Machine Learning and Artificial Intelligence: Trends and future directions

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Abstract

Machine learning is one of the recent emerging research areas in computer science and statistics. It is a decision making approach that applied in various domains like social media, health care, finance etc. Machine learning is an interdisciplinary field that integrates Artificial Intelligence, Big data, Cloud Computing and Information Theory. The main cache objective of machine learning is based on the previous experience. Machines are self learned and it predicts the future without error. In Big Data and Cloud Computing the volume of data sizes are very larger, which are processed with low consumption of power with the help of Machine learning. This paper mainly focuses on the current trends and future directions of Machine learning and Artificial intelligence is discussed. Both technological trends will give better results for future generation.

Keywords: Machine learning, decision making, self learned, low consumption.

Introduction

The term Machine learning was coined by Arthur Samuel in the year 1959, he defines "computers the ability to learn without being explicitly programmed". Machine Learning (ML) and Artificial Intelligence (AI) explore the study and construction of algorithms that learn from and make forecast on data. ML is one of the fastest growing technique and most exciting fields out there and Deep Learning is a new area represents its true bleeding edge. Nowadays, machine learning is one of the most popular research fields and its effectiveness has been validated in various application scenarios. A few examples are pattern recognition, image identification, computer vision, clustering analysis, network intrusion detection, autonomous driving etc. The advent of big data has stimulated broad interests in machine learning and privacy issues [6] by enabling corresponding algorithms to disclose more fine grained patterns and make more accurate predictions than ever before.

Literature Review

Xu and Fortes used a genetic algorithm supported with fuzzy multi objective optimization to simultaneously minimize the amount of wasted resources, energy consumption and thermal dissipation costs. Shen et al. presented Cloud Scale a prediction based online system for adaptive cloud resource allocation. Their resource demand predictor [5] uses a fast Fourier transform to identify a signature that can be used to estimate future demands. Berl et al. provided a more comprehensive survey of energy efficient cloud computing solutions.

Amodei et al. [6] gaves a general introduction of security issues about artificial intelligence, especially the supervised and reinforcement learning algorithms. Artificial Intelligence, machine learning and deep learning are basically machine perception. It is the power [7] to interpret sensory data. There are a number of emerging issues [14] associated with AI and big data. First one was iterative approaches such as genetic algorithms can make their use in a Map Reduce environment more difficult. Second, was dirty data, with potential errors, incompleteness or differential precision. AI was used to identify and clean dirty data or use dirty data as a means of establishing context knowledge for the data. Third was data visualization and fourth was flash storage technology evolves, approaches such as in memory database technology becomes increasingly feasible to potentially provide users with near-real-time analyses of larger databases, speeding decision making capabilities.

Unmanned cars are functioned with the GPS and sensors that used to identify the correct direction and find the way without human input. The unmanned cars can drive to anywhere. Advanced and sophisticated control [4] systems, software and algorithms interpret all the sensory data and information to identify and detect appropriate and right navigation paths, as well as obstacles, other subsystems and relevant signage information. Autonomous or driver less vehicles have sophisticated control systems capable of taking in sensor data and analyzing the data to differentiate different objects in the surrounding environment and recognize vehicles, pedestrians and other obstacles in the surrounding environment which will be very helpful for later path planning to desired destination.

Methods of Machine Learning

The two most widely used machine learning methods [7] are supervised learning and unsupervised learning. Among them about 70 percent is supervised learning. The remaining part is managed by unsupervised learning. It is further sub divided into Semi supervised and reinforcement learning. Supervised machine learning requires training with labeled data. Each labeled training data consists of input value and a desired target output value. The supervised learning algorithm analyzes the training data and makes an inferred function, which may be used for mapping new values. In unsupervised machine learning technique, hidden insights are drawn from unlabelled data sets, for example, cluster analysis. The third category, reinforcement learning allows a machine to learn its behavior from the feedback received through the interactions with an external environment. From a data processing point of view, both supervised and unsupervised learning techniques are preferred. Data analysis and reinforcement techniques are preferred for decision making problems. In spite of its realistic and marketable success, machine learning stays a young field with many underexplored research prospects. Some of these prospects are seem by contrasting present machine learning approaches to the types of learning observed in naturally happening systems such as humans and other animals, organizations, economies and biological evolution.

Current Trends in Machine Learning and Artificial Intelligence

As with the help of powerful technology, machine learning raises questions about which of its potential uses society should encourage and discourage. Whereas most machine learning algorithms are targeted to learn one specific function or data model from one single data source, humans clearly learn many different skills and types of knowledge, from years of diverse training experience, supervised and unsupervised, in a simple to more difficult sequence like learning to crawl, then walk, then run. Some of the questions related to them are of how to build

computer lifelong or enduring learners that operate nonstop for years, learning thousands of interrelated functions within an overall architecture that allows the system to develop its ability to learn one skill based on having learned another. Another aspect of the analogy to natural learning systems suggests the idea of team based, mixed initiative learning for analyze genomic data. Machine Learning trend is being seen by industries as a way of obtaining advantage over their competitors, if one business is able to make sense of the retrieve the data reasonably quicker, it will be able to get more customers [12] increase the revenue per customer, optimize its operation, and reduce its costs.

ML algorithms are helped to solve complex problems from the field of business. The best examples are Store manager which predicts the several weeks sales in advance to manage inventory and satisfy customer needs. It is mainly influenced by seasonality, competition and promotions and location. In Customer mix Prediction the Companies invest significant amount of money to acquire new investors in anticipation of future revenues. Losing customers mean loss of initial investment on acquisition and loss of possible future revenue. So, it is important for companies to predict early signs if a customer is about to mix. And then engage or offer incentives to customers to retain them. In Customer Segmentation, AI helps the retailers in maximize the return on their investments. Each customer score was based on three factors namely recency, frequency and monetary value. Google's self driving cars and Robotics are used in all domains.

Today we are living in computing era. The usage of storage as a service leads to generating humongous amount of data. Rapid advancement in computing power also brought in development in application of algorithms which can be utilize to get insights from huge amount of data being produced. It's other applications are media, entertainment and communication, financial and securities, health care, education, public service, insurance, marketing and wholesale trade, transportation, energy and utilities, manufacturing and natural resources. In multi media and Entertainment and Communication, the Organizations analyze customer data along with the behavioral data to create in depth customer profiles. Financial and Securities, the financial market activities are monitored by the Securities Exchange Commission (SEC) using big data. To hook illegal trading activity in the financial markets, SEC is using natural language processors and network analytics. It is used pre trade decision support analytics, credit risk, scoring and analysis, sentiment measurement, predictive analytics etc. Anti-money laundering, fraud mitigation and demand enterprise risk management are also looked using big data analytics. In Health care, it providers use big data for clinical trial data analysis, disease pattern analysis, patient care quality and analysis, medical device and pharmacy supply chain management, drug discovery and development analysis etc. With the development of mobile health apps, doctors provide evidence based medicine. Spread of infectious and communicable diseases are tracked using public health data and social media sites.

It is applied in Education system in United States. "Department of Education" is using big data to measure educator and learner performance. Students 'click patterns' are monitored to measure how long they stay in a particular topic. University of Tasmania in Australia with more than thirty thousand learners, has installed a learning and management system to retrieve the status of educator and learner who are involved in on-line sessions. In public services, big data is employed for environmental protection, women and child welfare, environmental change detection and management, human resource management etc. In marketing and retail industry, big data is used in merchandizing and market basket analysis, customer segmentation, customer loyalty programs, supply chain management, event and behavior based targeting etc.

Challenges in Machine Learning and Artificial Intelligence

The most challenging task of ML and AI are to identify the fraud detection, customer data renovation, trading using social analytics, industry credit risk reporting, trading and auditing perceptibility etc. Confidentiality and data security, access to information, data reliability, interoperability, management and governance are the key challenges that bring obstacle to big data use in health care. Data in health care is heterogeneous, uneven, isolated and hardly standardized. Integrating data originating from various sources is the most important practical difficulty in education industry. Protecting the privacy of the users also poses more. The key challenges in retail industry encompass understanding customers by creating a single view across multiple sources of customer information from point of sale, loyalty program, social media etc. There are many key challenges in the field of Big Data visualization. The first issue deals about the efficient data processing techniques which requires order to enable real time visualization and the second one deals about cost incurred for procure and manage the devices for large scale.

In business analytics [12] AI is applied with the help of Cloud Computing, even human cannot easily replaced by ML and Big Data analysis. In certain scenarios, at the end of every problem it can solved human analysts to stay in the loop. In autonomous vehicles, typical automotive safety arguments and discussions for the low integrity devices can really hinge upon the ability of a human driver to control the vehicle. For example, if a minor or major software fault [10] or error causes a potentially dangerous situation for the driver and the surrounding environment, the driver might be expected to over ride whatever software function and recover to a safe state without causing much problem. Suppose if any unexpected failure occur, then who is liable to recover from significant vehicle mechanical failures like tire blow outs, faults in engine and steering problem and in braking system. The driver is fully liable for taking the right corrective action while driving.

The number of issues associated with AI [14] and big data are the first one the nature of some machine learning algorithms. For example, iterative approaches such as genetic algorithms can make their use in a Map Reduce environment more difficult. Second one was dirty data, with potential errors, incompleteness or differential precision. AI can be used to identify and clean dirty data or use dirty data as a means of establishing context knowledge for the data. Third one is flash storage technology approaches such as in memory database technology becomes increasingly feasible to potentially provide users with near real time analyses of larger databases and speedy decision making capabilities. Fourth is more traditional approach that treats big data as being information typically available in a database, as a signal or text format. The researcher tries to find out forecast accurately with the help of big data for audio and video based data.

Conclusion

In future the above mentioned challenges are overcome and there is no doubt AI and MI will be the future. Nevertheless, ML is still a challenging and time demanding task that requires expensive effort. Recent advancement in ML methods will capable of working jointly with humans to analyze the complex data sets might bring together the abilities of machines to mock out slight statistical regularities from massive data sets with the abilities of humans to draw on diverse background knowledge to generate reasonable explanations and suggest new hypotheses. Although it is impossible to predict accurately about the future it appears essential that the society now begin to consider how to maximize its benefits. It can yield data from any source and investigate it by selecting suitable ML method to find answers that enable cost reductions, time reductions, new product development and smart decision making.

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