GSA: GRAVITATIONAL SEARCH ALGORITHM

AN HEURISTIC OPTIMIZATION METHOD

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CAMACHO BOSCA Jose Ramon, DIAZ Alejandro

GSA RESUME

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$$v_i^d (t+1) = rand_i v_i^d(t) + a_i^d(t)$$
$$x_i^d(t+1) = x_i^d(t) + v_i^d(t+1)$$

INSPIRATION IN THE PHYSICAL NATURE

Newton's second law : $a=F/M$

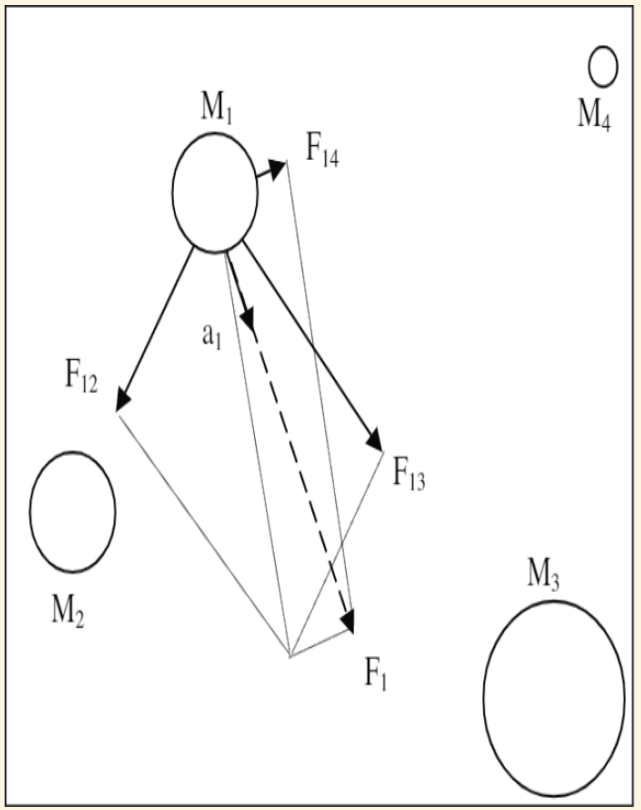
Newton's gravitational force: $$F = \dfrac{GM_1M_2}{R^2}$$

$G(t) = G(t_0)\left(\dfrac{t_0}{t}\right)^\beta$
$\beta<1$

$G(t_0)$ is the gravitational constant at the **first cosmic quantum-interval** of time

DIAGRAM DE FORCES:

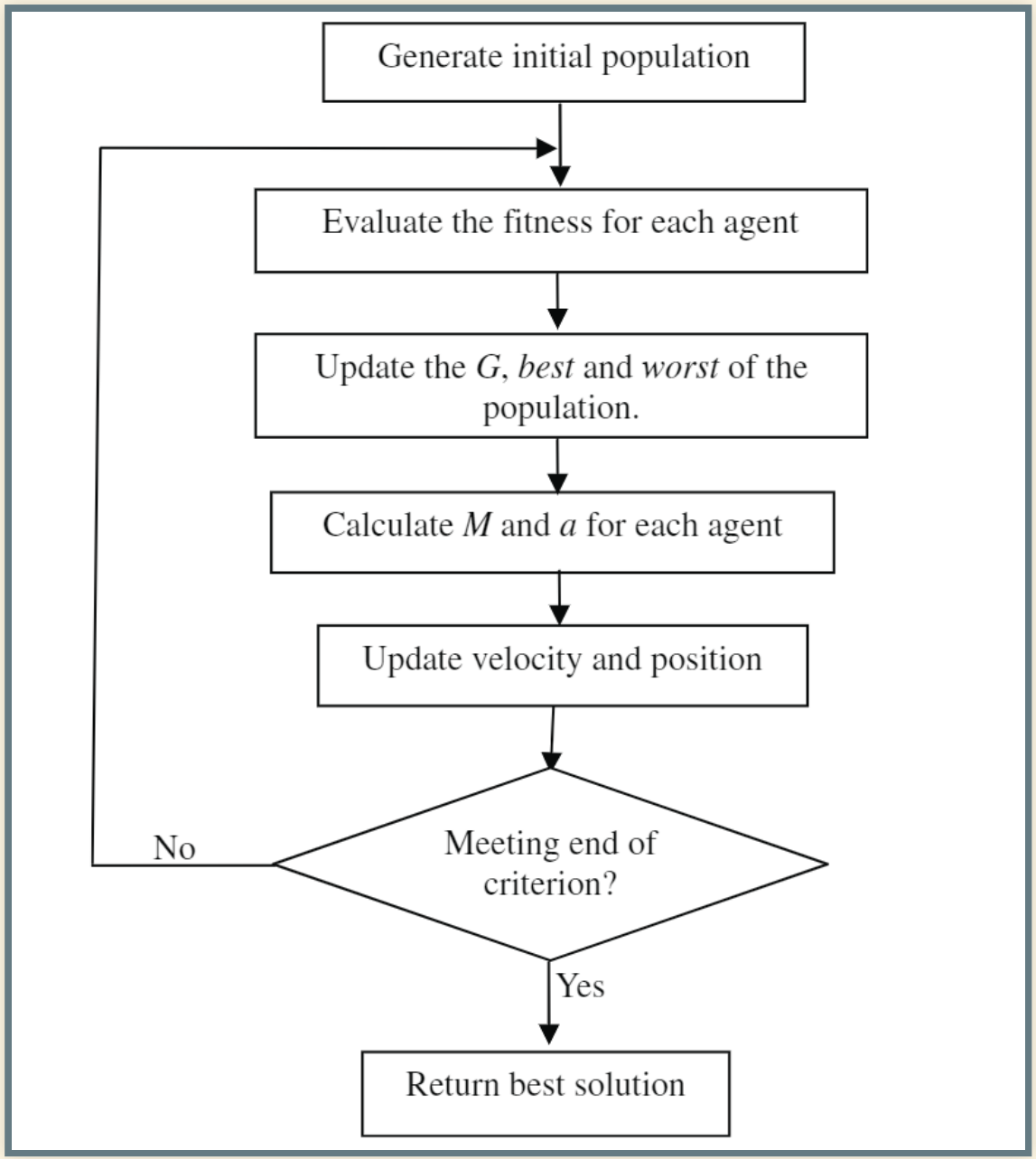
$$F_{if} = \dfrac{GM_{j}M_{i}}{R^2}$$ $$F_{i}^d(t) = \sum_j^{N}rand_j\dfrac{GM_{j}M_{i}}{R^2}$$ $$a_i^d(t) = \dfrac{F^d_{i}}{M_{i}}$$



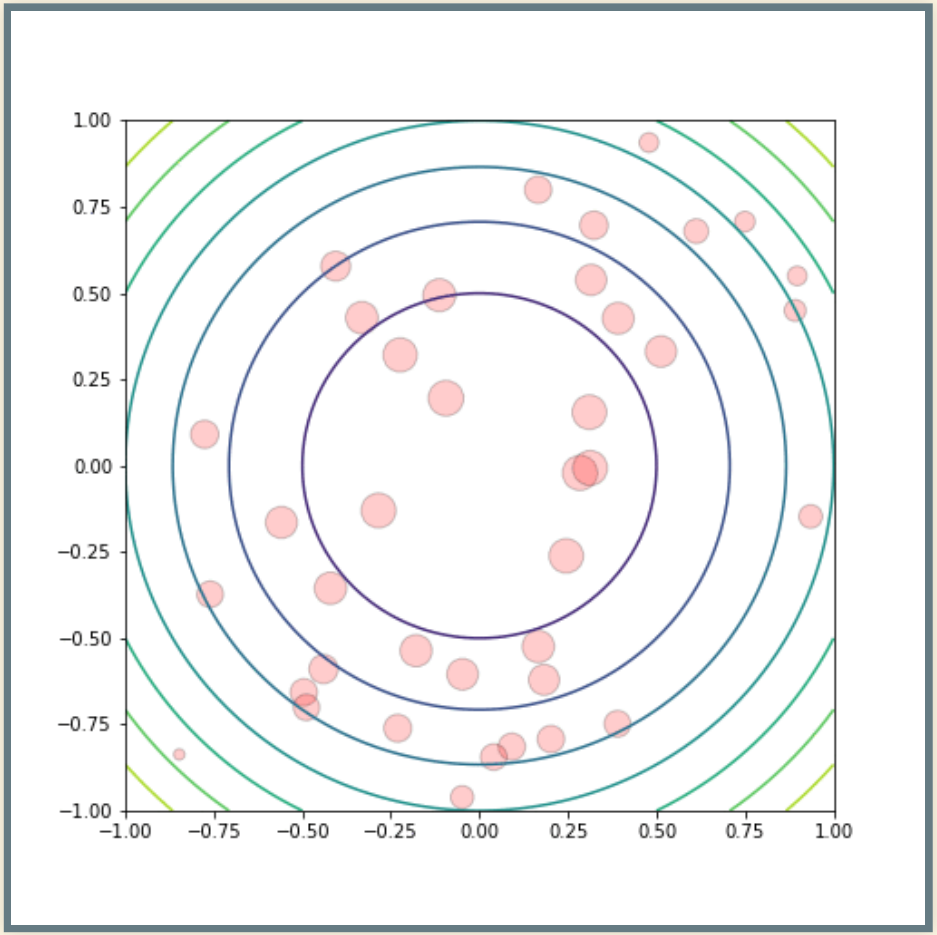
EVOLUTION OF THE MASSES

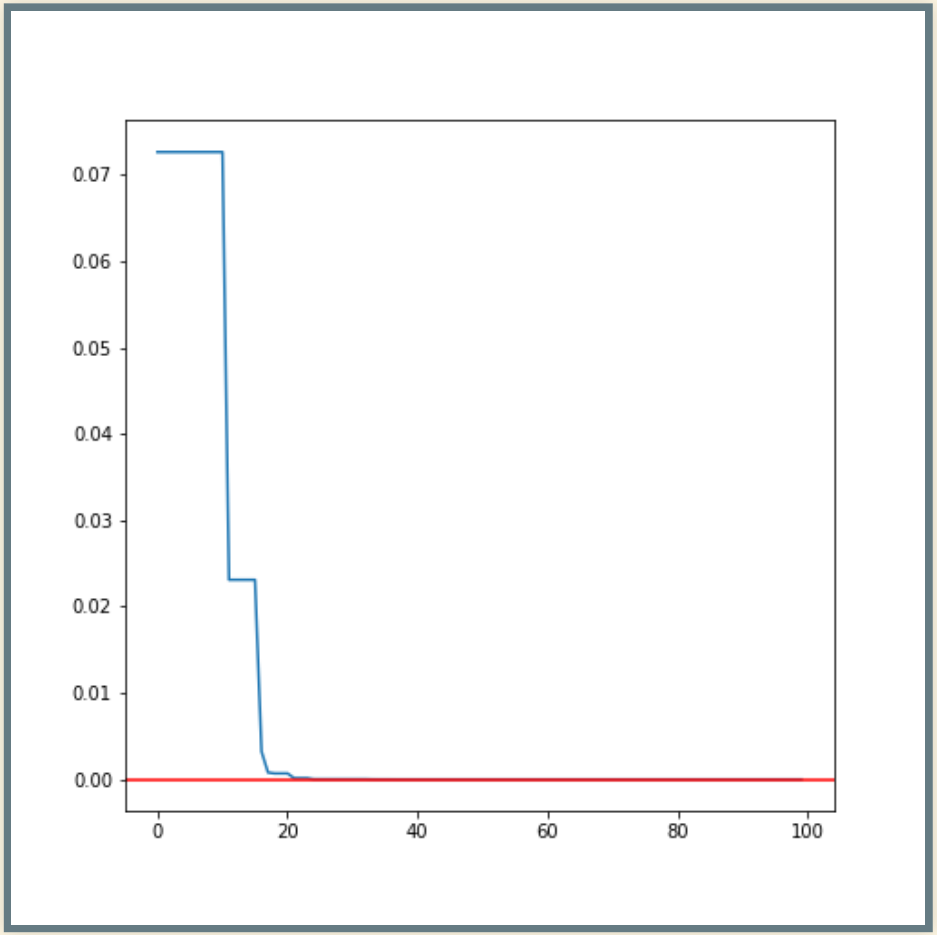
A heavier mass means a more efficient agent. Better agents have higher attractions and walk more slowly.

$$m_i(t) = \dfrac{fit_{i}(t) - worst(t)}{best(t) - worst(t)}$$ $$M_i(t) = \dfrac{m_i(t)}{\sum_j^N m_j(t)}$$

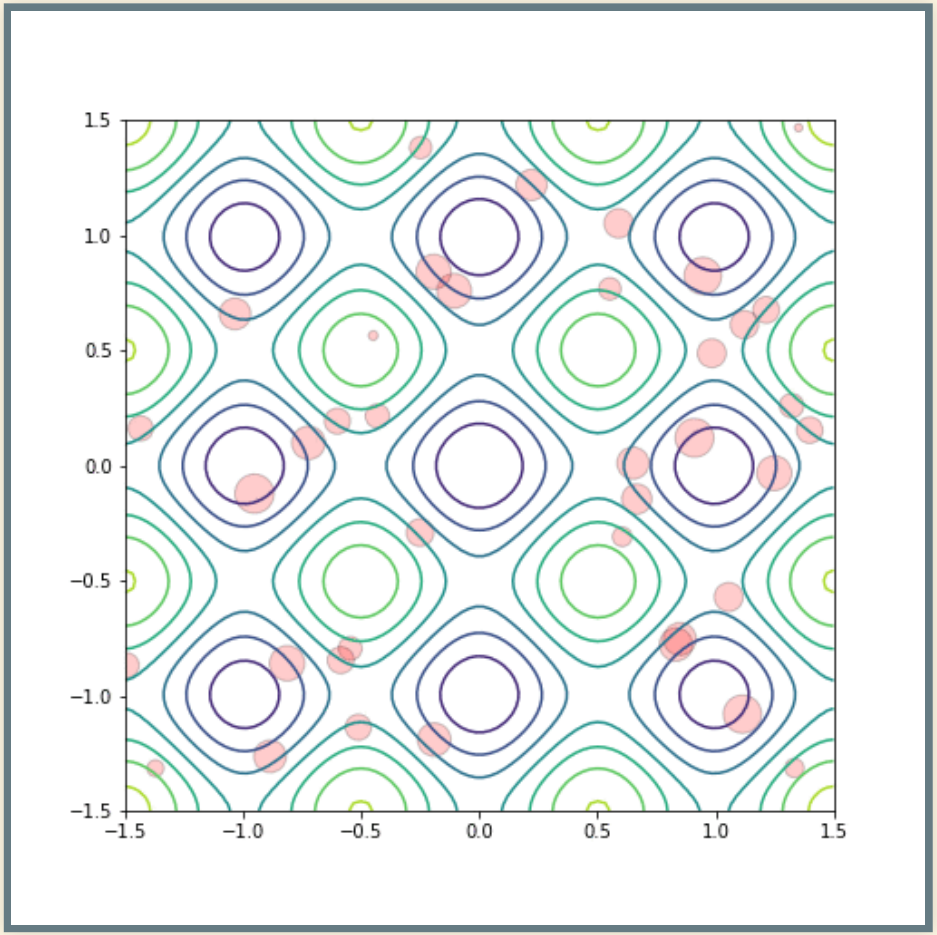

Generate initial population
Evaluate the fitness for each agent
Update the G, best and worst of the population.
Calculate M and a for each agent
Update velocity and position
Meeting end of criterion?
No
Yes
Return best solution

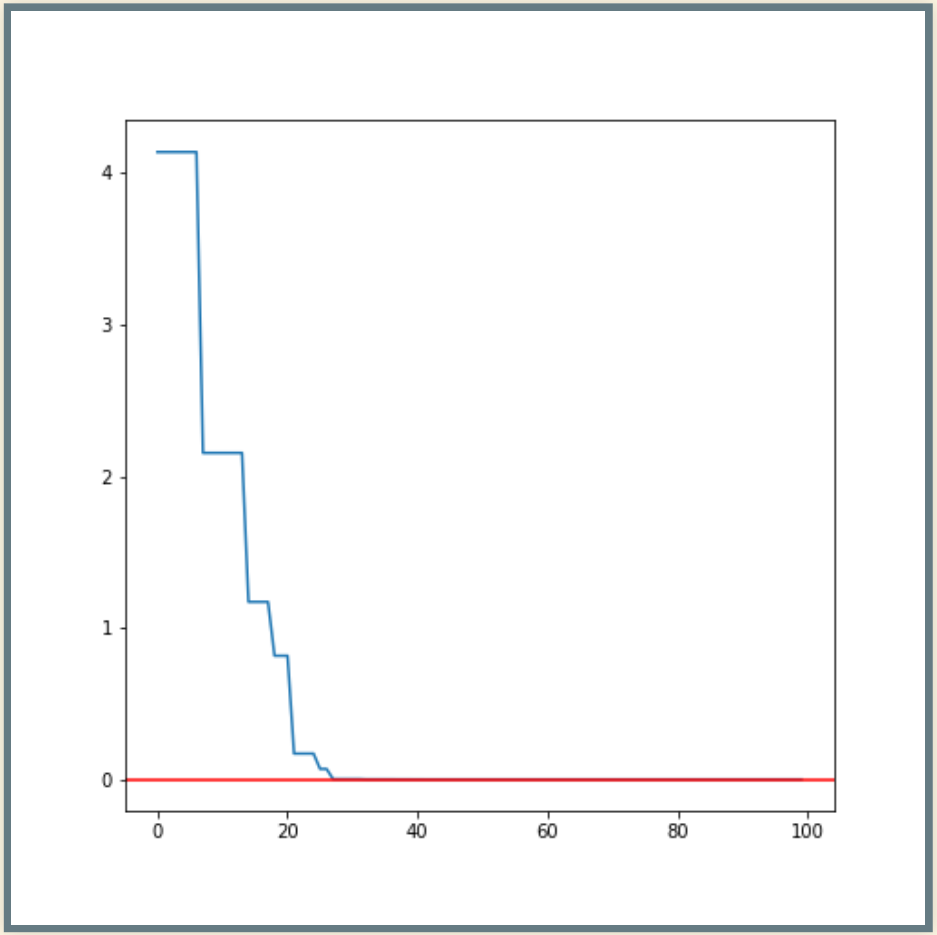
Paraboloid function



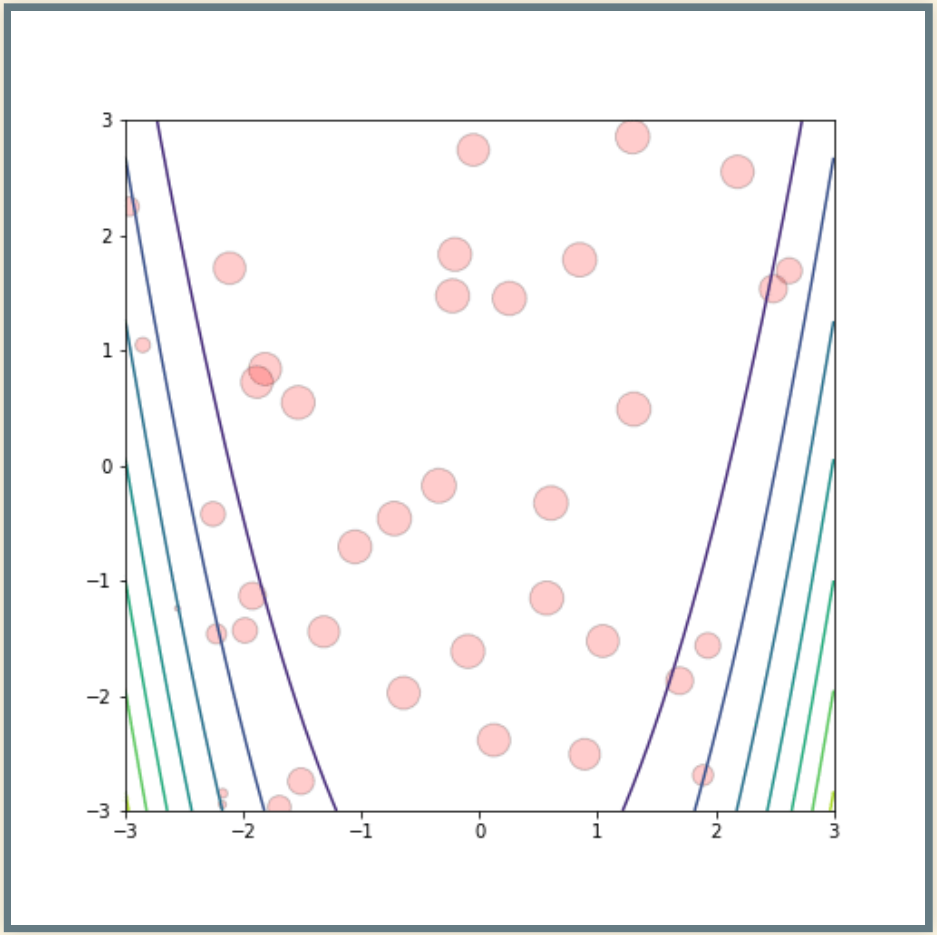


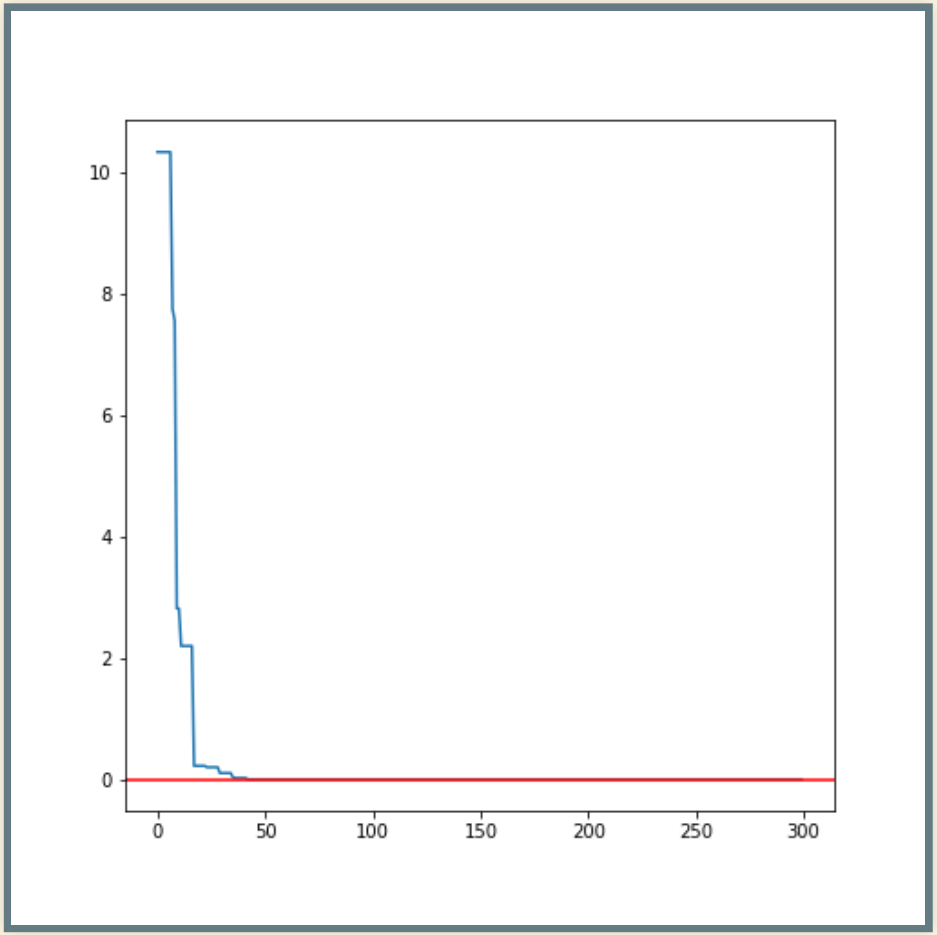
Rastrigin function





Rosenbrock function





COMPARATION OF THE ALGORITHM

Extracted from the same reference paper as we study

CONCLUSION ...

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- Using plots with a good animation seem to be a better algorithm

"LE MIEUX EST L'ENNEMI DU BIEN"

Montesquieu