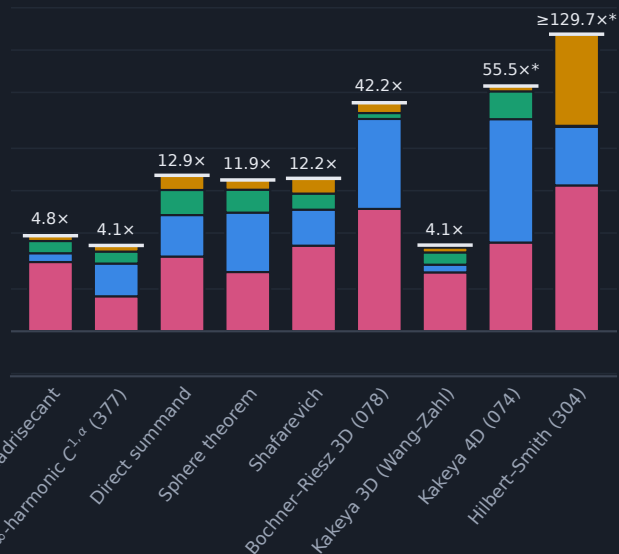
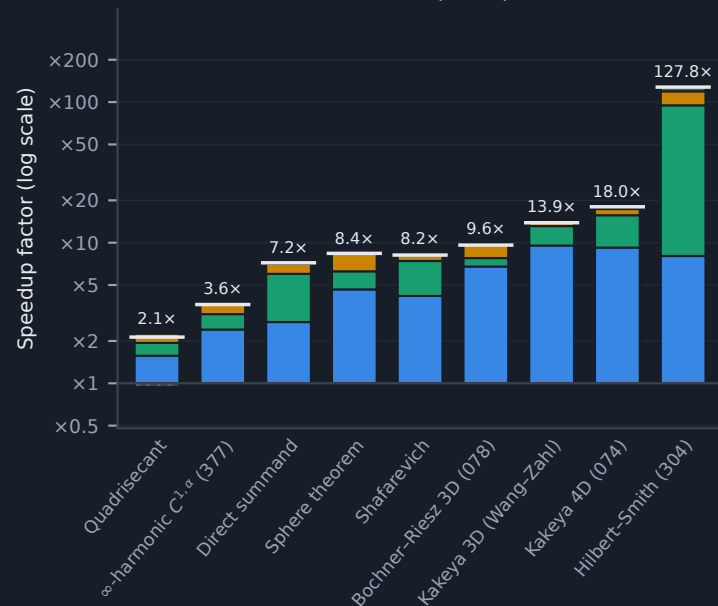


■ One check per chain
 ■ Build reuse
 ■ Ledger
 ■ Parallel replay
 ■ Fixed costs (net)
 ▨ Factor below $\times 1$
 — Net speedup

Final root ($n = 9$)

Dependency chain ($n = 9$)



Each bar: the factors of one problem and scope, stacked in log space (they multiply to the net speedup; hatched: a factor below 1). * includes an estimate; $\geq$ lower bound.