|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | M | DBEA-DR | NSGA-III | $\theta$-DEA | MOEA/DD | MOEA/D-PBI | MOEA/D-Tch | MOEA/D-WS | MOEA/D-IPBI | NSGA-II |
| DTLZ1\textsuperscript{-1} | 3 | 0.29207 | 0.27258 | 0.25057 | 0.24887 | 0.26146 | 0.27141 | 0.03935 | 0.17744 | 0.26905 |
| 5 | 0.01678 | 0.01265 | 0.00898 | 0.00972 | 0.01739 | 0.01208 | 0.00083 | 0.00671 | 0.01520 |
| 8 | 5.574E-05 | 5.227E-05 | 4.499E-05 | 0.881E-05 | 0.598E-05 | 3.215E-05 | 0.139E-05 | 2.855E-05 | 3.568E-05 |
| 10 | 1.192E-06 | 1.185E-06 | 0.451E-06 | 0.100E-06 | 0.079E-06 | 0.620E-06 | 0.025E-06 | 0.567E-06 | 0.765E-06 |
| DTLZ2\textsuperscript{-1} | 3 | 0.71081 | 0.68986 | 0.69303 | 0.68912 | 0.69439 | 0.68780 | 0.70652 | 0.70650 | 0.68187 |
| 5 | 0.20760 | 0.13957 | 0.13496 | 0.08794 | 0.15984 | 0.15556 | 0.14930 | 0.14910 | 0.17147 |
| 8 | 1.031E-02 | 4.454E-03 | 3.406E-03 | 2.690E-03 | 5.978E-03 | 0.459E-03 | 1.560E-03 | 1.560E-03 | 4.585E-03 |
| 10 | 1.247E-03 | 6.308E-04 | 5.541E-04 | 1.836E-04 | 5.199E-04 | 0.052E-04 | 0.640E-04 | 0.639E-04 | 3.797E-04 |
| DTLZ3\textsuperscript{-1} | 3 | 0.70917 | 0.69251 | 0.69468 | 0.68990 | 0.69609 | 0.68667 | 0.70650 | 0.70650 | 0.68267 |
| 5 | 0.20422 | 0.12951 | 0.13273 | 0.08190 | 0.15902 | 0.15199 | 0.14891 | 0.14886 | 0.16472 |
| 8 | 0.00983 | **0.00414** | 0.00401 | 0.00255 | 0.00596 | 0.00050 | 0.00156 | 0.00156 | 0.00390 |
| 10 | 0.00116 | **0.00054** | 0.00059 | 0.00018 | 0.00052 | 0.00001 | 0.00006 | 0.00006 | 0.00033 |
| DTLZ4\textsuperscript{-1} | 3 | 0.71168 | 0.69397 | 0.69546 | 0.68942 | 0.59319 | 0.68049 | 0.70650 | 0.64625 | 0.68358 |
| 5 | 0.19195 | 0.12326 | 0.11428 | 0.07242 | 0.12296 | 0.14878 | 0.14881 | 0.13995 | 0.16970 |
| 8 | 4.037E-03 | 4.582E-03 | 3.921E-03 | 2.198E-03 | 2.020E-03 | 0.485E-03 | 1.563E-03 | 1.340E-03 | 3.886E-03 |
| 10 | 3.377E-04 | 6.065E-04 | 6.409E-04 | 2.569E-04 | 2.333E-04 | 0.043E-04 | 0.642E-04 | 0.649E-04 | 3.006E-04 |
| WFG1\textsuperscript{-1} | 3 | 0.10958 | 0.10955 | 0.08936 | 0.08475 | 0.03944 | 0.07838 | 0.04427 | 0.06037 | 0.12500 |
| 5 | 0.00243 | 0.00221 | 0.00155 | 0.00094 | 0.00033 | 0.00174 | 0.00089 | 0.00113 | 0.00296 |
| 8 | 3.583E-06 | 1.835E-06 | 1.401E-06 | 1.028E-06 | 0.126E-06 | 3.015E-06 | 1.767E-06 | 1.798E-06 | 3.640E-06 |
| 10 | 5.600E-08 | 1.891E-08 | 1.524E-08 | 0.962E-08 | 0.149E-08 | 4.755E-08 | 2.414E-08 | 2.533E-08 | 4.974E-08 |
| WFG2\textsuperscript{-1} | 3 | 0.38567 | 0.38373 | 0.38347 | 0.38123 | 0.37769 | 0.37505 | 0.20617 | 0.31447 | 0.36889 |
| 5 | 0.01160 | 0.01067 | 0.00805 | 0.00611 | 0.00500 | 0.01143 | 0.00398 | 0.00443 | 0.01055 |
| 8 | 2.219E-05 | 0.784E-05 | 0.638E-05 | 0.383E-05 | 0.368E-05 | 1.585E-05 | 0.690E-05 | 0.730E-05 | 1.290E-05 |
| 10 | 3.505E-07 | 0.795E-07 | 0.569E-07 | 0.441E-07 | 0.378E-07 | 2.304E-07 | 0.885E-07 | 0.977E-07 | 1.787E-07 |
| WFG3\textsuperscript{-1} | 3 | 0.24752 | 0.26507 | 0.24959 | 0.23184 | 0.25481 | 0.25408 | 0.03245 | 0.11691 | 0.26451 |
| 5 | 0.01170 | 0.01279 | 0.00912 | 0.00388 | 0.00459 | 0.01082 | 0.00053 | 0.00286 | 0.01312 |
| 8 | 4.864E-05 | 3.666E-05 | 1.415E-05 | 0.262E-05 | 0.417E-05 | 1.598E-05 | 0.083E-05 | 0.300E-05 | 2.035E-05 |
| 10 | 9.460E-07 | 6.673E-07 | 2.511E-07 | 0.250E-07 | 0.483E-07 | 2.704E-07 | 0.106E-07 | 0.499E-07 | 4.847E-07 |
| WFG4\textsuperscript{-1} | 3 | 0.70957 | 0.66343 | 0.68880 | 0.66140 | 0.68582 | 0.66881 | 0.68655 | 0.69140 | 0.66561 |
| 5 | 0.15227 | 0.12711 | 0.14416 | 0.10758 | 0.13711 | 0.08523 | 0.10288 | 0.11997 | 0.14780 |
| 8 | 5.462E-03 | 5.007E-03 | 5.123E-03 | 0.255E-03 | 0.602E-03 | 0.548E-03 | 2.351E-03 | 1.914E-03 | 2.758E-03 |
| 10 | 5.228E-04 | 5.475E-04 | 2.537E-04 | 0.039E-04 | 0.239E-04 | 0.171E-04 | 1.539E-04 | 1.151E-04 | 1.951E-04 |
| WFG5\textsuperscript{-1} | 3 | 0.70099 | 0.66841 | 0.68748 | 0.67405 | 0.68567 | 0.67011 | 0.68645 | 0.69118 | 0.67184 |
| 5 | 0.14506 | 0.12789 | 0.12399 | 0.12320 | 0.13919 | 0.08783 | 0.10558 | 0.12259 | 0.16091 |
| 8 | 6.651E-03 | 0.00421 | 0.00436 | 0.00062 | 0.00080 | 0.00050 | 0.00237 | 0.00195 | 0.00250 |
| 10 | 7.616E-04 | 0.00046 | 0.00025 | 0.00002 | 0.00003 | 0.00001 | 0.00016 | 0.00011 | 0.00015 |
| WFG6\textsuperscript{-1} | 3 | 0.70518 | 0.68331 | 0.69235 | 0.67553 | 0.68534 | 0.66845 | 0.68665 | 0.69144 | 0.68281 |
| 5 | 0.13073 | 0.13628 | 0.12549 | 0.12332 | 0.13846 | 0.08150 | 0.10292 | 0.11987 | 0.16948 |
| 8 | 6.393E-03 | 0.00450 | 0.00382 | 0.00075 | 0.00076 | 0.00043 | 0.00236 | 0.00194 | 0.00248 |
| 10 | 6.862E-04 | 0.00053 | 0.00022 | 0.00002 | 0.00003 | 0.00001 | 0.00016 | 0.00011 | 0.00020 |
| WFG7\textsuperscript{-1} | 3 | 0.70742 | 0.65101 | 0.68135 | 0.65126 | 0.67742 | 0.65881 | 0.68664 | 0.69143 | 0.65047 |
| 5 | 0.13430 | 0.11727 | 0.11857 | 0.11268 | 0.13727 | 0.08508 | 0.10297 | 0.11996 | 0.14742 |
| 8 | 5.962E-03 | 0.00441 | 0.00382 | 0.00049 | 0.00054 | 0.00050 | 0.00237 | 0.00192 | 0.00340 |
| 10 | 4.475E-04 | 0.00047 | 0.00023 | 0.00002 | 0.00002 | 0.00001 | 0.00015 | 0.00011 | 0.00032 |
| WFG8\textsuperscript{-1} | 3 | 0.71138 | 0.68958 | 0.69311 | 0.67910 | 0.68517 | 0.66818 | 0.68660 | 0.69143 | 0.68535 |
| 5 | 0.16025 | 0.13845 | 0.12755 | 0.12962 | 0.13872 | 0.08272 | 0.10293 | 0.11978 | 0.17643 |
| 8 | 6.851E-03 | 0.00460 | 0.00405 | 0.00129 | 0.00090 | 0.00038 | 0.00237 | 0.00195 | 0.00381 |
| 10 | 6.248E-04 | 0.00055 | 0.00023 | 0.00005 | 0.00003 | 0.00001 | 0.00016 | 0.00012 | 0.00034 |
| WFG9\textsuperscript{-1} | 3 | 0.70013 | 0.67193 | 0.68446 | 0.64574 | 0.66636 | 0.65325 | 0.68255 | 0.68630 | 0.66060 |
| 5 | 0.16604 | 0.13747 | 0.12627 | 0.11905 | 0.13411 | 0.09712 | 0.10808 | 0.12487 | 0.15893 |
| 8 | 6.700E-03 | 0.00478 | 0.00431 | 0.00088 | 0.00073 | 0.00075 | 0.00222 | 0.00181 | 0.00380 |
| 10 | 7.218E-04 | 0.00048 | 0.00026 | 0.00003 | 0.00003 | 0.00003 | 0.00014 | 0.00010 | 0.00040 |

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| Problem | M | DBEA-DR | NSGA-III | $\theta$-DEA | MOEA/DD | MOEA/D-PBI | MOEA/D-Tch | MOEA/D-WS | MOEA/D-IPBI | NSGA-II |
| DTLZ1\textsuperscript{-1} | 3 | 0.04204 | 0.06023 | 0.08080 | 0.07764 | 0.07235 | 0.06726 | 0.46615 | 0.15033 | 0.05772 |
| 5 | 0.14258 | 0.15781 | 0.21539 | 0.18317 | 0.13134 | 0.17583 | 0.58701 | 0.24709 | 0.12841 |
| 8 | 0.22785 | 0.19939 | 0.22664 | 0.28573 | 0.42514 | 0.27490 | 0.67675 | 0.28280 | 0.21727 |
| 10 | 0.21029 | 0.19114 | 0.25461 | 0.28540 | 0.42793 | 0.30308 | 0.68698 | 0.30610 | 0.22753 |
| DTLZ2\textsuperscript{-1} | 3 | 0.05529 | 0.06849 | 0.07061 | 0.07231 | 0.06733 | 0.08081 | 0.05795 | 0.05797 | 0.07106 |
| 5 | 0.17814 | 0.20140 | 0.22591 | 0.26158 | 0.20294 | 0.19062 | 0.19319 | 0.19338 | 0.17835 |
| 8 | 0.35185 | 0.39590 | 0.44648 | 0.44169 | 0.38813 | 0.46403 | 0.39536 | 0.39528 | 0.34390 |
| 10 | 0.38280 | 0.41607 | 0.45647 | 0.50964 | 0.44616 | 0.55239 | 0.46082 | 0.46084 | 0.38069 |
| DTLZ3\textsuperscript{-1} | 3 | 0.05507 | 0.06945 | 0.06923 | 0.07147 | 0.06640 | 0.08231 | 0.05799 | 0.05799 | 0.07117 |
| 5 | 0.17233 | 0.20451 | 0.22735 | 0.26960 | 0.20317 | 0.19464 | 0.19361 | 0.19366 | 0.18317 |
| 8 | 0.34463 | 0.39347 | 0.43321 | 0.44242 | 0.38697 | 0.46253 | 0.39517 | 0.39519 | 0.34945 |
| 10 | 0.37802 | 0.41589 | 0.45076 | 0.50678 | 0.44444 | 0.55227 | 0.46063 | 0.46065 | 0.38427 |
| DTLZ4\textsuperscript{-1} | 3 | 0.05532 | 0.06933 | 0.06795 | 0.07172 | 0.14957 | 0.08734 | 0.05800 | 0.10622 | 0.07001 |
| 5 | 0.16489 | 0.21479 | 0.24070 | 0.27921 | 0.27387 | 0.19831 | 0.19371 | 0.21271 | 0.17809 |
| 8 | 0.35717 | 0.36310 | 0.42714 | 0.45958 | 0.52122 | 0.46517 | 0.39528 | 0.43285 | 0.35118 |
| 10 | 0.39271 | 0.39219 | 0.43337 | 0.48691 | 0.52423 | 0.55814 | 0.46055 | 0.46365 | 0.39096 |
| WFG1\textsuperscript{-1} | 3 | 0.02730 | 0.05290 | 0.10325 | 0.11665 | 0.29294 | 0.15693 | 0.37597 | 0.29304 | 0.04386 |
| 5 | 0.08794 | 0.11311 | 0.19147 | 0.32509 | 0.55926 | 0.17943 | 0.35539 | 0.31550 | 0.06629 |
| 8 | 0.10717 | 0.26898 | 0.34785 | 0.39702 | 0.99344 | 0.16412 | 0.32690 | 0.31295 | 0.10819 |
| 10 | 0.13916 | 0.29323 | 0.38999 | 0.43426 | 0.96296 | 0.14229 | 0.33064 | 0.31388 | 0.09226 |
| WFG2\textsuperscript{-1} | 3 | 0.05323 | 0.04190 | 0.04306 | 0.05567 | 0.05739 | 0.04694 | 0.33038 | 0.22170 | 0.06632 |
| 5 | 0.12385 | 0.07881 | 0.14449 | 0.18688 | 0.24328 | 0.07440 | 0.37314 | 0.32020 | 0.09517 |
| 8 | 0.19088 | 0.20953 | 0.35963 | 0.33890 | 0.45393 | 0.11549 | 0.42160 | 0.38028 | 0.15819 |
| 10 | 0.13720 | 0.25544 | 0.43200 | 0.36370 | 0.50669 | 0.12588 | 0.46156 | 0.40894 | 0.15103 |
| WFG3\textsuperscript{-1} | 3 | 0.11100 | 0.06083 | 0.08114 | 0.08829 | 0.08214 | 0.08449 | 0.49054 | 0.24954 | 0.05986 |
| 5 | 0.21589 | 0.16490 | 0.21009 | 0.26876 | 0.34333 | 0.19835 | 0.62850 | 0.37408 | 0.13927 |
| 8 | 0.28258 | 0.25089 | 0.31689 | 0.44622 | 0.47588 | 0.34387 | 0.72693 | 0.51896 | 0.25419 |
| 10 | 0.25925 | 0.25988 | 0.29982 | 0.46272 | 0.49450 | 0.36499 | 0.75953 | 0.50412 | 0.25219 |
| WFG4\textsuperscript{-1} | 3 | 0.05509 | 0.07067 | 0.06850 | 0.08952 | 0.08597 | 0.09036 | 0.07125 | 0.06708 | 0.07162 |
| 5 | 0.22407 | 0.20365 | 0.21184 | 0.27358 | 0.25924 | 0.27079 | 0.25575 | 0.22894 | 0.18955 |
| 8 | 0.36204 | 0.38615 | 0.41425 | 0.63248 | 0.60677 | 0.48890 | 0.42937 | 0.41881 | 0.37240 |
| 10 | 0.40419 | 0.43182 | 0.49779 | 0.72355 | 0.66994 | 0.55916 | 0.47924 | 0.47420 | 0.41505 |
| WFG5\textsuperscript{-1} | 3 | 0.05434 | 0.07096 | 0.06901 | 0.08740 | 0.08494 | 0.08793 | 0.07083 | 0.06681 | 0.07152 |
| 5 | 0.21098 | 0.20813 | 0.23067 | 0.24814 | 0.25227 | 0.26722 | 0.25228 | 0.22598 | 0.18380 |
| 8 | 0.35167 | 0.39476 | 0.42790 | 0.52843 | 0.58467 | 0.48796 | 0.42769 | 0.41669 | 0.37803 |
| 10 | 0.38225 | 0.44100 | 0.49854 | 0.61452 | 0.65891 | 0.55862 | 0.47784 | 0.47400 | 0.42550 |
| WFG6\textsuperscript{-1} | 3 | 0.05555 | 0.07064 | 0.06940 | 0.08761 | 0.08656 | 0.09107 | 0.07121 | 0.06708 | 0.07144 |
| 5 | 0.22326 | 0.20879 | 0.23472 | 0.23969 | 0.25092 | 0.27386 | 0.25563 | 0.22895 | 0.18108 |
| 8 | 0.36481 | 0.39207 | 0.44079 | 0.51870 | 0.58752 | 0.49671 | 0.42929 | 0.41820 | 0.38577 |
| 10 | 0.39790 | 0.43261 | 0.50390 | 0.61078 | 0.66057 | 0.56964 | 0.47855 | 0.47419 | 0.42065 |
| WFG7\textsuperscript{-1} | 3 | 0.05528 | 0.07491 | 0.06984 | 0.09135 | 0.08764 | 0.08919 | 0.07122 | 0.06709 | 0.07665 |
| 5 | 0.24217 | 0.21990 | 0.24024 | 0.26035 | 0.25841 | 0.26725 | 0.25555 | 0.22880 | 0.19349 |
| 8 | 0.36372 | 0.39812 | 0.44856 | 0.57769 | 0.61427 | 0.48629 | 0.42953 | 0.41873 | 0.36740 |
| 10 | 0.43155 | 0.43765 | 0.50225 | 0.65658 | 0.68282 | 0.55764 | 0.48052 | 0.47575 | 0.39785 |
| WFG8\textsuperscript{-1} | 3 | 0.05541 | 0.07182 | 0.07039 | 0.08438 | 0.08642 | 0.09138 | 0.07125 | 0.06708 | 0.07267 |
| 5 | 0.19352 | 0.21132 | 0.23438 | 0.22655 | 0.24985 | 0.27496 | 0.25585 | 0.22920 | 0.18775 |
| 8 | 0.35874 | 0.39399 | 0.44081 | 0.49022 | 0.57774 | 0.49801 | 0.42906 | 0.41764 | 0.37975 |
| 10 | 0.40761 | 0.43266 | 0.50071 | 0.57353 | 0.65643 | 0.57134 | 0.47790 | 0.47233 | 0.40987 |
| WFG9\textsuperscript{-1} | 3 | 0.05449 | 0.06858 | 0.06769 | 0.08732 | 0.08791 | 0.08518 | 0.07062 | 0.06719 | 0.07407 |
| 5 | 0.18347 | 0.20468 | 0.23095 | 0.23795 | 0.25551 | 0.25081 | 0.24740 | 0.22190 | 0.19209 |
| 8 | 0.34213 | 0.39243 | 0.43482 | 0.51895 | 0.59280 | 0.46407 | 0.42810 | 0.41925 | 0.37479 |
| 10 | 0.38110 | 0.44781 | 0.49704 | 0.60650 | 0.66438 | 0.52325 | 0.47860 | 0.47591 | 0.40130 |

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| Problem | M | DBEA-DR | | NSGA-III | $\theta$-DEA | MOEA/DD | MOEA/D-PBI | MOEA/D-Tch | MOEA/D-WS | MOEA/D-IPBI | NSGA-II |
| DTLZ1 | 3 | 1.11657 | | 1.11508 | 1.11767 | 1.11913 | 1.11711 | 1.06842 | 0.39572 | 0.48149 | 1.07411 |
| 5 | 1.56068 | | 1.57677 | 1.57767 | 1.57794 | 1.57768 | 1.51186 | 0.50052 | 0.02284 | 0.00000 |
| 8 | 2.01262 | | 2.13770 | 2.13788 | 2.13730 | 2.13620 | 2.05463 | 0.96246 | 1.44289 | 0.00000 |
| 10 | 2.52609 | | 2.59280 | 2.59272 | 2.59260 | 2.59220 | 2.51973 | 1.07913 | 1.90272 | 0.00000 |
| DTLZ2 | 3 | 0.74018 | | 0.74336 | 0.74390 | 0.74445 | 0.74418 | 0.70168 | 0.33187 | 0.33100 | 0.69708 |
| 5 | 1.29193 | | 1.30317 | 1.30679 | 1.30778 | 1.30728 | 1.14598 | 0.61944 | 0.27191 | 0.67442 |
| 8 | 1.89112 | | 1.96916 | 1.97785 | 1.97862 | 1.97817 | 1.35469 | 0.68315 | 0.54410 | 0.00004 |
| 10 | 2.42404 | | 2.50878 | 2.51416 | 2.51509 | 2.51500 | 1.69045 | 0.83883 | 0.64925 | 0.00000 |
| DTLZ3 | 3 | 0.74358 | | 0.73300 | 0.73642 | 0.73944 | 0.73654 | 0.69553 | 0.33026 | 0.31397 | 0.69959 |
| 5 | 1.26280 | | 1.29894 | 1.30376 | 1.30638 | 1.30398 | 1.14475 | 0.60143 | 0.00750 | 0.00000 |
| 8 | 1.54620 | | 1.95007 | 1.96849 | 1.97162 | 1.74240 | 1.33166 | 0.66684 | 0.29765 | 0.00000 |
| 10 | 1.38691 | | 2.50727 | 2.51279 | 2.51445 | 2.50933 | 1.69956 | 0.80348 | 0.52362 | 0.00000 |
| DTLZ4 | 3 | 0.74138 | | 0.73221 | 0.71077 | 0.74484 | 0.48232 | 0.45889 | 0.17191 | 0.23377 | 0.70481 |
| 5 | 1.28523 | | 1.30839 | 1.30878 | 1.30876 | 1.20680 | 1.00426 | 0.42941 | 0.33457 | 1.00881 |
| 8 | 1.90844 | | 1.98025 | 1.98078 | 1.98083 | 1.86439 | 1.35100 | 0.71296 | 0.53303 | 0.00000 |
| 10 | 2.45313 | | 2.51524 | 2.51539 | 2.51532 | 2.43536 | 1.56890 | 0.95488 | 0.64498 | 0.00000 |
| WFG1 | 3 | 0.50294 | | 0.65088 | 0.70151 | 0.69393 | 0.67291 | 0.92204 | 0.73804 | 0.81622 | 0.75944 |
| 5 | 0.68580 | | 0.85608 | 1.14844 | 1.23809 | 1.34797 | 1.51824 | 1.36724 | 1.36241 | 1.03120 |
| 8 | 0.91126 | | 1.36206 | 1.88297 | 1.91925 | 1.73875 | 2.05117 | 1.85604 | 1.75472 | 1.51083 |
| 10 | 1.10780 | | 2.22078 | 2.38349 | 2.37705 | 1.78435 | 2.46470 | 2.27031 | 2.18237 | 2.38032 |
| WFG2 | 3 | 1.22597 | | 1.22359 | 1.22945 | 1.22193 | 1.11888 | 1.12990 | 1.12266 | 1.16687 | 1.20760 |
| 5 | 1.57110 | | 1.59770 | 1.59708 | 1.55672 | 1.52205 | 1.58417 | 1.42821 | 1.42081 | 1.58790 |
| 8 | 2.12451 | | 2.13629 | 2.12442 | 2.04619 | 2.01678 | 2.13569 | 2.11651 | 2.11529 | 2.13214 |
| 10 | 2.58524 | | 2.58890 | 2.57778 | 2.48332 | 2.45715 | 2.58891 | 2.57478 | 2.57367 | 2.58882 |
| WFG3 | 3 | 0.98265 | | 0.81929 | 0.81556 | 0.77295 | 0.75364 | 0.80041 | 0.48971 | 0.74146 | 0.82967 |
| 5 | 1.38769 | | 1.01000 | 1.02782 | 0.95386 | 0.89357 | 0.88322 | 0.71619 | 0.93099 | 1.06314 |
| 8 | 1.86632 | | 1.21146 | 1.11348 | 1.15306 | 0.74674 | 1.27479 | 0.92248 | 1.41331 | 1.41857 |
| 10 | 2.33286 | | 1.55771 | 1.55919 | 1.37737 | 0.55186 | 1.69917 | 1.13233 | 1.72878 | 1.76576 |
| WFG4 | 3 | 0.70356 | | 0.72867 | 0.72949 | 0.72031 | 0.68710 | 0.66650 | 0.34131 | 0.63483 | 0.67605 |
| 5 | 1.19012 | | 1.28496 | 1.28736 | 1.26067 | 1.15695 | 1.01300 | 0.71180 | 1.04810 | 1.07969 |
| 8 | 1.73811 | | 1.96402 | 1.96426 | 1.83751 | 1.19841 | 1.33398 | 0.95883 | 1.45141 | 1.40330 |
| 10 | 2.26378 | | 2.50322 | 2.50376 | 2.22383 | 1.43393 | 1.49165 | 1.20197 | 1.74551 | 1.70402 |
| WFG5 | 3 | 0.67828 | | 0.68658 | 0.68706 | 0.67698 | 0.65668 | 0.61681 | 0.27764 | 0.58174 | 0.65059 |
| 5 | 1.17570 | | 1.22187 | 1.22209 | 1.18965 | 1.11627 | 0.93276 | 0.58164 | 0.96542 | 1.06695 |
| 8 | 1.76351 | | 1.84995 | 1.85027 | 1.71196 | 1.27483 | 1.18970 | 0.96591 | 1.33675 | 1.39529 |
| 10 | 2.27006 | | 2.34640 | 2.34644 | 2.07711 | 1.53615 | 1.35553 | 1.18471 | 1.57386 | 1.61976 |
| WFG6 | 3 | 0.66788 | | 0.68696 | 0.68698 | 0.67923 | 0.65655 | 0.62307 | 0.28542 | 0.58469 | 0.64111 |
| 5 | 1.13737 | | 1.21978 | 1.22284 | 1.19424 | 1.04043 | 0.93460 | 0.55026 | 0.97587 | 1.01175 |
| 8 | 1.60951 | | 1.84625 | 1.84330 | 1.69055 | 0.71742 | 1.17924 | 0.63171 | 1.21597 | 1.27938 |
| 10 | 1.97622 | | 2.32660 | 2.32759 | 2.01837 | 0.82027 | 1.44519 | 0.77606 | 1.48368 | 1.59677 |
| WFG7 | 3 | 0.72079 | | 0.72894 | 0.73099 | 0.72126 | 0.61145 | 0.66659 | 0.33309 | 0.62859 | 0.68591 |
| 5 | 1.23202 | | 1.29190 | 1.29548 | 1.25983 | 1.07723 | 1.01449 | 0.63899 | 1.04794 | 0.97811 |
| 8 | 1.80241 | | 1.97138 | 1.97353 | 1.82024 | 0.83439 | 1.30773 | 0.71170 | 1.45307 | 1.22911 |
| 10 | 2.24220 | | 2.50754 | 2.50858 | 2.25713 | 0.95972 | 1.59993 | 0.97177 | 1.73385 | 1.59601 |
| WFG8 | 3 | 0.63543 | | 0.66560 | 0.66687 | 0.65741 | 0.62986 | 0.61394 | 0.24450 | 0.26792 | 0.61230 |
| 5 | 1.07350 | | 1.18225 | 1.18354 | 1.15376 | 0.95660 | 0.60364 | 0.46673 | 0.82273 | 0.96648 |
| 8 | 1.30584 | | 1.75970 | 1.76647 | 1.70621 | 0.30471 | 1.20786 | 0.67808 | 1.24044 | 1.28486 |
| 10 | 1.74660 | | 2.28203 | 2.28502 | 2.10729 | 0.27470 | 1.60952 | 0.82704 | 1.57781 | 1.69433 |
| WFG9 | 3 | 0.66696 | | 0.67519 | 0.67978 | 0.67146 | 0.57864 | 0.62177 | 0.25170 | 0.51403 | 0.62199 |
| 5 | 1.15289 | | 1.21058 | 1.22122 | 1.15493 | 1.02426 | 0.78608 | 0.53143 | 0.94420 | 0.92841 |
| 8 | 1.69746 | | 1.80911 | 1.83678 | 1.60407 | 0.97800 | 1.23897 | 0.72454 | 1.18318 | 1.07824 |
| 10 | 2.17765 | | 2.34332 | 2.36516 | 1.92977 | 1.15138 | 1.59168 | 0.86178 | 1.49927 | 1.42611 |
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| Problem | M | DBEA-DS | NSGA-III | $\theta$-DEA | MOEA/DD | MOEA/D-PBI | MOEA/D-Tch | MOEA/D-WS | MOEA/D-IPBI | NSGA-II |
| DTLZ1 | 3 | 0.04085 | 0.04362 | 0.04170 | 0.04138 | 0.04175 | 0.06082 | 0.50173 | 0.42397 | 0.06481 |
| 5 | 0.10797 | 0.11308 | 0.11125 | 0.11110 | 0.11128 | 0.22189 | 0.73685 | 6.52117 | 19.87954 |
| 8 | 0.21661 | 0.17984 | 0.17513 | 0.17541 | 0.17601 | 0.23603 | 0.72480 | 0.52039 | 75.18619 |
| 10 | 0.20406 | 0.19094 | 0.18527 | 0.18552 | 0.18611 | 0.23786 | 0.78417 | 0.49928 | 77.22337 |
| DTLZ2 | 3 | 0.05410 | 0.05799 | 0.05804 | 0.05801 | 0.05800 | 0.07318 | 0.54279 | 0.54641 | 0.07182 |
| 5 | 0.16794 | 0.19403 | 0.19363 | 0.19368 | 0.19368 | 0.32648 | 0.69062 | 0.93890 | 0.31393 |
| 8 | 0.37975 | 0.40062 | 0.39802 | 0.39575 | 0.39572 | 0.46026 | 0.94291 | 0.99204 | 1.90946 |
| 10 | 0.43399 | 0.46752 | 0.46462 | 0.46145 | 0.46120 | 0.53319 | 1.00370 | 1.05344 | 2.15108 |
| DTLZ3 | 3 | 0.05351 | 0.06261 | 0.05908 | 0.05824 | 0.05848 | 0.07349 | 0.54419 | 0.54800 | 0.07194 |
| 5 | 0.18360 | 0.19601 | 0.19496 | 0.19384 | 0.19400 | 0.32551 | 0.70566 | 40.98681 | 116.19480 |
| 8 | 0.45803 | 0.41225 | 0.40224 | 0.39694 | 0.46660 | 0.47438 | 0.94647 | 1.23378 | 348.09573 |
| 10 | 0.66578 | 0.46843 | 0.46545 | 0.46165 | 0.46321 | 0.53973 | 1.01331 | 1.12693 | 308.79409 |
| DTLZ4 | 3 | 0.05408 | 0.07550 | 0.10791 | 0.05800 | 0.45495 | 0.47158 | 0.83789 | 0.71489 | 0.07012 |
| 5 | 0.17325 | 0.19378 | 0.19373 | 0.19372 | 0.33507 | 0.45264 | 0.82880 | 0.89434 | 0.22875 |
| 8 | 0.39938 | 0.39672 | 0.39597 | 0.39534 | 0.53322 | 0.64479 | 0.95178 | 1.00074 | 2.11783 |
| 10 | 0.45677 | 0.46302 | 0.46191 | 0.46074 | 0.56608 | 0.61814 | 0.99026 | 1.05641 | 2.33543 |
| WFG1 | 3 | 0.37862 | 0.21258 | 0.18074 | 0.18377 | 0.20233 | 0.07600 | 0.20087 | 0.15597 | 0.16604 |
| 5 | 0.38576 | 0.29117 | 0.20606 | 0.17134 | 0.19663 | **0.08683** | 0.18288 | 0.18297 | 0.26815 |
| 8 | 0.38956 | 0.16839 | 0.07692 | **0.06678** | 0.08509 | 0.08045 | 0.10808 | 0.12427 | 0.33417 |
| 10 | 0.36936 | 0.08868 | 0.09112 | **0.07619** | 0.14610 | 0.10095 | 0.10556 | 0.11972 | 0.23599 |
| WFG2 | 3 | 0.31750 | 0.04072 | 0.03577 | 0.04866 | 0.08872 | 0.08739 | 0.17910 | 0.12579 | 0.05805 |
| 5 | 0.07906 | 0.05691 | 0.05685 | 0.08325 | 0.10423 | 0.15136 | 0.21243 | 0.20765 | 0.12767 |
| 8 | 0.29646 | 0.07015 | 0.08495 | 0.09183 | 0.09860 | 0.11937 | 0.13764 | 0.13030 | 0.19386 |
| 10 | 0.26440 | 0.05969 | 0.08920 | 0.09114 | 0.09578 | 0.11840 | 0.13169 | 0.12416 | 0.19704 |
| WFG3 | 3 | 0.11423 | 0.15399 | 0.28832 | 0.05425 | **0.03745** | 0.04070 | 0.20844 | 0.19232 | 0.05006 |
| 5 | 0.14467 | 0.09697 | 0.12176 | 0.12018 | **0.08618** | 0.15235 | 0.34998 | 0.28723 | 0.10195 |
| 8 | 0.20164 | 0.23351 | 0.56029 | **0.14305** | 0.22451 | 0.33536 | 0.56095 | 0.43524 | 0.15998 |
| 10 | 0.20538 | 0.16754 | 0.41979 | **0.15640** | 0.31725 | 0.39634 | 0.57148 | 0.55067 | 0.16206 |
| WFG4 | 3 | 0.05942 | 0.05818 | 0.05823 | 0.07217 | 0.07700 | 0.09484 | 0.52334 | 0.25250 | 0.07274 |
| 5 | 0.16924 | 0.19213 | 0.19223 | 0.26733 | 0.30864 | 0.41147 | 0.63375 | 0.42761 | 0.18244 |
| 8 | 0.36754 | 0.39954 | 0.39905 | 0.51790 | 0.72445 | 0.51843 | 0.85709 | 0.59237 | 0.37909 |
| 10 | 0.41973 | 0.46687 | 0.46624 | 0.66822 | 0.84257 | 0.58032 | 0.92412 | 0.70445 | 0.45848 |
| WFG5 | 3 | 0.06080 | 0.06216 | 0.06212 | 0.07543 | 0.07569 | 0.10004 | 0.52875 | 0.24320 | 0.07718 |
| 5 | 0.16315 | 0.18937 | 0.18935 | 0.25529 | 0.29036 | 0.40381 | 0.65914 | 0.41589 | 0.18139 |
| 8 | 0.36496 | 0.39141 | 0.39123 | 0.51273 | 0.67067 | 0.51038 | 0.81440 | 0.48871 | 0.36793 |
| 10 | 0.41725 | 0.45671 | 0.45638 | 0.65521 | 0.80237 | 0.56802 | 0.88882 | 0.55651 | 0.45670 |
| WFG6 | 3 | 0.06614 | 0.06237 | 0.06236 | 0.07542 | 0.08158 | 0.09964 | 0.53091 | 0.24512 | 0.08111 |
| 5 | 0.17112 | 0.18939 | 0.18942 | 0.26168 | 0.32816 | 0.40693 | 0.67423 | 0.41625 | 0.19635 |
| 8 | 0.38251 | 0.39279 | 0.39211 | 0.52623 | 0.84861 | 0.52593 | 0.92164 | 0.70887 | 0.40164 |
| 10 | 0.44311 | 0.45856 | 0.45750 | 0.66364 | 0.95099 | 0.57914 | 0.97505 | 0.81882 | 0.46819 |
| WFG7 | 3 | 0.05736 | 0.05858 | 0.05843 | 0.07272 | 0.10435 | 0.09461 | 0.53919 | 0.25365 | 0.07482 |
| 5 | 0.16835 | 0.19302 | 0.19308 | 0.26131 | 0.34346 | 0.40967 | 0.67685 | 0.42667 | 0.22350 |
| 8 | 0.37137 | 0.39970 | 0.39841 | 0.50986 | 0.81487 | 0.52613 | 0.92975 | 0.61293 | 0.43800 |
| 10 | 0.42670 | 0.46668 | 0.46543 | 0.63276 | 0.94246 | 0.59069 | 0.97643 | 0.65444 | 0.49155 |
| WFG8 | 3 | 0.07706 | 0.06858 | 0.06826 | 0.07974 | 0.08798 | 0.10758 | 0.53692 | 0.50862 | 0.09200 |
| 5 | 0.18385 | 0.19572 | 0.19568 | 0.27004 | 0.31288 | 0.51613 | 0.70712 | 0.51826 | 0.21824 |
| 8 | 0.41671 | 0.41691 | 0.41495 | 0.49936 | 0.80811 | 0.54876 | 0.92428 | 0.79070 | 0.43170 |
| 10 | 0.47393 | 0.50584 | 0.49280 | 0.64259 | 0.92544 | 0.62707 | 1.00382 | 0.86101 | 0.48245 |
| WFG9 | 3 | 0.06389 | 0.06403 | 0.06323 | 0.07385 | 0.10025 | 0.09920 | 0.50142 | 0.26204 | 0.08311 |
| 5 | 0.16523 | 0.18615 | 0.18634 | 0.24683 | 0.29613 | 0.47733 | 0.66154 | 0.44104 | 0.21086 |
| 8 | 0.36858 | 0.39688 | 0.39539 | 0.51814 | 0.71655 | 0.53759 | 0.85700 | 0.67375 | 0.45885 |
| 10 | 0.42117 | 0.46273 | 0.46209 | 0.66553 | 0.83358 | 0.60033 | 0.92832 | 0.73585 | 0.50534 |