

Can Nature-Inspired Optimization Techniques solve complicated real-life problems ?

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Abstract: Optimization can be viewed as the art of selecting the best alternative among a given set of options. Optimization problems arise in almost all fields of science, engineering, finance and Industry – in fact in all walks of human activity in which the problem may be mathematically modelled. In most of the Nonlinear Optimization Problems, a global optimal solution rather than a local optimal solution is desired. Determining the global optimal solution of a nonlinear optimization problem is much more difficult than determining the local optimal solution. However, because of the practical necessity the search for the global optima is often necessary. The traditional methods available in literature for solving global optimization problems may be broadly classified as deterministic methods and probabilistic methods. The deterministic methods try to guarantee that a neighborhood of the global optima is attained. Such methods rely on a thorough search of the feasible domain. They are applicable, however, to a restricted class of functions only. On the other hand the probabilistic methods make use of probabilistic or stochastic approach to search for the global solutions. Although probabilistic methods do not give an absolute guarantee, these methods are preferred over the deterministic methods because they are applicable to wider class of functions. During the last two decades nature inspired optimization techniques are being developed which draw their inspiration from nature. Some of the methods in this category are: Ant Colony Optimization, Genetic Algorithms, Memetic Algorithms, Differential Evolution, Particle Swarm Optimization, Artificial Bee Colony, Bacterial Foraging, Bat Algorithm, Firefly algorithm, Cuckoo Search Algorithm, Bio-Geographical Algorithms, Glowworm Optimization, Artificial immune systems, Forest Optimization, Spider Monkey Algorithm, Gravitational Search Algorithms, etc. This talk will focus on the state-of-the-art nature inspired optimization techniques which are gaining popularity and are considered efficient due to their ability to find a reasonably acceptable solutions within a fair amount of time instead of providing a guarantee to hit the global optimal solution. A number of case studies will be demonstrated from various fields of Science, Engineering, Finance and Industries.