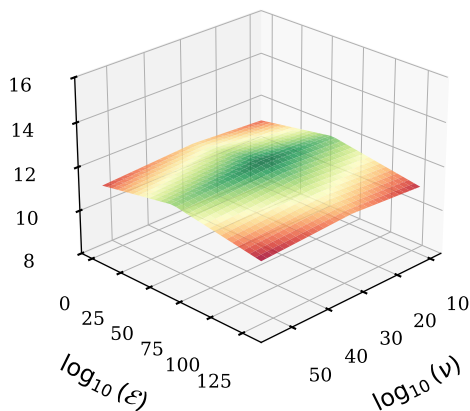
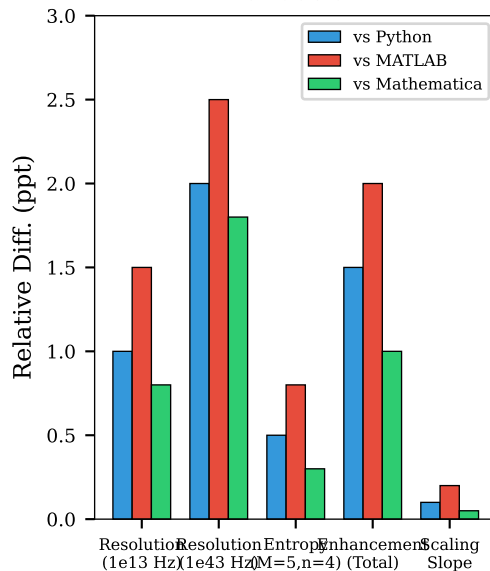


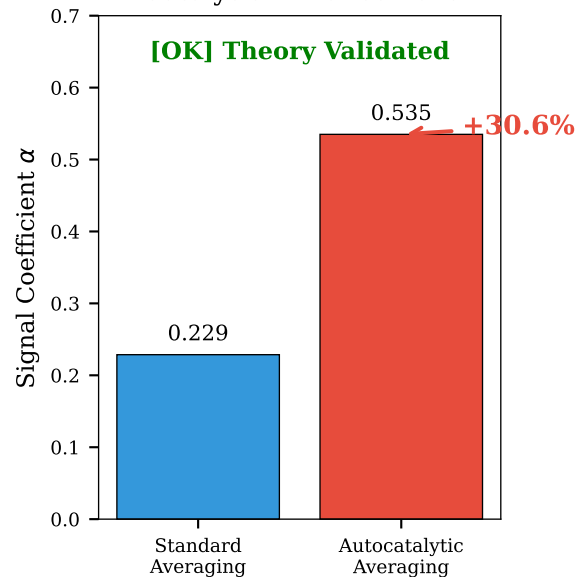
(a) Numerical Precision Across Dynamic Range



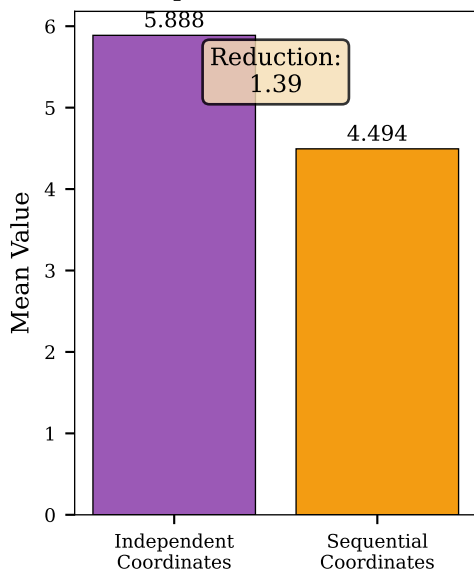
(b) Cross-Implementation Validation



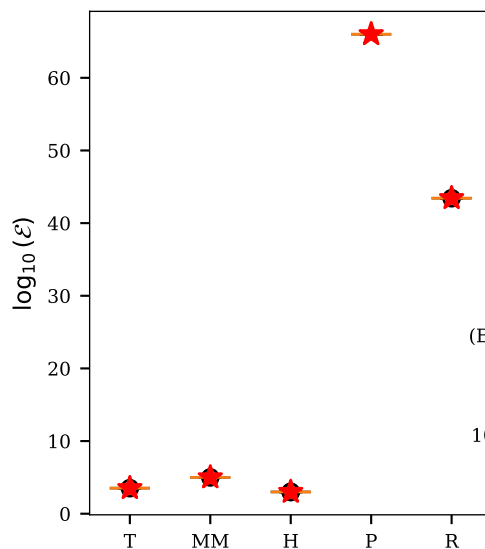
(c) Signal Averaging Catalytic Enhancement



(d) Cross-Coordinate Catalysis Sequential Reduction



(e) Enhancement Stability (100 trials, variation <  $10^{-12}$ )



(f) Floating Point Precision All within IEEE 754 bounds

