

# GENETIC ALGORITHM

## Definitions

A **genetic algorithm** (GA) is a search technique used in computing to find exact or approximate solutions to optimization and search problems.

## Genetic Algorithms

**Genetic algorithms** are a kind of algorithm used to find approximations in search problems. Genetic algorithms are a class of evolutionary algorithms that use ideas inspired by evolution to find a solution.

## Introduction

The concept of genetic algorithms is a search technique often used in computer science to find complex, non-obvious solutions to algorithmic optimization and search problems. Genetic algorithms are categorized as global search heuristics, and have a wide variety of applications, particularly in generating useful Artificial Intelligence agents in computer games.

For decades, games and the field of game theory have provided competitive, dynamic, often unpredictable environments that make ideal test beds for computational intelligence theories, architectures, and algorithms. Natural evolution can be modeled as a game, in which the rewards for an organism that plays a good game of life are the propagation of its genetic material to its successors and its continued survival. In natural evolution, the performance of an individual is defined with respect to its competitors and collaborators, as well as to the environment. More simply described, genetic algorithms are a simulation in which a population of abstract representations (called chromosomes or the genotype of the genome, after their biological counterparts) of candidate solutions (called individuals, creatures, or phenotypes) to an optimization problem.

Candidates are evaluated and crossbred in an attempt to generate high quality solutions which would be non-obvious and extremely time consuming to a human programmer. An evolutionary phase is initialized with a population of randomly generated entities (or human specified instances of high quality). The process is subdivided into different generations. In each generation, the fitness of every individual in the population is evaluated, and multiple individuals are stochastically selected from the current population (based on their fitness), and modified (recombined and possibly randomly mutated) to form a new population.

The new population is then used in the next iteration of the algorithm. The algorithm terminates when either a maximum number of generations has been produced, or a satisfactory fitness level has been reached for the population. If the algorithm has terminated due to a maximum number of generations, a satisfactory will not necessarily have been obtained.

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