

Innovations In Data Methodologies And Computational Algorithms For Medical Applications

Algorithm

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In mathematics and computer science, an algorithm () is a finite sequence of mathematically rigorous instructions, typically used to solve a class of specific problems or to perform a computation. Algorithms are used as specifications for performing calculations and data processing. More advanced algorithms can use conditionals to divert the code execution through various routes (referred to as automated decision-making) and deduce valid inferences (referred to as automated reasoning).

In contrast, a heuristic is an approach to solving problems without well-defined correct or optimal results. For example, although social media recommender systems are commonly called "algorithms", they actually rely on heuristics as there is no truly "correct" recommendation.

As an effective method, an algorithm...

Memetic algorithm

"Effective memetic algorithms for VLSI design automation = genetic algorithms + local search + multi-level clustering". Evolutionary Computation. 12 (3): 327–353

In computer science and operations research, a memetic algorithm (MA) is an extension of an evolutionary algorithm (EA) that aims to accelerate the evolutionary search for the optimum. An EA is a metaheuristic that reproduces the basic principles of biological evolution as a computer algorithm in order to solve challenging optimization or planning tasks, at least approximately. An MA uses one or more suitable heuristics or local search techniques to improve the quality of solutions generated by the EA and to speed up the search. The effects on the reliability of finding the global optimum depend on both the use case and the design of the MA.

Memetic algorithms represent one of the recent growing areas of research in evolutionary computation. The term MA is now widely used as a synergy of evolutionary...

Examples of data mining

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Computational sociology

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Computational sociology is a branch of sociology that uses computationally intensive methods to analyze and model social phenomena. Using computer simulations, artificial intelligence, complex statistical methods, and analytic approaches like social network analysis, computational sociology develops and tests theories of complex social processes through bottom-up modeling of social interactions.

It involves the understanding of social agents, the

interaction among these agents, and the effect of these interactions on the social aggregate. Although the subject matter and methodologies in social science differ from those in natural science or computer science, several of the approaches used in contemporary social simulation originated from fields such as physics and artificial intelligence. Some...

Big data

desire to understand and accept what they understand, where algorithms do not cope with this Level of automated decision-making: algorithms that support automated

Big data primarily refers to data sets that are too large or complex to be dealt with by traditional data-processing software. Data with many entries (rows) offer greater statistical power, while data with higher complexity (more attributes or columns) may lead to a higher false discovery rate.

Big data analysis challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy, and data source. Big data was originally associated with three key concepts: volume, variety, and velocity. The analysis of big data presents challenges in sampling, and thus previously allowing for only observations and sampling. Thus a fourth concept, veracity, refers to the quality or insightfulness of the data. Without sufficient investment...

Artificial intelligence in healthcare

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Artificial intelligence in healthcare is the application of artificial intelligence (AI) to analyze and understand complex medical and healthcare data. In some cases, it can exceed or augment human capabilities by providing better

or faster ways to diagnose, treat, or prevent disease.

As the widespread use of artificial intelligence in healthcare is still relatively new, research is ongoing into its applications across various medical subdisciplines and related industries. AI programs are being applied to practices such as diagnostics, treatment protocol development, drug development, personalized medicine, and patient monitoring and care. Since radiographs are the most commonly performed imaging tests in radiology, the potential for AI to assist with triage and interpretation of radiographs...

Machine learning

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Machine learning (ML) is a field of study in artificial intelligence concerned with the development and study of statistical algorithms that can learn from data and generalise to unseen data, and thus perform tasks without explicit instructions. Within a subdiscipline in machine learning, advances in the field of deep learning have allowed neural networks, a class of statistical algorithms, to surpass many previous machine learning approaches in performance.

ML finds application in many fields, including natural language processing, computer vision, speech recognition, email filtering, agriculture, and medicine. The application of ML to business problems is known as predictive analytics.

Statistics and mathematical optimisation (mathematical programming) methods comprise the foundations of...

Algorithmic bias

advertising is big data and algorithms". The Conversation. Retrieved November 19, 2017. Hickman, Leo

(July 1, 2013). *"How algorithms rule the world"*.
The

Algorithmic bias describes systematic and repeatable harmful tendency in a computerized sociotechnical system to create "unfair" outcomes, such as "privileging" one category over another in ways different from the intended function of the algorithm.

Bias can emerge from many factors, including but not limited to the design of the algorithm or the unintended or unanticipated use or decisions relating to the way data is coded, collected, selected or used to train the algorithm. For example, algorithmic bias has been observed in search engine results and social media platforms. This bias can have impacts ranging from inadvertent privacy violations to reinforcing social biases of race, gender, sexuality, and ethnicity. The study of algorithmic bias is most concerned with algorithms that reflect...

Applications of artificial intelligence

Computer-planned syntheses via computational reaction networks, described as a platform that combines "computational synthesis with AI algorithms to predict molecular

Artificial intelligence is the capability of computational systems to perform tasks typically associated with human intelligence, such as learning, reasoning, problem-solving, perception, and decision-making. Artificial intelligence (AI) has been used in applications throughout industry and academia. Within the field of Artificial Intelligence, there are multiple subfields. The subfield of Machine learning has been used for various scientific and commercial purposes including language translation, image recognition, decision-making, credit scoring, and e-commerce. In recent years, there have been massive advancements in the field of Generative Artificial Intelligence, which uses generative models to produce text, images, videos or other forms of data. This article describes applications of...

Data augmentation

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Data augmentation is a statistical technique which allows maximum likelihood estimation from incomplete data. Data augmentation has important applications in Bayesian analysis, and the technique is widely used in machine learning to reduce overfitting when training machine learning models, achieved by training models on several slightly-modified copies of existing data.

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