

CIFO 31/03/'25



21 APRIL → NO CLASS

WHEN TO COMPENSATE? PLEASE REPRES. WRITE AN EMAIL

PROPOSAL :

- FRIDAY 4 OF APRIL 16:00 OR LATER
SATURDAY 5 OF APRIL 15:00 OR LATER }

OK
W

THEORY OF EVOLUTION OF DARWIN

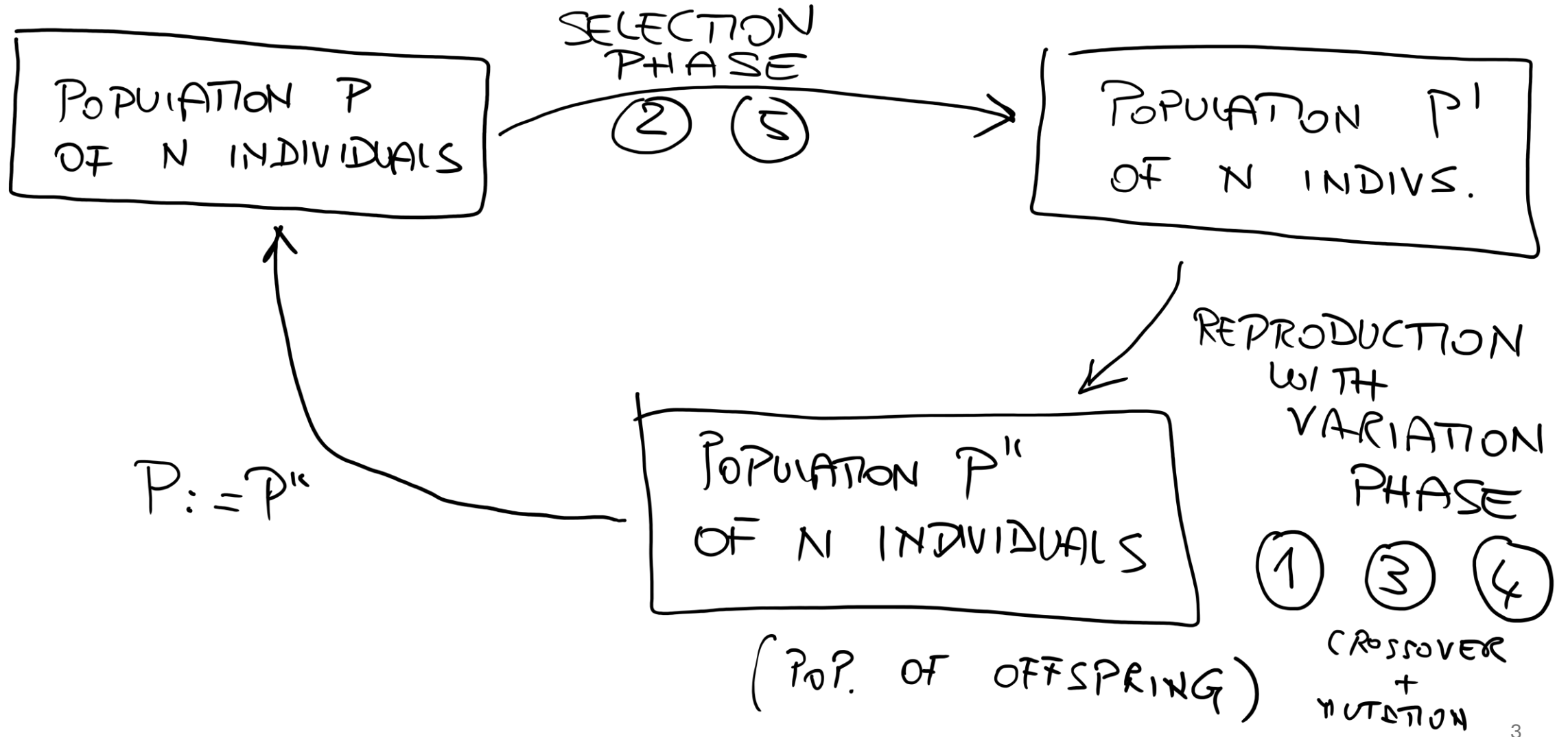
- 1 REPRODUCTION
- ② ABILITY OF ADAPTION TO ENVIRONN.
- 3 INHERITANCE
- 4 VARIATION
- ⑤ COMPETITION

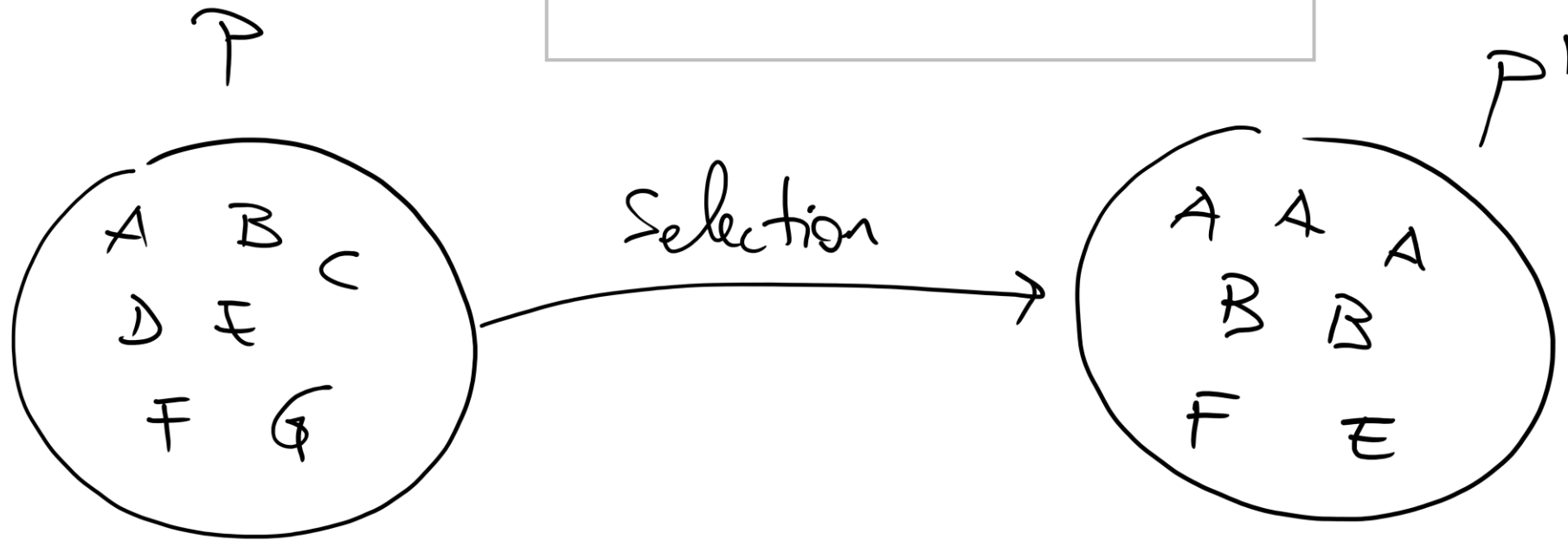
GENETIC ALGORITHMS

MANAGE A SET (POPULATION)
OF SOLUTION (INDIVIDUALS)
THROUGH VARIOUS ITERATIONS
(GENERATIONS)

GENETIC ALGORITHMS

(POP OF PARENTS)





THE SELECTION PHASE IS AN ITERATION OF N INDEPENDENT EXECUTIONS OF A SELECTION ALGORITHM, WHERE A SELECTION ALG. CHOOSES 1 INDIV. FROM P , AND COPIES IT INTO P' .

SELECTION ALGORITHMS

FITNESS PROPORTIONATE
RANKING
TOURNAMENT

1. THEY MUST BE PROBABILISTIC
2. FOR ANY PAIR OF SOLUTIONS A AND B IF $f(A)$ BETTER THAN $f(B)$, THEN THE PROB. OF SELECTING A MUST BE HIGHER THAN THE PROB. OF SELECTING B.
3. ALL INDIVIDUALS IN P MUST HAVE A PROB. > 0 OF BEING SELECTED
4. INDIVIDUALS COPIED INTO P' REMAIN IN P

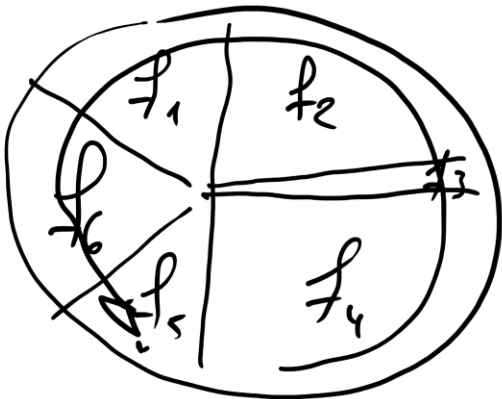
FITNESS PROPORTIONATE SELECTION (ROULETTE WHEEL)

GIVEN A POP. P OF N INDIVIDUALS WITH FITNESSES

$$\{ f_1, f_2, \dots, f_N \}$$

$$P(\text{sel. ind. } i) = \frac{f_i}{\sum_{j=1}^N f_j}$$

(MAXIMIZATION)



RANKING SELECTION

- SORT ALL INDIVIDUALS IN P FROM THE WORST TO THE BEST

EXAMPLE

1	i_3	$f(i_3) = 2$
2	i_1	$f(i_1) = 4$
3	i_5	$f(i_5) = 7$
4	i_2	$f(i_2) = 8$
5	i_4	$f(i_4) = 10$

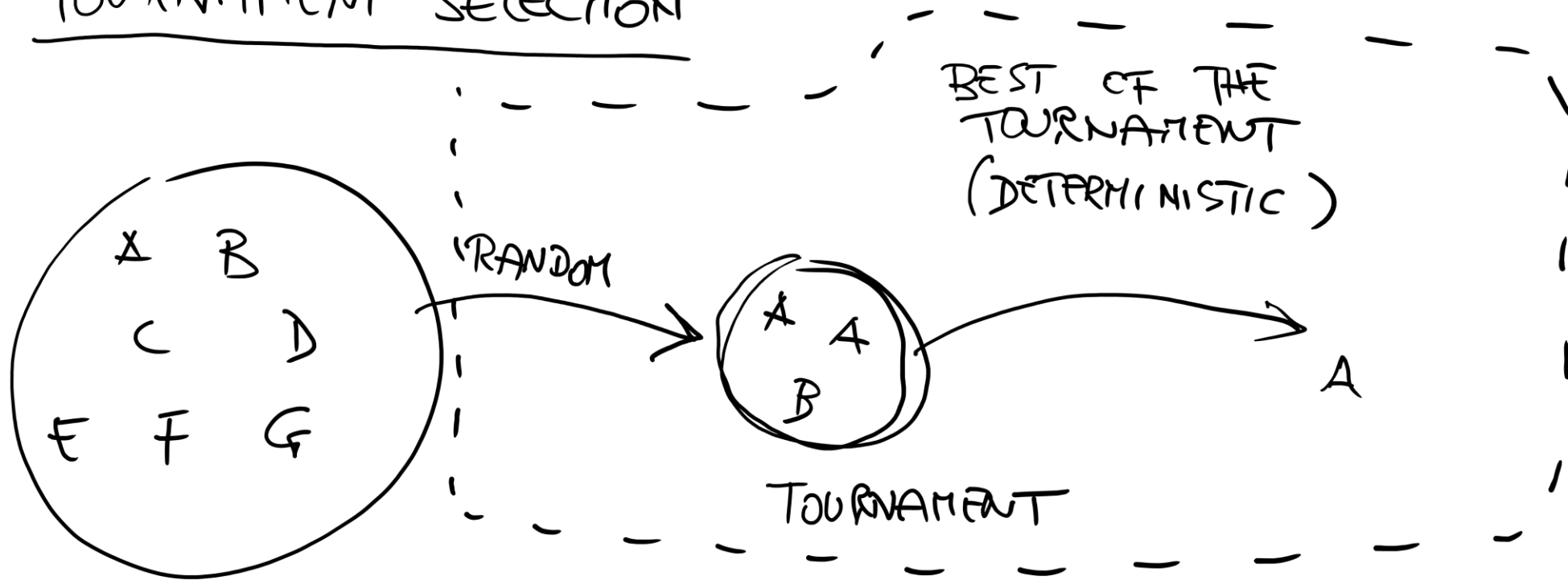
9

$$P(\text{sel. } i_1) = \frac{2}{1+2+3+4+5}$$

THIS ALGORITHM IS NOT SENSITIVE
TO DIFFERENCES IN FITNESS

NEW PARAMETER:
TOURNAMENT.
SIZE
K

TOURNAMENT SELECTION



1. IN SOME CASES IT IS NOT NEEDED TO CALCULATE ALL FITNESSES OF THE INDIVS. IN THE POP.
2. CHANGING K WE CHANGE THE SELECTION PRESSURE.

SELECTION DEPENDS ON THE PHENOTYPE

↓
FITNESS

GENETIC OPERATORS (CROSSOVER AND MUTATION)
DEPEND ON THE GENOTYPE

↓
STRUCTURE OF
THE SOLUTIONS

CROSSOVER (ONE-POINT CROSSOVER)

0 1 1 1 0 1 0 1 1 0 0 1
1 0 0 1 1 1 0 0 1 1 1 0

0 1 1 1 1 1 0 0 1 1 1 0
1 0 0 1 0 1 0 1 1 0 0 1

MUTATION

0 1 1 0 1 1 0 1 1 1 0 1
0 1 1 1 1 1 0 1 1 0 1

PROB. OF MUTATION

p_m

PROB. OF CHANGING
ONE CHARACTER

USUALLY
VERY SMALL















