Genetic algorithm example execution in cneuromax/ (num_processes = 4, pop_size = 8 <=> len_agents_batch = 2)

1 pop

1

Process 0 generates seeds

proc	0							
seed	11	12	13	14	15	16	17	18

2

3

Seeds are scattered across processes

proc	0		1		2		3	
seed	11	12	13	14	15	16	17	18

4

Processes mutate agents using the seeds

proc	0		1		2		3	
seed	11	12	13	14	15	16	17	18
agent	11	12	13	14	15	16	17	18

5

Processes evaluate the agents

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
fit	70	120	90	95	80	110	100	75

6

Process 0 gathers the fitnesses

proc	0							
fit	70	120	90	95	80	110	100	75

7

8

Process 0 generates new seeds

proc	0							
fit	70	120	90	95	80	110	100	75
seed	21	22	23	24	25	26	27	28

9

10

Process 0 computes fitnesses sorting indices and index ranking

proc	0							
seed	21	22	23	24	25	26	27	28
fit	70	120	90	95	80	110	100	75
fit si	0	7	4	2	3	6	5	1
fit ir	0	7	3	4	2	6	5	1

11

Process 0 re-aranges the seeds using their corresponding fitnesses index ranking

proc	0							
seed	21	28	24	25	23	27	26	22
fit ir	0	7	3	4	2	6	5	1
fit si	0	7	4	2	3	6	5	1

12

Process 0 computes pairing information: paired agent rankings, agent positions and send; according to the previously computed fitnesses sorting indices and index ranking

proc	0							
seed	21	28	24	25	23	27	26	22
fit ir	0	7	3	4	2	6	5	1
fit si	0	7	4	2	3	6	5	1
pair ar	4	3	7	0	6	2	1	5
pair ap	3	2	1	0	5	4	7	6
send	0	1	0	1	0	1	1	0

13

The exchange and mutate information is scattered across processes

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
seed	21	28	24	25	23	27	26	22
pair ap	3	2	1	0	5	4	7	6
send	0	1	0	1	0	1	1	0

14

Processes compute paired process MPI rank and tags using the paired agent position

fit ir	0	7	3	4	2	6	5	1

(show *fit ir* to understand *tag* & *pair pr* vals)

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
seed	21	28	24	25	23	27	26	22
send	0	1	0	1	0	1	1	0
pair ap	3	2	1	0	5	4	7	6
pair pr	1	1	0	0	2	2	3	3
tag	3	1	1	3	5	5	6	6

15

Processes exchange agents according to paired process MPI rank, tags & send

proc	0		1		2		3	
agent	14	12	12	14	16	16	17	17
send	0	1	0	1	0	1	1	0
pair pr	1	1	0	0	2	2	3	3
tag	3	1	1	3	5	5	6	6
seed	21	28	24	25	23	27	26	22

16

Processes mutate agents using the seeds

proc	0		1		2		3	
agent	14,21	12,28	12,24	14,25	16,23	16,27	17,26	17,22
seed	21	28	24	25	23	27	26	22

2 pops

1

Process 0 generates seeds

proc	0							
seed	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38

2

3

Seeds are scattered across processes

proc	0		1		2		3	
seed	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38

4

Processes mutate agents using the seeds

proc	0		1		2		3	
seed	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38
agent	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38

5

Processes evaluate the agents

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38
fit	120	110	85	105	100	175	150	190
	30	50	10	40	80	55	25	15

6

Process 0 gathers the fitnesses

proc	0							
fit	120	110	85	105	100	175	150	190
	30	50	10	40	80	55	25	15

7

8

Process 0 generates new seeds

proc	0							
fit	120	110	85	105	100	175	150	190
	30	50	10	40	80	55	25	15
seed	21	22	23	24	25	26	27	28
	41	42	43	44	45	46	47	48

9

10

Process 0 computes fitnesses sorting indices and index ranking

proc	0							
seed	21	22	23	24	25	26	27	28
	41	42	43	44	45	46	47	48
fit	120	110	85	105	100	175	150	190
	30	50	10	40	80	55	25	15
fit si	2	4	3	1	0	6	5	7
	2	7	6	0	3	1	5	4
fit ir	4	3	0	2	1	6	5	7
	3	5	0	4	7	6	2	1

11

Process 0 re-aranges the seeds using their corresponding fitnesses index ranking

proc	0							
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42
fit ir	4	3	0	2	1	6	5	7
	3	5	0	4	7	6	2	1
fit si	2	4	3	1	0	6	5	7
	2	7	6	0	3	1	5	4

12

Process 0 computes pairing information: paired agent rankings, agent positions and send; according to the previously computed fitnesses sorting indices and index ranking

proc	0							
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42
fit ir	4	3	0	2	1	6	5	7
	3	5	0	4	7	6	2	1
fit si	2	4	3	1	0	6	5	7
	2	7	6	0	3	1	5	4
pair ar	0	7	4	6	5	2	1	3
	7	1	4	0	3	2	6	5
pair ap	2	7	0	5	6	3	4	1
	4	7	3	2	0	6	5	1
send	1	0	0	0	0	1	1	1
	0	1	0	1	1	1	0	0

13

The exchange and mutate information is scattered across processes

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42
pair ap	2	7	0	5	6	3	4	1
	4	7	3	2	0	6	5	1
send	1	0	0	0	0	1	1	1
	0	1	0	1	1	1	0	0

14

Processes compute paired process MPI rank and tags using the paired agent position

fit ir	4	3	0	2	1	6	5	7
	3	5	0	4	7	6	2	1

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
	31	32	33	34	35	36	37	38
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42
send	1	0	0	0	0	1	1	1
	0	1	0	1	1	1	0	0
pair ap	2	7	0	5	6	3	4	1
	4	7	3	2	0	6	5	1
pair pr	1	3	0	2	3	1	2	0
	2	3	1	1	0	3	2	0
tag	0	7	0	5	6	5	6	7
	12	9	11	11	12	13	13	9

15

Processes exchange agents according to paired process MPI rank, tags & send

proc	0		1		2		3	
agent	11	18	11	16	17	16	17	18
	35	32	34	34	35	36	36	32
send	1	0	0	0	0	1	1	1
	0	1	0	1	1	1	0	0
pair pr	1	3	0	2	3	1	2	0
	2	3	1	1	0	3	2	0
tag	0	7	0	5	6	5	6	7
	12	9	11	11	12	13	13	9
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42

16

Processes mutate agents using the seeds

proc	0		1		2		3	
agent	11,25	18,24	11,21	16,23	17,22	16,27	17,26	18,28
	35,44	32,46	34,41	34,35	35,48	36,47	36,43	32,42
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42

2 pops (pop_merge)

1

Process 0 generates seeds

proc	0							
seed	11	12	13	14	15	16	17	18

2

Process 0 repeats the first row of seeds and reverses it

proc	0							
seed	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11

3

Seeds are scattered across processes

proc	0		1		2		3	
seed	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11

4

Processes mutate agents using the seeds

proc	0		1		2		3	
seed	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11
agent	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11

5

Processes evaluate the agents

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11
fit	90	80	170	120	70	145	160	75
	60	80	40	55	110	85	50	65

6

Process 0 gathers the fitnesses

proc	0							
fit	90	80	170	120	70	145	160	75
	60	80	40	55	110	85	50	65

7

Process 0 adds to each row the reverse of the other row (to match operation **#2**)

proc	0							
fit	155	130	255	230	125	185	240	135
	135	240	185	125	230	255	130	155

8

Process 0 generates new seeds

proc	0							
fit	155	130	255	230	125	185	240	135
	135	240	185	125	230	255	130	155
seed	21	22	23	24	25	26	27	28

9

Process 0 repeats the first row of seeds

proc	0							
fit	155	130	255	230	125	185	240	135
	135	240	185	125	230	255	130	155
seed	21	22	23	24	25	26	27	28
	21	22	23	24	25	26	27	28

10

Process 0 computes fitnesses sorting indices and index ranking

proc	0							
seed	21	22	23	24	25	26	27	28
	21	22	23	24	25	26	27	28
fit	155	130	255	230	125	185	240	135
	135	240	185	125	230	255	130	155
fit si	4	1	7	0	5	3	6	2
	3	6	0	7	2	4	1	5
fit ir	3	1	7	5	0	4	6	2
	2	6	4	0	5	7	1	3

11

Process 0 re-aranges the seeds using their corresponding fitnesses index ranking

proc	0							
seed	24	22	28	26	21	25	27	23
	23	27	25	21	26	28	22	24
fit ir	3	1	7	5	0	4	6	2
	2	6	4	0	5	7	1	3
fit si	4	1	7	0	5	3	6	2
	3	6	0	7	2	4	1	5

12

Process 0 computes pairing information: paired agent rankings, agent positions and send; according to the previously computed fitnesses sorting indices and index ranking

proc	0							
seed	24	22	28	26	21	25	27	23
	23	27	25	21	26	28	22	24
fit ir	3	1	7	5	0	4	6	2
	2	6	4	0	5	7	1	3
fit si	4	1	7	0	5	3	6	2
	3	6	0	7	2	4	1	5
pair ar	7	5	3	1	4	0	2	6
	6	2	0	4	1	3	5	7
pair ap	2	3	0	1	5	4	7	6
	1	0	3	2	6	7	4	5
send	0	0	1	1	0	1	1	0
	0	1	1	0	1	1	0	0

13

The exchange and mutate information is scattered across processes

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11
seed	24	22	28	26	21	25	27	23
	23	27	25	21	26	28	22	24
pair ap	2	3	0	1	5	4	7	6
	1	0	3	2	6	7	4	5
send	0	0	1	1	0	1	1	0
	0	1	1	0	1	1	0	0

14

Processes compute paired process MPI rank and tags using the paired agent position

fit ir	3	1	7	5	0	4	6	2
	2	6	4	0	5	7	1	3

proc	0		1		2		3	
agent	11	12	13	14	15	16	17	18
	18	17	16	15	14	13	12	11
seed	24	22	28	26	21	25	27	23
	23	27	25	21	26	28	22	24
send	0	0	1	1	0	1	1	0
	0	1	1	0	1	1	0	0
pair ap	2	3	0	1	5	4	7	6
	1	0	3	2	6	7	4	5
pair pr	1	1	0	0	2	2	3	3
	0	0	1	1	3	3	2	2
tag	2	3	2	3	5	5	6	6
	9	9	10	10	12	13	12	13

15

Processes exchange agents according to paired process MPI rank, tags & send

proc	0		1		2		3	
agent	13	14	13	14	16	16	17	17
	17	17	16	16	14	13	14	13
send	0	0	1	1	0	1	1	0
	0	1	1	0	1	1	0	0
pair pr	1	1	0	0	2	2	3	3
	0	0	1	1	3	3	2	2
tag	2	3	2	3	5	5	6	6
	9	9	10	10	12	13	12	13
seed	24	22	28	26	21	25	27	23
	23	27	25	21	26	28	22	24

16

Processes mutate agents using the seeds

proc	0		1		2		3	
agent	13,24	14,22	13,28	14,26	16,21	16,25	17,27	17,23
	17,23	17,27	16,25	16,21	14,26	13,28	14,22	13,24
seed	25	24	21	23	22	27	26	28
	44	46	41	35	48	47	43	42