

Table 1: Performance Results for Michalewicz_2D_m10 Problem

Optimizer	Mean Final Value	Std Dev	Best Value	Worst Value	Mean Func Evals	Success Rate (%)	Mean Time (s)
QQN-Bisection-1	-1.99e-2	8.69e-2	-3.99e-1	-1.17e-13	1278.7	0.0	0.036
Adam	-4.98e-1	4.98e-1	-9.97e-1	-2.05e-12	1642.0	50.0	0.032
QQN-StrongWolfe	-4.01e-2	1.75e-1	-8.01e-1	-8.45e-13	1192.1	0.0	0.031
QQN-Bisection-2	-4.01e-2	1.75e-1	-8.01e-1	-4.27e-14	1074.5	0.0	0.027
QQN-GoldenSection	-7.52e-7	2.11e-6	-9.60e-6	-8.52e-13	1573.8	0.0	0.026
Adam-Fast	-4.71e-1	4.78e-1	-1.00e0	-4.63e-13	1058.0	40.0	0.021
L-BFGS-Aggressive	-8.97e-2	2.69e-1	-8.97e-1	-2.07e-13	1145.5	0.0	0.015
L-BFGS-Conservative	-7.20e-7	2.35e-6	-1.07e-5	-2.95e-14	838.7	0.0	0.014
GD-WeightDecay	-3.24e-6	7.04e-6	-2.45e-5	-3.78e-13	423.0	0.0	0.013
L-BFGS	-9.99e-2	3.00e-1	-1.00e0	-4.83e-13	802.0	10.0	0.013
L-BFGS-MoreThuente	-2.50e-1	4.32e-1	-1.00e0	-4.09e-13	752.4	25.0	0.010
GD-Nesterov	-9.98e-2	2.99e-1	-9.99e-1	-3.87e-13	272.0	10.0	0.008
GD	-1.16e-6	2.04e-6	-7.38e-6	-3.67e-14	252.8	0.0	0.006
L-BFGS-Limited	-2.50e-1	4.32e-1	-1.00e0	-3.18e-14	466.0	25.0	0.006
Adam-AMSGrad	-2.99e-1	4.57e-1	-9.96e-1	-1.10e-12	192.4	30.0	0.004
GD-Momentum	-3.25e-2	1.42e-1	-6.49e-1	-6.08e-14	42.9	0.0	0.001
GD-AdaptiveMomentum	-5.00e-2	2.18e-1	-9.99e-1	-6.90e-14	29.5	5.0	0.001
QQN-CubicQuadraticInterpolation	-5.13e-7	2.19e-6	-1.00e-5	-4.20e-14	19.1	0.0	0.001
Adam-Robust	-3.65e-7	9.47e-7	-3.26e-6	-9.07e-14	13.0	0.0	0.000
Adam-WeightDecay	-3.49e-7	6.17e-7	-2.33e-6	-7.24e-14	13.0	0.0	0.000
Trust Region-Precise	-7.80e-7	1.28e-6	-4.71e-6	-4.65e-14	4.5	0.0	0.000
Trust Region-Conservative	-8.81e-7	3.16e-6	-1.46e-5	-1.54e-13	4.3	0.0	0.000
Trust Region-Adaptive	-4.40e-7	7.97e-7	-2.59e-6	-3.25e-14	4.3	0.0	0.000
Trust Region-Aggressive	-5.33e-7	1.94e-6	-8.89e-6	-6.50e-14	4.2	0.0	0.000
Trust Region-Standard	-6.09e-7	2.15e-6	-9.91e-6	-1.36e-13	4.2	0.0	0.000