

Table 1: Performance Results for PenaltyI\10Dn\_alpha1e6Problem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
QQN-GoldenSection	5.63	$9.55 \times 10^{-4}$	5.63	5.63	908.6	0.0	0.015
QQN-Bisection-1	5.64	$2.68 \times 10^{-3}$	5.63	5.64	444.6	0.0	0.012
GD	8.58	$1.63 \times 10^1$	5.68	$1.10 \times 10^2$	18.4	0.0	0.000
Adam-WeightDecay	9.72	4.69	5.73	$2.03 \times 10^1$	272.2	0.0	0.006
GD-WeightDecay	$1.88 \times 10^1$	$2.64 \times 10^1$	6.97	$1.07 \times 10^2$	16.0	0.0	0.000
QQN-Bisection-2	$2.26 \times 10^1$	6.82	$1.18 \times 10^1$	$4.42 \times 10^1$	549.2	0.0	0.011
QQN-Backtracking	$2.41 \times 10^1$	8.76	$1.13 \times 10^1$	$4.56 \times 10^1$	707.1	0.0	0.019
QQN-StrongWolfe	$2.91 \times 10^1$	$1.13 \times 10^1$	$1.23 \times 10^1$	$5.49 \times 10^1$	588.8	0.0	0.015
QQN-CubicQuadraticInterpolation	$4.03 \times 10^1$	$2.31 \times 10^1$	$1.18 \times 10^1$	$1.05 \times 10^2$	396.8	0.0	0.014
GD-Nesterov	$1.05 \times 10^2$	$2.02 \times 10^2$	6.71	$6.31 \times 10^2$	14.7	0.0	0.000
GD-Momentum	$3.89 \times 10^2$	$5.48 \times 10^2$	7.20	$1.97 \times 10^3$	15.2	0.0	0.000
Adam-Fast	$1.46 \times 10^3$	$2.40 \times 10^3$	7.26	$1.30 \times 10^4$	28.9	0.0	0.001
Adam-AMSGrad	$6.14 \times 10^4$	$2.76 \times 10^4$	$1.80 \times 10^4$	$1.15 \times 10^5$	502.0	0.0	0.012
Adam	$6.20 \times 10^4$	$3.53 \times 10^4$	$1.37 \times 10^3$	$1.42 \times 10^5$	502.0	0.0	0.011
QQN-MoreThuente	$1.25 \times 10^5$	$2.64 \times 10^4$	$7.51 \times 10^4$	$1.72 \times 10^5$	487.0	0.0	0.009
L-BFGS-Conservative	$2.09 \times 10^5$	$9.09 \times 10^5$	5.62	$4.17 \times 10^6$	681.9	0.0	0.008
L-BFGS	$2.73 \times 10^5$	$3.26 \times 10^5$	$1.18 \times 10^1$	$1.09 \times 10^6$	117.4	0.0	0.001
L-BFGS-Aggressive	$3.72 \times 10^5$	$3.87 \times 10^5$	8.09	$1.01 \times 10^6$	387.1	0.0	0.003
Trust Region-Standard	$7.17 \times 10^5$	$1.75 \times 10^5$	$4.22 \times 10^5$	$1.12 \times 10^6$	602.0	0.0	0.004
Trust Region-Conservative	$7.66 \times 10^5$	$1.70 \times 10^5$	$3.81 \times 10^5$	$1.09 \times 10^6$	602.0	0.0	0.004
Trust Region-Adaptive	$7.78 \times 10^5$	$1.59 \times 10^5$	$4.78 \times 10^5$	$1.05 \times 10^6$	602.0	0.0	0.004