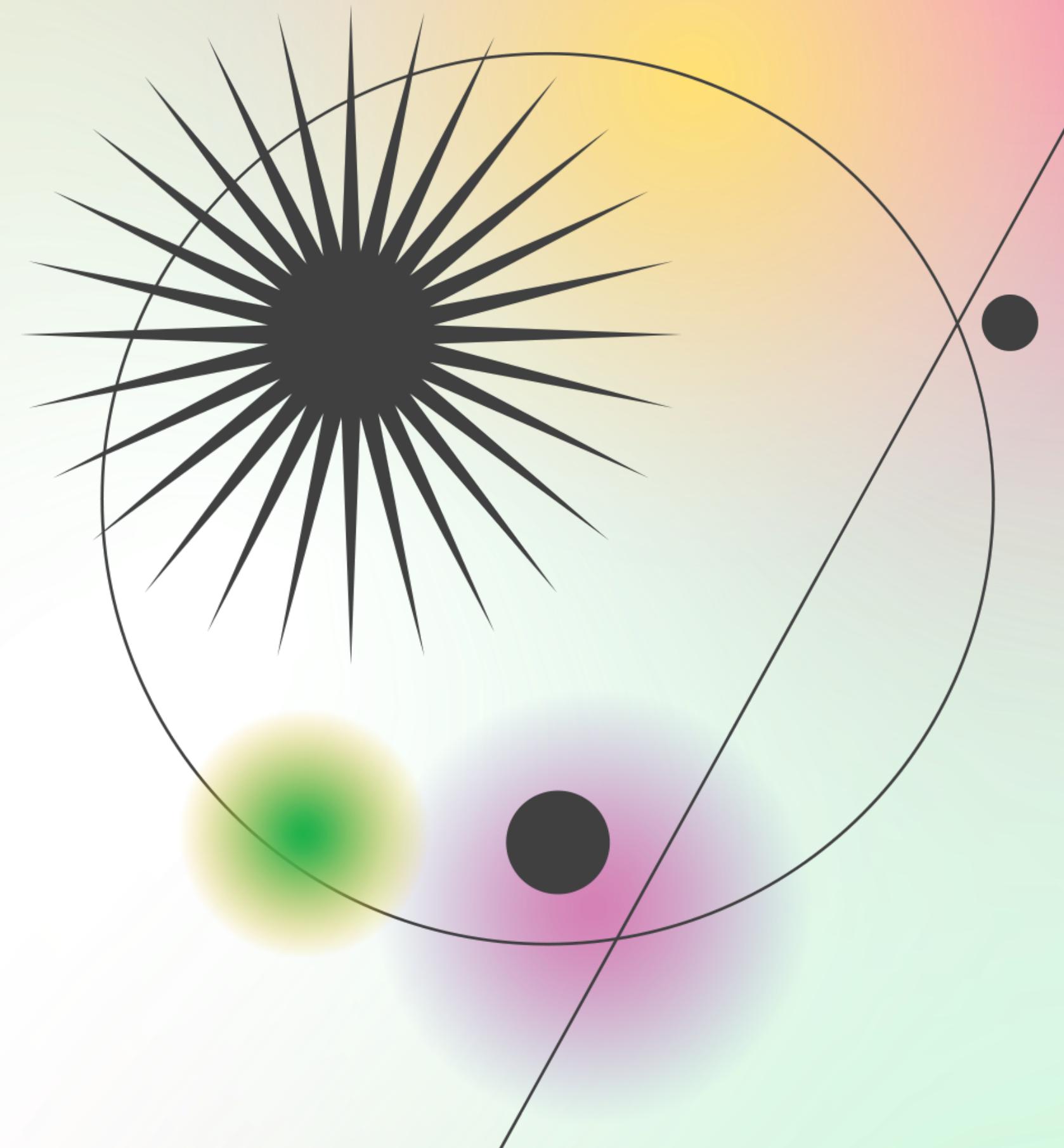


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Functions for GA

FUNCTIONS USED

1. Initial Population
2. Fitness function
3. Selection function
4. Crossover function
5. Mutation function



continuation of functions



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Initial Population - gives random numbers

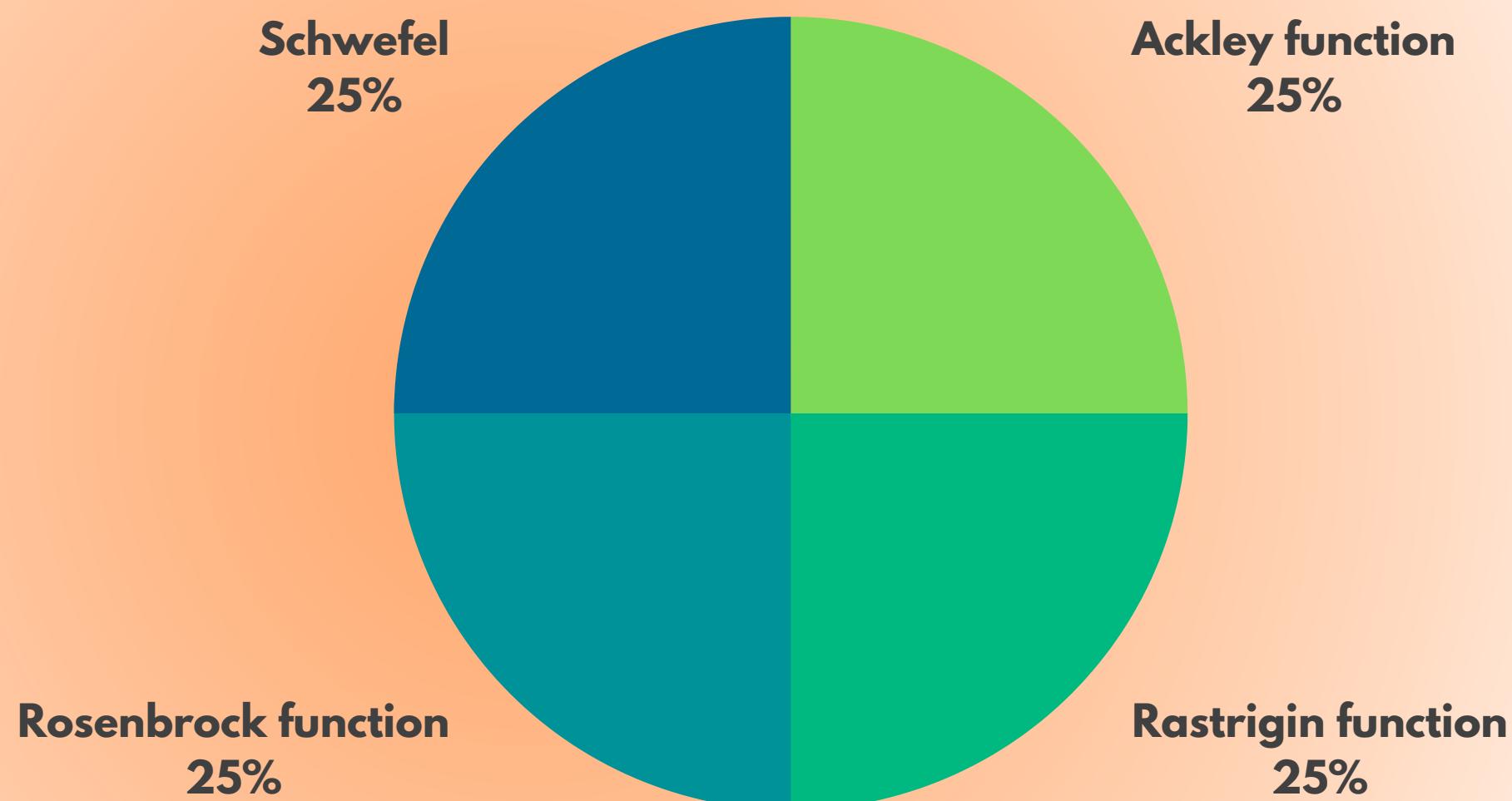
Fitness function - The fitness function determines how fit an individual is

Selection function - The idea of selection phase is to select the fittest individuals and let them pass their genes to the next generation

Crossover function - For each pair of parents to be mated, a crossover point is chosen at random from within the genes.

Mutation function - Mutation occurs to maintain diversity within the population and prevent premature convergence.





Mathematical benchmark functions

- functions that test genes.

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Ackley:

$$f(x, y) = -20 \exp \left[-0.2 \sqrt{0.5(x^2 + y^2)} \right] \\ - \exp [0.5 (\cos 2\pi x + \cos 2\pi y)] + e + 20$$

Rastrigin:

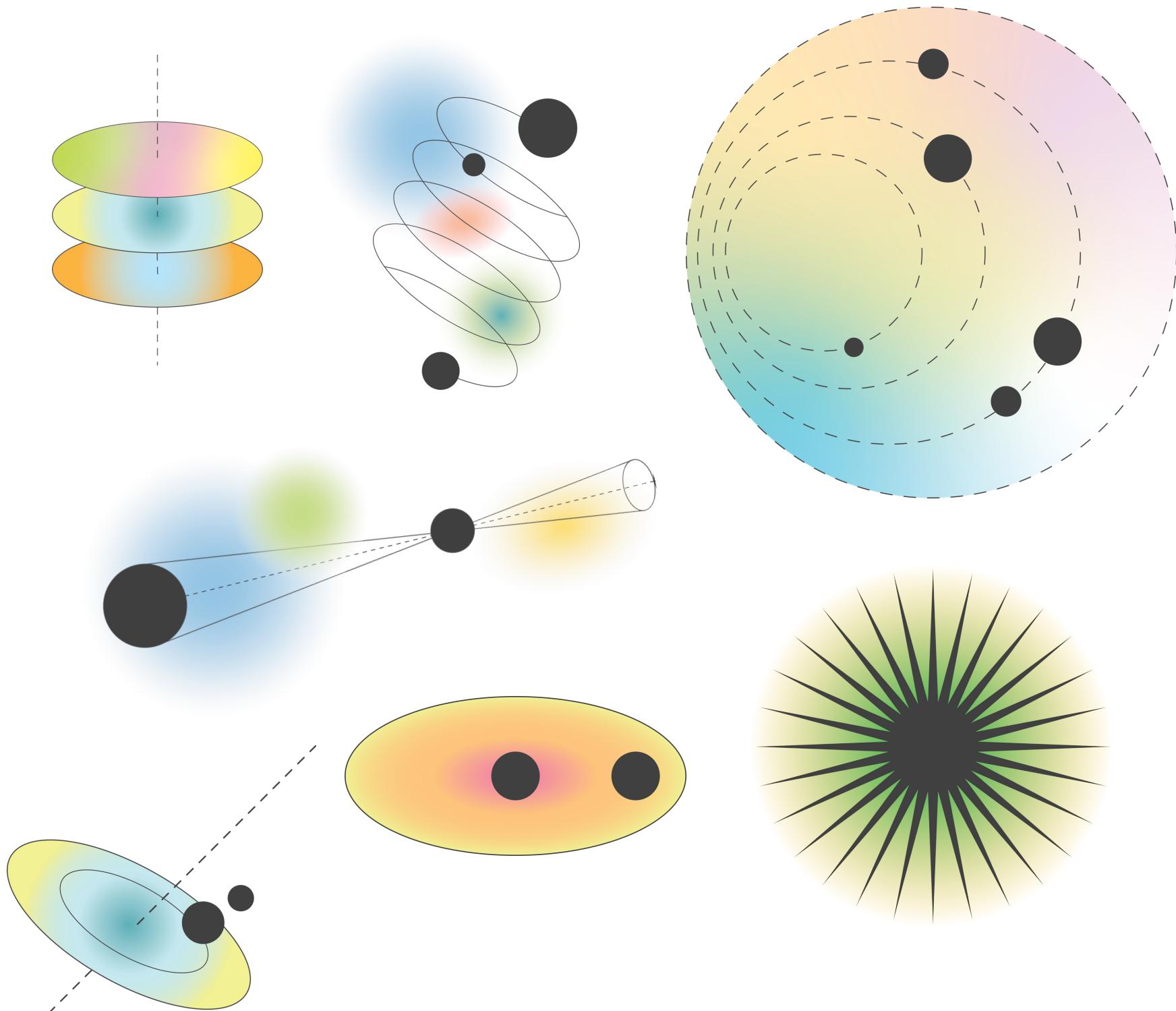
$$f(\mathbf{x}) = An + \sum_{i=1}^n [x_i^2 - A \cos(2\pi x_i)]$$

Rosenbrock:

$$f(x, y) = (a - x)^2 + b(y - x^2)^2$$

Schwefel:

$$f(\mathbf{x}) = 418.9829d - \sum_{i=1}^d x_i \sin(\sqrt{|x_i|})$$

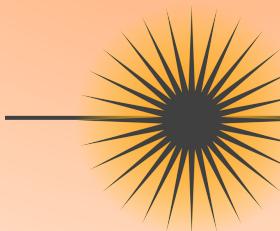


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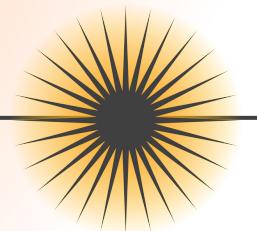
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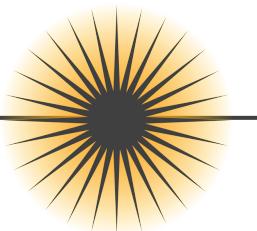
Gene exchange processes



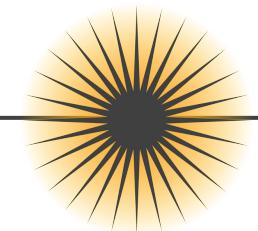
Population



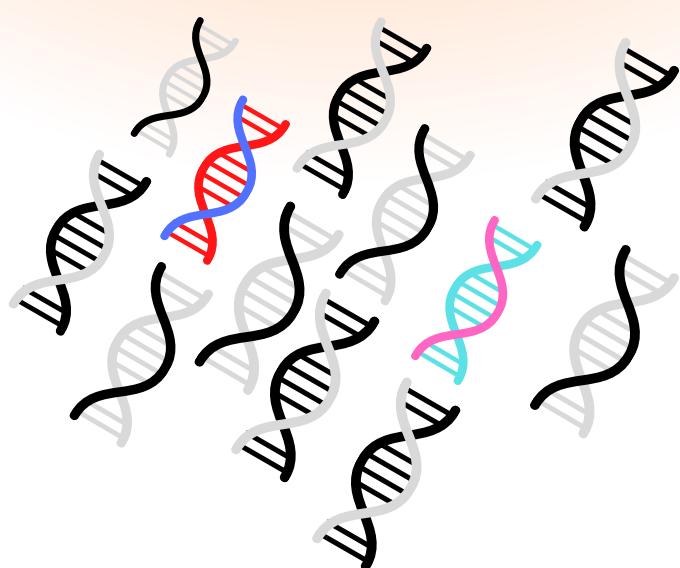
Selection



Crossover



Mutation



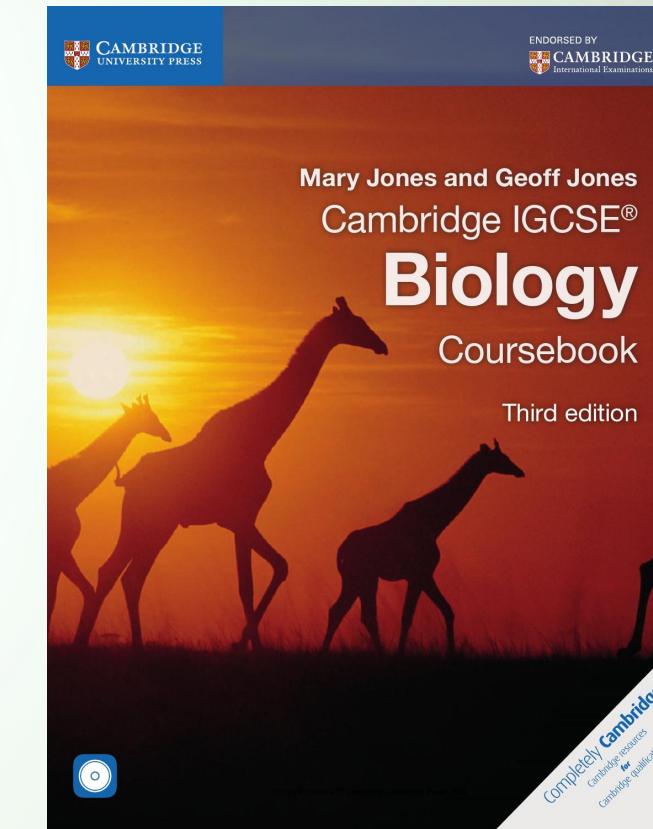
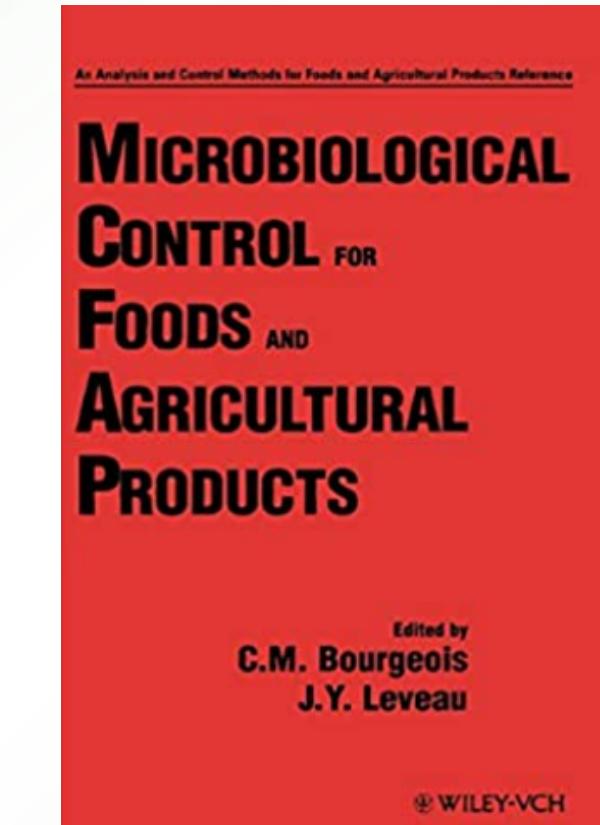
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sources used



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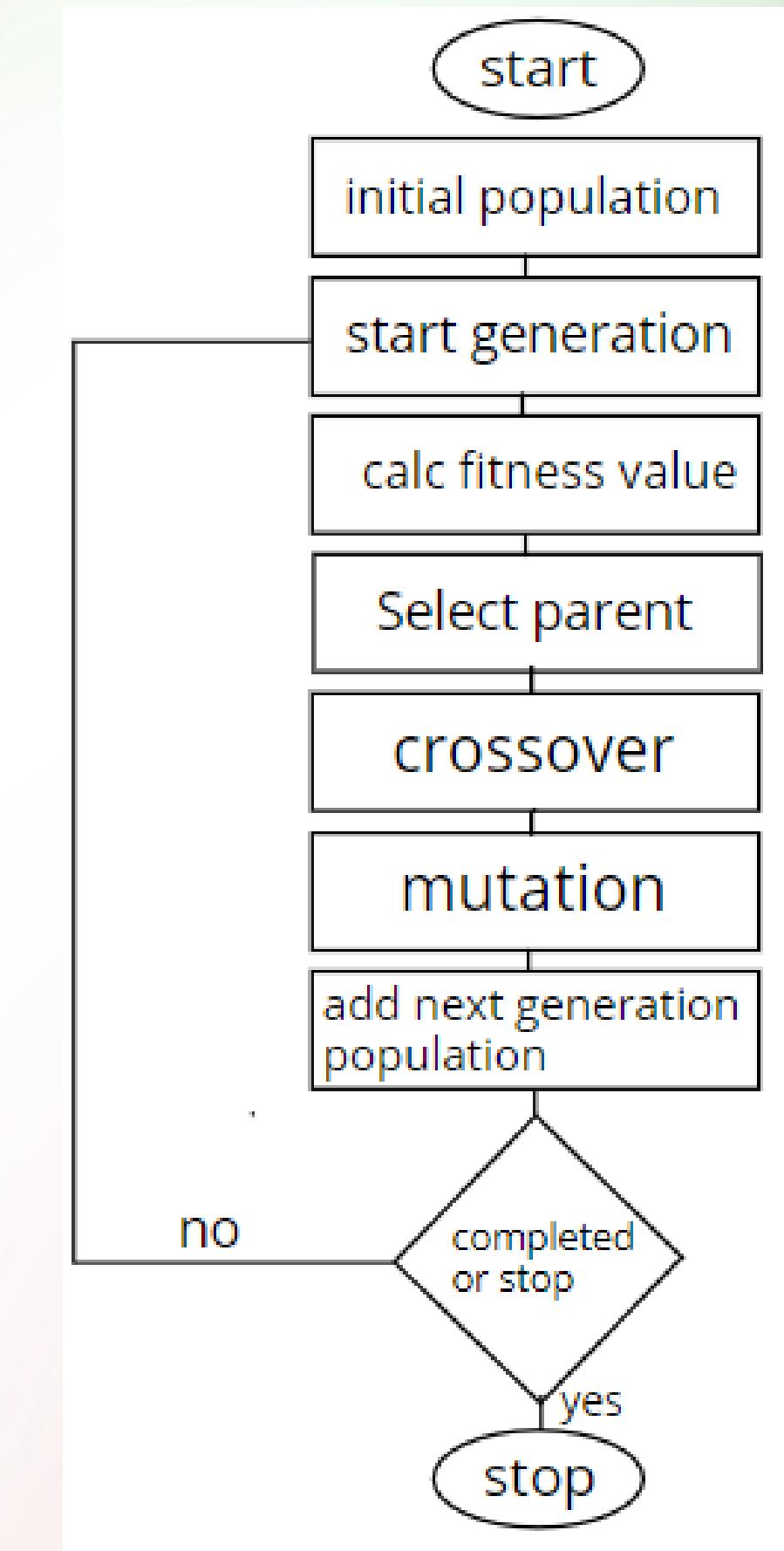


- <https://www.sfu.ca/~ssurjano/schwef.html>
- https://en.wikipedia.org/wiki/Rosenbrock_function
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- <https://www.geeksforgeeks.org/genetic-algorithms/>
- <https://towardsdatascience.com/introduction-to-genetic-algorithms-including-example-code-e396e98d8bf3>

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Flowchart for Genetic Algorithms



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Thanks for
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