



EVOLUTIONARY ALGORITHMS

# HOMEWORK

## Second task

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ACADEMIC YEAR 2018-2019

1. Let us suppose, that an algorithm's running time is polynomial, that is  $cn^\alpha$  for some  $\alpha$ ,  $c \in \mathbb{R}$  constants. Give an estimate for  $c$  and  $\alpha$  if for input lengths  $n = [4, 5, 6, 7, 8, 9, 10]$  we measured the following running times [37.1 58.7 84.0 115.1 150.8 190.9 235.2].
2. Let us suppose, that we have a population containing 4 individuals called e1, e2, e3, e4. Their fitness's are 0.4, 0.7, 0.3, 0.05. We use a roulette-wheel selection to select the four parents.
  - What is the probability, that e2 won't be chosen as parent at all?
  - What is the probability, that e3 will be chosen two times?
3. What can be a good measure of performance for a genetic algorithm? Justify your answer! Using your measure find the optimal probability of the mutation for the backpacking problem, using elitism, a tournament selection with  $k = 4$ , a fitness function described in the first lecture (sum of the values if the sum of the weights is below or equal to the capacity, 0 otherwise). Is there a significant difference in the efficiency between the optimal parameter and setting the probability of mutation to 0?

## Bibliography

- [1] Course Webpage  
<http://math.bme.hu/~safaro/evolalgen.html>
- [2] <https://tex.stackexchange.com/>