

Table 1: Performance Results for Levy_5D Problem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
QQN-StrongWolfe	3.31e-7	3.09e-7	1.45e-9	9.50e-7	69.2	100.0	0.002
QQN-CubicQuadraticInterpolation	2.65e-7	2.41e-7	2.28e-9	8.78e-7	96.0	100.0	0.003
QQN-Bisection-2	2.16e-7	2.19e-7	1.51e-10	8.82e-7	101.3	100.0	0.002
QQN-Bisection-1	3.74e-7	3.37e-7	4.32e-9	9.98e-7	103.4	100.0	0.003
L-BFGS-MoreThuente	6.91e-7	2.89e-7	1.12e-9	9.44e-7	296.9	100.0	0.006
L-BFGS-Conservative	6.68e-7	2.83e-7	1.69e-8	9.92e-7	332.8	100.0	0.008
QQN-GoldenSection	2.57e-7	2.61e-7	1.77e-10	8.61e-7	382.3	100.0	0.007
GD-WeightDecay	9.96e-7	2.36e-9	9.93e-7	1.00e-6	1448.8	100.0	0.048
L-BFGS	4.35e-2	1.89e-1	2.47e-7	8.69e-1	173.6	80.0	0.004
L-BFGS-Aggressive	2.73e-2	8.04e-2	6.19e-7	2.69e-1	825.3	75.0	0.012
L-BFGS-Limited	2.87e-4	1.19e-3	2.75e-7	5.49e-3	1375.8	70.0	0.024
Adam-WeightDecay	1.43e-6	8.78e-7	9.65e-7	3.66e-6	2087.2	60.0	0.050
GD-Nesterov	9.57e-2	5.82e-2	9.78e-7	1.77e-1	102.2	25.0	0.003
GD-Momentum	1.72e-1	6.34e-2	9.75e-7	2.44e-1	56.5	10.0	0.002
GD	2.32e-4	2.08e-5	1.98e-4	2.68e-4	1668.0	0.0	0.044
Trust Region-Standard	2.49e0	5.26e0	4.43e-4	2.47e1	26.4	0.0	0.000
Adam	7.73e-3	2.59e-3	3.13e-3	1.23e-2	2502.0	0.0	0.054
Trust Region-Conservative	1.23e-2	2.42e-3	8.28e-3	1.73e-2	996.6	0.0	0.007
Trust Region-Precise	3.62e-2	1.15e-2	1.69e-2	5.90e-2	168.1	0.0	0.001
Adam-Robust	6.80e-2	2.38e-2	3.18e-2	1.12e-1	2502.0	0.0	0.061
Trust Region-Adaptive	1.06e1	3.16e1	4.60e-2	1.07e2	46.9	0.0	0.000
Adam-AMSGrad	7.64e-2	1.84e-2	5.66e-2	1.23e-1	2502.0	0.0	0.061
Adam-Fast	1.67e-1	6.57e-3	1.54e-1	1.81e-1	37.0	0.0	0.001
Trust Region-Aggressive	4.37e-1	1.99e-1	1.82e-1	1.11e0	8.2	0.0	0.000
GD-AdaptiveMomentum	4.77e-1	4.91e-2	3.80e-1	5.58e-1	19.2	0.0	0.001