We generate **Swarm-like** Optimization Algorithms using **Grammatical Evolution**

Franken-Swarm: Grammatical Evolution for the Automatic Generation of Swarm-like Meta-heuristics

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Motivation

- Dozens of optimization methods inspired by natural processes have been proposed;
- The design of these algorithms resembles rather an art than a science and is subject to human bias.
- We want to examine their design space to find good unexplored combinations.

Results

- Similar performance between GE-crafted and human-crafted methods on COCO Benchmark;
- The training regimen and choice of fitness function should be a priority for the continuation of this work.

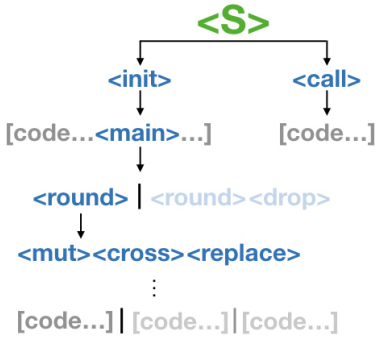
Abstract Meta-heuristic Framework

1: Select Operators using Grammatical Evolution
2: Initialize population as set of random solutions S
3: **while** Not reached maximum number of iterations **do**
4: **for** Each Solution $s \in S$ **do**
5: **for** Each Update Procedure $p \in P$ **do**
6: Use Operator Mut_p to generate s' from s
7: Use Operator $Cross_p$ to generate s'' from s'
8: Use Operator $Replace_p$ to choose between s'' and s
9: *Drop Op.* replaces some solutions in S with random ones.

List of Operators used in the model	
Mutation Operator	**Crossover Operator**
Lèvy Mutation	Exponential Crossover
PSO Velocity	Blend Crossover
DE Mutation	*None*
Replacement Operator	**Drop Operator**
Replace Always	Fixed Probability
Replace if Better	Drop Worst
Replace if Better (CS)	*None*

Extra figures

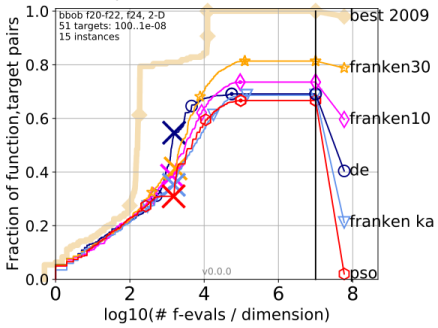
What's Grammatical Evolution?



What has evolved?

Name	Operators
Franken30	*Proc1*: PSO Velocity, Xover: *None*, Replace If Better *Drop*: Fixed Probability
Franken10	*Proc1*: DE Mut, Xover: Expo., Replace If Better (CS) *Proc2*: PSO Velocity, Xover: *None*, Replace Always *Drop*: *None*
Franken Ka	*Proc1*: DE mut, Xover: *None*, Replace if Better *Proc2*: PSO Vel., Xover: *None*, Replace if Better (CS) *Drop*: *None*

How did it perform?



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