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Co-variance Guided Artificial Bee Colony

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Abstract

Artificial Bee Colony (ABC) is one of the proficient and largely used optimization technique, inspired by the food search behavior of honey bees. This article presents a novel Co-variance guided Artificial Bee Colony (CABC) algorithm which is a unification of ABC and statistical co-variance. The co-variance matrix of data sets is a good approximation of the Hessian and acts as a source of gradient information in meta-heuristic optimization. In this article we have demonstrated how to use covariance information about the “population of candidate solutions” for speeding up the underlying ABC optimization technique. The COCO (COmparing Continuous Optimisers), Black Box Optimization Benchmarking 2015 (BBOB) test bed with 24 benchmarks has been used to evaluate the performance of CABC algorithm. It is observed from experimental as well as statistical results that CABC has a consistent better performance when compared with other state-of-the-art evolutionary algorithms.

Keywords: Optimization, Swarm Intelligence, Artificial Bee Colony, Co-variance Information, COCO Bench-marking,

1. Introduction

Swarm Intelligence (SI) can be succinctly defined as the combined and cooperative behavior of stochastic, dispersed and self-organized swarms. Ant colonies, bird flocks, bees hive, fish schools, glow worm luminescence, bats echolocation and self-propelled particle, are some of the well known examples existing in the nature which have inherent optimization characteristics. These species adapts and organize themselves in a manner which is not only overwhelming but worth noticing also. The individual swarm member acts without any central administration or supervision. In spite of being stochastic and independent each of these agents has mechanism through which they communicate

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