Overview

The custom ACO is similar to the MMAS and MMAS* methods in regards to the evaporation calculation method but differs unsurprisingly in the use of multiple ants. For this custom ACO specifically, a value of 15 ants was used. Additionally, testing was performed using an evaporation of 0.1, alpha of 1 and epsilon of 0.01. Some tuning was performed with these valued found to provide satisfactory results across the test problem suit.

F1: OneMax

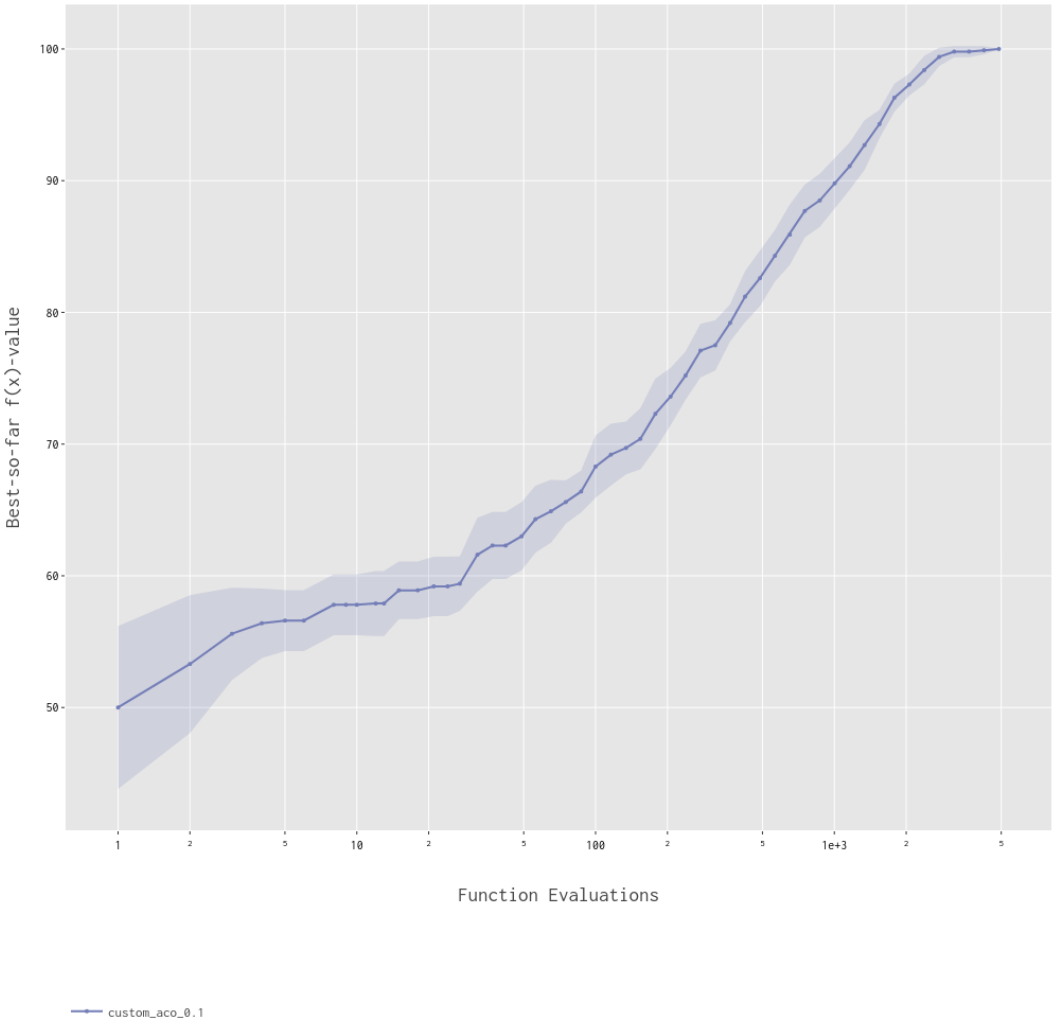

Figure 1: Custom ACO run on F1: OneMax

Running the custom ACO on F1: OneMax yields positive results with the algorithm beating or matching MMAS and MMAS* dependent on the evaporation rate used. The shape of the curve is very similar to that of the MMAS and MMAS* runs with a evaporation rate of 0.001, although this algorithm utilises an evaporation rate of 0.1.

F2: LeadingOnes

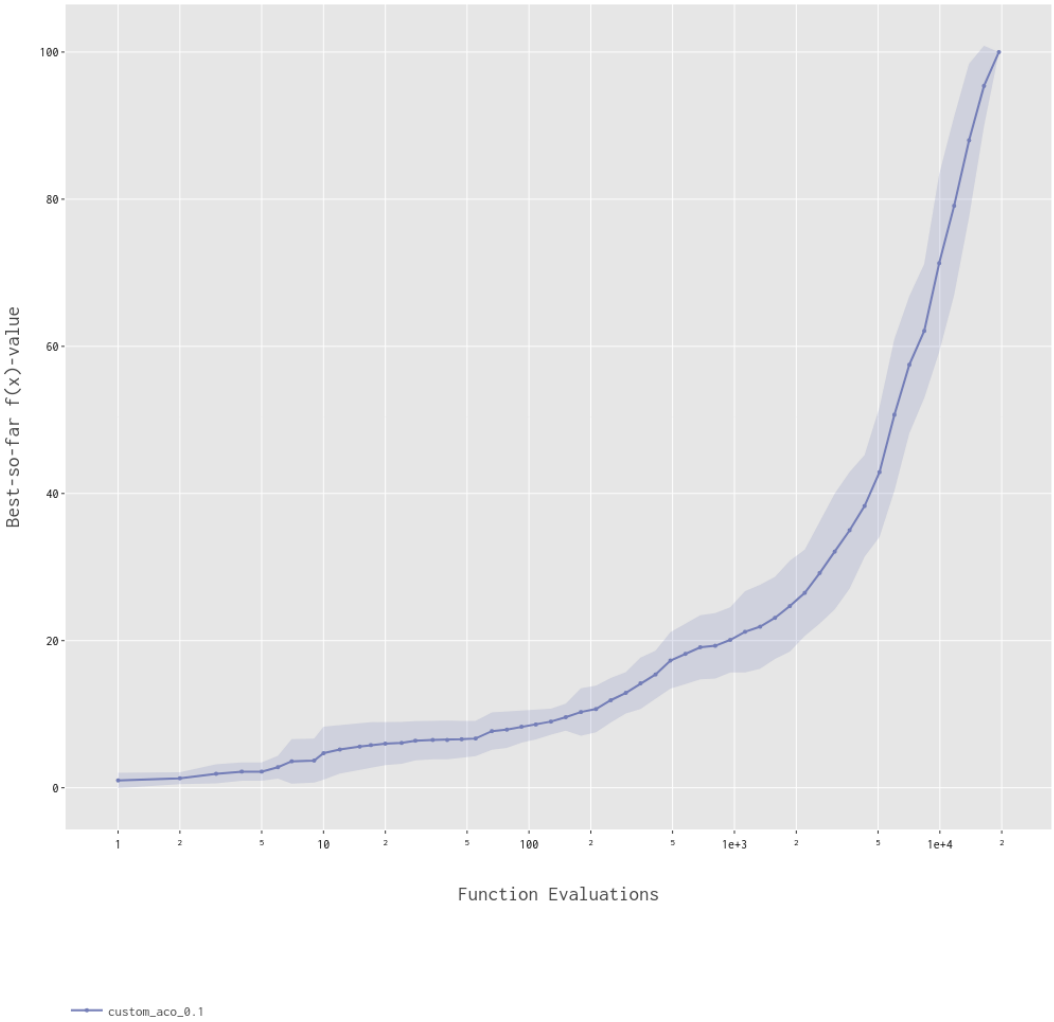

Figure 2: Custom ACO run on F2: LeadingOnes

Running the custom ACO on F2: LeadingOnes again matches or beats MMAS and MMAS* depending on the evaporation rate. The shape of the curve is again similar.

F3: A Linear Function with Harmonic Weights

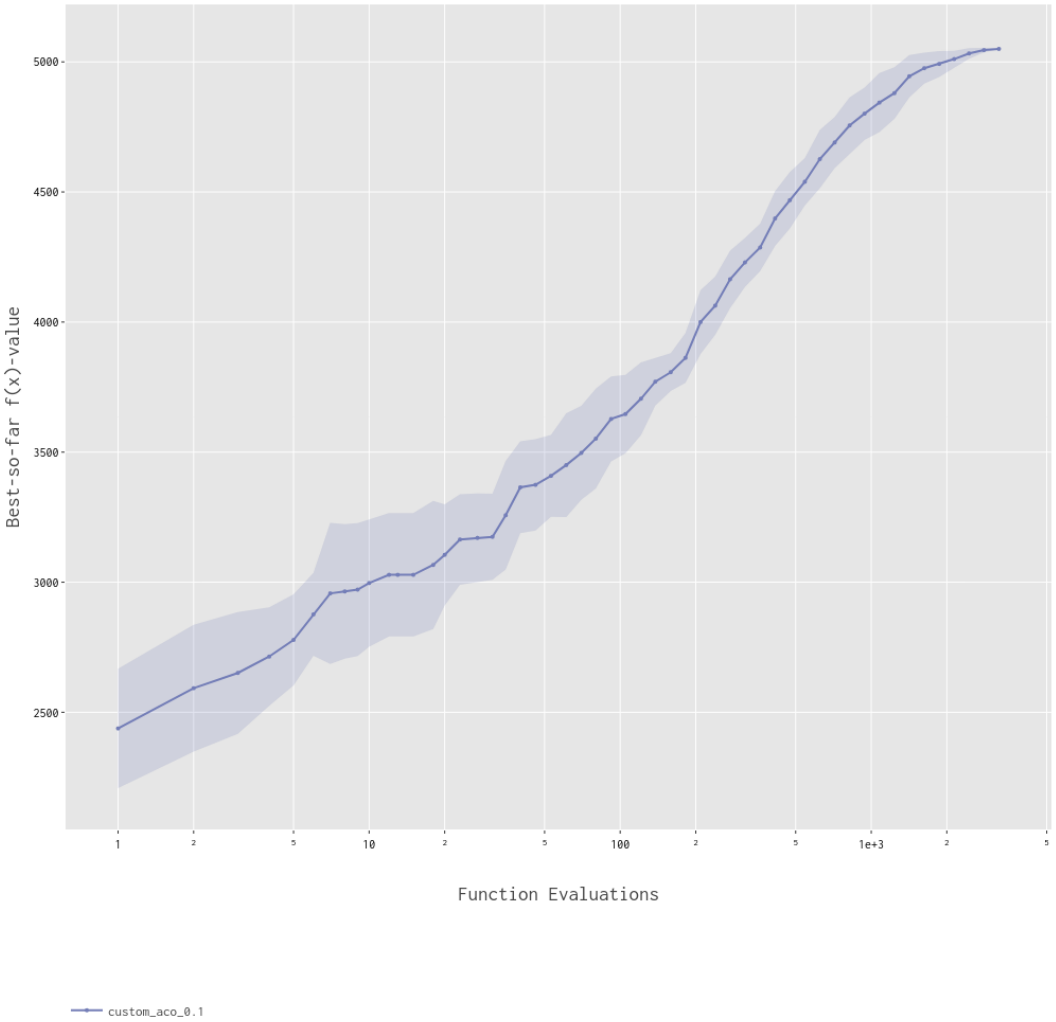

Figure 3: Custom ACO run on F3: A Linear Function with Harmonic Weights

Running the custom ACO on F3: A Linear Function with Harmonic Weights yields similar results to previous problems with the algorithm matching or beating MMAS and MMAS* depending on the evaporation rate.

F18: Low Autocorrelation Binary Sequences (LABS)

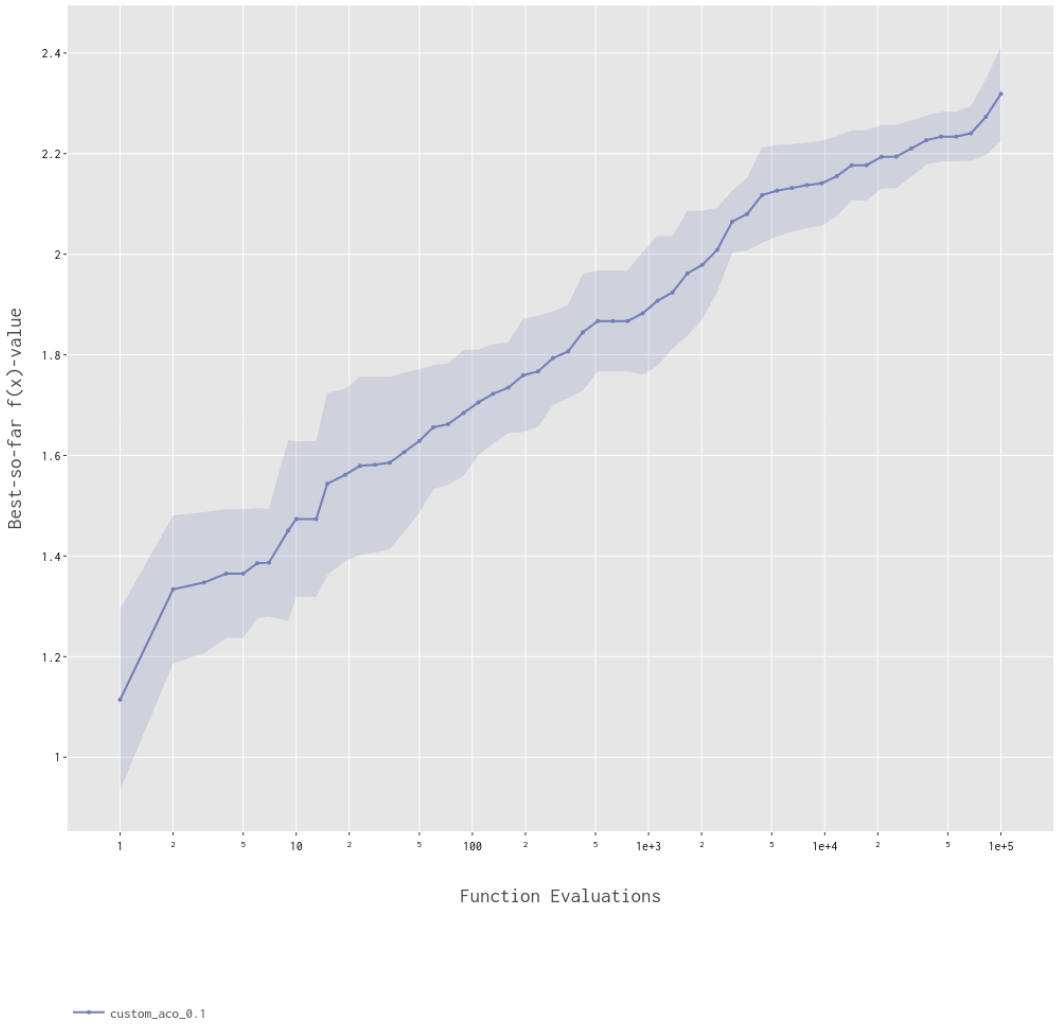

Figure 4: Custom ACO run on F18: Low Autocorrelation Binary Sequences (LABS)

F18: Low Autocorrelation Binary Sequences (LABS) is where MMAS and MMAS* begin to take the lead, with the custom ACO reaching significantly lower f(x) values within the allocated budget. While MMAS displays exponential growth patterns, the custom ACO performs rather linearly in this test problem.

F23: N-Queens Problem

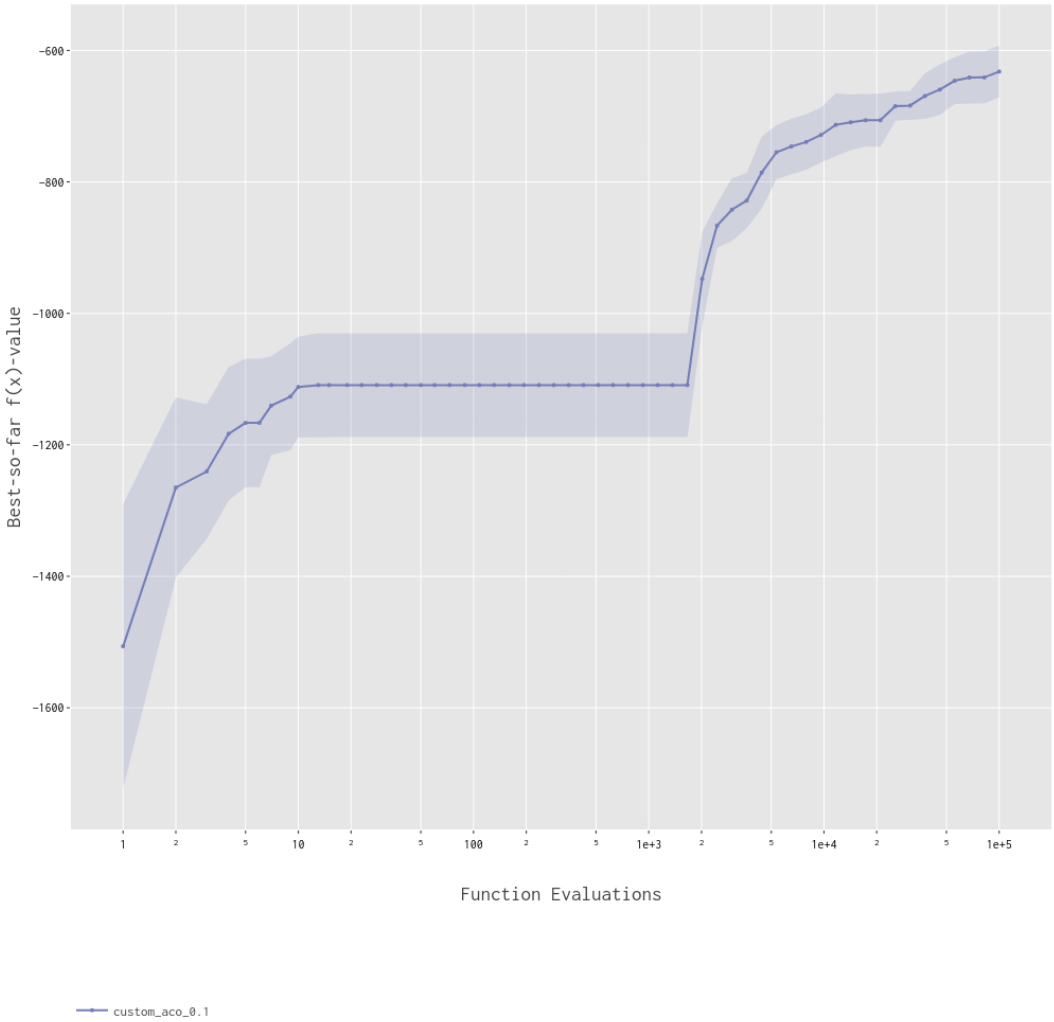

Figure 5: Custom ACO run on F23: N-Queens Problem

Again in F23: N-Queens Problem, the custom ACO struggle and is unable to reach the optimal solution in the allocated budget, while MMAS and MMAS* both manage to find the optimal solution in the same number of evaluations.

F24: Concatenated Trap

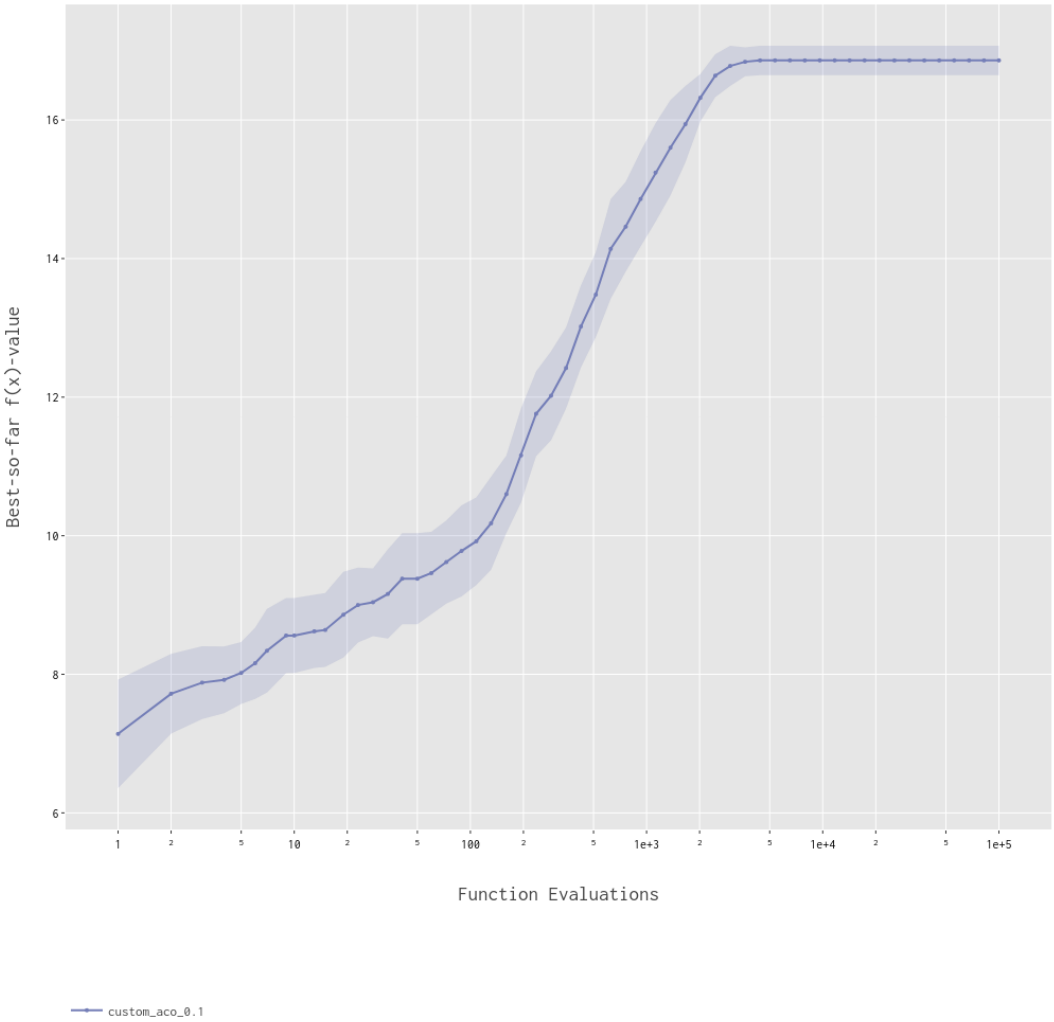

Figure 6: Custom ACO run on F24: Concatenated Trap

Running the custom ACO on F24: Concatenated Trap, leads to similar results as MMAS and MMAS* although taking slightly more evaluations. The shape of the graph is very similar to MMAS and MMAS* runs with evaporation rates of 0.1 and 1.0

F25: NK landscapes (NKL)

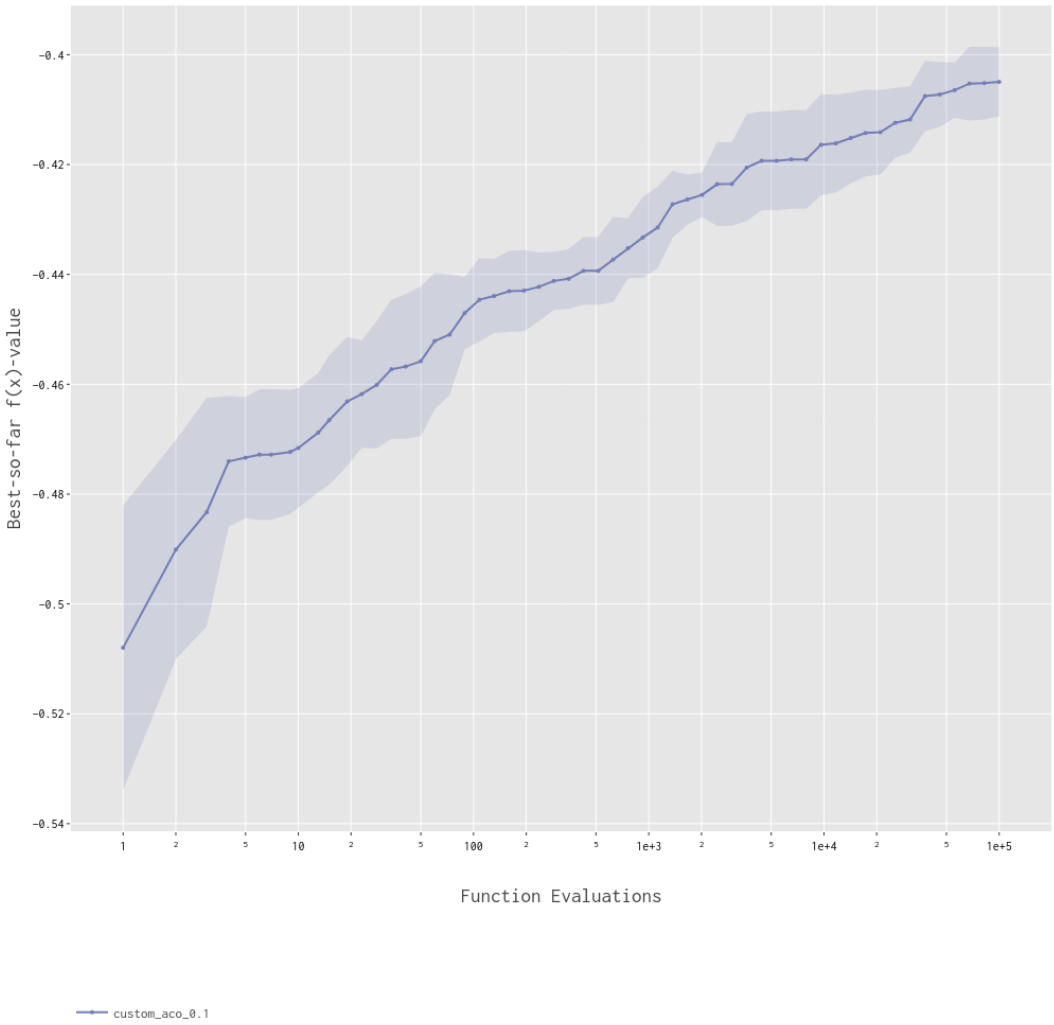

Figure 7: Custom ACO run on F25: NK landscapes (NKL)

Similarly to F18: Low Autocorrelation Binary Sequences (LABS), the custom ACO struggles with F25: NK landscapes (NKL), reaching a lower f(x) value than MMAS and MMAS*. It once again displays rather linear growth which limits its f(x) within the fixed evaluation budget.