Genetic algorithms (GAs) are a class of search and optimization algorithms inspired by the process of natural selection and evolution.

* Random search algo
* Optimal solution of problem with some constraints

Details: The genetic algorithm is a method for solving both constrained and unconstrained optimization problems that is based on natural selection, the process that drives biological evolution. The genetic algorithm repeatedly modifies a population of individual solutions. At each step, the genetic algorithm selects individuals from the current population to be parents and uses them to produce children for the next generation. Over successive generations, the population "evolves" toward an optimal solution. You can apply the genetic algorithm to solve a variety of optimization problems that are not well suited for standard optimization algorithms, including problems in which the objective function is discontinuous, nondifferentiable, stochastic, or highly nonlinear. The genetic algorithm can address problems of mixed integer programming, where some components are restricted to integer valued.

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| Pros of Genetic Algorithms: | Cons of Genetic Algorithms: |
| 1. provides many solutions  2. Parallel Processing  3. Flexibility  4. No Derivative Information Required  5. Global Search  6. easy to code and almost same procedure for all problems | 1. Time Complexity, slow algo  2. Premature Convergence  3. Problem-Specific Encoding  4. Lack of Guarantee  5. Difficulty with Complex Constraints |

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| Termination criteria of GA:   1. Max no of generation 2. Diversity minimum level 3. No change in fitness level 4. Target fitness is achieved. | Steps:   1. Initialize population 2. Calculate fitness value 3. Selection based on fitness value 4. Crossover 5. Mutation 6. Repeat until termination criteria achieved |

A diagram of a flowchart

Description automatically generated with low confidence

Population: state of chromosomes/individuals