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Genetic Algorithm in Disease Prediction

Atrayee Chatterjee[1], Souvik Paul[2]
[1] *Assistant Professor, BCA Department, The Heritage Academy, Maulana Abul Kalam Azad University of Technology,Kolkata-107, India*
[2] *Assistant Professor, BCA Department, The Heritage Academy, Maulana Abul Kalam Azad University of Technology,Kolkata-107, India*

Abstract*: Genetic Algorithm traces the path of genetic crossover. Genetic Algorithm also predicts which the probable conditions of mutation are and which can also predict certain diseases. Here it is a theoretical approach dealing with GA and different kinds of mutation and its side effects. Mutation also is a predictor of cancer which can in future be detected and help us in curing the same.*
Keywords: *Genetic Algorithm, Genes, Chromosome, Crossover, Mutation, DNA, Cancer.*

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I. Introduction

Genetic Algorithm is an adaptive heuristic search techniques based on the evolutionary concepts of natural selection and genetics. The basic technique of Genetic Algorithms are designed to simulate process in natural systems necessary for evolution , especially those follow the principles first laid down by Charles Darwin of " Survival of the fittest".

II. genetic algorithm

Let's put some light n the theory of Charles Darwin. Darwin described the evolutionary theory as a way of natural selection. He described that the biological concept of fitness is defined as reproductive success i.e.: "Survival of the form that will leave most copies of itself in successive generation". Thus from this we need to know how evolution happens in nature. The basic evolutionary currency is chromosome. Chromosome is a DNA molecule which carries genetic and hereditary information. Each chromosome contains some genes. A gene is a block of DNA. Each gene determines some aspect of the organism.

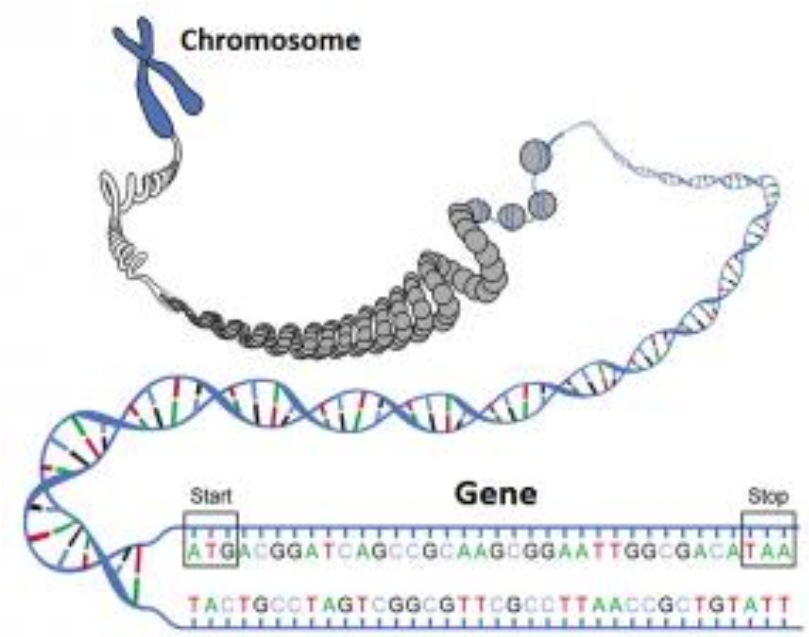

Figure 1

III. crossover

Reproduction in the nature involves recombination of genes from parents. In this process small amounts of mutations (errors) occur while copying genetic information. One type of recombination is known as Crossover.

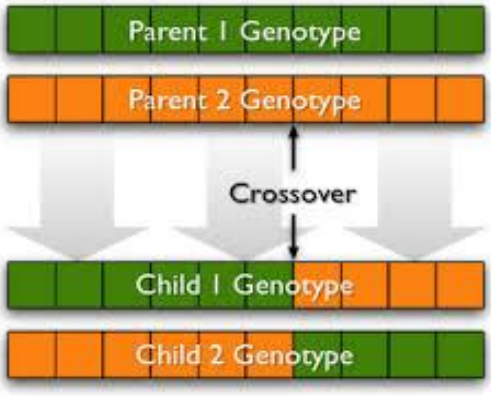

Figure 2

IV. mutation

Mutation is a change that occurs in our DNA sequence, either due to mistakes in DNA copies or as the result of environmental factors such as UV light or Cigarette smoke.

➢ Over a lifetime our DNA can undergo changes or mutation in the sequence of bases, A, C, G,T

A – Adenine
C- Cytosine
G – Guanine
T- Thymine

➢ Characteristically mutation can be classified into following types:

- Bit Flip Mutation: In this cases of mutation if any gene is represented through binary codes then a particular bit is transformed from 0 to 1 or from 1 to 0.

Example:

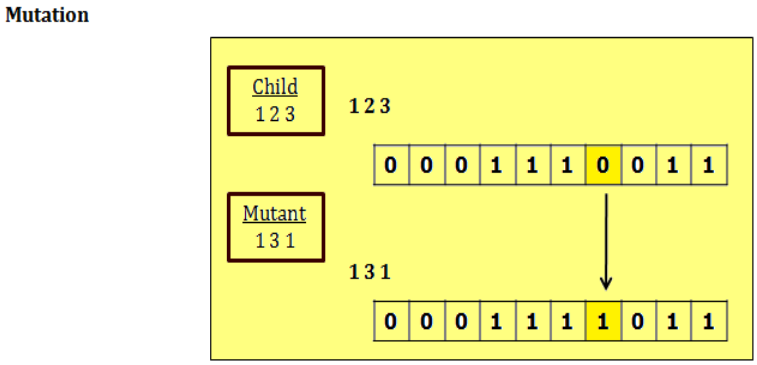

Figure 3

- **Random Mutation**: This kind of gene mutation does not follow any pattern. It does not give any kind of pre indications. If the detection of this condition in patient is not done on time then the patient condition may detoriate instantaneously.
- **Swap Mutation:** In this type of mutation the genes exchange places within themselves.

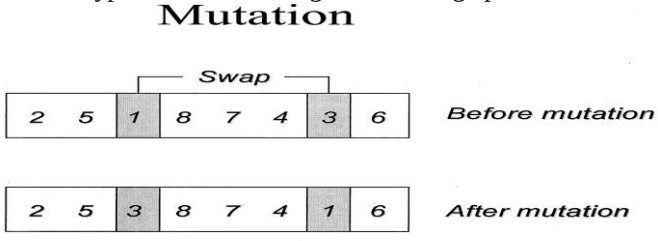

Figure 4

- **Scramble Mutation:** In this type of mutation the bit streams change their places randomly within themselves.

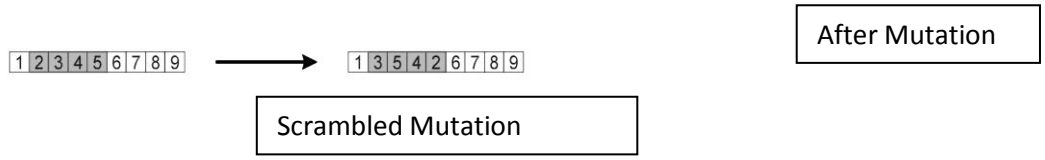

Figure 5

- These mutational changes causes change in the proteins, which can be good or bad.
- Mutations can occur during DNA replication, if errors are made and not corrected n time.
- Mutations can also occur as a result of environmental factors such as smoking , radiation.
- Often cells can recognize any potentially mutation causing damaged gene and repair it before it becomes fixed mutation.
- Mutation contribute to genetic variations within species
- Mutations can be inherited, particularly if they have a positive effect.

Example: The disorder sickle cell anaemia is caused by a mutation in gene that instructs the building of a protein called haemoglobin. This causes the red blood cells to become an abnormal rigid and sickle shaped. In African population this mutation protects against Malaria.

- However mutation can also disrupt normal gene activity and causes disease like cancer.

Cancer is the most common human genetic disease; it is caused by mutations occurring in a number of growth controlling genes. Some faulty cancer causing genes can exist from birth, increasing a person's chance of getting Cancer.

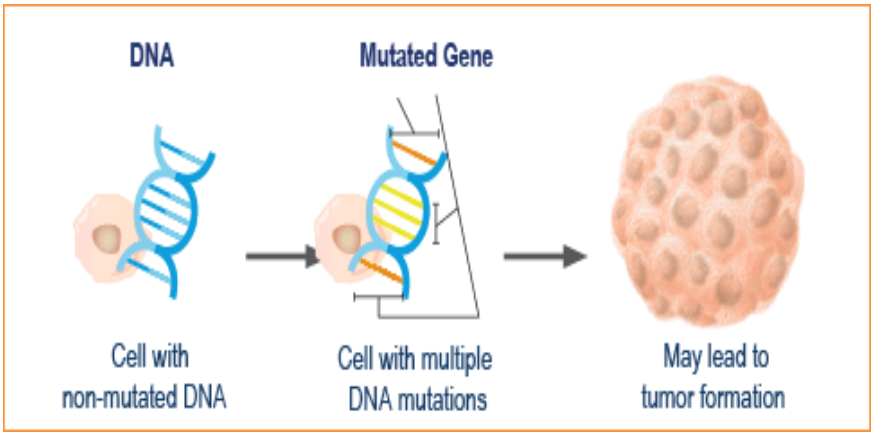

Figure 6

V. Conclusions

Genetic Algorithm is an efficient way to predict cancer. It has procedures that may be used to search among sets of clinical variables for those that are best predictors. Genetic algorithm is a method of feature (genes) selection for the support vector machine and ANN to classify cancer status of a patient. Genetic algorithm successfully identified genes that classify patient with Cancer with notable predictive performances.

References

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A reference list **MUST** be included using the following information as a guide. Only *cited* text references are included. Each reference is referred to in the text by a number enclosed in a square bracket (i.e., [3]). References **must be numbered and ordered according to where they are first mentioned in the paper,** NOT alphabetically.

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