

Table 1: Performance Results for Sphere\_2D Problem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
<b>L-BFGS-Aggressive</b>	0.00e0	0.00e0	0.00e0	0.00e0	10.0	100.0	0.000
L-BFGS-MoreThuente	0.00e0	0.00e0	0.00e0	0.00e0	10.0	100.0	0.000
QQN-StrongWolfe	0.00e0	0.00e0	0.00e0	0.00e0	11.0	100.0	0.000
QQN-CubicQuadraticInterpolation	0.00e0	0.00e0	0.00e0	0.00e0	12.0	100.0	0.000
QQN-Bisection-2	0.00e0	0.00e0	0.00e0	0.00e0	13.0	100.0	0.000
L-BFGS	8.79e-5	3.32e-4	0.00e0	1.51e-3	13.5	100.0	0.000
QQN-Bisection-1	0.00e0	0.00e0	0.00e0	0.00e0	15.0	100.0	0.000
GD-Nesterov	2.51e-3	2.02e-3	2.83e-4	4.93e-3	16.4	100.0	0.000
GD-Momentum	4.85e-4	1.02e-3	1.93e-4	4.95e-3	16.9	100.0	0.001
L-BFGS-Limited	1.24e-3	1.70e-3	0.00e0	4.92e-3	23.1	100.0	0.000
QQN-GoldenSection	3.22e-14	4.92e-15	2.46e-14	3.96e-14	46.0	100.0	0.000
GD-WeightDecay	4.67e-3	1.71e-4	4.31e-3	4.95e-3	51.6	100.0	0.002
GD	4.93e-3	5.43e-5	4.81e-3	5.00e-3	152.6	100.0	0.004
L-BFGS-Conservative	4.28e-3	6.13e-4	2.80e-3	4.97e-3	156.2	100.0	0.004
Trust Region-Conservative	1.69e-3	1.41e-3	2.11e-4	4.46e-3	602.0	100.0	0.004
Adam-WeightDecay	4.98e-3	2.03e-5	4.94e-3	5.00e-3	1113.1	100.0	0.024
GD-AdaptiveMomentum	2.05e-1	2.50e-1	2.68e-5	5.53e-1	13.8	60.0	0.000
Trust Region-Precise	6.58e-1	7.91e-1	5.18e-6	2.79e0	115.3	55.0	0.001
Adam	7.60e-3	2.83e-3	4.96e-3	1.28e-2	2432.4	40.0	0.049
Trust Region-Adaptive	6.68e2	6.05e2	1.21e-5	1.22e3	41.1	35.0	0.000
Trust Region-Aggressive	7.95e3	5.21e3	2.26e-5	1.15e4	18.6	30.0	0.000
Adam-Fast	8.78e-2	5.67e-2	2.82e-4	1.34e-1	33.5	30.0	0.001
Trust Region-Standard	1.25e3	2.01e3	7.55e-4	6.04e3	27.1	10.0	0.000
Adam-Robust	5.86e-2	2.41e-2	2.27e-2	1.25e-1	2502.0	0.0	0.056
Adam-AMSGrad	7.20e-2	3.21e-2	2.82e-2	1.30e-1	2502.0	0.0	0.055