

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)
<b>QQN-Bisection-1</b>	$4.50 \times 10^{-14}$	$5.88 \times 10^{-14}$	$1.56 \times 10^{-16}$	$2.42 \times 10^{-13}$	142.4	100.0	0.004
QQN-Bisection-2	$6.50 \times 10^{-14}$	$9.60 \times 10^{-14}$	$1.14 \times 10^{-16}$	$4.02 \times 10^{-13}$	139.6	100.0	0.004
QQN-StrongWolfe	$1.06 \times 10^{-12}$	$1.41 \times 10^{-12}$	$1.98 \times 10^{-16}$	$3.80 \times 10^{-12}$	137.2	100.0	0.005
QQN-Backtracking	$2.48 \times 10^{-12}$	$1.31 \times 10^{-12}$	$7.42 \times 10^{-16}$	$3.98 \times 10^{-12}$	222.8	100.0	0.009
QQN-CubicQuadraticInterpolation	$1.55 \times 10^{-13}$	$4.02 \times 10^{-13}$	$9.49 \times 10^{-17}$	$2.58 \times 10^{-12}$	261.1	97.5	0.010
QQN-GoldenSection	$8.51 \times 10^{-14}$	$1.48 \times 10^{-13}$	$5.77 \times 10^{-18}$	$9.59 \times 10^{-13}$	531.4	96.7	0.010
QQN-MoreThuente	$1.34 \times 10^{-13}$	$1.62 \times 10^{-13}$	$7.35 \times 10^{-16}$	$5.96 \times 10^{-13}$	241.3	95.0	0.006
L-BFGS	$3.86 \times 10^{-2}$	$7.48 \times 10^{-2}$	$1.73 \times 10^{-13}$	$2.82 \times 10^{-1}$	361.9	20.0	0.008
L-BFGS-Aggressive	$2.60 \times 10^{-2}$	$6.71 \times 10^{-2}$	$1.11 \times 10^{-12}$	$2.69 \times 10^{-1}$	712.6	12.5	0.012
L-BFGS-Conservative	$2.10 \times 10^{-8}$	$2.75 \times 10^{-8}$	$5.67 \times 10^{-10}$	$9.08 \times 10^{-8}$	557.6	0.0	0.014
GD-WeightDecay	$2.07 \times 10^{-3}$	$3.49 \times 10^{-4}$	$1.67 \times 10^{-3}$	$2.69 \times 10^{-3}$	335.0	0.0	0.011
GD	$1.64 \times 10^{-2}$	$3.86 \times 10^{-3}$	$1.14 \times 10^{-2}$	$2.41 \times 10^{-2}$	335.0	0.0	0.009
GD-Nesterov	$6.53 \times 10^{-2}$	$7.38 \times 10^{-2}$	$7.05 \times 10^{-7}$	$1.81 \times 10^{-1}$	196.2	0.0	0.006
Trust Region-Adaptive	$8.95 \times 10^{-2}$	$6.77 \times 10^{-2}$	$3.44 \times 10^{-2}$	$3.43 \times 10^{-1}$	46.0	0.0	0.000
Adam-Fast	$1.68 \times 10^{-1}$	$8.13 \times 10^{-3}$	$1.52 \times 10^{-1}$	$1.81 \times 10^{-1}$	37.3	0.0	0.001
GD-Momentum	$1.88 \times 10^{-1}$	$3.21 \times 10^{-2}$	$1.31 \times 10^{-1}$	$2.61 \times 10^{-1}$	26.9	0.0	0.001
Adam-WeightDecay	$3.51 \times 10^{-1}$	$8.53 \times 10^{-2}$	$1.92 \times 10^{-1}$	$4.78 \times 10^{-1}$	502.0	0.0	0.011
Trust Region-Conservative	1.22	$2.09 \times 10^{-1}$	$8.69 \times 10^{-1}$	1.77	602.0	0.0	0.004
Adam	1.93	$2.88 \times 10^{-1}$	1.45	2.59	502.0	0.0	0.011
Adam-AMSGrad	2.06	$2.88 \times 10^{-1}$	1.62	2.61	502.0	0.0	0.012
Trust Region-Standard	4.38	8.65	$1.90 \times 10^{-2}$	$2.78 \times 10^1$	21.8	0.0	0.000