

Table 1: Performance Results for Trigonometric\10DProblem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
QQN-Backtracking	$7.18 \times 10^{-4}$	$3.13 \times 10^{-3}$	$9.84 \times 10^{-17}$	$1.44 \times 10^{-2}$	306.9	95.0	0.011
GD-WeightDecay	$4.70 \times 10^{-3}$	$1.90 \times 10^{-2}$	$3.26 \times 10^{-10}$	$8.75 \times 10^{-2}$	210.1	85.0	0.009
QQN-StrongWolfe	$1.28 \times 10^{-2}$	$3.70 \times 10^{-2}$	$1.17 \times 10^{-15}$	$1.67 \times 10^{-1}$	403.7	65.0	0.014
QQN-Bisection-2	$3.63 \times 10^{-3}$	$8.40 \times 10^{-3}$	$5.41 \times 10^{-15}$	$2.76 \times 10^{-2}$	258.4	30.0	0.007
QQN-Bisection-1	$9.38 \times 10^{-3}$	$2.02 \times 10^{-2}$	$3.14 \times 10^{-15}$	$8.28 \times 10^{-2}$	485.4	20.0	0.015
GD	$4.24 \times 10^{-3}$	$1.18 \times 10^{-2}$	$5.96 \times 10^{-7}$	$5.21 \times 10^{-2}$	335.0	0.0	0.012
QQN-GoldenSection	$2.48 \times 10^{-2}$	$4.68 \times 10^{-2}$	$5.99 \times 10^{-7}$	$2.48 \times 10^{-1}$	909.8	0.0	0.016
L-BFGS-Conservative	$2.51 \times 10^{-2}$	$5.35 \times 10^{-2}$	$7.44 \times 10^{-7}$	$2.36 \times 10^{-1}$	701.5	0.0	0.012
Adam-WeightDecay	$4.74 \times 10^{-2}$	$6.94 \times 10^{-2}$	$5.60 \times 10^{-5}$	$3.09 \times 10^{-1}$	493.1	0.0	0.014
Adam-Fast	$5.19 \times 10^{-2}$	$7.92 \times 10^{-2}$	$2.27 \times 10^{-6}$	$2.81 \times 10^{-1}$	123.8	0.0	0.003
QQN-CubicQuadraticInterpolation	$1.30 \times 10^{-1}$	$1.32 \times 10^{-1}$	$3.64 \times 10^{-3}$	$6.49 \times 10^{-1}$	389.8	0.0	0.017
GD-Nesterov	$1.59 \times 10^{-1}$	$5.70 \times 10^{-2}$	$8.15 \times 10^{-2}$	$2.97 \times 10^{-1}$	51.0	0.0	0.002
Trust Region-Adaptive	$2.01 \times 10^{-1}$	$1.15 \times 10^{-1}$	$4.21 \times 10^{-2}$	$4.08 \times 10^{-1}$	126.5	0.0	0.001
QQN-MoreThuente	$4.17 \times 10^{-1}$	1.17	$1.30 \times 10^{-6}$	4.29	500.2	0.0	0.013
Adam-AMSGrad	$6.02 \times 10^{-1}$	$5.10 \times 10^{-1}$	$2.35 \times 10^{-2}$	1.95	502.0	0.0	0.015
Trust Region-Standard	$6.45 \times 10^{-1}$	$3.67 \times 10^{-1}$	$7.82 \times 10^{-2}$	1.65	36.4	0.0	0.000
Adam	$6.52 \times 10^{-1}$	$5.74 \times 10^{-1}$	$5.24 \times 10^{-2}$	2.34	502.0	0.0	0.013
GD-Momentum	$7.71 \times 10^{-1}$	1.24	$3.85 \times 10^{-4}$	3.50	49.0	0.0	0.002
Trust Region-Conservative	9.04	3.56	3.43	$1.45 \times 10^1$	602.0	0.0	0.006
L-BFGS-Aggressive	$1.04 \times 10^1$	2.89	5.25	$1.56 \times 10^1$	772.0	0.0	0.007
L-BFGS	$4.09 \times 10^1$	$4.80 \times 10^1$	7.07	$1.75 \times 10^2$	72.4	0.0	0.001