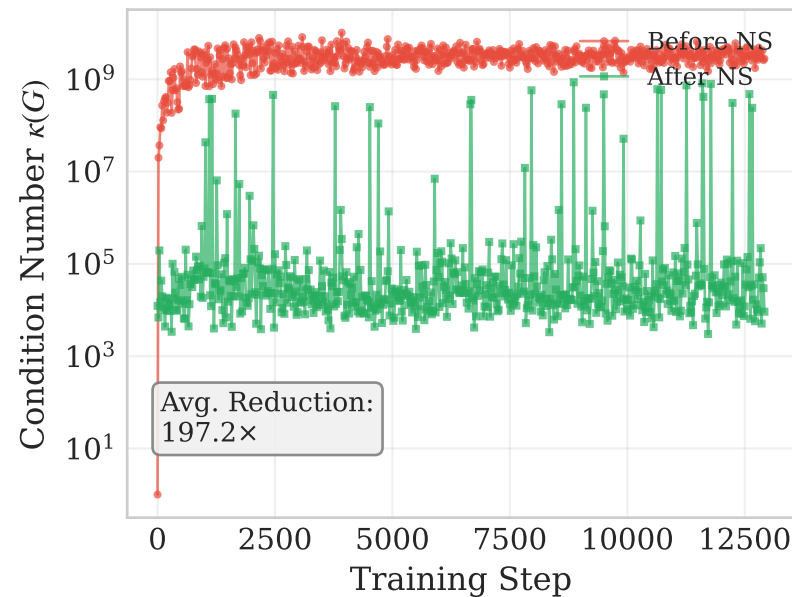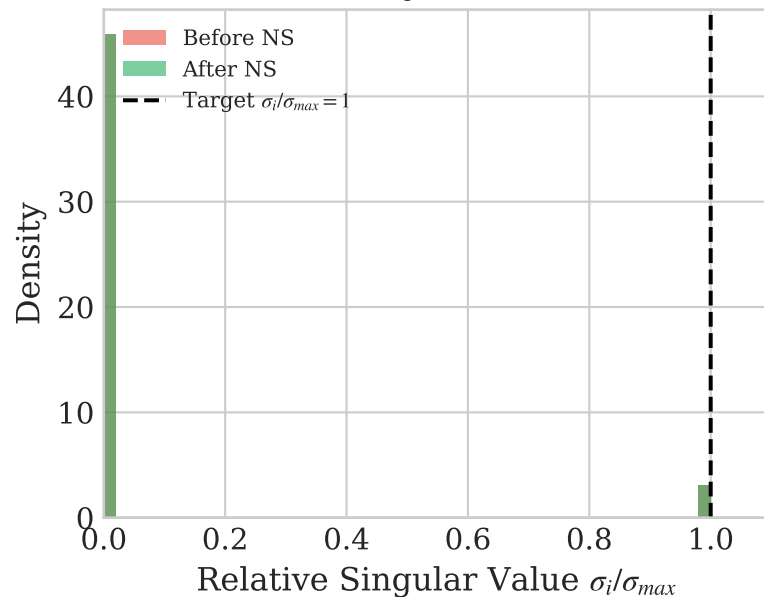# Single-Step Newton-Schulz Orthogonalization Effect

(a) Condition Number $\kappa = \sigma_{max}/\sigma_{min}$

Before NS
After NS

Avg. Reduction:
197.2×

Condition Number $\kappa(G)$

Training Step

(b) SV Uniformity: σ_i/σ_{max} Distribution

Before NS
After NS
Target $\sigma_i/\sigma_{max} = 1$

Density

Relative Singular Value σ_i/σ_{max}

(c) Orthogonality Error (Column-wise)

Before NS
After NS

$\|G^T G - I\|_F / \|I\|_F$

Training Step