

Abs distance is  $abs[final\ solution - global\ minimum]$ . The budget for most functions is 10,000. The budget for F8 and F9 is 40,000. The budget for F4 and F10 is 300,000. The budget for three algorithms is always the same.

Figure 1 sum of abs distance for 20 runs (most functions)

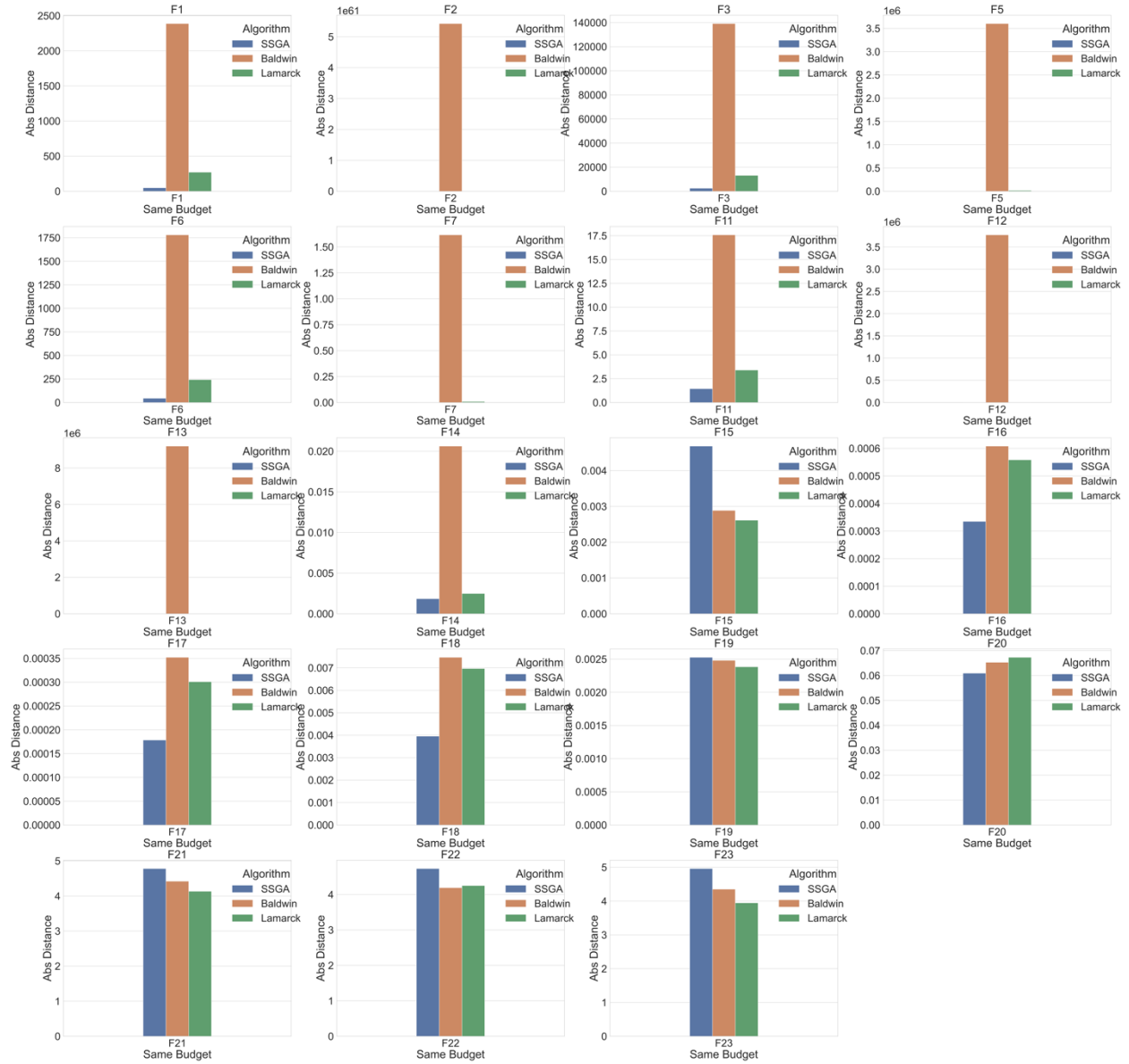


Figure 2 sum of abs distance for 20 runs( F8 and F9)

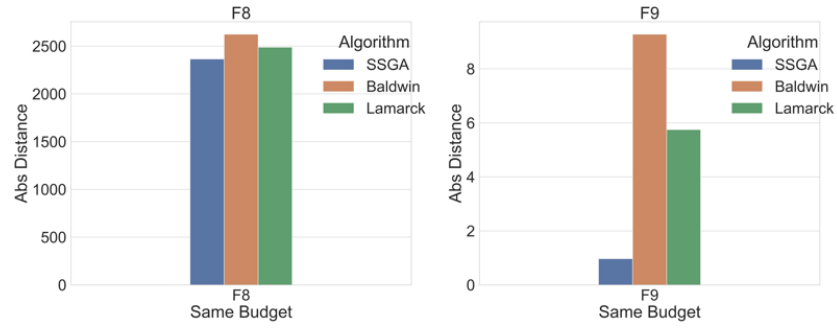
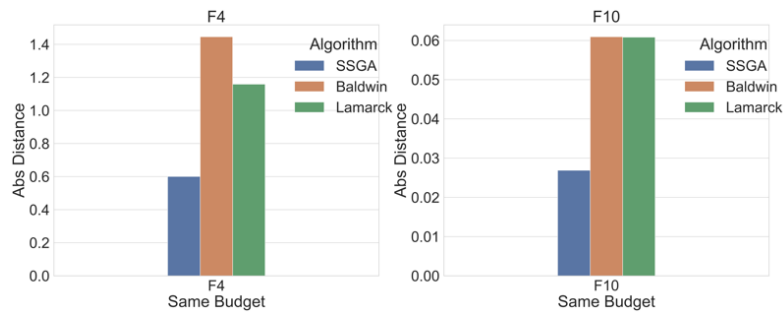


Figure 3 sum of abs distance for 20 runs (F4 and F10)



For each function and each parameter combination, we have 20 runs, and this means we have 20 abs distance. Max min distance is calculated as  $(x - x.min()) / (x.max() - x.min())$ . Each algorithm's 20 abs distance is normalized by itself. For example, SSGA produces 20 abs distances for each function and each parameter combination, then each box of SSGA is normalized based on 20 abs distances.

Figure 4 max min distance for 20 runs( most functions)

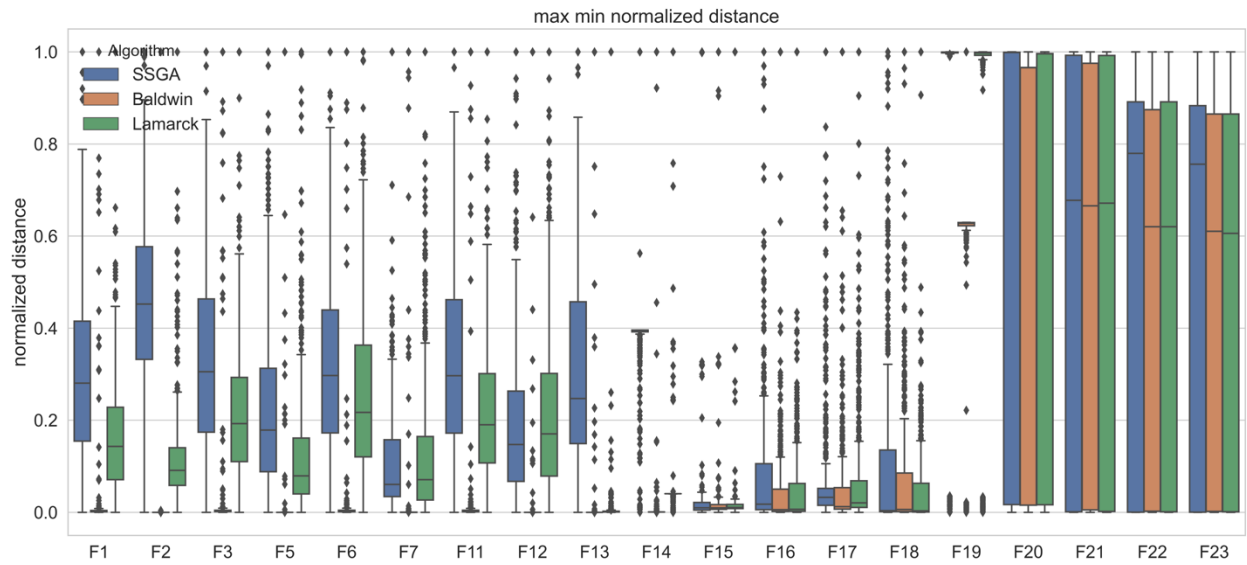


Figure 5 max min distance for 20 runs (F4 and F10)

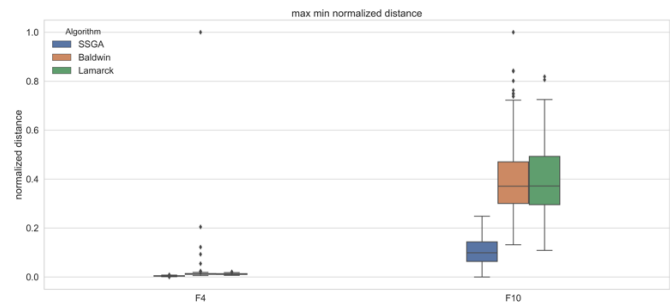
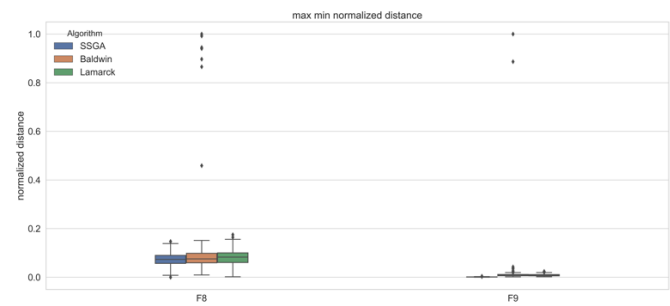


Figure 6 max min distance for 20 runs (F8 and F9)



Final solutions for 20 runs are generated base on the same budget. The red line is global minimum.

Figure 7 final solutions for 20 runs (F4 and F10)

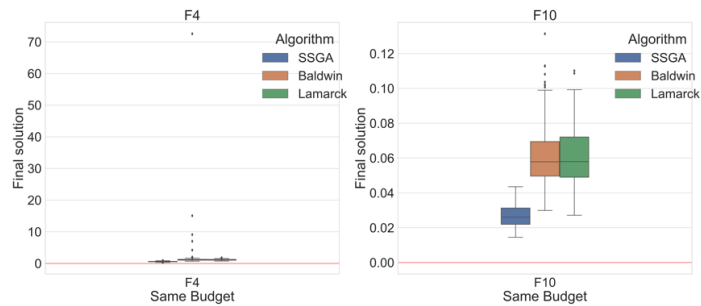


Figure 8 final solutions for 20 runs (F8 and F9)

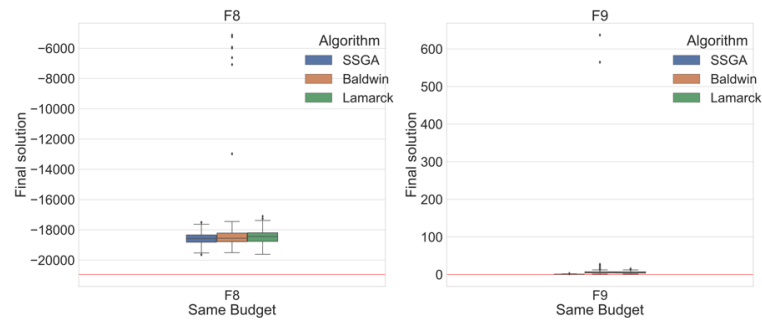


Figure 9 final solutions for 20 runs (most functions)

