COMP 5660/6660 Fall 2021 Exam 3 - Canvas Quiz

This is a closed-book, closed-notes exam. The sum of the max points for all the questions is 48, but note that the max exam score will be capped at 46 (i.e., there are 2 bonus points, but you can't score more than 100%). You have exactly 50 minutes to complete this exam. Keep your answers clear and concise while complete. Good luck!

1. A multi-population cooperative CoEA is a CoEA where: [4 pts]

   (a) each population tries to solve its own problem without harming the fitness of any of the other populations

   (b) the populations are symbiotic species

   (c) each population is a different species representing part of a larger problem

   Select one of:

   - a
   - b
   - c
   - a and b
   - a and c
   - b and c
   - all of a, b, and c
   - none of a, b, nor c

2. In the context of two-population competitive coevolution, a CIAO plot: [4 pts]

   (a) visualizes the progress of the two populations where the luminance of each pixel (x, y) indicates the relative performance of the y-axis population's fittest individual in generation y versus the x-axis population's fittest individual in generation x

   (b) visualizes the relative performance of two populations where the luminance of each pixel (x, y) indicates the average performance of individual y from the y-axis population versus all its ancestors fittest opponents

   (c) visualizes the relative performance of the two populations where the luminance of each pixel (x, y) indicates the current best fitness from the x-axis population at generation x divided by the current best fitness from the y-axis population at generation y

   (d) allows the visual comparison of two different coevolutionary runs by comparing the populations from the final generation of each run

   (e) isn't a plot, "ciao" is Italian for "hello"

   Select one of:

   - a
   - b
   - c
   - d
   - e
   - none of a, b, c, d, nor e

3. Your Assignment 2c Pac-Man versus maps base problem: [4 pts]

   (a) is technically not a competitive coevolution problem because Pac-Man controllers and maps are different species, so compete in different niches

   (b) is technically not a competitive coevolution problem because they cooperate to find the fittest pairing of a Pac-Man controller and a map

   (c) is technically not a competitive coevolution problem because Pac-Man's adversaries, the Ghosts, are not being evolved

   Select one of:

   - a
   - b
   - c
   - a and b
   - a and c
   - b and c
   - all of a, b, and c
   - none of a, b, nor c

4. What is the motivation for the automated design of crossover operators for EAs employing self-adaptation: [4 pts]

   (a) EA performance is sensitive to the choice of crossover operator

   (b) identifying & configuring best traditional crossover operator is time consuming

   (c) existing crossover operators may be suboptimal for the problem at hand

   (d) the optimal crossover operator may change during evolution

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, b, and d
   - a, c, and d
   - b, c, and d
   - all of a, b, c, and d
   - none of a, b, c, nor d

5. Which of the following inherent characteristics of an EA makes it belong to the family of "embarrassingly parallel" algorithms:

   (a) fitness evaluations within a generation can be computed independently
   (b) runs of an EA can be computed independently
   (c) individual fitness evaluations contain independent and parallelizable operations

   Select one of:

   - a
   - b
   - c
   - a and b
   - a and c
   - b and c
   - all of a, b, and c
   - none of a, b, nor c

6. Some of the issues Interactive EAs face are: [4 pts]

   (a) human fitness bottleneck (i.e., humans are relatively slow in evaluating trial solutions)
   (b) humans are prone to fatigue and loss of attention
   (c) humans can be inconsistent
   (d) due to the visual and memory limitations of humans, the number of solutions being ranked at any given moment, needs to be kept relatively small

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, b, and d
   - a, c, and d
   - b, c, and d
   - all of a, b, c, and d
   - none of a, b, c, nor d

7. In the automated design of EAs, encoding the evolutionary process as a directed graph is preferable compared to Koza-style GP trees, because it: [4 pts]

   (a) is easier to code

   (b) has a larger space of representable EAs

   (c) makes bloat impossible

   (d) is a more natural representation for evolutionary cycles

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, b, and d
   - a, c, and d
   - b, c, and d
   - a, b, c, and d
   - none of a, b, c, nor d

8. Which of the following statements about Supportive Coevolution are true: [4 pts]

   (a) When employing supportive coevolution, the target fitness function only requires one individual per fitness evaluation, where as coevolution requires two or more individuals per fitness function evaluation

   (b) Supportive coevolution can only have a single genotype that must be used for all support individuals

   (c) Supportive coevolution is used to perform self-adaptation

   (d) Supportive coevolution requires a diffusion model to function

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d

- a, b, and c
- a, b, and d
- a, c, and d
- b, c, and d
- all of a, b, c, and d
- none of a, b, c, nor d

9. Which of the following statements about transitivity in competitive coevolutionary games are true: [4 pts]

   (a) Tournament-based pairing schemes are ineffective for intransitive games, because eliminated strategies might still be dominant against the champion.

   (b) Raw fitness is meaningless for intransitive games, and needs to be replaced by a surrogate fitness function.

   (c) Competitive fitness sharing is effective for intransitive games, because it rewards strategies specialized to beat otherwise undefeated opponents.

   (d) The Elo rating system is a good choice to model intransitive games, because it predicts winners based on differences in skill ratings.

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, b, and d
   - a, c, and d
   - b, c, and d
   - all of a, b, c, and d
   - none of a, b, c, nor d

10. The Maelstrom model for competitive coevolution makes use of adversarial islands that: [4 pts]

    (a) perform interactive asymmetric coevolution

    (b) distribute individuals within a population about a geometry for localized evolution

    (c) generate relative fitness estimates against the local populations

    Select one of:

    - a
    - b
    - c

- a and b
- a and c
- b and c
- all of a, b, and c
- none of a, b, nor c

11. Assuming a simple genetic algorithm whose global optimum has a fitness of 100.0 and given the following bit strings v_1 through v_5 and schema S
$v_1 = (10110110011001)\ fitness(v_1) = 1.0$
$v_2 = (10110110011001)\ fitness(v_2) = 1.0$
$v_3 = (10110110011001)\ fitness(v_3) = 1.0$
$v_4 = (10110110011001)\ fitness(v_4) = 1.0$
$v_5 = (10110110011001)\ fitness(v_5) = 1.0$
$S = (10110110011001)$

    (a) Compute the *order* of S. [1]

    (b) Compute the *defining length* of S and show your computation. [1]

    (c) Compute the fitness of S and show your computation. [1]

    (d) Do you expect the number of strings matching S to increase or decrease in subsequent generations? Explain your answer! [5]