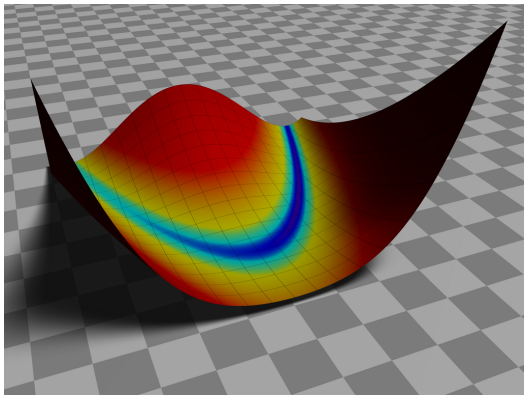
Real-Coded Genetic Algorithm

Lecture 24



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Outline

Real-Coded GA

What are some advantages and disadvantages of using real numbers instead of binary?

Advantages:

- Aribtrary machine (up to machine precision)
- Avoids Hamming cliffs: 0111 (7) to 1000 (8)
- Avoids coding/decoding
- Usually more efficient than binary coded

Disadvantages:

- Not suitable for integer or discrete variables
- Crossover and mutuation are less natural

Initial Population

$$x_i = x_{li} + r(x_{ui} - x_{li})$$

Again, Latin Hypercube Sampling provides a more effective way.

Selection

Unchanged. Can still use tournament, roulette wheel, or other methods.

Reproduction

Can use a single or multi-point crossover:

Parents:

4.2	6.4	5.3	5.2	1.3
1.2	4.5	4.6	6.8	7.5

Offspring:

4.2	6.4	5.3	6.8	7.5
1.2	4.5	4.6	5.2	1.3

Other options exist like a linear combination of the parents:

$$x_c = w_1 x_{p1} + w_2 x_{p2}$$

Mutation

Perturb each variable with some small probability (e.g., $p < 0.02$)

Can perturb using a uniform probability distribution:

$$x_{newi} = x_i + (r_i - 0.5)\Delta_i$$

Or a Gaussian probability distribution.

$$x_{newi} = x_i + \mathcal{N}(0, \sigma_i)$$

Examples