

Table 1: Performance Results for Zakharov_2D Problem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
L-BFGS-MoreThuente	7.07e-9	1.81e-9	3.76e-9	9.71e-9	67.3	100.0	0.001
QQN-Bisection-2	9.02e-14	2.34e-13	4.37e-17	9.97e-13	84.0	100.0	0.002
QQN-CubicQuadraticInterpolation	1.52e-9	3.10e-9	1.85e-11	9.62e-9	89.2	100.0	0.003
QQN-StrongWolfe	4.83e-9	2.70e-9	1.51e-9	9.93e-9	95.0	100.0	0.003
QQN-Bisection-1	7.75e-14	8.83e-14	9.76e-18	3.54e-13	114.6	100.0	0.002
QQN-GoldenSection	7.14e-11	3.11e-10	5.21e-21	1.43e-9	180.9	100.0	0.003
GD	9.76e-9	9.66e-11	9.61e-9	9.97e-9	417.4	100.0	0.011
Adam-WeightDecay	9.88e-9	7.13e-11	9.74e-9	9.97e-9	2040.6	100.0	0.043
L-BFGS-Limited	6.46e-7	2.30e-6	1.04e-9	1.04e-5	658.2	90.0	0.012
L-BFGS-Conservative	6.39e-7	1.89e-6	5.41e-10	6.44e-6	863.5	75.0	0.022
L-BFGS-Aggressive	3.75e0	5.80e0	4.91e-10	1.50e1	1213.0	70.0	0.007
L-BFGS	2.88e-2	5.11e-2	5.69e-10	1.73e-1	158.7	60.0	0.003
GD-WeightDecay	8.53e-2	5.34e-2	8.63e-9	1.56e-1	47.9	25.0	0.002
Adam	1.77e-3	1.69e-3	5.24e-5	6.40e-3	2502.0	0.0	0.050
Adam-Robust	3.83e-2	2.87e-2	6.91e-3	1.35e-1	2502.0	0.0	0.058
Trust Region-Precise	6.91e-2	9.24e-2	8.62e-3	4.38e-1	503.2	0.0	0.003
Trust Region-Conservative	8.84e-1	1.50e0	1.05e-2	6.57e0	2569.1	0.0	0.016
Trust Region-Adaptive	4.96e3	2.16e4	3.14e-2	9.91e4	121.0	0.0	0.001
Adam-AMSGrad	9.29e-2	2.94e-2	4.85e-2	1.34e-1	2502.0	0.0	0.056
Trust Region-Standard	2.38e0	4.10e0	1.22e-1	1.46e1	38.3	0.0	0.000
Adam-Fast	2.81e-1	1.57e-2	2.54e-1	3.10e-1	37.5	0.0	0.001
GD-AdaptiveMomentum	7.05e-1	1.56e-1	4.12e-1	1.03e0	16.6	0.0	0.001
GD-Nesterov	6.00e-1	7.84e-2	5.01e-1	7.53e-1	16.7	0.0	0.001
Trust Region-Aggressive	5.16e4	2.24e5	5.33e-1	1.03e6	18.9	0.0	0.000
GD-Momentum	1.08e0	1.28e-1	8.96e-1	1.34e0	17.1	0.0	0.000