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| Code | GENETIC_ALGORITHM.PY |
| Author | Nathaniel Heatwole, PhD (heatwolen@gmail.com) (GitHub) (LinkedIn) |
| Summary | Use a genetic algorithm to optimize (maximize) an erratic function, one that has many sharp peaks/valleys and local extrema and several “distractor” answers |
| Methods/ Process | <p>Genetic algorithm</p> <ul style="list-style-type: none"> - Iterative optimization method that mimics the workings of biological evolution - As the iterations progress, the pool of candidate solutions generally improves - Can optimize complex parameter spaces (including non-convex, non-differentiable, and non-continuous) - Concepts: <ul style="list-style-type: none"> - <i>Fitness</i>: objective function (“genetic” representation of parameter space) - <i>Population</i>: total simulated people - <i>Selection</i>: randomly select persons from current population to breed (with replacement), in proportion to their fitness - <i>Crossover</i>: randomly combine parameter values (“genes”) from parents - <i>Mutation</i>: randomly replace some genes with randomly chosen values (helps ensure good areas of the solution space are not overlooked) - <i>Generations</i>: total iterations - <i>Output</i>: global best solution (across all generations) |
| Objective Function | <p>Maximize:¹</p> $Y(X) = \sin(A * X) + \sin(B * X) + \sin(C * X) $ <p>with:</p> $A = (2 * \pi) / 13$ $B = (2 * \pi) / 18$ $C = (2 * \pi) / 23$ |
| Results | Algorithm efficiently locates the neighborhood of the maximum value |

¹ This function is similar to the one at <https://mathblog.wordpress.com/2013/09/01/sums-of-periodic-functions>.