



SNS COLLEGE OF ENGINEERING

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Department of Artificial Intelligence and

Data Science

Course Name – Introduction to Artificial Intelligence

II Year / III Semester

Unit-4 Planning and Learning





Genetic Algorithm

Genetic Algorithm in Machine Learning

A genetic algorithm is an adaptive heuristic search algorithm inspired by "Darwin's theory of evolution in Nature." It is used to solve optimization problems in machine learning. It is one of the important algorithms as it helps solve complex problems that would take a long time to solve.

Genetic Algorithm in Machine Learning

Genetic Algorithms are being widely used in different real-world applications, for example, Designing electronic circuits, code-breaking, image processing, and artificial creativity. In this topic, we will explain Genetic algorithm in detail, including basic terminologies used in Genetic algorithm, how it works, advantages and limitations of genetic algorithm, etc.



What is a Genetic Algorithm?

Before understanding the Genetic algorithm, let's first understand basic terminologies to better understand this algorithm:

Population: Population is the subset of all possible or probable solutions, which can solve the given problem.

Chromosomes: A chromosome is one of the solutions in the population for the given problem, and the collection of gene generate a chromosome.

Gene: A chromosome is divided into a different gene, or it is an element of the chromosome. **Allele:**

Allele is the value provided to the gene within a particular chromosome.



Fitness Function: The fitness function is used to determine the individual's fitness level in the population. It means the ability of an individual to compete with other individuals. In every iteration, individuals are evaluated based on their fitness function.

Genetic Operators: In a genetic algorithm, the best individual mate to regenerate offspring better than parents. Here genetic operators play a role in changing the genetic composition of the next generation.

Selection:

After calculating the fitness of every existent in the population, a selection process is used to determine which of the individualities in the population will get to reproduce and produce the seed that will form the coming generation.



Types of selection styles available

Roulette wheel selection

Event selection

Rank- grounded selection

So, now we can define a genetic algorithm as a heuristic search algorithm to solve optimization problems. It is a subset of evolutionary algorithms, which is used in computing. A genetic algorithm uses genetic and natural selection concepts to solve optimization problems.