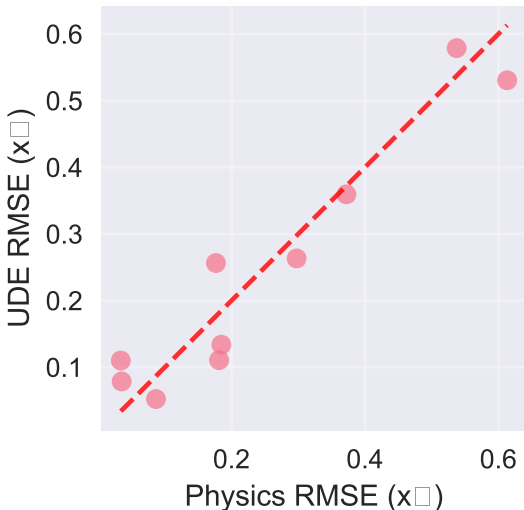


UDE vs Physics (RMSE, $\times 10^3$)

$N=10$, $\Delta=-0.0045$ (95% CI: [-0.0393, 0.0308])

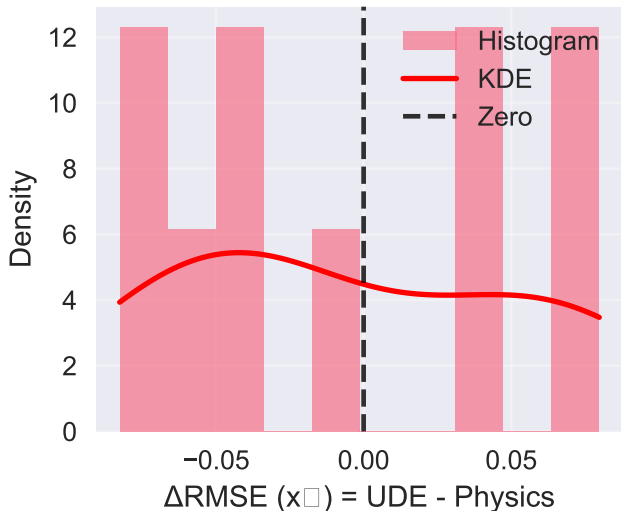
Wilcoxon $p=0.9219$, Cohen's $d_z=-0.0747$



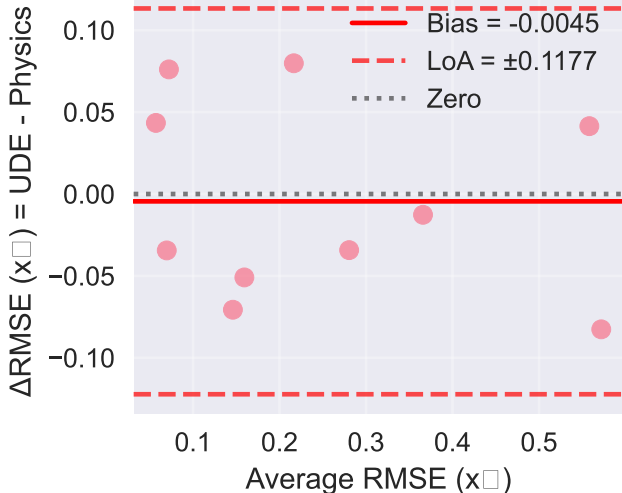
Distribution of $\Delta RMSE$ (x_{\square})

N=10, mean Δ =-0.0045 (95% CI: [-0.0393, 0.0308])

p=0.9219, dz=-0.0747



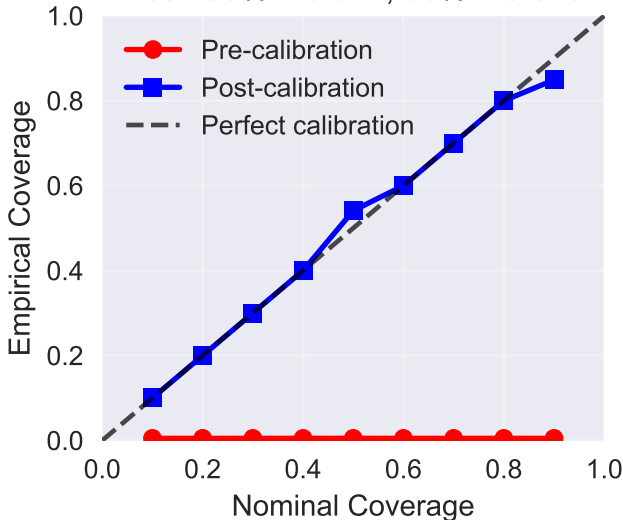
Bland-Altman Plot (RMSE x \square)
 Bias = -0.0045, LoA = [-0.1222, 0.1133]
 Above zero: 4, Below zero: 6 (N=10)



BNODE Calibration (Pre vs Post)

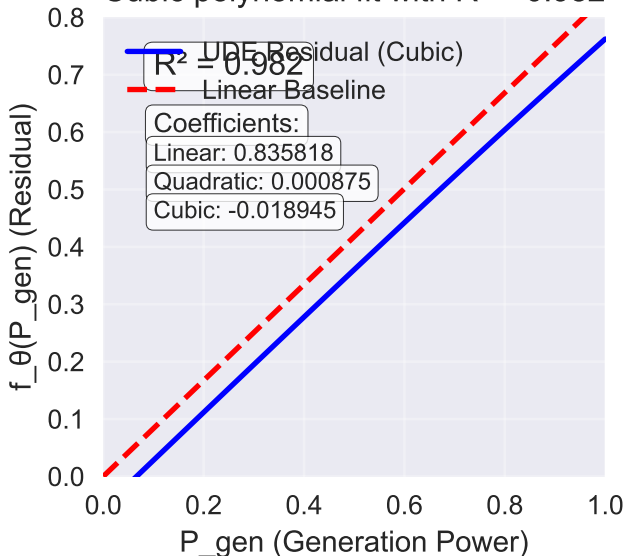
Pre: 50% = 0.005, 90% = 0.005

Post: 50% = 0.541, 90% = 0.849



Symbolic Extraction: UDE Residual

Cubic polynomial fit with $R^2 = 0.982$



Computational Efficiency

UDE: 0.27 ± 0.05 ms, Physics: 0.08 ± 0.01 ms

Speedup: 3.36x (counterintuitive)

