

Table 1: Optimizer Family Comparison Matrix

QQN Family	Adam	GD	L-BFGS	Trust Region
QQN	47W-4L-8T	35W-7L-17T	39W-1L-19T	49W-0L-10T

**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.