## Elements of genetic algorithms

Chromosome: a set of genes; a chromosome contains the solution in form of genes. In TSP each cites can be considered as a chromosome.

Gene : a part of chromosome; a gene contains a part of solution. It determines the solution. In TSP the latitudinal and longitudinal coordinates of each cities can be considered as a gene.

Population: - number of individuals (solution space) present with same length of chromosome or solution space.

Fitness : the value assigned to an individual based on how far or close a individual is from the solution; greater the fitness value better the solution it contains

Breeding(crossover) : taking two fit individuals and then intermingling their chromosome to create new two individuals

Fitness function: - a function that assigns fitness value to the individual. It depends on the problem in question.

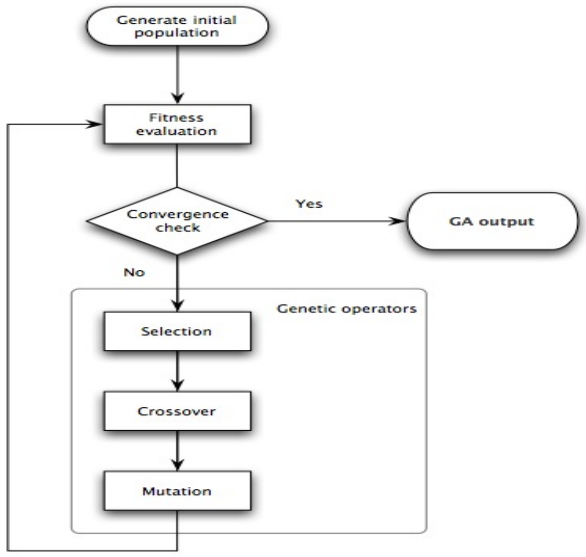
Selection: - selecting individuals for creating the next generation based on the fitness values

Encoding: - a function that maps certain chromosomes to the phenotype. There are several encoding function such as binary encoding, permutation encoding, value encoding and tree encoding. In TSP we use permutation encoding

## How the concepts of natural evolution are adapted to EA /GA algorithms?

Genetic algorithm is an adaptive heuristic search algorithm based on the evolutionary ideas of natural selection and genetics. At a certain stage of evolution, a population is composed of a number of individuals, also called Strings or chromosomes. These are made of units (genes, features, characters), which control the inheritance of one or several characters. Each genotype would represent a potential solution to a problem.

The decision variables, or phenotypes, in a GA are obtained by applying some mapping from the chromosome representation into the decision variable space, which represent potential solutions to an optimization problem. A suitable decoding function may be required for mapping chromosomes onto phenotypes.




## What kind of problems can be solved with these methods?

Genetic algorithm is a search and optimization algorithm that can solve both discrete and continuous problems. TSP is also a good example that can be solved using the genetic algorithm.

## Teams and definitions in genetic algorithm

Scaling: we use scaling in may that we want to scale the fitness so that selection pressure remains the same throughout the run. There are three type of scaling mechanism: Linear scaling, power scaling, and exponential scaling.

Fitness: the value assigned to an individual based on how far or close a individual is from the solution; greater the fitness value better the solution it contains

Ranking: is a way of ranking the solutions (individuals) in a population instead of using the fitness as a

the run. There are three type of scaling mechanism: Linear scaling, power scaling, and exponential scaling.

Fitness: the value assigned to an individual based on how far or close a individual is from the solution; greater the fitness value better the solution it contains

Ranking: is a way of ranking the solutions (individuals) in a population instead of using the fitness as a probability of selection. The best rank will get N for N individual and the worst solution (individual) will get 1

## Research areas that use genetic algorithm

-In Multiple sequence alignment
-In RNA structure prediction
-In Motife discovery
-In building a phylogenetic tree
-Gene expression profiling