

Table 1: Performance Results for Sphere_10D Problem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
Adam-Robust	1.08e-1	3.40e-2	4.84e-2	1.71e-1	2502.0	0.0	0.061
Adam-AMSGrad	2.64e-1	4.59e-2	1.95e-1	3.63e-1	2502.0	0.0	0.060
Adam	4.98e-3	5.65e-5	4.94e-3	5.21e-3	2391.8	95.0	0.052
Adam-WeightDecay	4.92e-3	3.21e-5	4.88e-3	4.98e-3	968.0	100.0	0.022
Trust Region-Conservative	3.41e-1	3.63e-1	1.07e-3	1.34e0	2968.8	35.0	0.020
GD	4.91e-3	5.40e-5	4.82e-3	5.00e-3	192.4	100.0	0.005
L-BFGS-Conservative	4.51e-3	2.33e-4	4.20e-3	4.95e-3	197.5	100.0	0.005
Trust Region-Precise	5.27e-1	7.84e-1	1.01e-4	2.83e0	504.0	65.0	0.004
GD-WeightDecay	4.61e-3	1.67e-4	4.33e-3	4.92e-3	62.5	100.0	0.002
Trust Region-Adaptive	7.30e2	5.96e2	2.03e-4	1.22e3	139.3	30.0	0.001
Adam-Fast	6.12e-1	2.40e-2	5.73e-1	6.56e-1	37.4	0.0	0.001
L-BFGS-Limited	1.08e-3	1.10e-3	5.57e-7	4.03e-3	40.3	100.0	0.001
GD-AdaptiveMomentum	5.51e-1	6.74e-1	2.42e-4	1.41e0	18.4	60.0	0.001
GD-Nesterov	1.59e-1	2.14e-1	1.53e-5	4.62e-1	19.9	65.0	0.001
GD-Momentum	1.70e-1	2.92e-1	2.45e-5	7.34e-1	19.4	75.0	0.001
Trust Region-Standard	6.75e2	1.25e3	2.86e-5	6.06e3	51.8	15.0	0.000
Trust Region-Aggressive	1.09e4	1.85e3	5.34e3	1.18e4	30.3	0.0	0.000
QQN-GoldenSection	1.60e-13	1.03e-14	1.45e-13	1.79e-13	46.0	100.0	0.000
L-BFGS	0.00e0	0.00e0	0.00e0	0.00e0	15.0	100.0	0.000
QQN-Bisection-2	0.00e0	0.00e0	0.00e0	0.00e0	13.0	100.0	0.000
QQN-Bisection-1	0.00e0	0.00e0	0.00e0	0.00e0	15.0	100.0	0.000
QQN-CubicQuadraticInterpolation	0.00e0	0.00e0	0.00e0	0.00e0	12.0	100.0	0.000
QQN-StrongWolfe	0.00e0	0.00e0	0.00e0	0.00e0	11.0	100.0	0.000
L-BFGS-MoreThuente	0.00e0	0.00e0	0.00e0	0.00e0	10.0	100.0	0.000
L-BFGS-Aggressive	0.00e0	0.00e0	0.00e0	0.00e0	10.0	100.0	0.000