

(1) Spherical 函数

$$f_1 = \sum_{i=1}^n x_i^2, \quad x_i \in [-100, 100]$$

全局最优解 $x^* = (0, \dots, 0)$, $f(x^*) = 0$

(2) Rosenbrock 函数

$$f_2 = \sum_{i=1}^n \left(100(x_{i+1} - x_i^2)^2 + (x_i - 1)^2 \right), \quad x_i \in [-30, 30]$$

全局最优解 $x^* = (0, \dots, 0)$, $f(x^*) = 0$ 。

(3) Rastrigin 函数

$$f_3 = \sum_{i=1}^n \left(x_i^2 - 10 \cos(2\pi x_i) + 10 \right), \quad x_i \in [-5.12, 5.12]$$

全局最优解 $x^* = (1, \dots, 1)$, $f(x^*) = 0$ 。

(4) Griewank 函数

$$f_4 = \frac{1}{4000} \sum_{i=1}^n x_i^2 - \prod_{i=1}^n \cos \left| \frac{x_i}{\sqrt{i}} \right| + 1, \quad x_i \in [-600, 600]$$

全局最优解 $x^* = (0, \dots, 0)$, $f(x^*) = 0$ 。

(5) Ackley 函数

$$f_5 = -20 \exp(-0.2 \sqrt{\frac{1}{n} \sum_{i=1}^n x_i^2}) - \exp \left(\frac{1}{n} \sum_{i=1}^n \cos(2\pi x_i) \right) + 20 + e, \quad x_i \in [-32, 32]$$

全局最优解 $x^* = (0, \dots, 0)$, $f(x^*) = 0$ 。

(6) High conditioned elliptic 函数

$$f_6(x) = \sum_{i=1}^n \left(10^6 \right)^{\frac{i-1}{n-1}} x_i^2, \quad x_i \in [-100, 100]$$

全局最优解 $x^* = (0, \dots, 0)$, $f(x^*) = 0$ 。

(7) Michalewicz 函数

$$f_7(x) = - \sum_{i=1}^n \sin(x_i) \sin \left(\frac{ix_i^2}{\pi} \right)^{20}, \quad x_i \in [0, \pi]$$

全局最优解未知。

(8) Trid 函数

$$f_8(x) = \sum_{i=1}^n (x_i - 1)^2 - \sum_{i=2}^n x_i x_{i-1}, \quad x_i \in [-n^2, n^2]$$

$$\text{全局最优解 } x^* = i(n+1-i), \quad f(x^*) = -\frac{n(n+4)(n-1)}{6}。$$

(9) Schwefel 函数

$$f_9 = \sum_{i=1}^n \left[-x_i \sin(\sqrt{|x_i|}) \right], \quad x_i \in [-500, 500]$$

$$\text{全局最优解 } x^* = (420.9687, \dots, 420.9687), \quad f(x^*) = .418.9829n。$$

(10) Schwefel 1.2 函数

$$f_{10} = \sum_{i=1}^n \left(\sum_{j=1}^i x_j \right)^2, \quad x_i \in [-100, 100]$$

$$\text{全局最优解 } x^* = (0, \dots, 0), \quad f(x^*) = 0。$$

(11) Schwefel 2.4 函数

$$f_{11} = \sum_{i=1}^n \left[(x_i - 1)^2 + (x_1 - x_i^2)^2 \right], \quad x_i \in [0, 10]$$

$$\text{全局最优解 } x^* = (1, \dots, 1), \quad f(x^*) = 0。$$

(12) Weierstrass 函数

$$f_{12} = \sum_{i=1}^n \sum_{k=0}^{k_{\max}} \left[a^k \cos(2\pi b^k (x_i + 0.5)) \right] - n \sum_{k=0}^{k_{\max}} a^k \cos(\pi b^k x_i), \quad x_i \in [-0.5, 0.5]$$

$$\text{其中。} a = 0.5, \quad b = 3, \quad k_{\max} = 20; \quad \text{全局最优解 } x^* = (0, \dots, 0), \quad f(x^*) = 0。$$