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FACULTY OF EGINEERING AND TECHNOLOGY

Soft Computing

LECTURE -22

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OUTLINE

- Evolutionary Computation
- Implementation of SA
- Advantages of Simulated Annealing
- Algorithm Overview
- References

Evolutionary Computation

❑Evolutionary computation is another field, that is strongly inspired by nature (see Artificial Intelligence: Genetic Programming). This field was pioneered independently in the 1960s by Fogel et al. 1966, Holland 1975, Rechenberg 1973.

❑Rechenberg used evolutionary strategies to develop highly optimized devices, such as irregularly shaped reduction pieces for pipes, e.g., for an air conditioning system, which proved to have a lower air flow resistance than ordinary reduction pieces.

❑In evolutionary computation, the process of natural evolution is used as a role model for a strategy for finding optimal or near optimal solutions for a given problem.

Evolutionary Computation Operation

- Encoding/Decoding

$$x_i = x_i^- + (x_i^+ - x_i^-)\ \frac{1}{2^{l_i} - 1}\ \left(\sum_{j=0}^{l_i - 1} s_j 2^j \right).$$

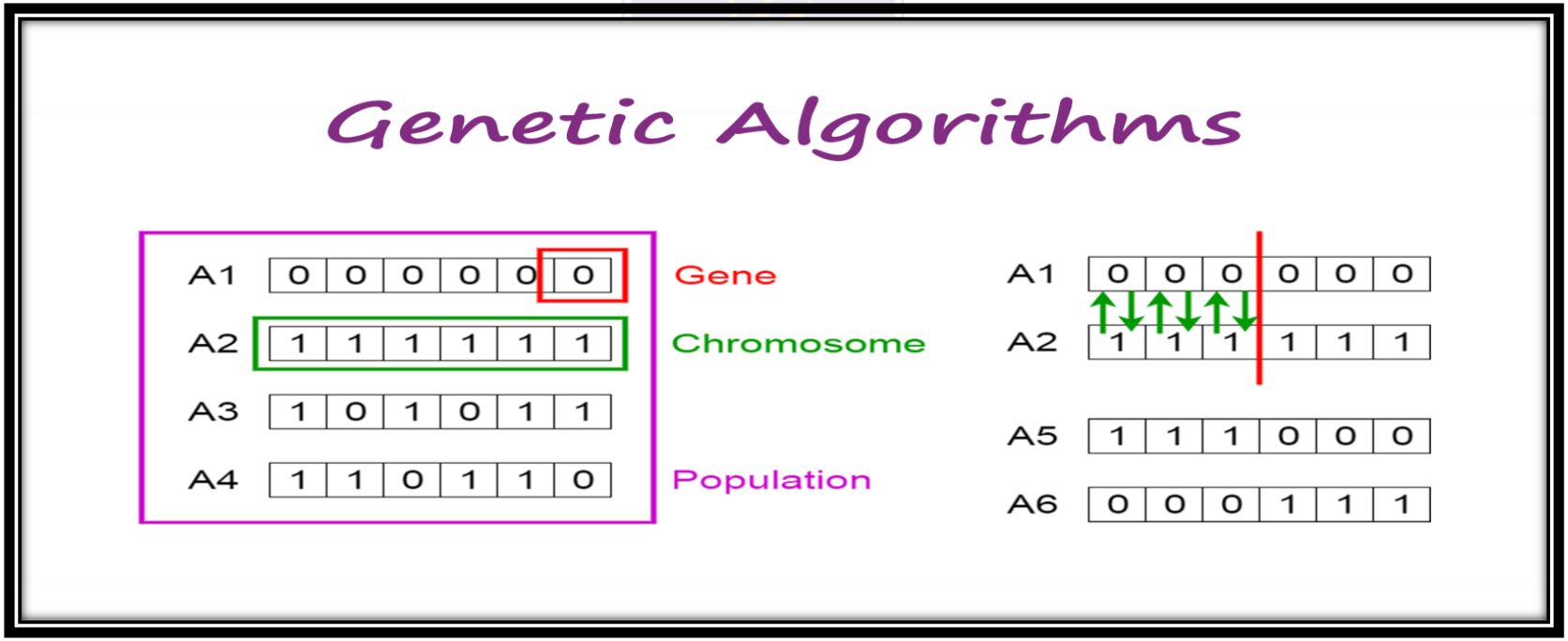
- Selection/Reproduction
- ✓ Sampling Mechanism

$$P_i = \frac{f(\mathbf{x}_i)}{\sum_{i=1}^{N_P} f(\mathbf{x}_i)}, \qquad i = 1, 2, \ldots, N_P.$$

- ✓ Replacement Strategy
- Crossover
- Mutation

Genetic Algorithm

A genetic algorithm is a search heuristic that is inspired by Charles Darwin's theory of natural evolution. This algorithm reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation.



Phases of GA

Five phases are considered in a genetic algorithm.

- ❑Initial population
- ❑Fitness function
- ❑Selection
- ❑Crossover
- ❑Mutation

MULTIPLE CHOICE QUESTION

6. What is the study of how the language sounds?

a) Speechology

b) Biology

c) Trilogy

d) Phonology

7. What are periodic changes in pressure that propagate through the air?

a) Air waves

b) Sound waves

c) Rate

d) None of the mentioned

8. What is called as the properties of the signal that extend over interval?

a) Hops

b) Rate

c) Frames

d) All of the mentioned

9. Which is used to capture the internal structure of the phones?

a) One-state phone model

b) Two-state phone model

c) Three-state phone mone

d) All of the mentioned

10. Which are partially captured by triphone model?

a) Articulation effects

b) Coarticulation effects

c) Both Articulation & Coarticulation effects

d) None of the mentioned

REFERENCES

- https://towardsdatascience.com/introduction-to-genetic-algorithms-including-example-code-e396e98d8bf3#:~:text=A%20genetic%20algorithm%20is%20a,offspring%20of%20the%20next%20generation.