F1: OneMax

The plot displays the OneMax problem, where the objective is to maximise the number of 1s in a 100-bit string. The global optimum is achieved when all bits are set to 1, giving a maximum fitness of 100. OneMax is considered a simple benchmark function.

RandomSearch shows limited progress. While it makes small improvements early on through chance, its lack of refinement means progress quickly slows, and best-so-far values plateau far below optimum. This reflects RS's inability to systematically accumulate improvements across the bitstring.

In contrast, RLS and (1+1) EA both steadily climb toward the optimum. Each single-bit flip that increases the number of 1s directly improves fitness, making both algorithms well suited to this problem. However, RLS reaches the optimum slightly earlier, plateauing at 100 with fewer evaluations. The (1+1) EA follows a similar trajectory but lags slightly behind, as its probabilistic multi-bit flips occasionally slow its otherwise steady climb. Ultimately, both methods reliably find the global optimum, but RLS demonstrates a small efficiency advantage.

Standard deviation patterns confirm these trends. RS exhibits wide variability across runs due to its stochastic nature, while RLS and (1+1) EA show some spread at the start but quickly converge to similar, stable trajectories as solutions accumulate more 1s.

In summary, the F1 results align with expectations: RS is ineffective at refining solutions, while RLS and (1+1) EA reliably reach the global optimum. Between the two, RLS proves slightly more efficient, reaching the plateau sooner, while (1+1) EA follows closely behind.