



# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



## ARTIFICIAL INTELLIGENCE FOR ELECTRICAL ENGINEERING

TOPIC : **CROSS OVER AND MUTATION, GENERATIONAL  
CYCLE**





# MUTATION

- After selection and crossover, you now have a new population full of individuals.
- Some are directly copied, and others are produced by crossover.
- In order to ensure that the individuals are not all exactly the same, you allow for a small chance of mutation.
- You loop through all the alleles of all the individuals, and if that allele is selected for mutation, you can either change it by a small amount or replace it with a new value. The probability of mutation is usually between 1 and 2 tenths of a percent.
- Mutation is fairly simple. You just change the selected alleles based on what you feel is necessary and move on. Mutation is, however, vital to ensuring genetic diversity within the population.



# MUTATION



Before: 1101101001101110  
After: 110110001101110



# SYMBOLIC AI VS. GENETIC ALGORITHMS

- Most symbolic AI systems are very static.
- Most of them can usually only solve one given specific problem, since their architecture was designed for whatever that specific problem was in the first place.
- Thus, if the given problem were somehow to be changed, these systems could have a hard time adapting to them, since the algorithm that would originally arrive to the solution may be either incorrect or less efficient.
- Genetic algorithms (or GA) were created to combat these problems; they are basically algorithms based on natural biological evolution.



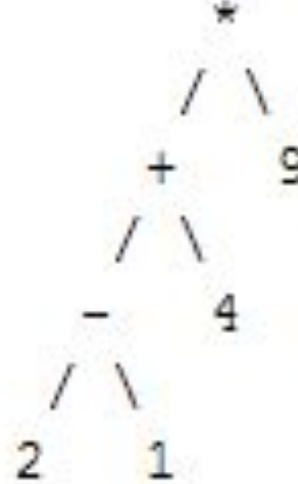
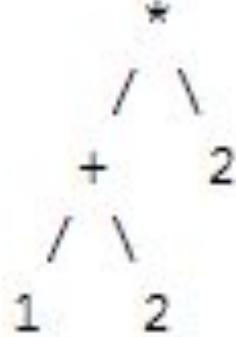
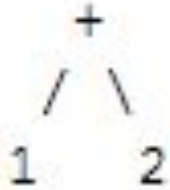
# GENETIC PROGRAMMING



- In programming languages such as LISP, the mathematical notation is not written in standard notation, but in prefix notation. Some examples of this:
  - $+ 2 1$  :  $2 + 1$
  - $* + 2 1 2$  :  $2 * (2 + 1)$
  - $* + - 2 1 4 9$  :  $9 * ((2 - 1) + 4)$
- Notice the difference between the left-hand side to the right? Apart from the order being different, no parenthesis! The prefix method makes it a lot easier for programmers and compilers alike, because order precedence is not an issue.
- You can build expression trees out of these strings that then can be easily evaluated, for example, here are the trees for the above three expressions.



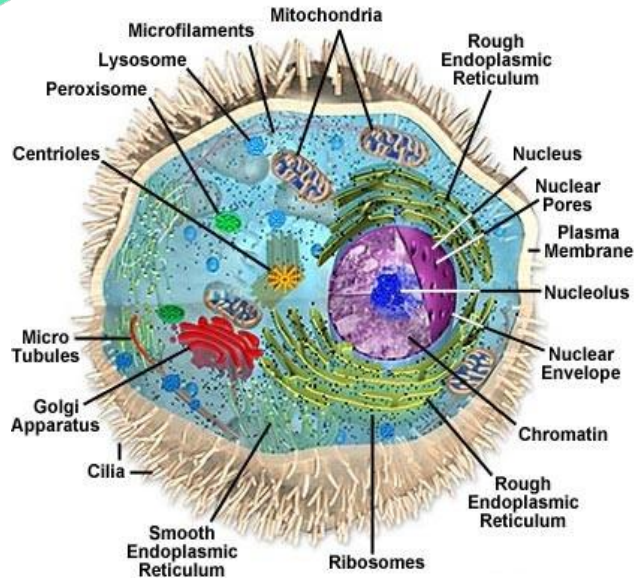
# GENETIC PROGRAMMING





# THANK YOU

Anatomy of the Animal Cell



The Cell Nucleus

