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Editorial

Genetic Algorithm Reflects the Process of Natural Selection

Mathieu Stevenin*

Regional Ethical Reflection Committee, Hauts de France University, Lille, Amiens, France

DESCRIPTION

Genetic Algorithm (GA) may be a search-based optimization technique supported the principles of Genetics and survival. It's frequently wont to find optimal or near-optimal solutions to difficult problems which otherwise would take a lifetime to unravel. It's frequently wont to solve optimization problems, in research, and in machine learning. Nature has always been an excellent source of inspiration to all or any mankind. Genetic Algorithms (GA's) are search based algorithms supported the concepts of survival and genetics. GA's are a subset of a way larger branch of computation referred to as Evolutionary Computation. GA's were developed by John Holland and his students and colleagues at the University of Michigan, most notably David E. Goldberg and has since been tried on various optimization problems with a high degree of success.

GA's are global search algorithms that employment by using the principles of evolution. Traditionally, GA's have used binary strings to encode the features that compose a private within the population; the binary segments of a private that represent a selected feature are referred to as chromosomes. Binary strings are convenient to use because they will be easily manipulated by GA operators like crossover and mutate. Binary chromosomes also can be wont to represent non-binary numbers that have integer and floating point types. Given a drag and a population of people, a GA will evaluate each individual as a possible solution consistent with a predefined evaluation function. The evaluation function assigns a worth of goodness to every individual supported how well the individual solves a given problem.

ADVANTAGES

GA's have various advantages which have made them immensely popular. These include −

- Doesn't require any derivative information (which might not be available for several real-world problems).
- Is quicker and more efficient as compared to the normal methods.
- Have excellent parallel capabilities.
- Optimizes both continuous and discrete functions and also multi-objective problems.
- Provides an inventory of "good" solutions and not just one solution.
- Always gets a solution to the matter, which gets better over the time.
- Useful when the search space is extremely large and there are an outsized number of parameters involved.

LIMITATIONS OF GENETIC ALGORITHM

Like any technique, GA's also suffer from a couple of limitations. These include −

- GA's aren't fitted to all problems, especially problems which are simple and that derivative information is out there.
- Fitness value is calculated repeatedly which could be computationally expensive for a few problems.
- Being stochastic, there are not any guarantees on the optimality or the standard of the answer .
- If not implemented properly, the GA might not converge to the optimal solution.

Genetic Algorithms have the power to deliver a "good-enough" solution "fast-enough". This makes genetic algorithms attractive to be used in solving optimization problems. the explanations why GAs are needed are as follows –

Solving Difficult Problems

In computing, there's an outsized set of problems, which are NP-Hard. What this essentially means is that, even the foremost powerful computing systems take a really while (even years!) to unravel that problem. In such a scenario, GAs convince be an efficient tool to supply usable near-optimal solutions during a short amount of your time.

Failure of Gradient Based Methods

Traditional calculus based methods work by starting at a random point and by occupation the direction of the gradient, till we reach the highest of Capitol Hill. This system is efficient and works alright for single-peaked objective functions just like the cost function in rectilinear regression. But, in most real-world situations, we've a really complex problem called as landscapes, which are made from many peaks and lots of valleys, which

Correspondence to: Mathieu Stevenin, Director, Regional Ethical Reflection Committee, Hauts de France University Hospital, Amiens, France, E-mail: stevenmat@chu-amiens.fr

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causes such methods to fail, as they suffer from an inherent tendency of getting stuck at the local optima.

Getting an honest Solution Fast

Some difficult problems just like the Travelling Salesperson Problem (TSP) have real-world applications like path finding and VLSI Design. Now imagine that you simply are using your GPS Navigation system, and it takes a couple of minutes (or even a couple of hours) to compute the "optimal" path from the source to destination. Delay in such world applications isn't acceptable and thus a "good-enough" solution, which is delivered "fast" is what's required.