Evolutionary Computation

CSE-848 **Spring, 2021**

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Assignment 3

Again, please use a Jupyter notebook for this assignment: You can copy the tasks below into markdown cells and answer them in other markdown cells. You can do LaTeX type editing, but make sure the cells actually can be executed as you expect. As for Task 3, you need to prepare code in a language of your choice, e.g., Python, R, Octave. Make sure the code executes properly. Upload the notebook to the course D2L site -> Assessments -> Assignments -> Assignment 3.

Task 1

List all the selection mechanisms, both parent and survivor, that you have learned about and discuss their properties.

Task 2

Let S_1={1***10**00**} and S_2={***1*01*****} be two schemata.

1. Give the order and the defining length of S_1 and S_2.
2. What is the probability for one-point crossover with crossover rate p_c that crossover breaks S_1, or S_2? (i.e., the probability that the child created by the operator does not belong to the given schema, assuming each is crossed over with a mate that does not match it in any of the positions with a value specified.)
3. What is the probability that mutation with mutation rate p_m breaks S_1, or S_2?
4. What is the probability that S_1 or S_2 survive the application of both crossover and mutation?
5. Is it correct to call one of these two schemata a “building block”? Explain why, or why not.

Task 3

In Lecture 7, the 8-Queens problem was introduced. Write an evolutionary algorithm to solve this problem and compare it to an exhaustive algorithm that takes only into account the constraints of the board (one queen only in one row and column). If you need guidance, check the notes of Lecture 7 for suggestions for operators and parameters.