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CS 470 Artificial Intelligence

Quiz #4

**What is evolutionary computing?**

Evolutionary computing is the creation and study of problem-solving algorithms based on biological evolution. Evolutionary computing falls with the evolutionary algorithms subfield of AI and includes evolutionary programming, evolution strategies, genetic algorithms, and genetic programming.

**History of evolutionary computing**

In the 1960s, three interpretations of evolutionary computing were defined by the works *Evolutionary Programming* (Lawrence J. Foge, 1962), *Genetic Algorithms* (John Henry Holland, 1962), and *Evolution Strategies* (Ingo Rechenberg and H.P. Schwefel, 1965). For the next decade and a half, each of these works represented a distinct area of evolutionary computing. In 1989, another was created through *Genetic* Programming (John Koza, 1989). These areas were independently developed until they became viewed as different subsets of a larger domain.

**What is a genetic algorithm?**

A genetic algorithm is an algorithm to solve optimization problems that is based on the evolutionary process of natural selection. A population of individual solutions is modified. Each modified solution is randomly selected to form a parent for other generations. The idea is that eventually, this process results in solutions that “evolve” toward optimal solutions. In genetic algorithms, mutation refers to an operator over selected parents and children in the population. Recombination is another operator that is used to select solutions from one population generation to the next. A fitness function is used to score the overall optimization level of a current solution. Stochastics methods are used to select the more fit solutions for the next successive generation.

**Provide the main algorithm for a GA**

The first step is initialization of the population with random individuals (candidate solutions). Next a fitness function is used to evaluate all individuals. Third, genitors are selected from the parent population. Offspring are created using crossover. And mutation occurs and newborns are evaluated.

**References**

<https://en.wikipedia.org/wiki/Evolutionary_computation>

<https://courses.cs.washington.edu/courses/cse466/05sp/pdfs/lectures/10-EvolutionaryComputation.pdf>

<https://ac.els-cdn.com/S0020019002002041/1-s2.0-S0020019002002041-main.pdf?_tid=c51e1d90-1736-11e8-bb5f-00000aacb35e&acdnat=1519238652_826051c91471e4b9cf6fcc19bb17402b>