Introduction to Artificial Intelligence

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Artificial intelligence

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Abstract

Artificial intelligence (AI), deep learning, machine learning and neural networks represent incredibly exciting and powerful machine learning-based techniques used to solve many real-world problems. For a primer on machine learning, you may want to read this five-part series that I wrote.

While human-like deductive reasoning, inference, and decision-making by a computer is still a long time away, there have been remarkable gains in the application of AI techniques and associated algorithms.

Introduction

Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Some of the activities computers with artificial intelligence are designed for include: Speech recognition, Learning, Planning, Problem solving. In this topic we shall discus the following subjects; Deep learning, Machine learning, Computer Programming, Medical field.

Deep Learning has enabled many practical applications of Machine Learning and by extension the overall field of AI. Deep Learning breaks down tasks in ways that makes all kinds of machine assists seem possible, even likely. Driverless cars, better preventive healthcare, even better movie recommendations, are all here today or on the horizon. AI i s the present and the future. With Deep Learning's help, AI may even get to that science fiction state we've so long imagined.

Machine Learning at its most basic is the practice of using algorithms to parse data, learn from it, and then make a determination or prediction about something in the world. So rather than hand-coding software routines with a specific set of instructions to accomplish a particular task, the machine is "trained" using large amounts of data and algorithms that give it the ability to learn how to perform the task.

Review of Literature

Artificial intelligence is a branch of computer science that aims to create intelligent machines. It has become an essential part of the technology industry. Research associated with artificial intelligence is highly technical and specialized. The core problems of artificial intelligence include programming computers for certain traits such as: Knowledge, Reasoning, Problem solving, Perception, Learning, Planning, and Ability to manipulate and move objects. Knowledge engineering is a core part of AI research.

Machines can often act and react like humans only if they have abundant information relating to the world. Artificial intelligence must have access to objects, categories, properties and relations between all of them to implement knowledge engineering. Initiating common sense, reasoning and problem-solving power in machines is a difficult and tedious approach. Machine learning is another core part of AI. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions.

Classification determines the category an object belongs to and regression deals with obtaining a set of numerical input or output examples, thereby discovering functions enabling the generation of suitable outputs from respective inputs. Mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science often referred to as computational learning theory. Machine perception deals with the capability to use sensory inputs to deduce the different aspects of the world, while computer vision is the power to analyze visual inputs with a few sub- problems such as facial, object and gesture recognition. Robotics is also a major field related to AI. Robots require intelligence to handle tasks such as object manipulation and navigation, along with sub-problems of localization, motion planning and mapping.

Deep learning while flashy is really just a term to describe certain types of neural networks and related algorithms that consume often very raw input data. They process this data through many layers of nonlinear transformations of the input data in order to calculate a target output.

Unsupervised feature extraction is also an area where deep learning excels. Feature extraction is when an algorithm is able to automatically derive or construct meaningful features of the data to be used for further learning, generalization, and understanding. The burden is traditionally on the data scientist or programmer to carry out the feature extraction process in most other machine learning approaches, along with feature selection and engineering.

Feature extraction usually involves some amount dimensionality reduction as well, which is reducing the amount of input features and data required to generate meaningful results. This has many benefits, which include simplification, computational and memory power reduction, and so on. Programmers would train a neural network to detect an object or phoneme by blitzing the network with digitized versions of images containing those objects or sound waves containing those phonemes. If the network didn't accurately recognize a particular pattern, an algorithm would adjust the weights. The eventual goal of this training was to get the network to consistently recognize the patterns in speech or sets of images that we humans know as, say, the phoneme "d" or the image of a dog. This is much the same way a child learns what a dog is by noticing the details of head shape, behavior, and the like in furry, barking animals that other people call dogs.

Machine learning came directly from minds of the early AI crowd, and the algorithmic approaches over the years included decision tree learning, inductive logic programming. clustering, reinforcement learning, and Bayesian networks among others. As we know, none achieved the ultimate goal of General AI, and even Narrow AI was mostly out of reach with early machine learning approaches.

As it turned out, one of the very best application areas for machine learning for many years was computer vision, though it still required a great deal of hand-coding to get the job done. People would go in and write hand-coded classifiers like edge detection filters so the program could identify where an object started and stopped; shape detection to determine if it had eight sides; a classifier to recognize the letters "S-T-O-P." From all those hand-coded classifiers they would develop algorithms to make sense of the image and "learn" to determine whether it was a stop sign.

Good, but not mind-bendingly great. Especially on a foggy day when the sign isn't perfectly visible, or a tree obscures part of it. There's a reason computer vision and image detection didn't come close to rivaling humans until very recently, it was too brittle and too prone to error.

Time, and the right learning algorithms made all the difference.

Conclusion

AI is an extremely powerful and exciting field. It's only going to become more important and ubiquitous moving forward, and will certainly continue to have very significant impacts on modern society.

Artificial neural networks (ANNs) and the more complex deep learning technique are some of the most capable AI tools for solving very complex problems, and will continue to be developed and leveraged in the future.

While a terminator-like scenario is unlikely any time soon, the progression of artificial intelligence techniques and applications will certainly be very exciting to watch!

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