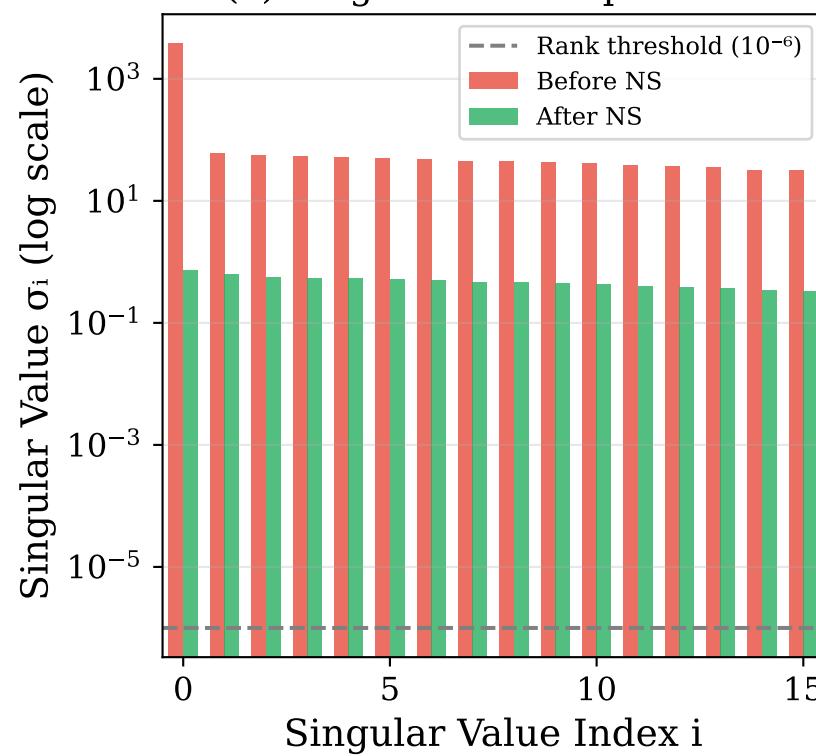
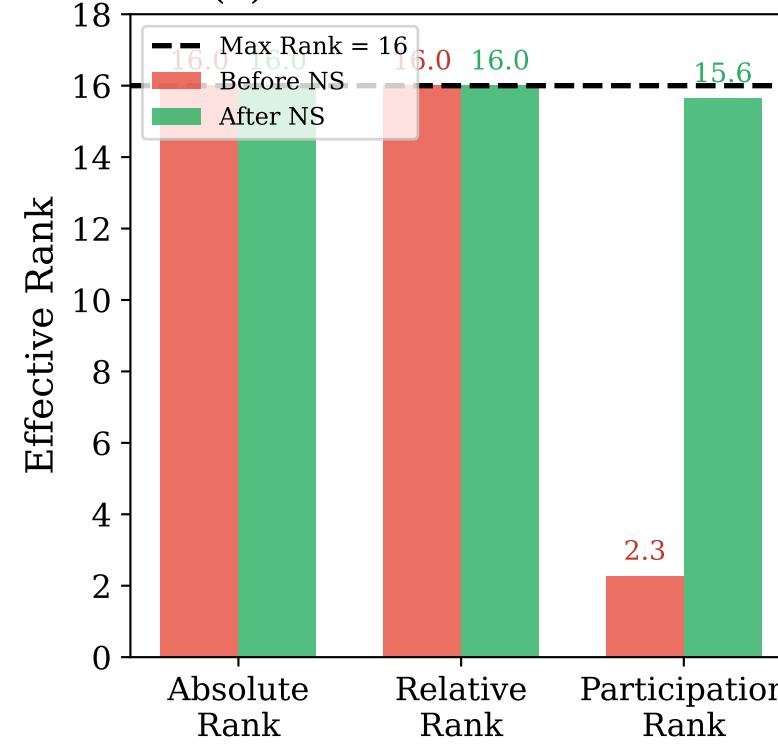


Newton-Schulz Transforms Near Rank-Deficient Matrix to Full-Rank

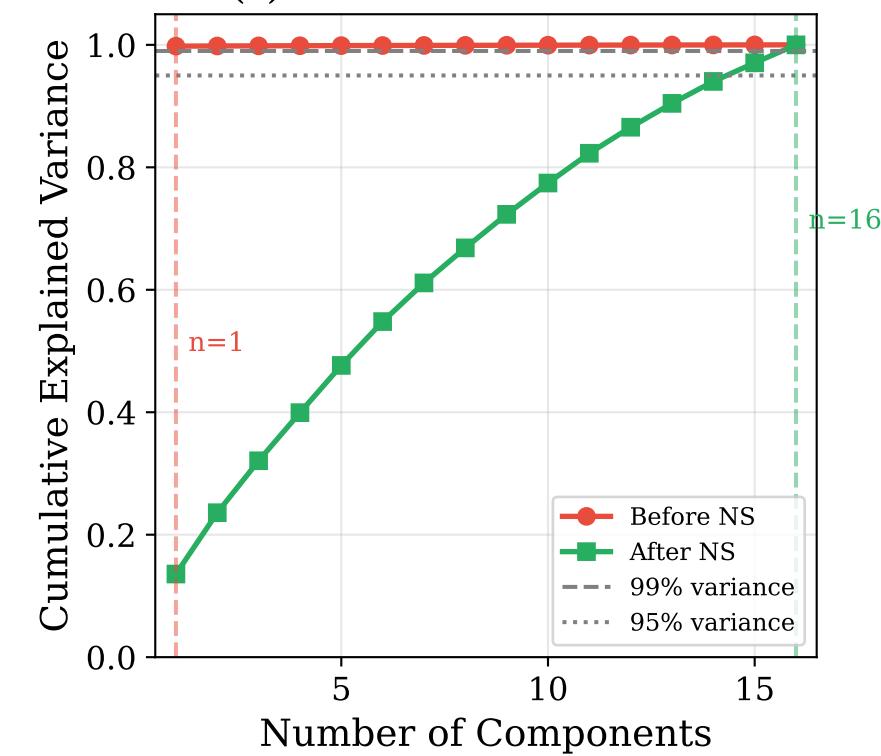
(a) Singular Value Spectrum



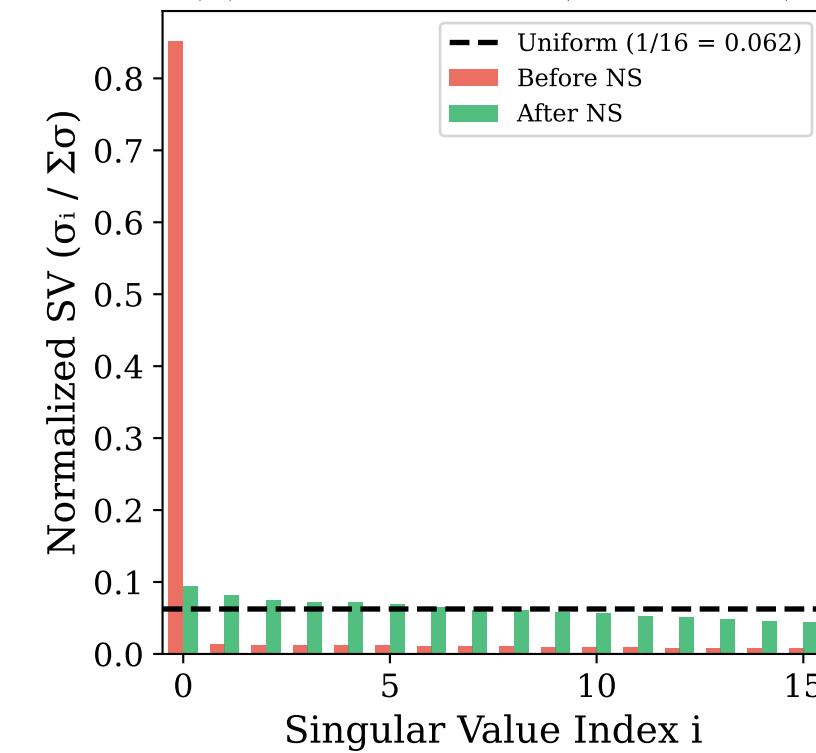
(b) Effective Rank Metrics



(c) Variance Concentration



(d) SV Distribution (normalized)



(e) Summary

RANK ANALYSIS SUMMARY

Matrix shape: [128 × 16]
Maximum possible rank: 16

BEFORE Newton-Schulz:

- ─ Effective rank: 16 / 16
- ─ Participation rank: 2.3
- ─ Condition number: 1.20e+02
- ─ Components for 99%: 1

AFTER Newton-Schulz:

- ─ Effective rank: 16 / 16 ← FULL RANK!
- ─ Participation rank: 15.6
- ─ Condition number: 2.15e+00
- ─ Components for 99%: 16

IMPROVEMENT:

- ─ Rank: 16 → 16 (1.0×)
- ─ Condition: 55.9× reduction

(f) Active Dimensions (Active: 16/16, Inactive: 0/16)

