Hydrozoan Algorithm

Q. $f(x_1, x_2) = (1 - x_1)^2 + 100(x_2 - x_1^2)^2$

Search space = $[-2, 1]$.

f returns fitness value.

⇒ Initial input vector

$$H = \begin{bmatrix} 2 & 3 \\ 3 & 4 \\ 4 & 5 \end{bmatrix}$$

$\downarrow$ x_1 $\quad$ $\downarrow$ x_2

Here, n is no. of inputs, $\therefore n = 3$

$D = 2$. (D - dimensional).

Corresponding fitness values $\Rightarrow F = \begin{bmatrix} 101 \\ 2504 \\ 12109 \end{bmatrix}$

Growth value $G_1(i) = 1000 / F(i)$.

$$G_1 = \begin{bmatrix} 9.9 \\ 0.4 \\ 0.08 \end{bmatrix}$$

Median $(G_1) = 0.4$

$$\text{Skearn} = G_1 - \text{Med} = \begin{bmatrix} 9.9 \\ 0.4 \\ 0.08 \end{bmatrix} - \begin{bmatrix} 0.4 \\ 0.4 \\ 0.4 \end{bmatrix}$$

$$= \begin{bmatrix} 9.5 \\ 0 \\ -0.32 \end{bmatrix}$$

Min = −0.32 , Max = 9.5 (swarm values)

$$Split = \begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix}$$

~~Clone = 9.9 9.9 9.9~~

$$Clone = \begin{bmatrix} 2 & 3 \\ 2 & 3 \\ 2 & 3 \\ 3 & 4 \end{bmatrix}$$

Mutation :-

$$Clone(i,j) = Clone(i,j) \times (1+RP)$$

$$RP = (Max - Min) \times rand() + Min.$$

$$Max = 10^{-1}, \quad Min = 10^{-2}.$$

Let after mutation,

$$Clone = \begin{bmatrix} 2 & 3 \\ 2.06 & 3.21 \\ 2.121 & 3.22 \\ 3.29 & 4.08 \end{bmatrix}$$

Corresponding fitness values :

$$F = \begin{bmatrix} 101 \\ 106.69 \\ 167.67 \\ 4538.73 \end{bmatrix}$$

Crossover :-

$$Prob(i) = \frac{F(i)}{\text{sum of fitness}}$$

Sum = 4914.1

$$Prob = \begin{bmatrix} 0.021 \\ 0.022 \\ 0.034 \\ 0.924 \end{bmatrix} \quad \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix}$$

First max prob. = 0.924 at index 4.
Second max prob. = 0.034 at index 3.

~~Crossover between 3 and 4.~~
~~Let Clone now be~~
~~New Clone F = to 1~~
~~106.6917~~
~~169~~

After crossover between 3 & 4,

$$\text{New } F = \begin{bmatrix} 101 \\ 709.91 \\ 965.96 \\ 1241.25 \end{bmatrix}$$

sorted in increasing order

The smallest F(i) is the answer for this iteration.

$F_1 = 101$

=

Clone (i) whose fitness is F_1 = Ibest.

Now, all clone values whose fitness value is equal or greater than fitness threshold are set equal to Ibest for the next iteration. Here we take Fitness threshold = F(2) = 709.91

New Clone for next iteration = $\begin{bmatrix} 2 & 3 \\ 2 & 3 \\ 2 & 3 \\ 2 & 3 \end{bmatrix}$

H is set to this clone and the process is repeated again.

For final answer, we take the average of all the F values in each iteration.