

PSO wind farm layout optimization

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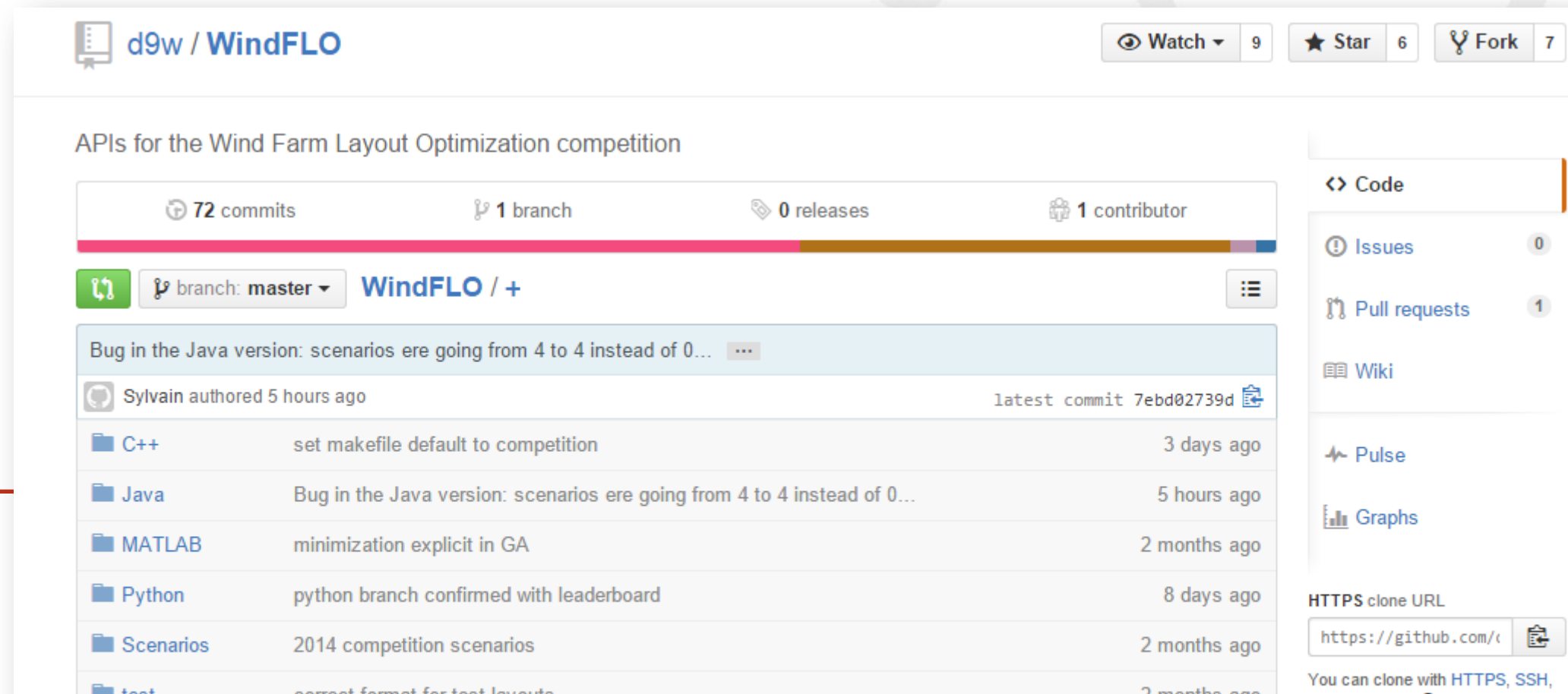
The problem

- 2nd Edition of the Wind Farm Layout Optimazation Competition
- Find a good wind farm layout
- Minimize the cost of energy
- Tested on 5 unknown scenarios



The API

- Written in C++, Java, Python and MATLAB
- Online layout evaluator
- Now with leaderboard!



d9w / **WindFLO**

Watch 9 Star 6 Fork 7

APIs for the Wind Farm Layout Optimization competition

72 commits 1 branch 0 releases 1 contributor

branch: master WindFLO / +

Bug in the Java version: scenarios ere going from 4 to 4 instead of 0...

Sylvain authored 5 hours ago latest commit 7ebd02739d

C++	set makefile default to competition	3 days ago
Java	Bug in the Java version: scenarios ere going from 4 to 4 instead of 0...	5 hours ago
MATLAB	minimization explicit in GA	2 months ago
Python	python branch confirmed with leaderboard	8 days ago
Scenarios	2014 competition scenarios	2 months ago
test	correct format for test layouts	2 months ago

Code

Issues 0

Pull requests 1

Wiki

Pulse

Graphs

HTTPS clone URL

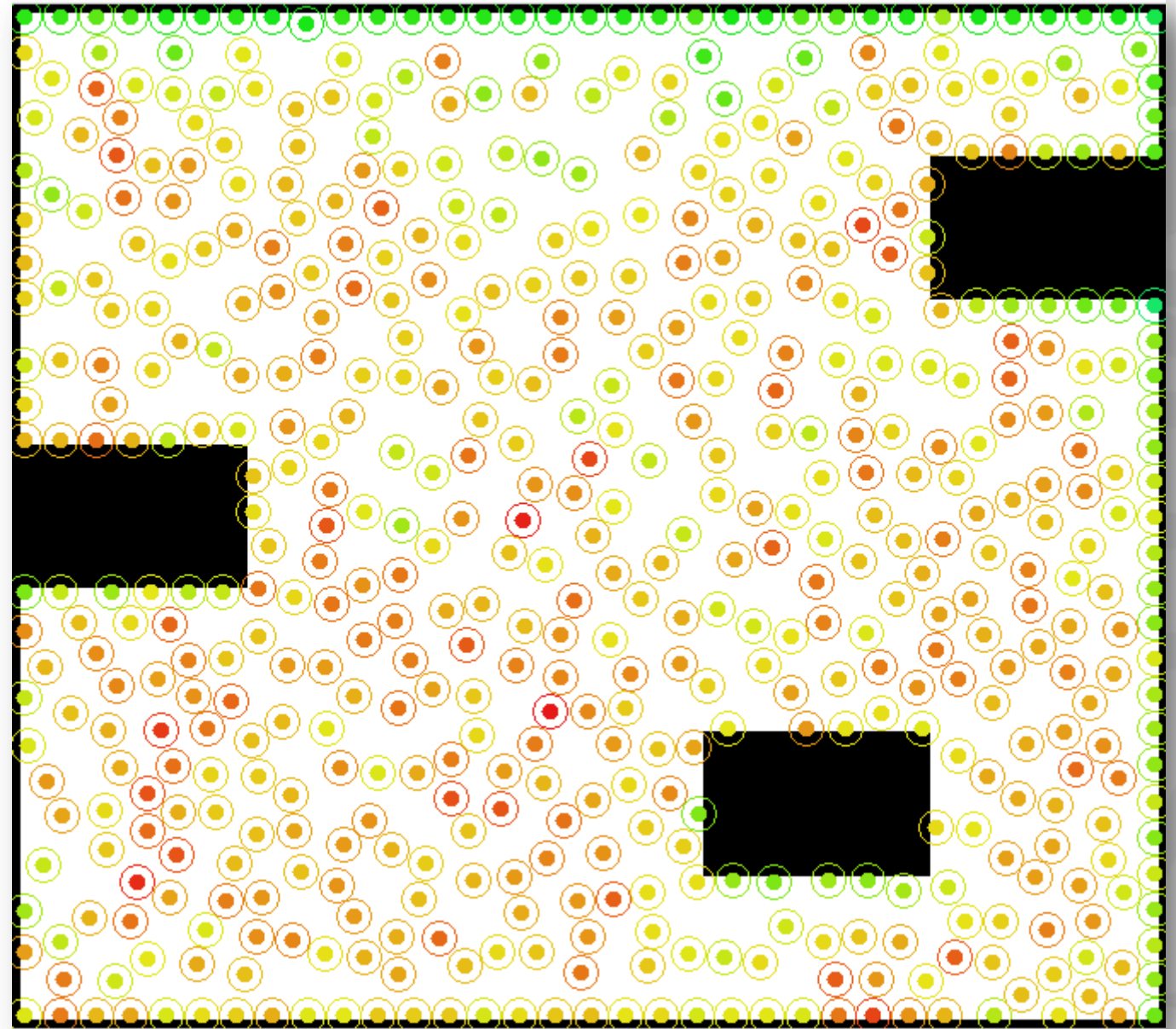
https://github.com/c

You can clone with HTTPS, SSH,



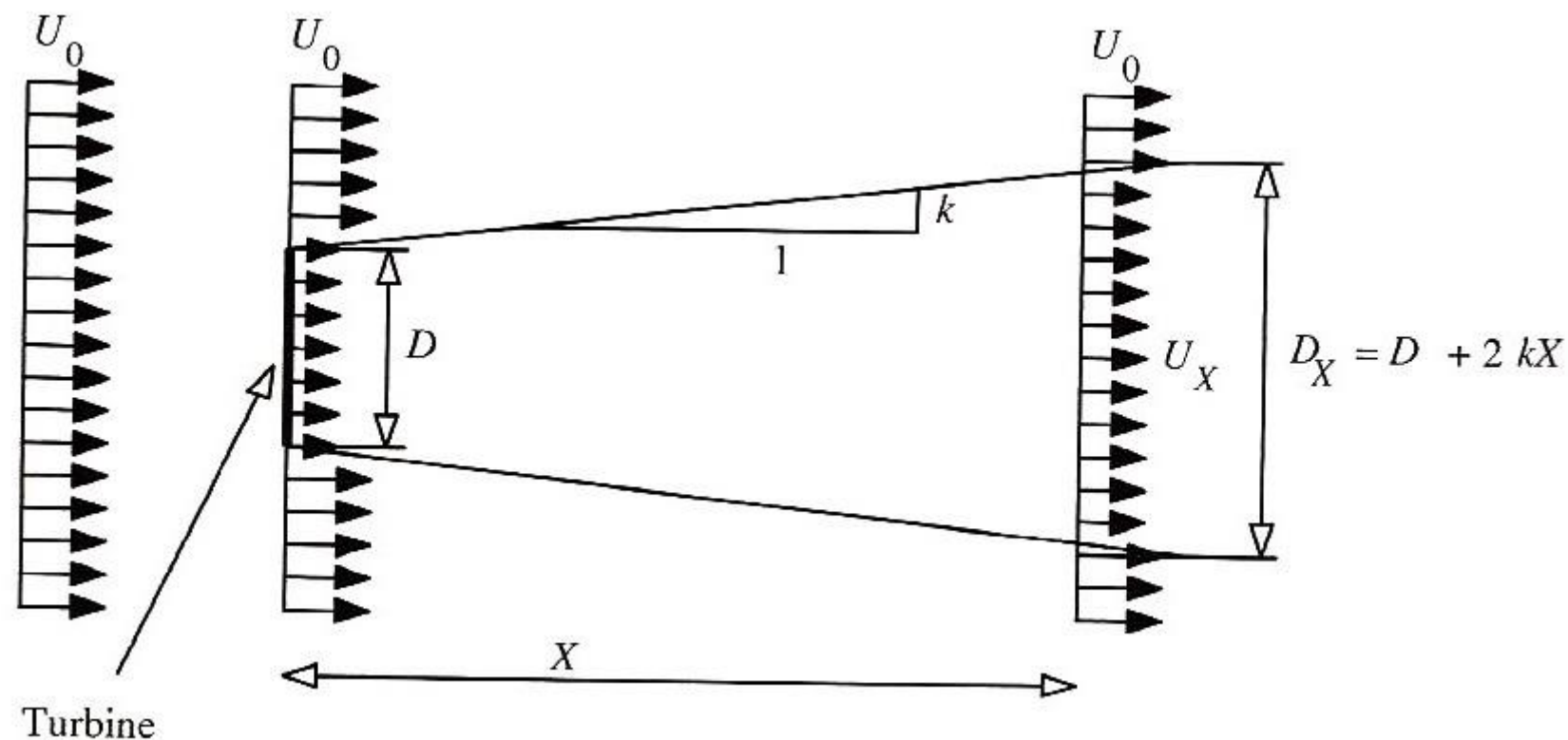
The scenarios

- Obstacles
- Wind direction
- Wind power
- Size



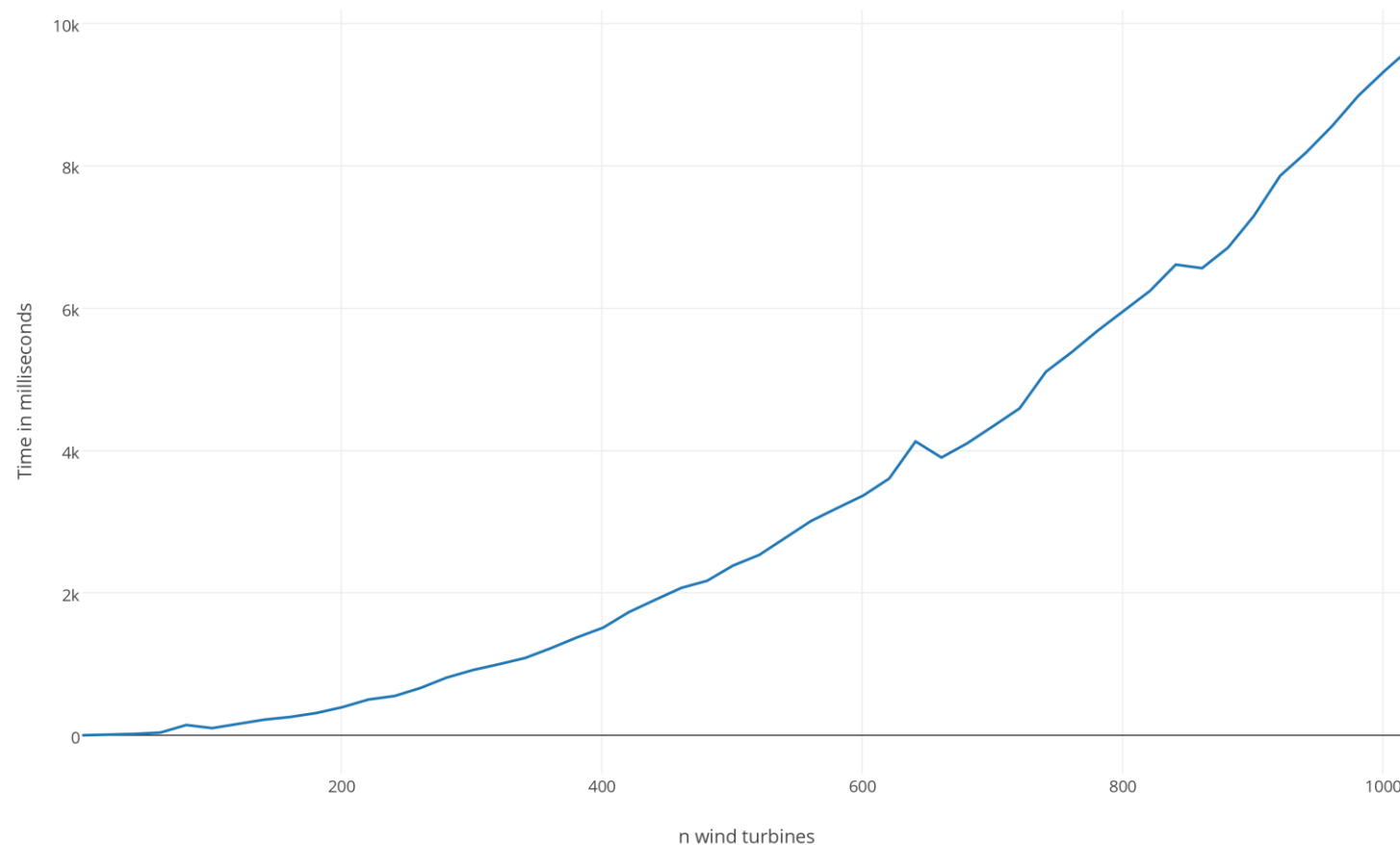
The evaluator: Wind wake effect

- Wind turbine slows down wind
- 24 different directions are considered



The evaluator: Calculating wind wake

- Many different wind directions
- Computationally very expensive

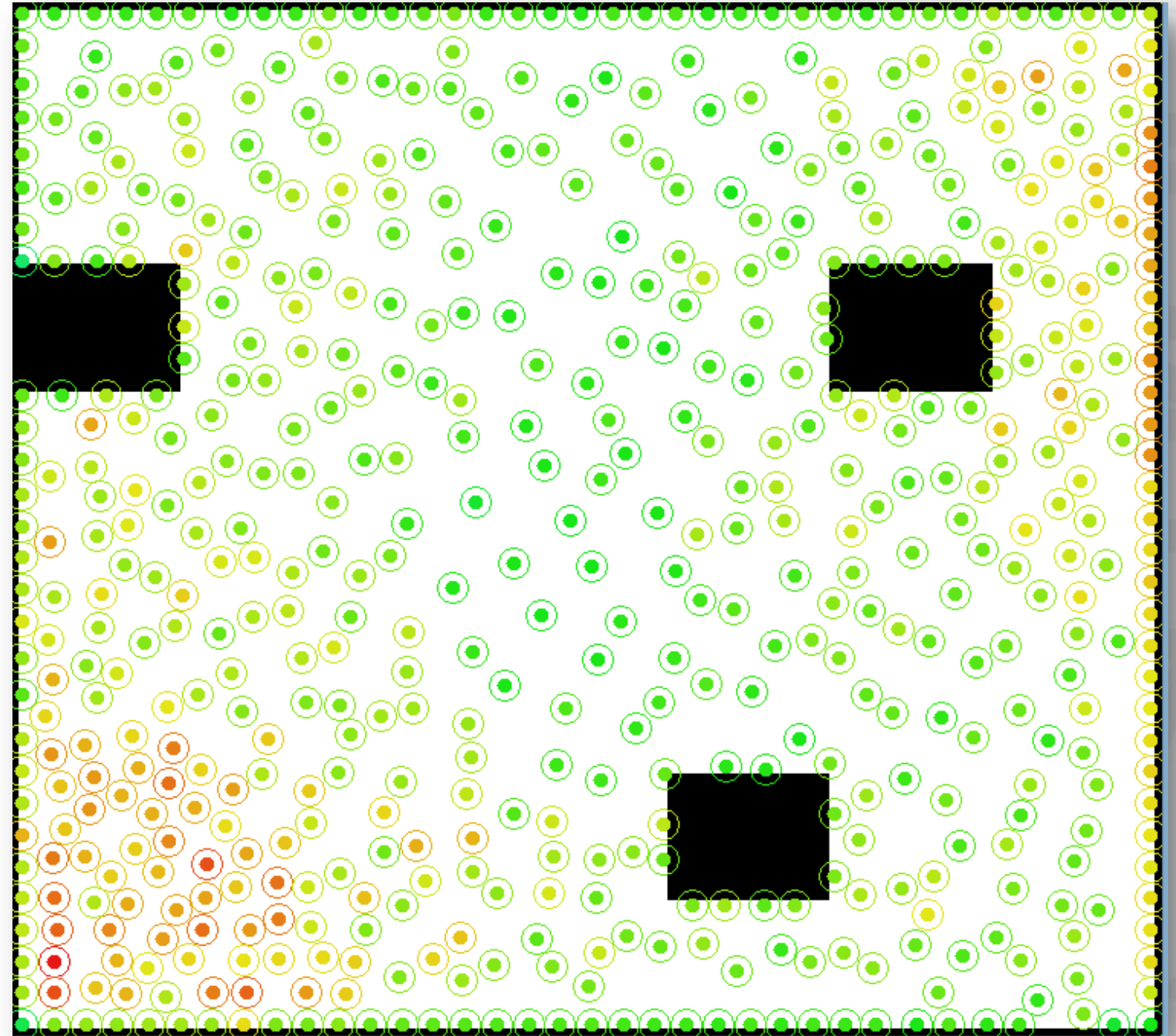


Our approach: Particle Swarm Optimization

- Each wind turbine is a particle
- Pulled towards personal best
- Pulled towards global best
- Separation: turbines repel each other
- Remove turbines with low fitness
- Add turbines at random

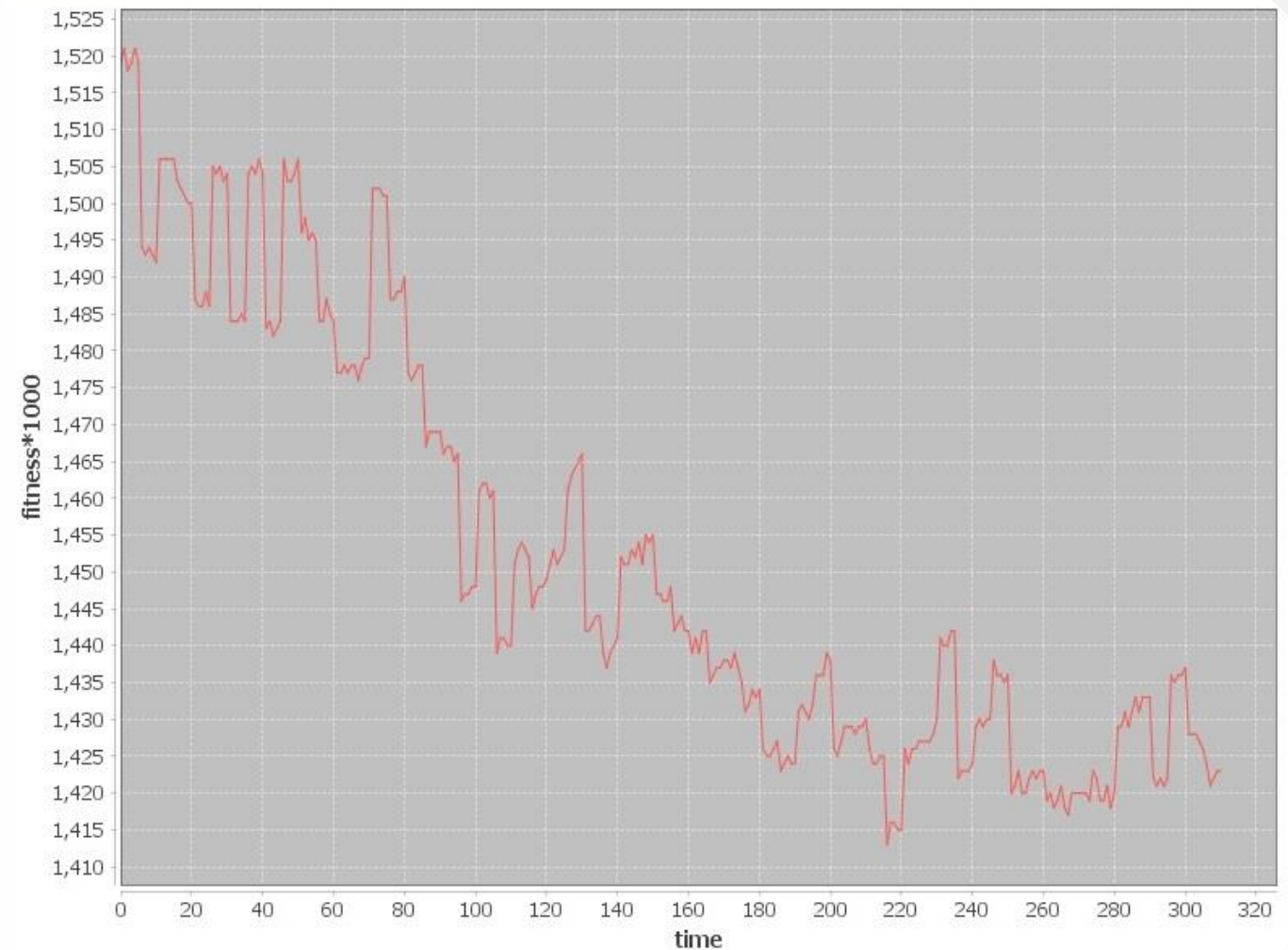
Progress

- Fully implemented method
- Remove/add strategy
- Finetuning of parameters
 - Social coefficient
 - Individual coefficient
- Demo



Performance so far

- Iteratively improving algorithm on half the scenarios
- Fourth on the leaderboard



Is PSO worth pursuing for wind farm layout optimization?

Wind Farm Layout Competition		Leaderboard	Information	Luc Nies & Guido Zuidhof		Logout
Place	User name	Evaluation count	Scores	Points	Total	ID
1	Carlos Segura - CIMAT Team	7512	[0.00132, 0.001786, 0.002796, 0.000831, 0.001577]	[10, 10, 10, 10, 10]	50	80
2	Brian Goldman	7213	[0.001372, 0.001805, 0.00283, 0.000844, 0.001596]	[6, 6, 6, 4, 6]	28	31
3	Ahmed Kheiri	1257	[0.001388, 0.00188, 0.002979, 0.000863, 0.001657]	[4, 4, 4, 3, 4]	19	222
4	Luc Nies & Guido Zuidhof	3530	[0.001474, 0.001883, 0.003092, 0.000896, 0.001686]	[0, 3, 2, 2, 3]	10	121
5	Carlos Segura - CIMAT Team	1204	[inf, inf, inf, 0.000831, inf]	[0, 0, 0, 6, 0]	6	183
6	Python GA	10000	[0.001561, 0.001931, 0.003052, 0.000911, 0.001724]	[0, 2, 3, 0, 0]	5	4
7	Java GA	10000	[0.001466, 0.001931, 0.003119, 0.000897, 0.001705]	[0, 1, 1, 1, 2]	5	10
8	Ahmed Kheiri	181	[0.001389, inf, inf, inf, inf]	[3, 0, 0, 0, 0]	3	228
9	Ahmed Kheiri	134	[0.001397, inf, inf, inf, inf]	[2, 0, 0, 0, 0]	2	230
10	Krzysztof Michalak	2080	[0.001493, 0.001962, 0.003271, 0.000909, 0.00172]	[0, 0, 0, 0, 1]	1	34
11	Ahmed Kheiri	232	[0.001417, inf, inf, inf, inf]	[1, 0, 0, 0, 0]	1	231
12	C++ GA	300	[0.001591, 0.001969, 0.003272, 0.000916, 0.001752]	[0, 0, 0, 0, 0]	0	11