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HAL Authorization

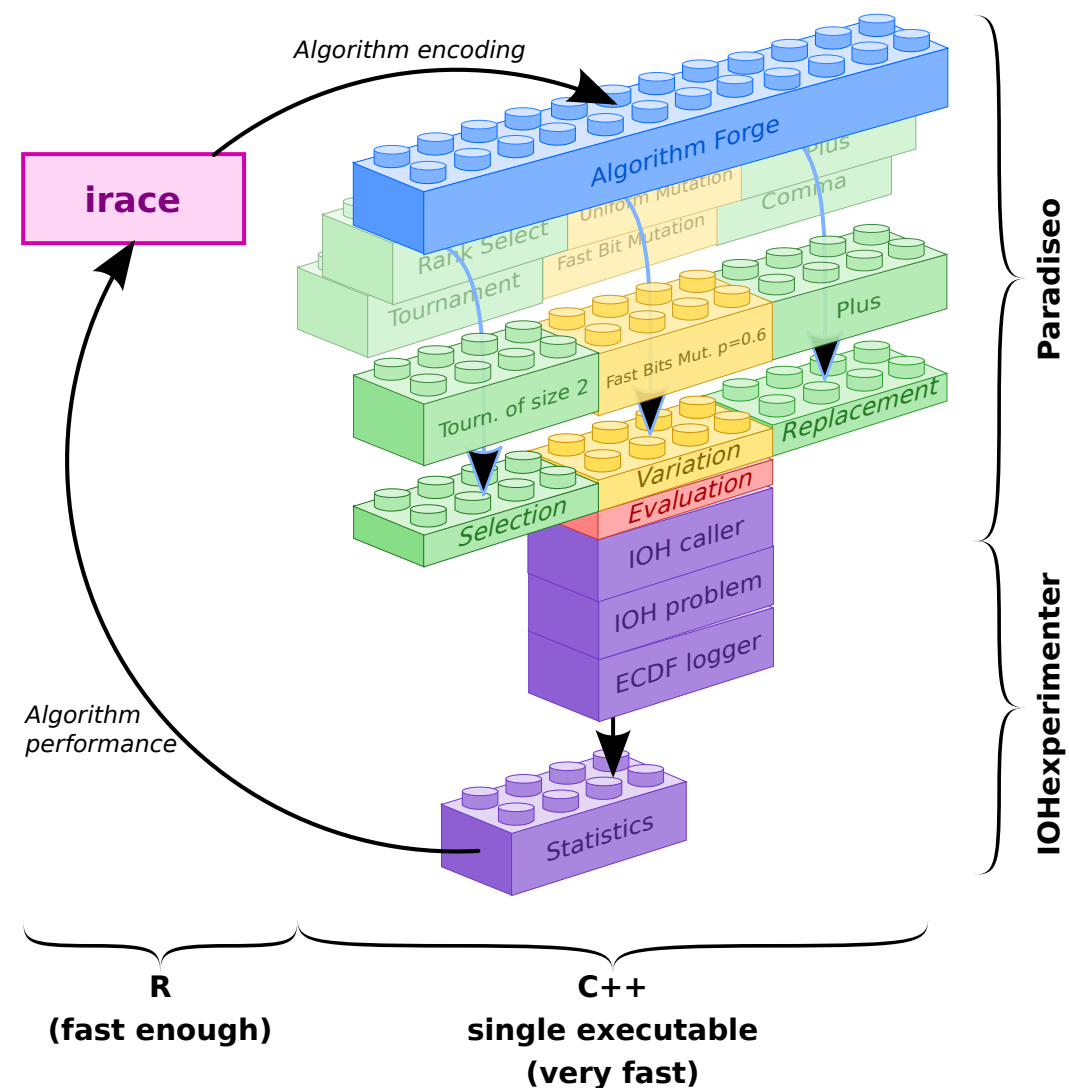
# Using Irace, Paradiseo and IOHprofiler for Large-Scale Algorithm Configuration

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<https://nojhan.github.io/paradiseo/>  
<https://iohprofiler.github.io/>  
<https://mlopez-ibanez.github.io/irace/>

## 1. Fast Automated Pipeline



100 000 runs for each of 19 problems  
**in 3 hours on a laptop**

(at least 10 times faster than optimized C/Python/Numpy counterpart)

Very fast runs,  
 very expressive models,  
 (for algorithms and performance)  
 standardized results data,  
 that can be easily explored,  
 Open-source.

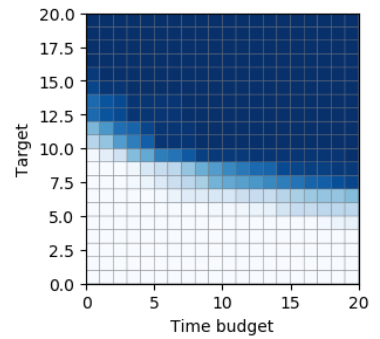
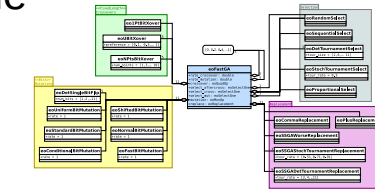
## 2. Killer Features

- Large set of Parametrized Components
- +
- Large Algorithms Families
- +
- Expressive Benchmark Generators
- +
- Expressive Performances Statistics
- +
- Automatic Configurator Interface
- +
- Comprehensive Behaviour Logging
- +
- Data Export to Interactive Analyzer

## 3. Example

Algo. : FastGA  $\approx 6e8$  algorithms  
 Bench.: W-models = 19 problems w. invariance instances  
 Stat. : 2D Quality/Time log ECDH volume

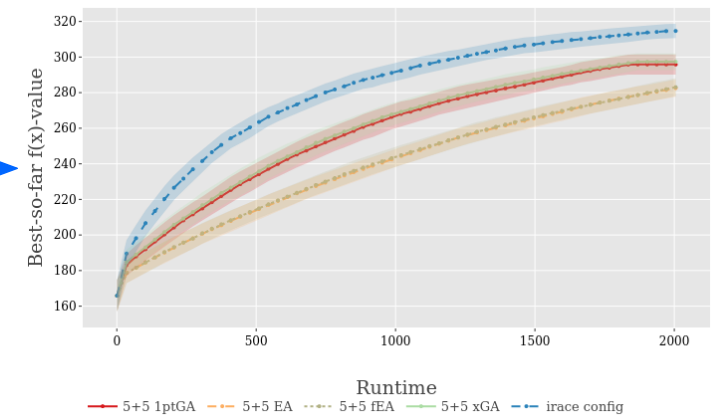
Per-instance configuration with irace.



## 4. Results

Elite algo outperforms baselines

Elite operators vary across problems



Op. index	Problem 5										Problem 17										All problems														
	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10		
Pc	5	6	1	3	-	-	-	-	-	-	-				1	14	-	-	-	-	-	-	-	18	74	56	57	65	-	-	-	-	-	-	-
SelectC	1		5	2		4	3	-	-	-	-			15	-	-	-	-	-	-	-	-	-	18	16	141	19	18	30	28	-	-	-	-	-
Crossover	1	5	2	2	1	1				1	2			15	-	-	-	-	-	-	-	-	-	11	29	78	24	6	8	11	19	18	23	43	
Pm			2	3	10	-	-	-	-	-	-					15	-	-	-	-	-	-	-	4	9	25	49	183	-	-	-	-	-	-	-
SelectM				14			1	-	-	-	-	6	2	1	2	2								26	17	61	36	27	41	62	-	-	-	-	-
Mutation	2	5			1	1	2	4												1	9	4	1	2	7		3	1	2	6	10	62	81	96	
Replace	15											15												245	2	3	6	2	1	2	5	1	3		

## 5. Perspectives

- Interfaces toward other configuration solvers.
- Even larger studies.
- Even more algorithms/operators.
- Even more benchmarks.
- Grammar-based/bottom-up framework.
- Assessing the contribution of new ideas in interplay with operators and parameters.
- Stop thinking of "algorithms" and think of "combination of parametrized operators".

## 6. Learn More

Amine Aziz-Alaoui, Carola Doerr, Johann Dreo: **"Towards large scale automated algorithm design by integrating modular benchmarking frameworks"**, GECCO Companion 2021: 1365-1374.  
<https://arxiv.org/abs/2102.06435>

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