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. 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()), while z-score distance is (x-x.mean())/(x.std()).

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

Chart, box and whisker chart

Description automatically generated

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

Chart, waterfall chart

Description automatically generated

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

Chart, waterfall chart

Description automatically generated

Figure sum of max min distance for 20 runs( most functions)

Chart, bar chart

Description automatically generated

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

Chart, bar chart

Description automatically generated

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

Chart, bar chart

Description automatically generated

Figure sum of z-score normalized distance for 20 runs (most functions)

Chart, waterfall chart

Description automatically generated

Figure sum of z- score normalized distance for 20 runs (F4 and F10)

Chart, bar chart

Description automatically generated

Figure sum of z- score normalized distance for 20 runs (F8 and F9)

Chart, bar chart

Description automatically generated