

Sikraken Optimisation - by Kacper Krakowiak



The genetic algorithm is present in nature, following Charles Darwin's theory of natural selection. The definition can be summarised as "principle by which each slight variation [of a trait], if useful, is preserved". Basically means the strongest trait passed down from a set of parents will continue to multiply, and the weaker traits will inevitably die and wont make it to the multiplication phase. There are a few nuances, such as mutation and crossover. Mutation is self explanatory, in further (or more refined) generations, some children will undergo random changes outside of what has so far evolved in a given pool (very small chance of mutation). Just like in nature all living organisms features are written in DNA through Genotypes and Phenotypes, we can actually simulate these in computing.

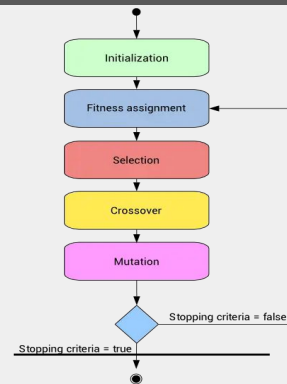
"Sikraken is a tool that aims to generate test inputs to achieve a high level of branch coverage against a broad, well-established set of C codes benchmarks.

Sikraken has 2 modes, Regression and Budget. In Regression mode 2 integers need to be manually inputted by the user [\$restarts,\$tries], which will dictate how the Generation algorithm will behave when it get stuck in a complex loop or other conditional statement, within a given c code sample. In budget mode we simply place a time cap, when the time is reached the generation simply ceases.

Goal is to find the optimal integer pair for [\$restarts,\$tries], using the genetic algorithm



Python is know to be ideal for implementing algorithms and comes with many specialised libraries for multiple different algorithm (including our desired genetic algorithm)



Sources:

1 Sikraken Doc (2024). Research strategy [online]. Available from: https://docs.google.com/document/d/1uDLnIrFGWUNYyzsotZAZ_jFvRSPEoixVMgw1UZZ0uq/edit?tab=t.0 [accessed 25 October 2024].

2 Natural-Selection_Wikipedia(2024). Research strategy [online]. Available from: https://en.wikipedia.org/wiki/Natural_selection#:~:text=He%20defined%20natural%20selection%20as%20a%20likely%20to%20survive%20and%20reproduce [accessed 6 December 2024].