The Supplementary Material of the Paper "Improving Decomposition-based MOEAs for Combinatorial Optimisation by Intensifying Corner Weights"

Table 1: MS results (mean and SD) of MOEA/D-CenWI and MOEA/D-CWI.

Problem	MOEA/D-CenWI	MOEA/D-CWI
KP $(2, D = 250)$	1.015E+03(4.6E+01)$^{+}$	**1.283E+03(1.7E+02)**
KP $(2, D = 500)$	1.875E+03(9.5E+01)$^{+}$	**2.116E+03(2.2E+02)**
KP $(3, D = 250)$	3.002E+03(1.3E+02)$^{\approx}$	**3.113E+03(5.3E+01)**
KP $(3, D = 500)$	4.426E+03(2.1E+02)$^{+}$	**5.200E+03(3.7E+02)**
NK $(2, K = 2)$	2.336E-01(2.7E-02)$^{+}$	**2.567E-01(2.5E-02)**
NK $(2, K = 3)$	2.007E-01(2.2E-02)$^{+}$	**2.402E-01(2.2E-02)**
NK $(2, K = 5)$	2.121E-01(3.7E-02)$^{+}$	**2.667E-01(3.2E-02)**
NK $(3, K = 2)$	4.097E-01(2.1E-02)$^{\approx}$	**4.181E-01(1.5E-02)**
NK $(3, K = 3)$	4.331E-01(1.5E-02)$^{\approx}$	**4.437E-01(2.1E-02)**
NK $(3, K = 5)$	4.196E-01(4.3E-02)$^{\approx}$	**4.248E-01(2.6E-02)**
TSP $(2, \rho = 0.2)$	6.457E+00(5.1E-01)$^{+}$	**7.990E+00(1.0E+00)**
TSP $(2, \rho = 0)$	8.908E+00(1.3E+00)$^{+}$	**1.189E+01(1.1E+00)**
TSP $(2, \rho = -0.2)$	1.498E+01(1.0E+00)$^{+}$	**1.779E+01(1.8E+00)**
TSP $(3, \rho = 0.2)$	1.648E+01(1.4E+00)$^{\approx}$	**1.698E+01(8.9E-01)**
TSP $(3, \rho = 0)$	2.192E+01(9.6E-01)$^{\approx}$	**2.218E+01(7.9E-01)**
TSP $(3, \rho = -0.2)$	2.897E+01(1.7E+00)$^{\approx}$	**2.959E+01(8.0E-01)**
$+/\approx/-$	9/7/0	-

The symbols $+, \approx$ and $-$ indicate that MOEA/D-CWI is statistically better than, equivalent to and worse than MOEA/D-CenWI at a 0.05 level by Wilcoxon's rank sum test. The better mean for each case is highlighted in boldface.

Table 2: MS results (mean and SD) of MOEA/D and MOEA/D-CWI.

Problem	MOEA/D	MOEA/D-CWI
KP $(2, D = 250)$	1.152E+03(2.2E+01)$^{+}$	**1.283E+03(1.7E+02)**
KP $(2, D = 500)$	2.037E+03(8.3E+01)$^{+}$	**2.116E+03(2.2E+02)**
KP $(3, D = 250)$	3.099E+03(2.5E+02)$^{\approx}$	**3.113E+03(5.3E+01)**
KP $(3, D = 500)$	4.624E+03(1.1E+02)$^{+}$	**5.200E+03(3.7E+02)**
NK $(2, K = 2)$	2.457E-01(5.2E-02)$^{+}$	**2.567E-01(2.5E-02)**
NK $(2, K = 3)$	2.119E-01(8.4E-02)$^{+}$	**2.402E-01(2.2E-02)**
NK $(2, K = 5)$	2.137E-01(1.2E-02)$^{+}$	**2.667E-01(3.2E-02)**
NK $(3, K = 2)$	4.092E-01(4.8E-02)$^{+}$	**4.181E-01(1.5E-02)**
NK $(3, K = 3)$	4.384E-01(9.1E-02)$^{\approx}$	**4.437E-01(2.1E-02)**
NK $(3, K = 5)$	4.186E-01(8.6E-02)$^{\approx}$	**4.248E-01(2.6E-02)**
TSP $(2, \rho = 0.2)$	6.747E+00(4.9E-01)$^{+}$	**7.990E+00(1.0E+00)**
TSP $(2, \rho = 0)$	8.935E+00(4.2E+00)$^{+}$	**1.189E+01(1.1E+00)**
TSP $(2, \rho = -0.2)$	1.611E+01(4.9E+00)$^{+}$	**1.779E+01(1.8E+00)**
TSP $(3, \rho = 0.2)$	1.670E+01(1.2E+00)$^{\approx}$	**1.698E+01(8.9E-01)**
TSP $(3, \rho = 0)$	2.184E+01(1.0E-01)$^{+}$	**2.218E+01(7.9E-01)**
TSP $(3, \rho = -0.2)$	2.883E+01(1.3E+00)$^{\approx}$	**2.959E+01(8.0E-01)**
$+/\approx/-$	11/5/0	-

The symbols $+, \approx$ and $-$ indicate that MOEA/D-CWI is statistically better than, equivalent to and worse than MOEA/D at a 0.05 level by Wilcoxon's rank sum test. The better mean for each case is highlighted in boldface.

Table 3: MS results (mean and SD) of the four algorithms.

Problem	NSGA-II	IBEA	NSGA-III	MOEA/D-CWI
KP ($m = 2, D = 250$)	**1.641E+03(4.5E+01)**$^{-}$	1.637E+03(2.5E+02)$^{-}$	1.581E+03(2.4E+02)$^{-}$	1.283E+03(1.7E+02)
KP ($m = 2, D = 500$)	1.975E+03(3.0E+02)$^{+}$	1.846E+03(2.8E+02)$^{+}$	1.786E+03(1.1E+02)$^{+}$	**2.116E+03(2.2E+02)**
KP ($m = 3, D = 250$)	2.975E+03(2.1E+02)$^{+}$	2.877E+03(1.8E+02)$^{+}$	2.866E+03(1.4E+02)$^{+}$	**3.113E+03(5.3E+01)**
KP ($m = 3, D = 500$)	4.901E+03(1.2E+02)$^{+}$	4.848E+03(3.3E+02)$^{+}$	4.804E+03(3.6E+01)$^{+}$	**5.200E+03(3.7E+02)**
NK ($m = 2, K = 2$)	**2.761E-01(5.1E-03)**$^{\approx}$	2.416E-01(1.5E-02)$^{\approx}$	2.446E-01(6.0E-03)$^{\approx}$	2.567E-01(2.5E-02)
NK ($m = 2, K = 3$)	2.231E-01(2.6E-02)$^{+}$	1.910E-01(4.4E-02)$^{+}$	2.082E-01(4.7E-02)$^{+}$	**2.402E-01(2.2E-02)**
NK ($m = 2, K = 5$)	2.605E-01(2.1E-02)$^{\approx}$	2.549E-01(4.8E-02)$^{\approx}$	2.603E-01(4.2E-02)$^{\approx}$	**2.667E-01(3.2E-02)**
NK ($m = 3, K = 2$)	3.927E-01(7.7E-03)$^{+}$	**4.367E-01(2.8E-02)**$^{\approx}$	3.972E-01(1.3E-02)$^{+}$	4.181E-01(1.5E-02)
NK ($m = 3, K = 3$)	4.292E-01(3.2E-02)$^{+}$	4.055E-01(2.7E-02)$^{+}$	4.260E-01(1.4E-02)$^{+}$	**4.437E-01(2.1E-02)**
NK ($m = 3, K = 5$)	4.319E-01(3.3E-02)$^{\approx}$	4.404E-01(2.8E-02)$^{\approx}$	**4.533E-01(4.5E-02)**$^{-}$	4.248E-01(2.6E-02)
TSP ($m = 2, \rho = 0.2$)	7.986E+00(4.9E-01)$^{\approx}$	7.568E+00(3.1E-01)$^{+}$	7.182E+00(8.9E-01)$^{+}$	**7.990E+00(1.0E+00)**
TSP ($m = 2, \rho = 0$)	**1.227E+01(1.0E+00)**$^{\approx}$	1.086E+01(9.7E-01)$^{\approx}$	1.143E+01(1.8E+00)$^{\approx}$	1.189E+01(1.1E+00)
TSP ($m = 2, \rho = -0.2$)	1.773E+01(1.4E+00)$^{\approx}$	1.504E+01(1.2E+00)$^{+}$	1.433E+01(9.9E-01)$^{+}$	**1.779E+01(1.8E+00)**
TSP ($m = 3, \rho = 0.2$)	1.587E+04(1.1E+00)$^{\approx}$	1.536E+04(6.2E-01)$^{\approx}$	1.539E+04(1.1E+00)$^{\approx}$	**1.698E+04(8.9E-01)**
TSP ($m = 3, \rho = 0$)	**2.228E+01(1.9E+00)**$^{\approx}$	1.993E+01(1.7E+00)$^{\approx}$	1.859E+01(1.5E+00)$^{\approx}$	2.218E+01(7.9E-01)
TSP ($m = 3, \rho = -0.2$)	2.726E+01(1.7E+00)$^{\approx}$	2.885E+01(1.6E+00)$^{\approx}$	2.808E+01(8.2E-01)$^{\approx}$	**2.959E+01(8.0E-01)**
$+/\approx/-$	6/9/1	7/8/1	8/6/2	-

The symbols $+, \approx$ and $-$ indicate that MOEA/D-CWI is statistically better than, equivalent to and worse than the peer algorithms at a 0.05 level by Wilcoxon's rank sum test. The best mean for each case is highlighted in boldface.

Table 4: MS results (mean and SD) of compared algorithms

Problem	MOEA/D-DRA-UT	MOEA/D-DRA-UT-CWI	MOEA/D-LdEA	MOEA/D-LdEA-CWI
KP ($2, D = 250$)	1.984E+03(2.0E+02)$^{+}$	**2.203E+03(9.6E+01)**	1.751E+03(8.5E+01)$^{+}$	**1.987E+03(3.1E+02)**
KP ($2, D = 500$)	**2.237E+03(1.7E+02)**$^{\approx}$	2.155E+03(2.2E+02)	2.285E+03(2.6E+02)$^{+}$	**2.551E+03(3.1E+02)**
KP ($3, D = 250$)	3.808E+03(1.9E+02)$^{\approx}$	**3.866E+03(1.5E+02)**	3.848E+03(3.3E+02)$^{\approx}$	**3.856E+03(2.6E+02)**
KP ($3, D = 500$)	4.634E+03(1.0E+02)$^{\approx}$	**4.682E+03(1.0E+02)**	4.699E+03(2.2E+02)$^{\approx}$	**4.711E+03(9.4E+02)**
NK ($2, K = 2$)	**2.882E-01(1.1E-02)**$^{\approx}$	2.837E-01(6.2E-03)	2.777E-01(3.8E-03)$^{+}$	**2.926E-01(3.1E-03)**
NK ($2, K = 3$)	2.358E-01(7.7E-03)$^{+}$	**2.632E-01(3.2E-02)**	2.389E-01(6.0E-03)$^{\approx}$	**2.484E-01(8.4E-03)**
NK ($2, K = 5$)	**2.863E-01(5.2E-02)**$^{\approx}$	2.780E-01(3.5E-02)	2.558E-01(7.7E-03)$^{\approx}$	**2.632E-01(3.2E-02)**
NK ($3, K = 2$)	4.759E-01(4.1E-03)$^{+}$	**4.912E-01(5.6E-03)**	4.922E-01(3.5E-03)$^{\approx}$	**4.940E-01(4.5E-03)**
NK ($3, K = 3$)	4.851E-01(7.6E-03)$^{\approx}$	**4.892E-01(8.5E-03)**	**4.951E-01(6.3E-03)**$^{\approx}$	4.914E-01(2.7E-03)
NK ($3, K = 5$)	4.956E-01(6.1E-03)$^{\approx}$	**4.964E-01(8.2E-03)**	4.951E-01(7.9E-03)$^{\approx}$	**5.012E-01(1.4E-02)**
TSP ($2, \rho = 0.2$)	6.767E+00(4.6E+00)$^{+}$	**7.792E+00(3.8E+00)**	6.335E+00(1.8E+00)$^{+}$	**7.284E+00(1.2E+00)**
TSP ($2, \rho = 0$)	9.101E+00(4.2E+00)$^{\approx}$	**9.122E+00(3.5E+00)**	9.266E+00(6.2E+00)$^{\approx}$	**9.268E+00(4.5E+00)**
TSP ($2, \rho = -0.2$)	1.643E+01(5.7E+00)$^{\approx}$	**1.692E+01(4.7E+00)**	1.897E+01(1.3E+00)$^{+}$	**1.950E+01(1.4E+00)**
TSP ($3, \rho = 0.2$)	1.669E+01(1.2E+02)$^{\approx}$	**1.688E+01(1.1E+02)**	1.620E+01(1.8E+02)$^{\approx}$	**1.626E+01(1.3E+02)**
TSP ($3, \rho = 0$)	2.393E+01(1.0E+02)$^{+}$	**2.404E+01(1.0E+02)**	2.909E+01(1.4E+02)$^{\approx}$	**2.922E+01(2.1E+02)**
TSP ($3, \rho = -0.2$)	2.999E+01(1.4E+02)$^{\approx}$	**3.001E+01(1.3E+02)**	2.611E+01(2.3E+02)$^{\approx}$	**2.624E+01(3.4E+02)**
$+/\approx/-$	5/11/0		5/11/0	

The symbols $+, \approx$ and $-$ indicate that MOEA/D-DRA-UT-CWI (MOEA/D-LdEA-CWI) is statistically better than, equivalent to and worse than MOEA/D-DRA-UT (MOEA/D-LdEA) at a 0.05 level by Wilcoxon's rank sum test. The better mean for each case is highlighted in boldface.

Table 5: MS results (mean and SD) of compared algorithms on the multi-objective NRP.

Problem	MOEA/D-DRA-UT	MOEA/D-DRA-UT-CWI	MOEA/D-LdEA	MOEA/D-LdEA-CWI
NRP ($c = 15, D = 40$)	0.493(0.018)$^{\approx}$	**0.507(0.027)**	0.550(0.029)$^{\approx}$	**0.552(0.021)**
NRP ($c = 50, D = 80$)	0.484(0.027)$^{+}$	**0.530(0.066)**	0.587(0.047)$^{\approx}$	**0.589(0.028)**
NRP ($c = 2, D = 200$)	0.540(0.016)$^{\approx}$	**0.542(0.020)**	0.587(0.040)$^{+}$	**0.596(0.023)**
NRP ($c = 100, D = 20$)	0.509(0.010)$^{+}$	**0.522(0.042)**	0.541(0.018)$^{+}$	**0.564(0.011)**
NRP ($c = 100, D = 25$)	0.475(0.016)$^{+}$	**0.497(0.037)**	0.576(0.018)$^{\approx}$	**0.587(0.027)**
NRP ($c = 100, D = 140$)	0.540(0.022)$^{\approx}$	**0.548(0.011)**	0.552(0.032)$^{+}$	**0.577(0.017)**
$+/\approx/-$	3/3/0		3/3/0	

The symbols $+, \approx$ and $-$ indicate that MOEA/D-DRA-UT-CWI (MOEA/D-LdEA-CWI) is statistically better than, equivalent to and worse than MOEA/D-DRA-UT (MOEA/D-LdEA) at a 0.05 level by Wilcoxon's rank sum test. The better mean for each case is highlighted in boldface.