Interactive Automatic Algorithm Configuration for Bi-Objective Optimization
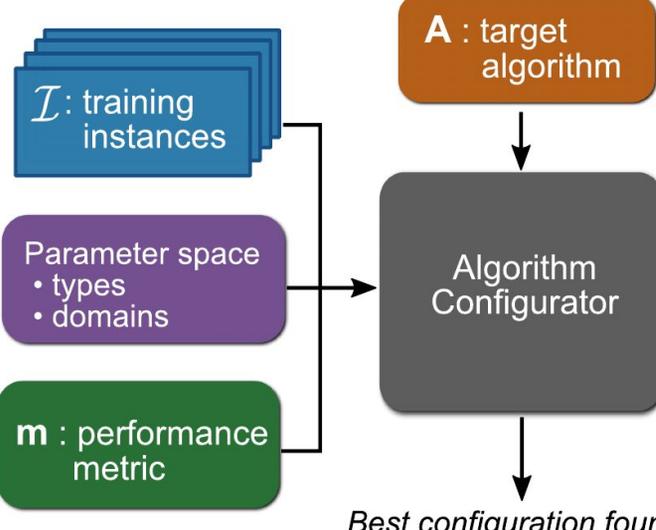
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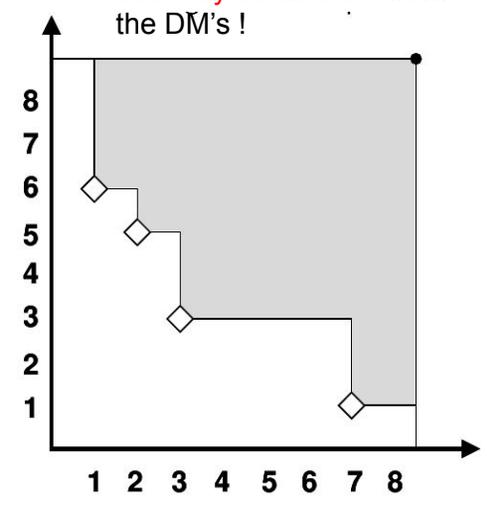jediaz@usfq.edu.ec, Universidad San Francisco de Quito

Automatic Algorithm Configuration (e.g., irace)

- $\mathcal{I}$: training instances
- Parameter space
  - types
  - domains
- **m** : performance metric

A : target algorithm

Algorithm Configurator

Evaluate configuration θ

Best configuration found θ*

Instance I_1 → A(θ) → m_1
Instance I_2 → A(θ) → m_2
Instance I_t → A(θ) → m_t

Aggregate performance values
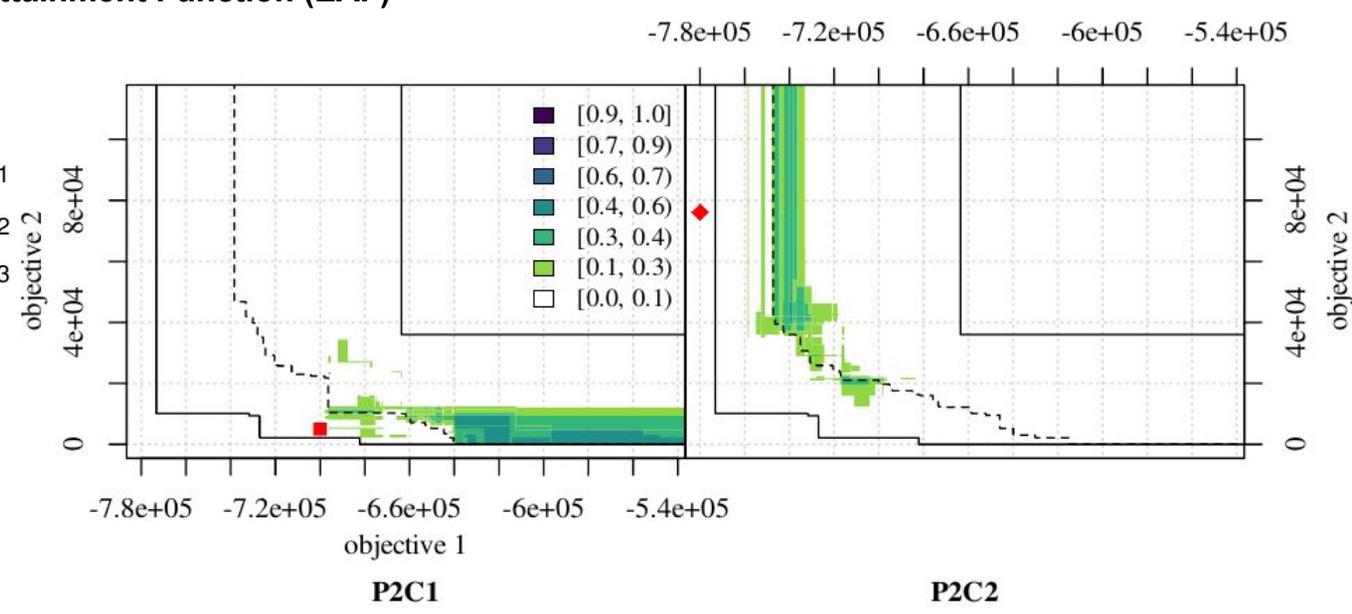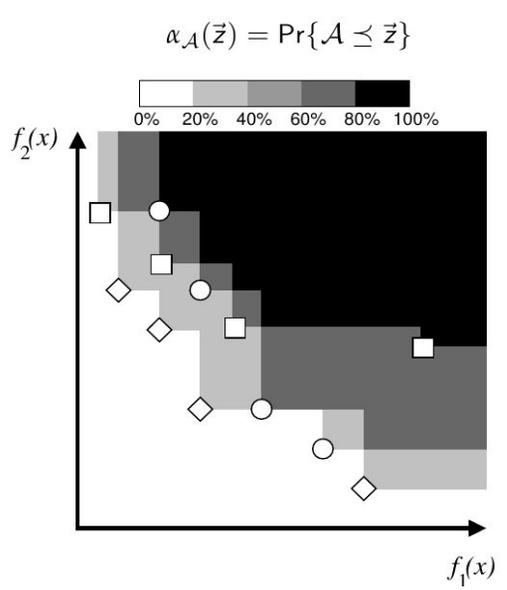
💡 Use EAF differences to elicit preferences about incomparable configurations of a multi-objective optimizer
💡 Convert EAF differences into a weighted hypervolume
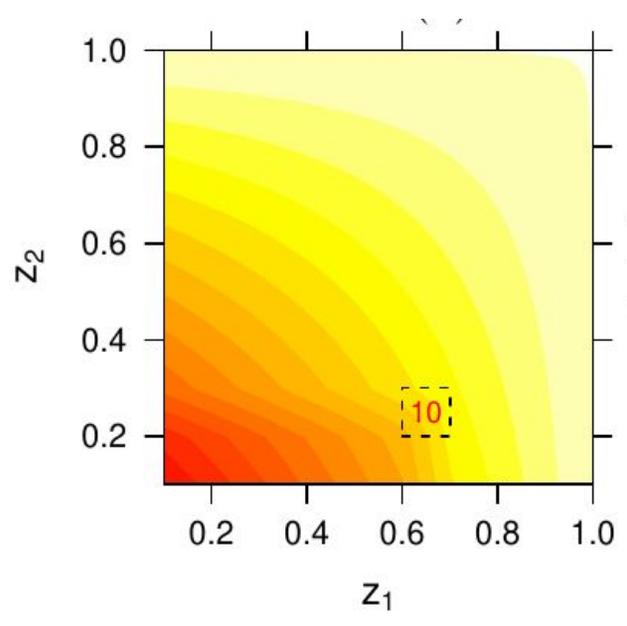💡 Use this weighted hypervolume to guide the automatic algorithm configuration of a multi-objective optimizer

✓ irace + **hypervolume** = AAC of **multi-objective** algorithms
🙁 HV assumes a preference that may be different from the DM's !

Empirical Attainment Function (EAF)

$$\alpha_{\mathcal{A}}(\vec{z}) = \Pr\{\mathcal{A} \preceq \vec{z}\}$$

0% 20% 40% 60% 80% 100%

$f_2(x)$

◇ Run 1
○ Run 2
□ Run 3

$f_1(x)$

[0.9, 1.0]
[0.7, 0.9)
[0.6, 0.7)
[0.4, 0.6)
[0.3, 0.4)
[0.1, 0.3)
[0.0, 0.1)

objective 2

objective 1

P2C1

P2C2

Weighted HV

z_2

z_1

10

irace + WHV

objective 1

objective 2

[0.9, 1.0]
[0.7, 0.9)
[0.6, 0.7)
[0.4, 0.6)
[0.3, 0.4)
[0.1, 0.3)
[0.0, 0.1)

objective 1

objective 2

P2iraceC1

P2iraceC2