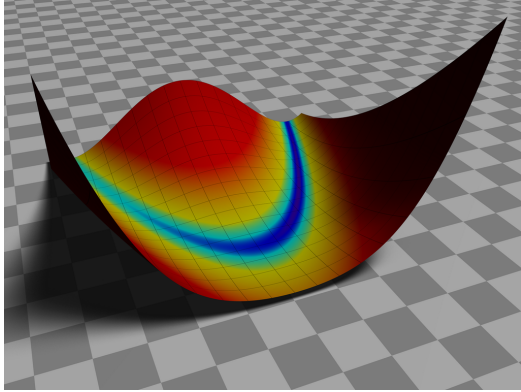# Genetic Algorithm Wrap Up

Lecture 25

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Outline

Constraints

Multiobjective GA

Examples

Constraints

Penalty Methods

$$J(x) = f(x) + P(x)$$

- Log barrier and other interior point approaches are *not* often used because it can be difficult to find feasible solutions.
- Exterior penalities like Augmented Lagrangian are more effective.

Simpler approaches can also be used:

$$P(x) = \sum_i \mu_i |c_{vio}|_i$$

Or, to guarantee that an infeasible point is always worse than any feasible point:

$$P(x) = \sum_i \mu_i |c_{vio}|_i + \max f_{\text{feasible}}$$

Tournament

If using a tournament method we can avoid penalties altogether. Recall that in a tournament we random create pairs and decide which one to keep.

1. If one feasible and one infeasible, choose the feasible solution.
2. If both feasible, choose the one with the better objective.
3. If both infeasible, choose the one with the smaller constraint violation.

Multiobjective GA
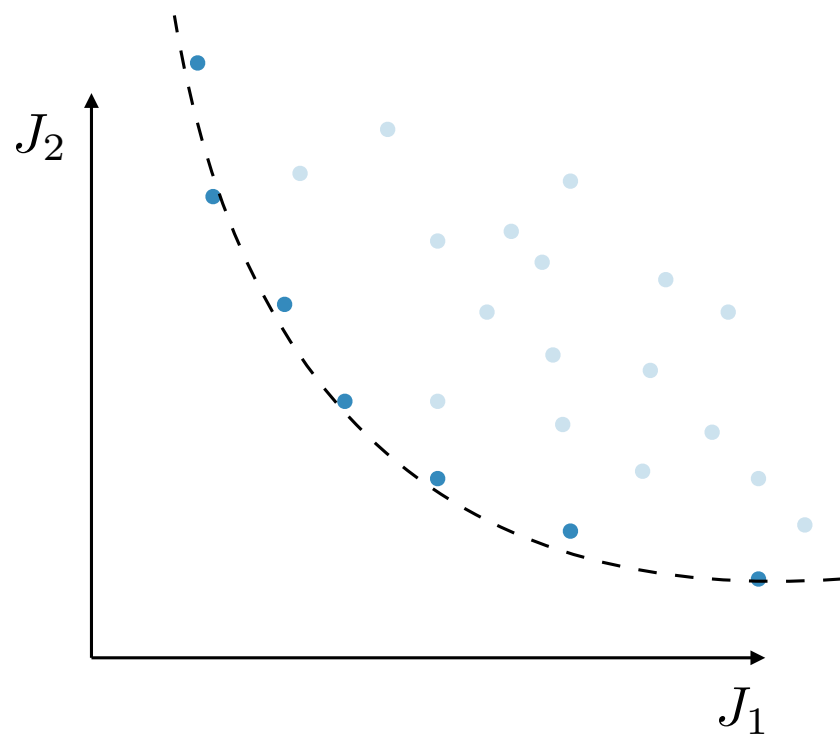
Review: Multiobjective Optimization

Which of these points are dominated?

- A (32, 34)
- B (30, 37)
- C (28, 35)

A : nondominated
B : dominated by C (but not by A)
C : nondominated

A genetic algorithm is easy to use with multiobjective optimization because we have a population rather than a point. Our current Pareto front just consists of all points that are nondominated.

Examples

New Python optimization interface

Multiobjective optimization