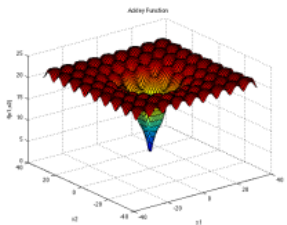


Documetatie lab4

PROBLEMA 1

Funcția

10	Funcția Ackley		$f(\mathbf{x}) = -a \exp \left(-b \sqrt{\frac{1}{d} \sum_{i=1}^d x_i^2} \right) - \exp \left(\frac{1}{d} \sum_{i=1}^d \cos(cx_i) \right) + a + \exp(1)$ <p>$a = 20, b = 0.2, c = 2\pi$</p> <p>$\mathbf{x} \in [-32.768, 32.768], i = 1, \dots, d$</p>	$f(\mathbf{x})=0;$ $x(i)=0,$ $i=1:d.$	Multimodala
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Optim: $f(\mathbf{x}) = 0$ cand $\mathbf{x}=0$

Varianta 1

- populație inițială setată random
- alegerea părinților proporțional cu fitnessul
- alegerea supraviețuitorilor după cel mai bun fitness
- mutație uniformă
- încrucișare discretă

Varianta 2

- populație inițială setată random
- alegerea părinților proporțional cu fitnessul
- alegerea supraviețuitorilor după cel mai bun fitness
- mutație uniformă
- încrucișare convexă unică

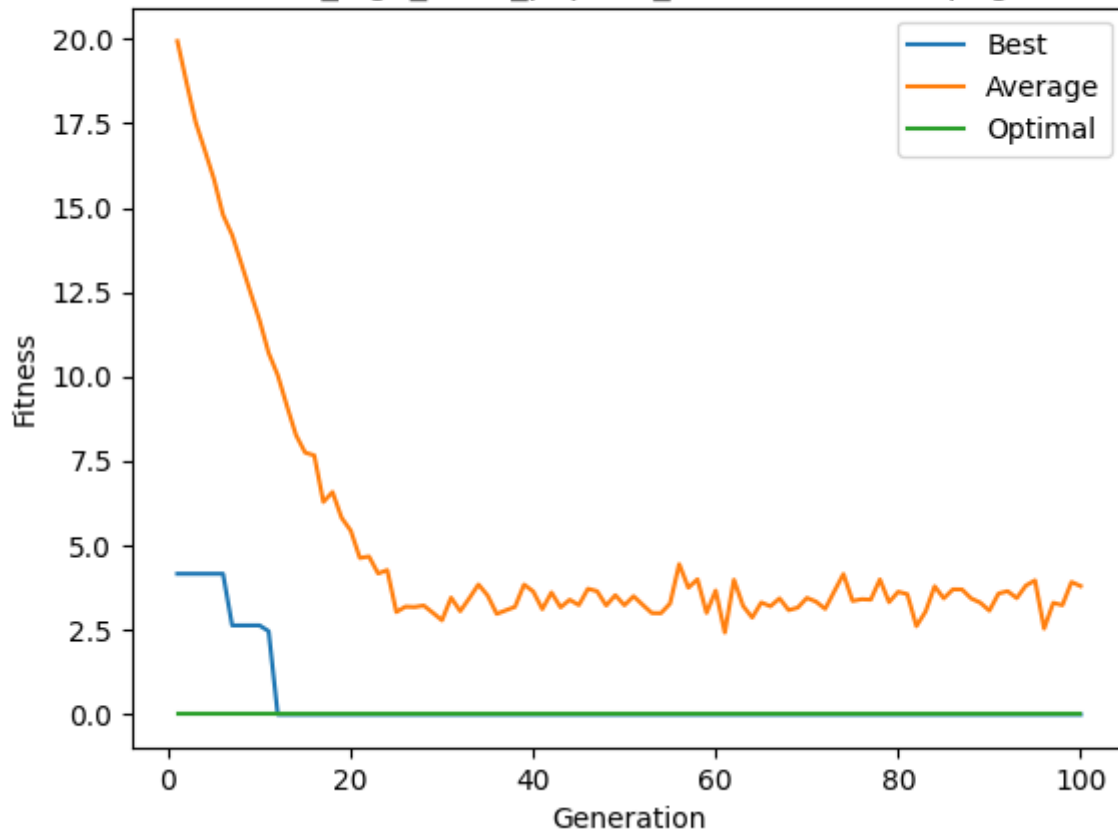
Rezultate Alg 1

Alg 1, prob_mut=0.4, prob_cross=0.3 10 runs

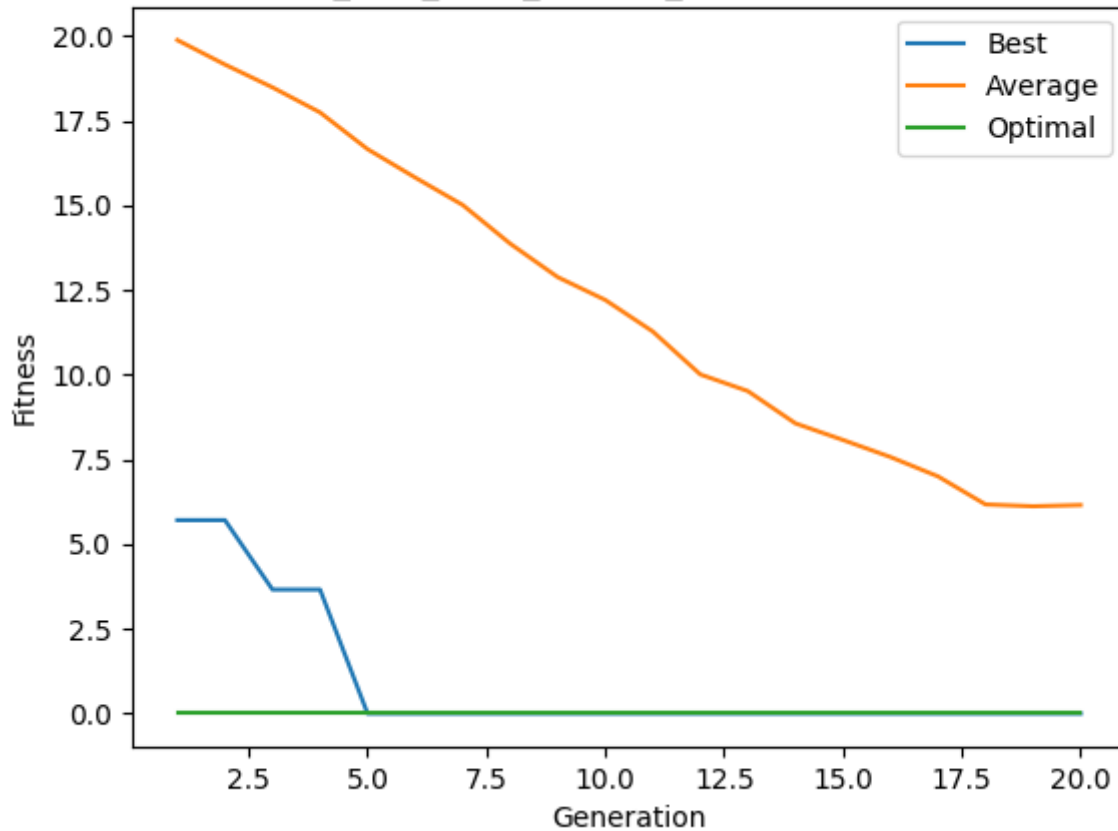
Dimension	Population	Generation	Best	Best average	Time
2	10	10	2.6375310921083046 [0,-1]	2.8364311368005337	0.522 s
	10	20	4.440892098500626e-16 [0,0]	4.440892098500626e-16	0.178 s
	100	20	4.440892098500626e-16 [0,0]	1.9155177433143562	0.665 s
	100	100	4.440892098500626e-16 [0,0]	1.9517438368019362	2.802 s
	100	200	4.440892098500626e-16 [0,0]	2.002204129328535	5.491 s
8	10	19	13.203684573342692 [9, 7, -9, 0, 2, -1, -1, 4]	14.968166727723824	0.147 s
	10	20	9.849740463682146 [-4, -3, -4, 0, 1, 3, -5, -4]	12.912568109601748	0.213 s
	100	20	4.637366208953047 [-1.9479351606432544, 0, 0, 1, -1, 0, -2, 2]	10.774049831739607	1.411 s
	100	100	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	4.941714081739464	6.431 s
	100	200	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	4.713123760935681	12.786 s
	200	200	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	5.0702879436906185	26.874 s
	200	400	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	5.0265623452137	53.280 s
	200	500	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	5.034171735018306	65.547 s

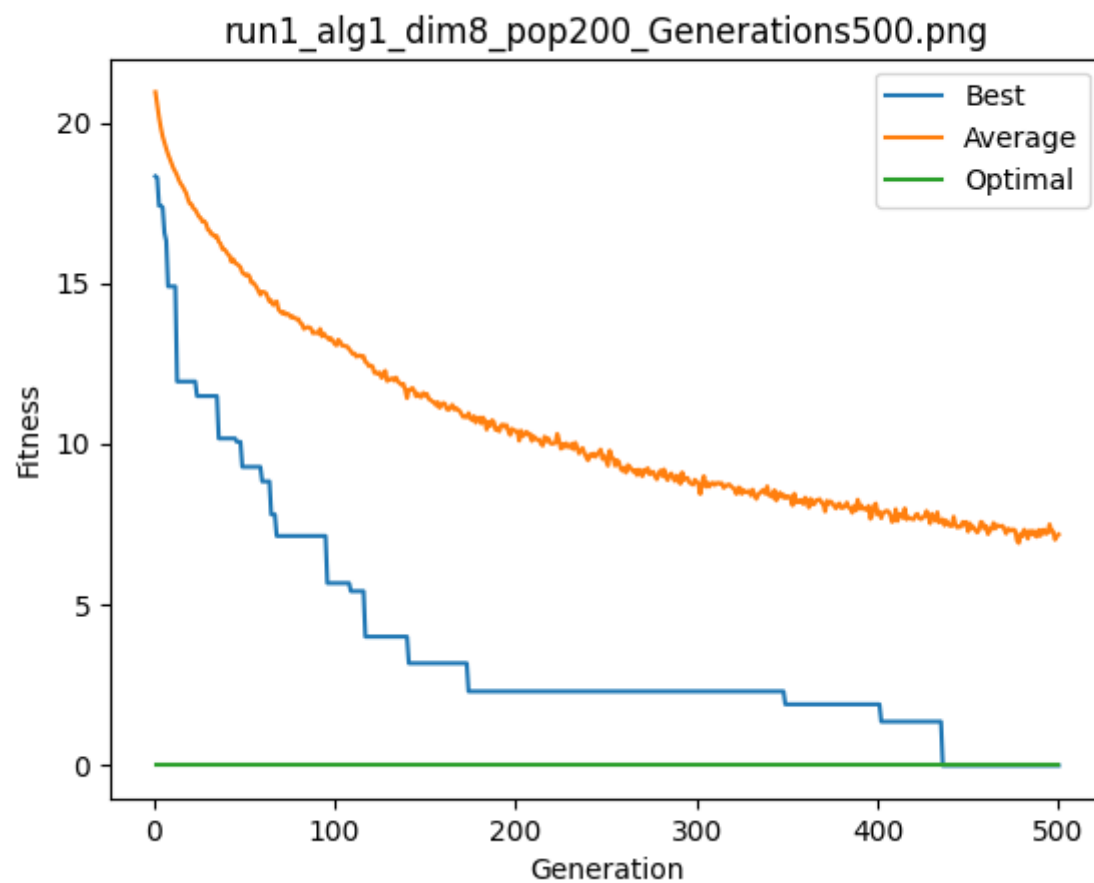
16	10	10	16.305675592079766	17.379548391791833	0.184 s
	10	20	12.62397108501504	15.297753607042884	0.289 s
	100	20	11.310932089375651	16.089450407958186	2.357 s
	100	100	8.977776981877037	13.577252879157397	11.293 s
	100	200	6.876234001506971	11.934531389426573	22.021 s
	200	200	6.717270800284304	12.223269757235366	47.423 s
	200	400	4.72108103002596	10.776929208992359	90.794 s
	200	500	5.057870911647608	10.434093845825297	111.629 s

run1_alg1_dim2_pop100_Generations100.png



run1_alg1_dim2_pop100_Generations20.png





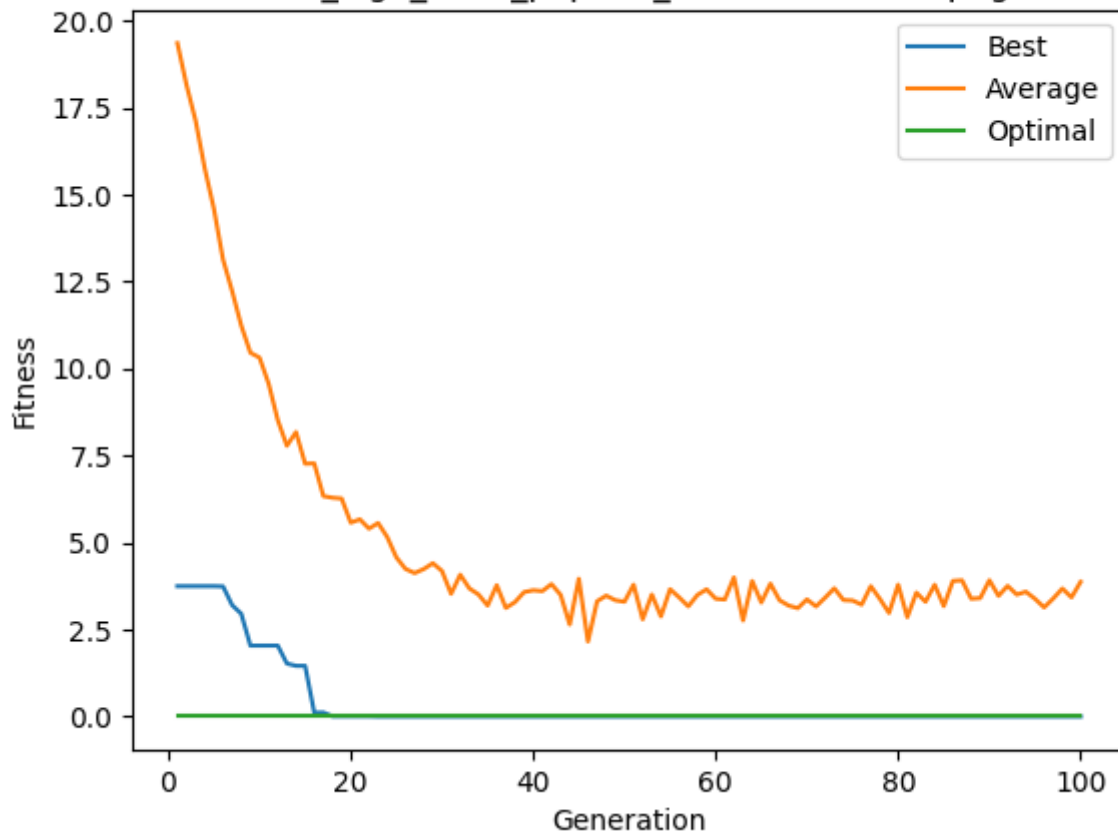
Rezultate Alg 2

Alg 2, prob_mut=0.4, prob_cross=0.3 10 runs

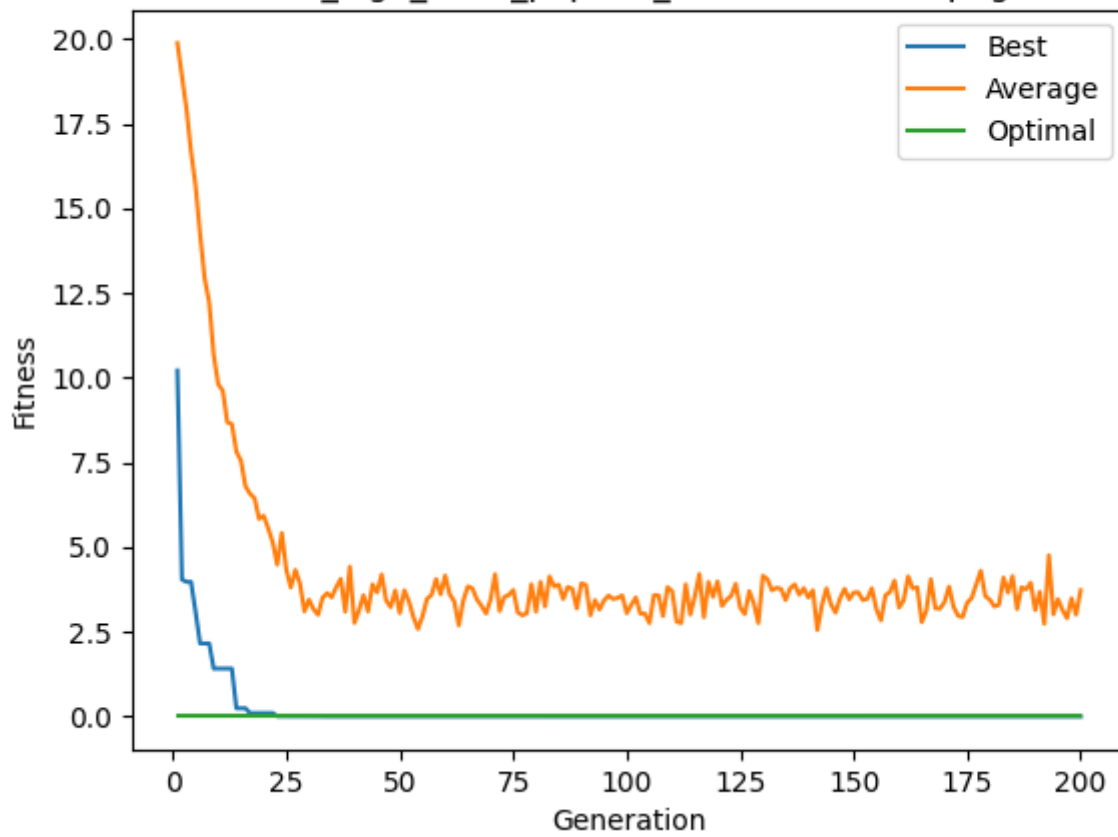
Dimension	Population	Generation	Best	Best average	Time
2	10	10	4.440892098500626e-16 [0,0]	0.01041327845188121	0.142
	10	20	4.440892098500626e-16 [0,0]	6.730789662702717e-06	0.141 s
	100	20	4.440892098500626e-16 [0,0]	2.367931672119999	0.373 s
	100	100	4.440892098500626e-16 [0,0]	1.9724064870592144	1.383 s
	100	200	4.440892098500626e-16 [0,0]	2.0875008727507094	2.675 s
8	10	10	10.868885769922153	14.59923006223087	0.109 s
	10	20	9.058125484502828	12.9653274077196	0.133 s
	100	20	5.806503466611321	10.774049831739607	0.390 s
	100	100	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	6.1473578053714615	1.544 s
	100	200	0.009035796936022411	4.767028357394833	2.938 s
	200	200	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	5.116885912029696	5.640 s
	200	400	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	5.0870903049587	11.131 s
	200	500	4.440892098500626e-16 [0, 0, 0, 0, 0, 0, 0, 0]	5.006244706395375	14.062 s
	10	10	15.403775255722152	17.550934355835032	0.110 s
	10	20	15.422644504265506	16.576747775997347	0.138 s
	100	20	13.17897519987712	16.75506425769756	0.430 s

16	100	100	10.304762950828493	13.9894494213368	1.755 s
	100	200	8.37216302707349	13.267451832648252	3.244 s
	200	200	8.296363383585849	13.152322736643614	6.464 s
	200	400	6.344453302554292	11.645383276173712	12.605 s
	200	500	5.562208629936105	11.189864765868462	15.757 s

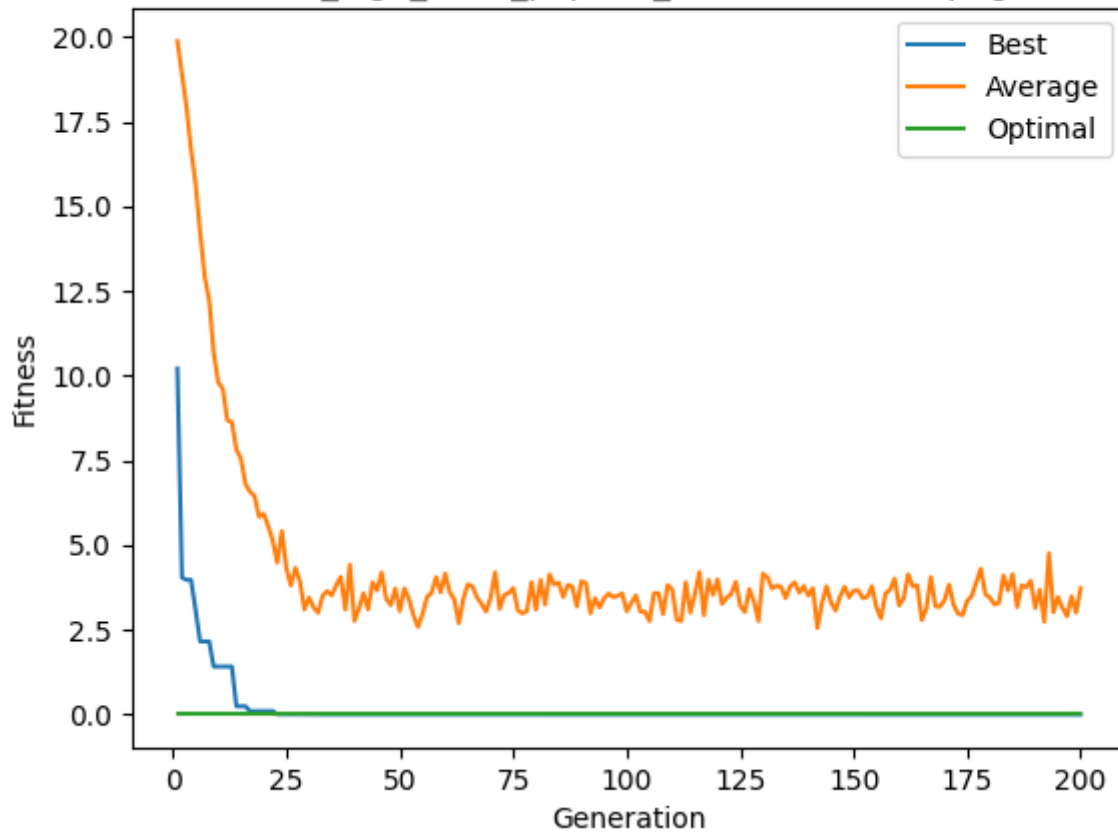
run1_alg2_dim2_pop100_Generations100.png



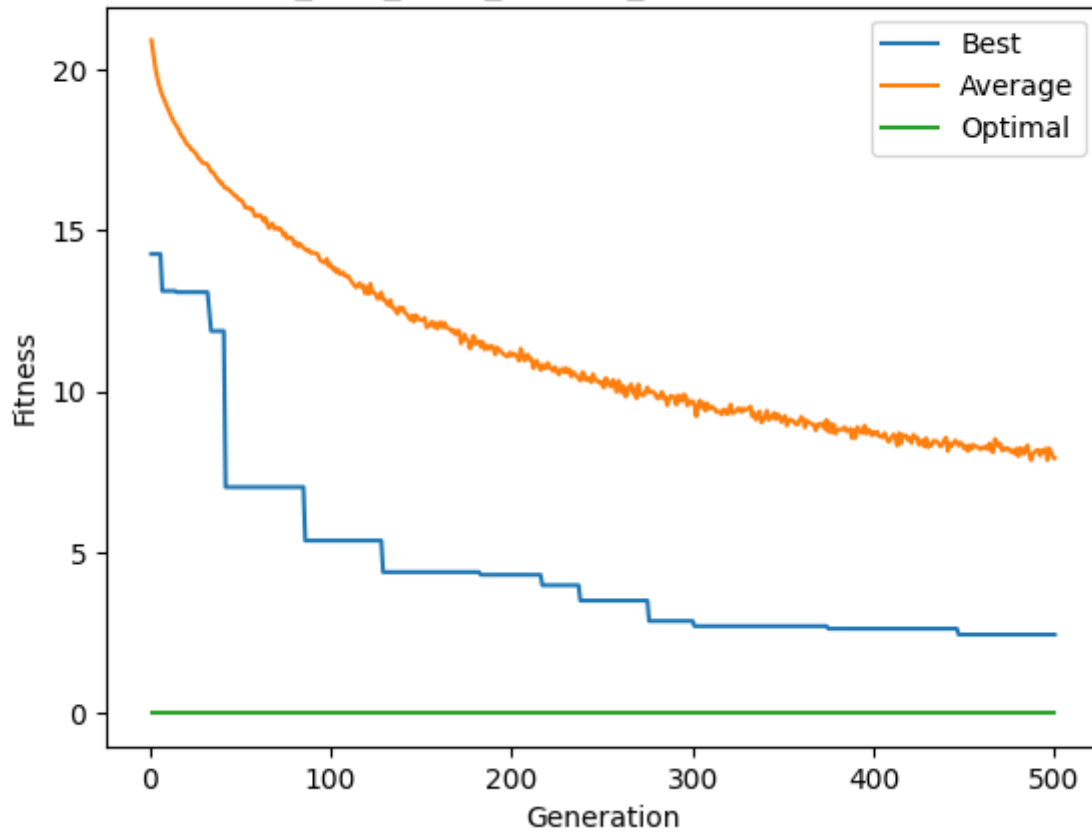
run1_alg2_dim2_pop100_Generations200.png

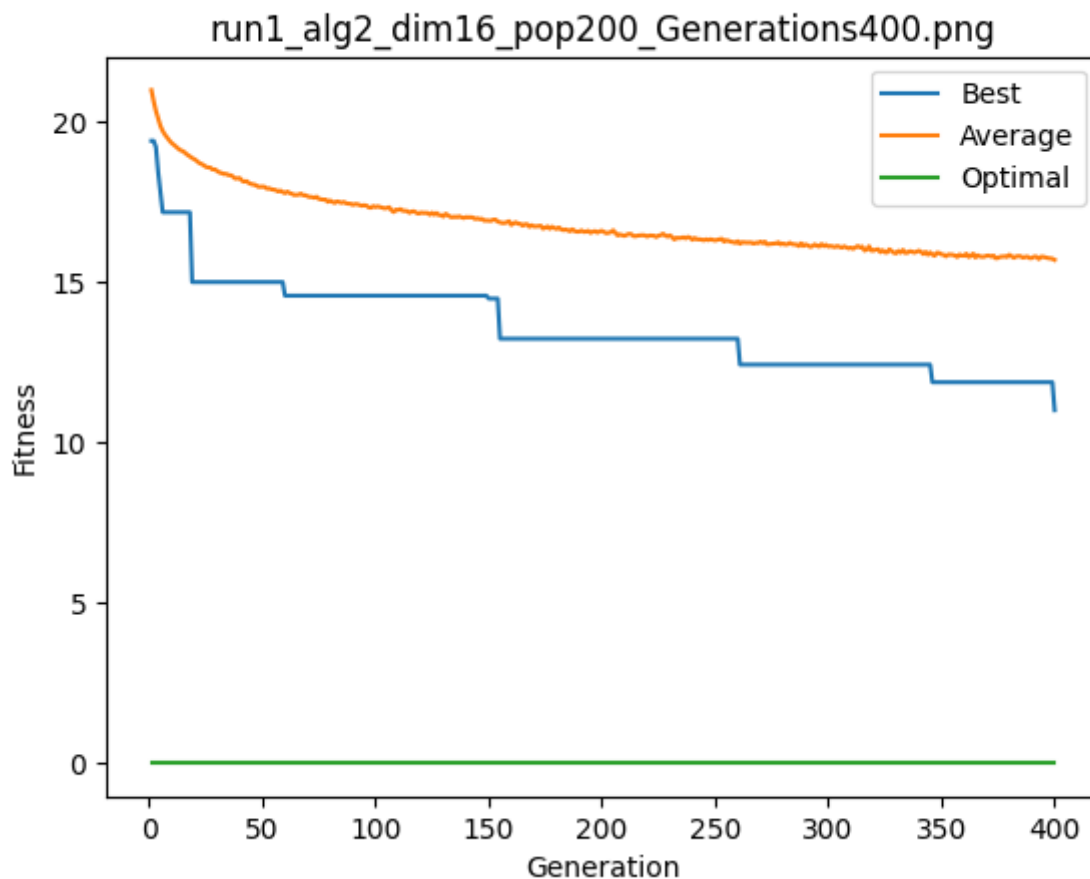


run1_alg2_dim2_pop100_Generations200.png



run1_alg2_dim8_pop200_Generations500.png





Concluzii

- in dimensiune 2 este suficient un numar al populatiei si al generatiilor mic pentru a obtine optimul
- cu cat creste numarul dimensiunii, cu atat trebuie crescut si numarul populatiei si al generatiilor
- pentru dimensiune mica (2) a doua varianta de algoritm are un timp mai mic de executie si valorile best average putin mai bune
- cand dimensiunea creste(16), alg 2 are rezultate mai slabe decat alg 1

PROBLEMA 2

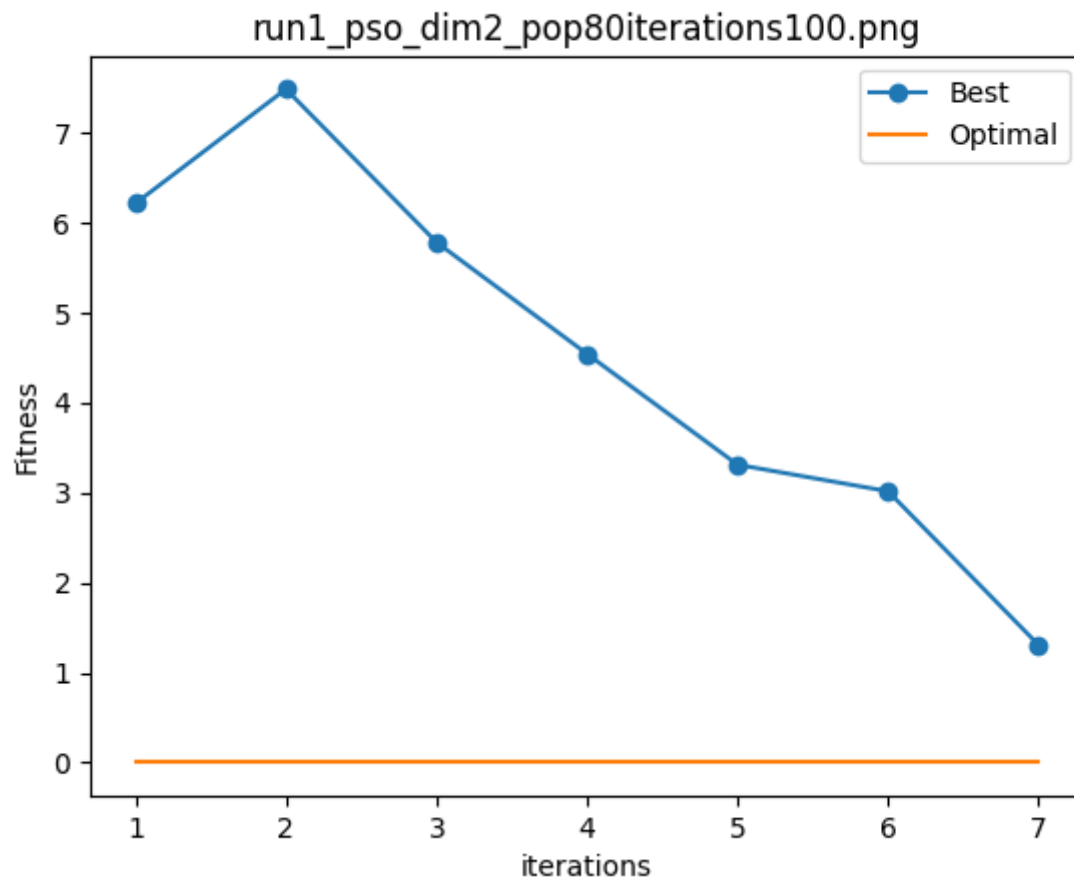
Aceeasi functie

Implementare PCO conform materialelor din curs + seminar

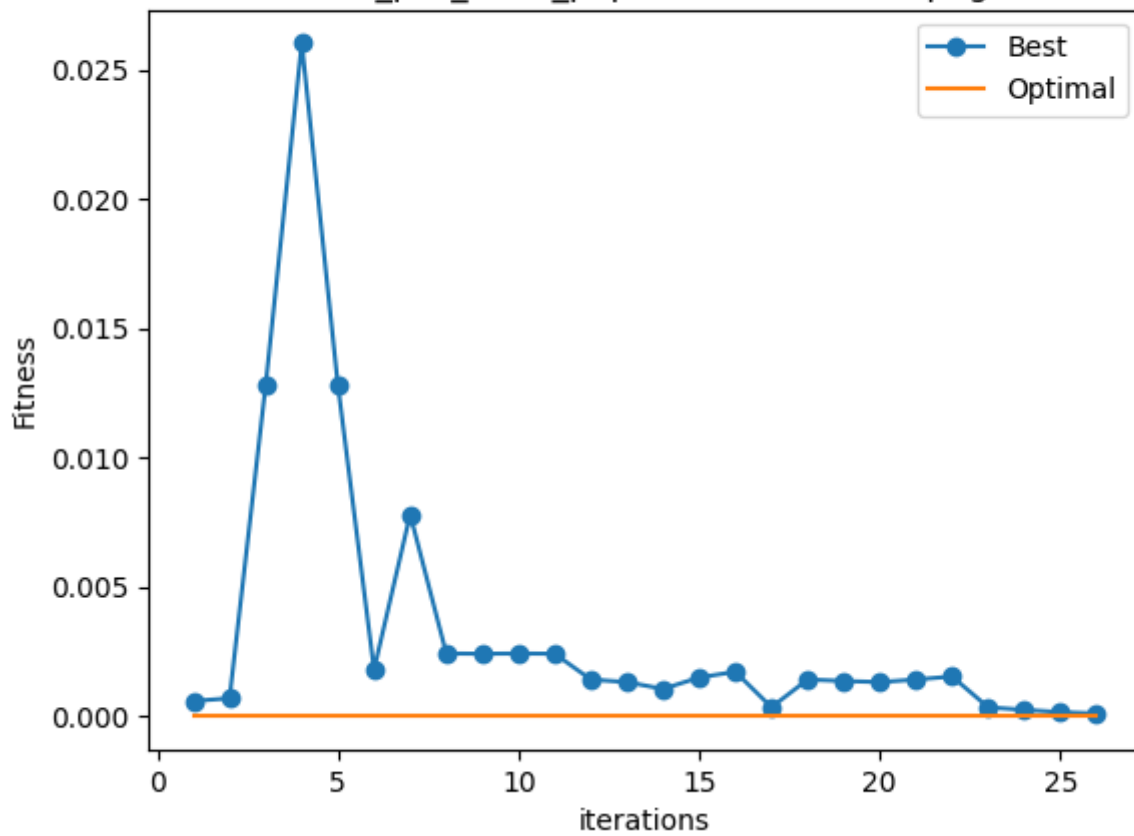
Rezultate

PSO c1=c2=2, w=1 Vmax=50 10 runs

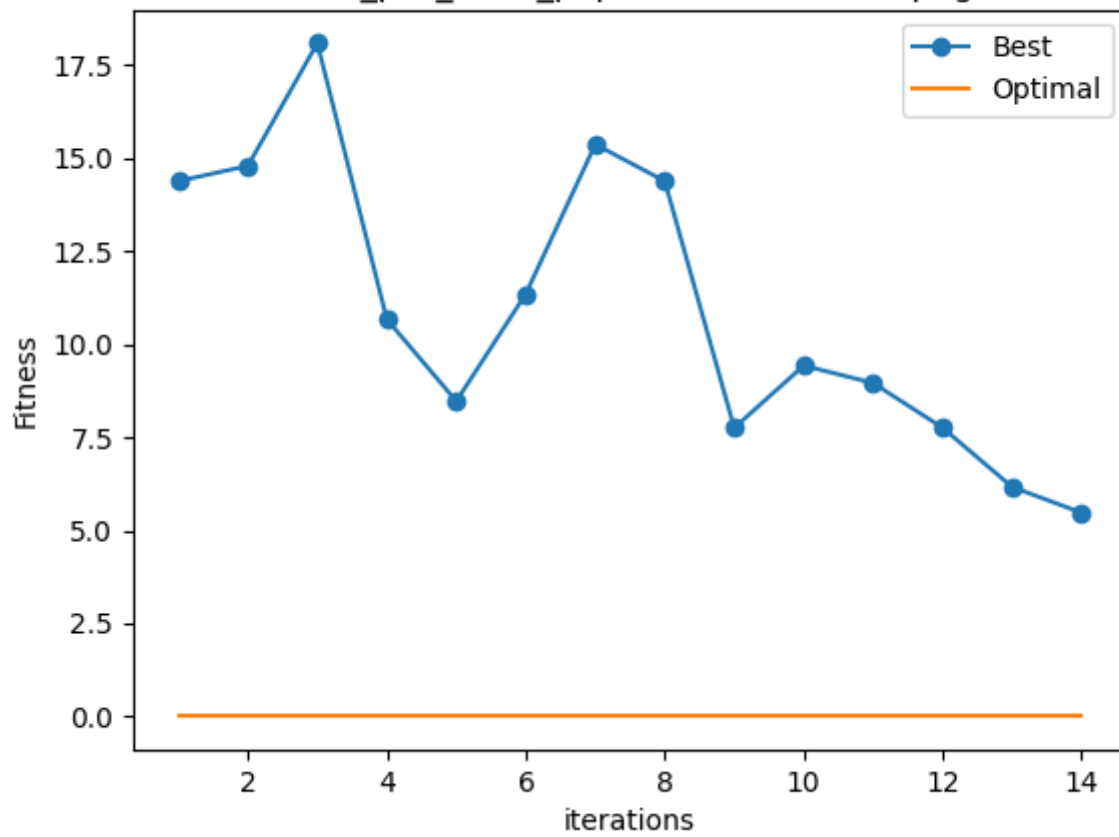
Dimension	Population	Iterations	Best	Best Average	Time
2	20	100	0.36958011153907977 [-0.04546171 0.06215859]	2.08852254851901	3.093 s
	80	100	0.033554266760802864 [-0.0067714 0.00837722]	0.033554266760802864	12.048 s
	100	100	0.09534060436584157 [-0.01395849 0.02301819]	0.20688159848495427	15.154 s
	100	200	0.0037932594913212547 [-0.00128846 0.00030732]	0.0037932594913212547	29.728 s
	100	400	4.440892098500626e-16 [-1.84988347e-16 -2.38530903e-16]	4.440892098500626e-16	59.083 s
8	20	100	4.427760629251907	5.809806211277621	3.378 s
	80	100	0.9412606069022655	4.269574828394186	13.168 s
	100	100	6.246694715606232	7.355403387905234	16.445 s
	100	200	0.4620279821381392	0.8522098875877	32.945 s
	100	400	3.673950033089568e-12	1.731242310004038e-11	63.949 s
16	20	100	4.575886519646886	6.420669792635568	3.705 s
	80	100	6.352181309527847	7.721503978103121	14.597 s
	100	100	3.9505306939442346	5.3887615414680345	18.148 s
	100	200	1.091674673244008	2.1634923704996933	36.143 s
	100	400	1.3464787862904615e-05	2.9422494779619176e-05	69.968 s

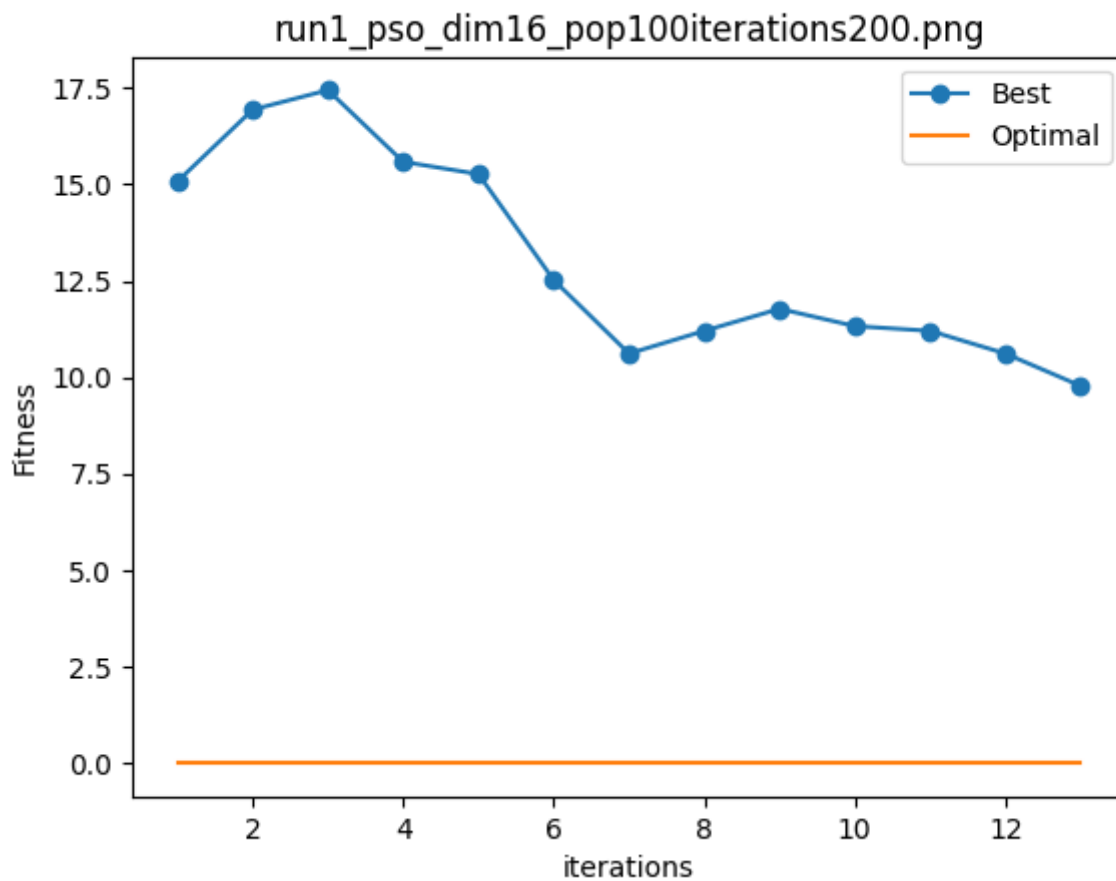


run1_pso_dim2_pop100iterations400.png



run1_pso_dim8_pop100iterations200.png





Concluzii

- cu cat numarul de particule si de iteratii este mai mare, cu atat best-ul se apropie mai tare se optimul functiei
- cel mai bun rezultat(foarte aproape de optim) s-a obtinut in dimensiune 2 cu 100 de particule si 400 de iteratii