

Table 1: Optimizer Family Comparison Matrix

QQN Family	Adam	GD	L-BFGS	Trust Region
QQN	43W-3L-13T	35W-8L-16T	38W-0L-21T	47W-0L-12T

**Legend:** W = Wins (statistically significant better performance), L = Losses (statistically significant worse performance), T = Ties (no significant difference). Green indicates QQN family dominance, red indicates non-QQN family dominance.