with a large number of layers, each of which is trained independently to reduce the computational burden and increase the overall flexibility of the algorithm. This paper covers the implementation of a multilayer deep learning network using a genetic algorithm, including tuning the genetic algorithm, as well as results of experiments involving data compression and object classification. This paper aims to show that a genetic algorithm can be used to train a non trivial deep learning network in place of existing methodologies for network training, and that the features extracted can be used for a variety of real world computational problems."--Abstract.

Parallel Implementations of Backpropagation Neural Networks on Transputers Apress

Artificial neural networks and genetic algorithms both are areas of research which have their origins in mathematical models constructed in order to gain understanding of important natural processes. By focussing on the process models rather than the processes themselves, significant new computational techniques have evolved which have found application in a large number of diverse fields. This diversity is reflected in the topics which are subjects of the contributions to this volume. There are contributions reporting successful applications of

the technology to the solution of industrial/commercial problems. This may well reflect the maturity of the technology, notably in the sense that 'real' users of modelling/prediction techniques are prepared to accept neural networks as a valid paradigm. Theoretical issues also receive attention, notably in connection with the radial basis function neural network. Contributions in the field of genetic algorithms reflect the wide range of current applications, including, for example, portfolio selection, filter design, frequency assignment, tuning of nonlinear PID controllers. These techniques are also used extensively for combinatorial optimisation problems.

Advances in Neural Networks - ISNN 2007 Springer Science & Business Media

Machine Learning Proceedings 1994

Automated Machine Learning Springer Nature

The two volume set LNCS 3102/3103 constitutes the refereed proceedings of the Genetic and Evolutionary Computation Conference, GECCO 2004, held in Seattle, WA, USA, in June 2004. The 230 revised full papers and 104 poster papers presented were carefully reviewed and selected from 460 submissions. The papers are organized in topical sections on artificial life, adaptive behavior, agents, and ant colony optimization; artificial immune systems, biological applications; coevolution; evolutionary robotics; evolution strategies and evolutionary programming; evolvable hardware; genetic algorithms; genetic programming; learning classifier systems; real world applications; and search-based software engineering.

Training Neural Networks Using Genetic Algorithms PHI Learning Pvt. Ltd.

This book provides theoretical and practical knowledge about a methodology for evolutionary algorithm-based search strategy with the integration of several machine learning and deep learning techniques. These include convolutional neural networks, Gröbner bases, relevance vector machines, transfer learning, bagging and boosting methods, clustering techniques (affinity propagation), and belief networks, among others. The development of such tools contributes to better optimizing methodologies. Beginning with the essentials of evolutionary algorithms and covering interdisciplinary research topics, the contents of this book are valuable for different classes of readers: novice, intermediate, and also expert readers from related fields. Following the chapters on introduction and basic methods, Chapter 3 details a new research direction, i.e., neuro-evolution, an evolutionary method for the generation of deep neural networks, and also describes how evolutionary methods are extended in combination with machine learning techniques. Chapter 4 includes novel methods such as particle swarm optimization based on affinity propagation (PSOAP), and transfer learning for differential evolution (TRADE), another machine learning approach for extending differential evolution. The last chapter is dedicated to the state of the art in gene regulatory network (GRN) research as one of the most interesting and active research fields. The author describes an evolving reaction network, which expands the neuro-

evolution methodology to produce a type of genetic network suitable for biochemical systems and has succeeded in designing genetic circuits in synthetic biology. The author also presents real-world GRN application to several artificial intelligent tasks, proposing a framework of motion generation by GRNs (MONGERN), which evolves GRNs to operate a real humanoid robot.
Handbook of Fuzzy Computation World Scientific
Abstract: "Many scientific and industrial problems can be better understood by learning from samples of the task at hand. For this reason, the machine learning and statistics communities devote considerable research effort on generating inductive-learning algorithms that try to learn the true 'concept' of a task from a set of its examples. Often times, however, one has additional resources readily available, but largely unused, that can improve the concept that these learing algorithms generate. These resources include available computer cycles, as well as prior knowledge describing what is currently known about the domain. Effective utilization of available computer time is important since for most domains an expert is willing to wait for weeks, or even months, if a learning system can produce an improved concept. Using prior knowledge is important since it can contain information not present in the current set of training examples. In this thesis, I present three 'anytime' approaches to connectionist theory refinement. Briefly, these approaches start by translating a set of rules describing what is currently known about the domain into a neural network, thus generating a knowledge-based neural network (KNN). My approaches then utilize available computer time to improve this KNN by continually refining its weights and topology. My first method, TopGen, searches for good 'local' refinements to the KNN topology. It does this by adding nodes to the KNN in a manner analogous to symbolically adding rules and conjuncts to an incorrect rule base. My next approach, REGENT, uses genetic algorithms to find better 'global' changes to this topology. REGENT proceeds by using (a) the domain-specific rules to help create the initial population of KNNs and (b) crossover and mutation operators specifically designed for KNNs. My final algorithm, ADDEMUP, searches for an 'ensemble' of KNNs that work together to produce an effective composite prediction. ADDEMUP works by using genetic algorithms to continually create new networks, keeping the set of networks that are as accurate as possible while disagreeing with each other as much as possible. Empirical results show that these algorithms successfully achieve each of their respective goals."
Training of Neural Networks by Means of Genetic Algorithms Working on Very Long Chromosomes Springer
The articles presented here were selected from preliminary versions presented at the International Conference on Genetic Algorithms in June 1991, as well as at a special Workshop on Genetic Algorithms for Machine Learning at the same Conference. Genetic algorithms are general-purpose search algorithms that use principles inspired by

natural population genetics to evolve solutions to problems. The basic idea is to maintain a population of knowledge structure that represent candidate solutions to the problem of interest. The population evolves over time through a process of competition (i.e. survival of the fittest) and controlled variation (i.e. recombination and mutation). Genetic Algorithms for Machine Learning contains articles on three topics that have not been the focus of many previous articles on GAs, namely concept learning from examples, reinforcement learning for control, and theoretical analysis of GAs. It is hoped that this sample will serve to broaden the acquaintance of the general machine learning community with the major areas of work on GAs. The articles in this book address a number of central issues in applying GAs to machine learning problems. For example, the choice of appropriate representation and the corresponding set of genetic learning operators is an important set of decisions facing a user of a genetic algorithm. The study of genetic algorithms is proceeding at a robust pace. If experimental progress and theoretical understanding continue to evolve as expected, genetic algorithms will continue to provide a distinctive approach to machine learning. Genetic Algorithms for Machine Learning is an edited volume of original research made up of invited contributions by leading researchers.

Optimizing Convolutional Neural Network Parameters Using Genetic Algorithm for Breast Cancer Classification

Springer

Initially conceived as a methodology for the representation and manipulation of imprecise and vague information, fuzzy computation has found wide use in problems that fall well beyond its originally intended scope of application. Many scientists and engineers now use the paradigms of fuzzy computation to tackle problems that are either intractable

Methods and Applications of Artificial Intelligence

CRC Press

This book describes the application of evolutionary computation in the automatic generation of a neural network architecture. The architecture has a significant influence on the performance of the neural network. It is the usual practice to use trial and error to find a suitable neural network architecture for a given problem. The process of trial and error is not only time-consuming but may not generate an optimal network. The use of evolutionary computation is a step towards automation in neural network architecture generation. An overview of the field of evolutionary computation is presented, together with the biological background from which the field was inspired. The most commonly used approaches to a mathematical foundation of the field of genetic algorithms are given, as well as an overview of the hybridization between evolutionary computation and neural networks. Experiments on the implementation of automatic neural network generation using genetic programming and one using genetic algorithms are described, and the efficacy of genetic algorithms as a learning algorithm for a feedforward neural network is also investigated. Contents:Artificial Neural

NetworksEvolutionary ComputationThe Biological BackgroundMathematical Foundations of Genetic AlgorithmsImplementing GasHybridisation of Evolutionary Computation and Neural NetworksUsing Genetic Programming to Generate Neural NetworksUsing a GA to Optimise the Weights of a Neural NetworkUsing a GA with Grammar Encoding to Generate Neural NetworksConclusions and Future Directions Readership: Scientists, engineers, and researchers interested in artificial intelligence and systems & knowledge engineering. keywords:Artificial Neural Networks;Neural Networworks Architecture;Automatic Neural Networworks Generation;Learning;Genetic Algorithms;Evolutionary Algorithms;Hybridization

Practical Computer Vision Applications Using Deep Learning with CNNs Springer Science & Business Media Explore the ever-growing world of genetic algorithms to solve search, optimization, and AI-related tasks, and improve machine learning models using Python libraries such as DEAP, scikit-learn, and NumPy Key Features Explore the ins and outs of genetic algorithms with this fast-paced guide Implement tasks such as feature selection, search optimization, and cluster analysis using Python Solve combinatorial problems, optimize functions, and enhance the performance of artificial intelligence applications Book Description Genetic algorithms are a family of search, optimization, and learning algorithms inspired by the principles of natural evolution. By imitating the evolutionary process, genetic algorithms can overcome hurdles encountered in traditional search algorithms and provide high-quality solutions for a variety of problems. This book will help you get to grips with a powerful yet simple approach to applying genetic algorithms to a wide range of tasks using Python, covering the latest developments in artificial intelligence. After introducing you to genetic algorithms and their principles of operation, you'll understand how they differ from traditional algorithms and what types of problems they can solve. You'll then discover how they can be applied to search and optimization problems, such as planning, scheduling, gaming, and analytics. As you advance, you'll also learn how to use genetic algorithms to improve your machine learning and deep learning models, solve reinforcement learning tasks, and perform image reconstruction. Finally, you'll cover several related technologies that can open up new possibilities for future applications. By the end of this book, you'll have hands-on experience of applying genetic algorithms in artificial intelligence as well as in numerous other domains. What you will learn Understand how to use state-of-the-art Python tools to create genetic algorithm-based applications Use genetic algorithms to optimize functions and solve planning and scheduling problems Enhance the performance of machine learning models and optimize deep learning network architecture Apply genetic algorithms to reinforcement learning tasks using OpenAI Gym Explore how images can be reconstructed using a set of semi-transparent shapes Discover other

bio-inspired techniques, such as genetic programming and particle swarm optimization Who this book is for This book is for software developers, data scientists, and AI enthusiasts who want to use genetic algorithms to carry out intelligent tasks in their applications. Working knowledge of Python and basic knowledge of mathematics and computer science will help you get the most out of this book.