

Figure 1: timing-pattern

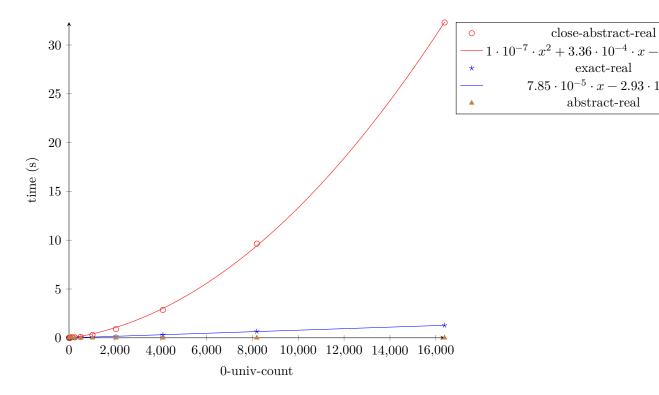


Figure 2: timing-n-polymorphic-universes param-1-n 0

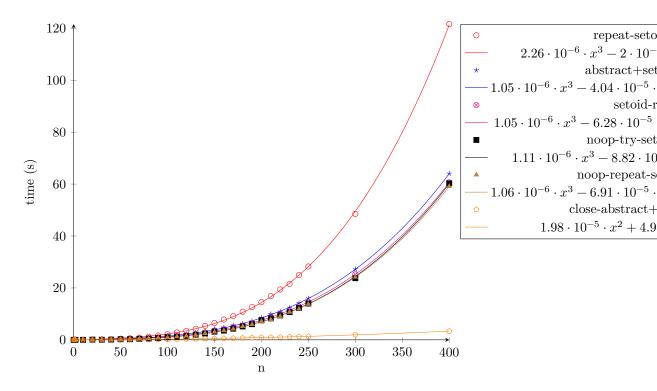
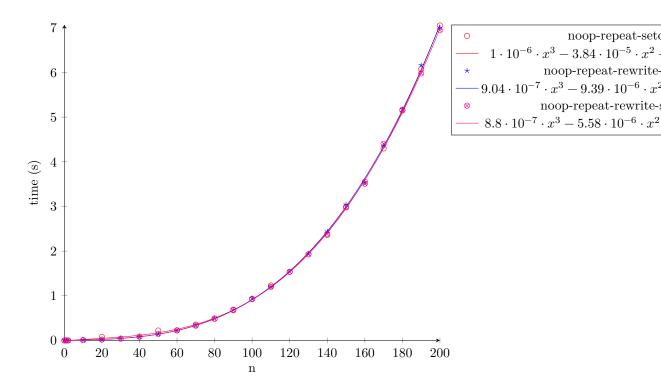
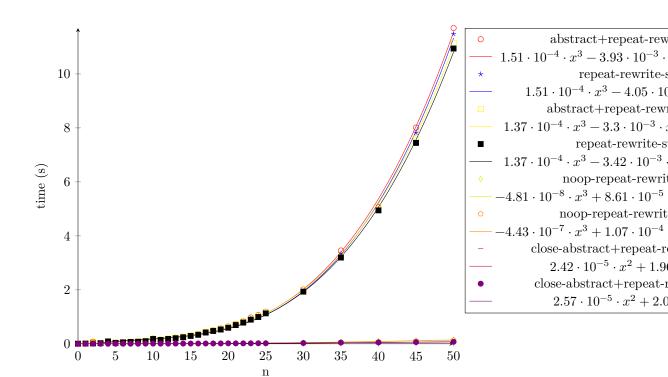


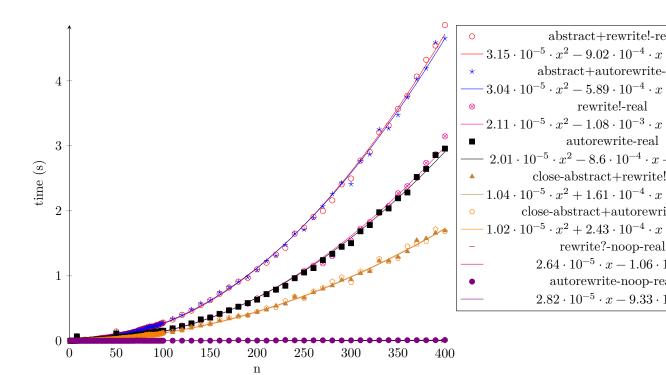
Figure 3: timing-repeat-setoid-rewrite-under-binders



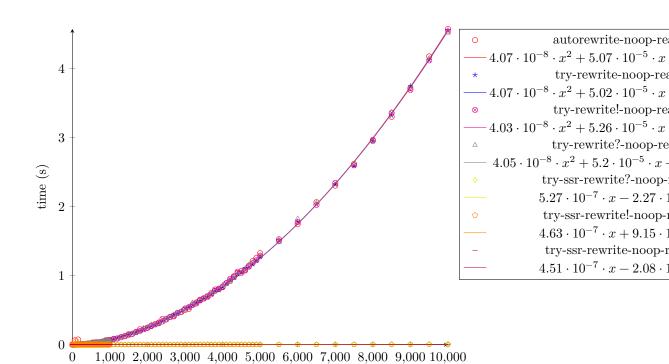
 $Figure\ 4:\ timing-repeat-setoid-rewrite-under-binders-noop$



 $Figure\ 5:\ timing-rewrite-strat-under-binders$



 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$



 $Figure~7:~timing\mbox{-rewrite-repeated-app-autorewrite-noop}$

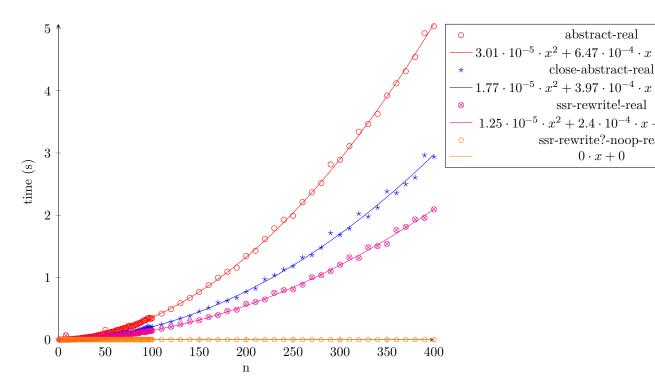


Figure 8: timing-rewrite-repeated-app-ssrrewrite

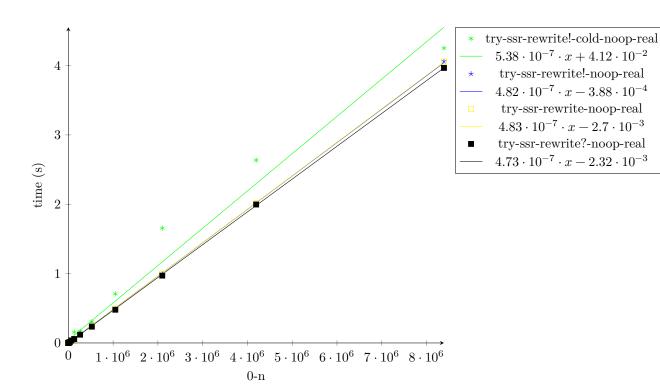
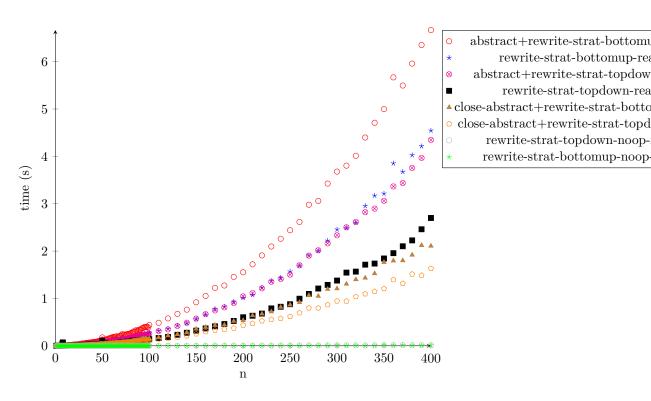


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$

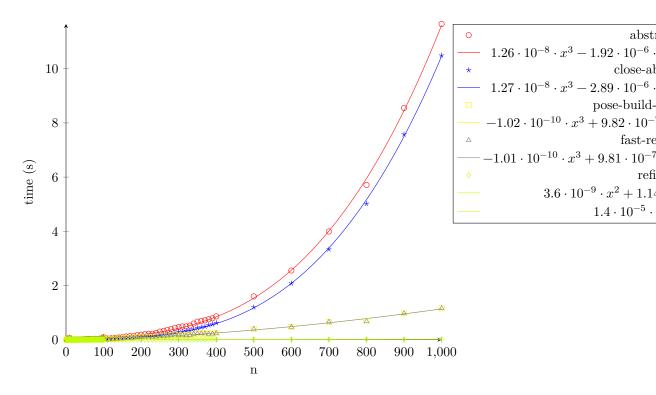


rewrite-strat-bottomup-rea

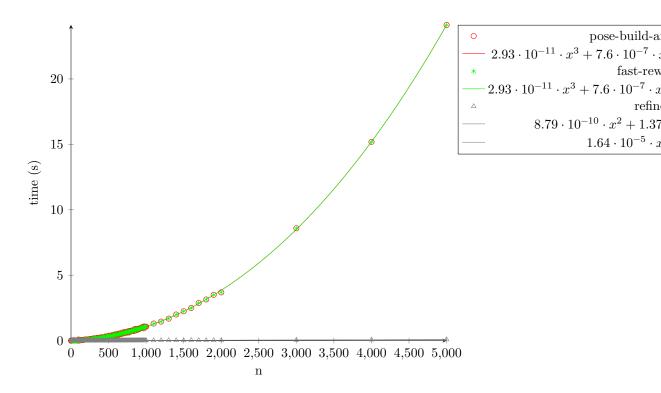
abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

rewrite-strat-topdown-nooprewrite-strat-bottomup-noop-

 $Figure~10:~timing\mbox{-rewrite-repeated-app-rewrite-strat}$



 $Figure~11:~timing\mbox{-rewrite-repeated-app-fast-rewrite}$



 $Figure~12:~timing\mbox{-rewrite-repeated-app-fast-rewrite-no-abstract}$

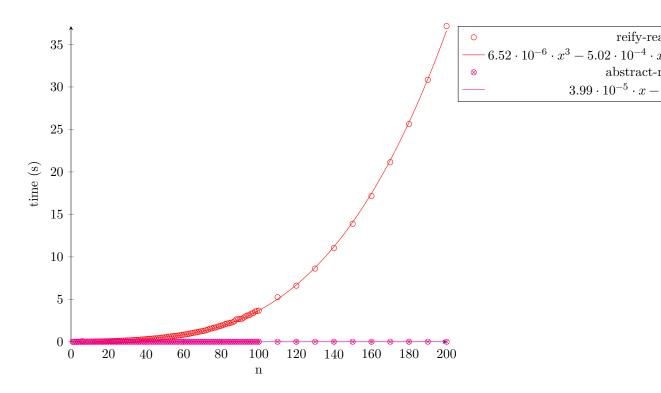


Figure 13: timing-typeclass-reification-let-in-HOAS

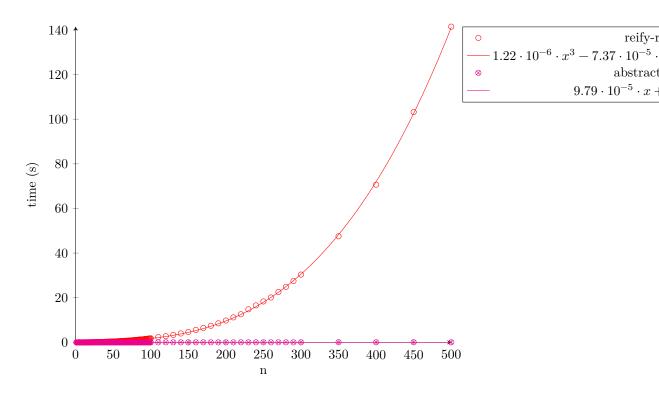
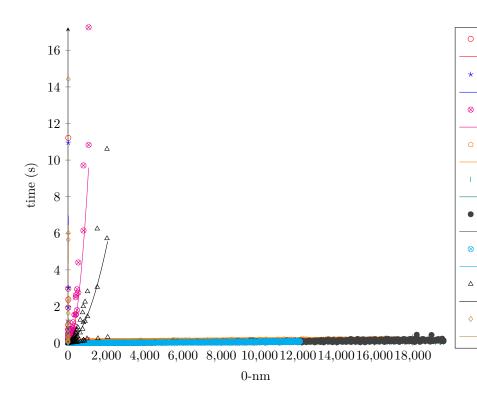


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot

 $8.43\cdot 10^{-6}\cdot x^2 - 1.84\cdot 10^{-4}\cdot x^2 + 1.84\cdot 1$

 $7.24 \cdot 10^{-11} \cdot x^2 + 5.82 \cdot 10^{-6} \cdot$

 $1.04 \cdot 10^{-10} \cdot x^2 + 3.94 \cdot 10^{-6} \cdot$

 $2.31\cdot 10^{-10}\cdot x^2 + 4.8\cdot 10^{-6}\cdot \\$

 $1.4 \cdot 10^{-10} \cdot x^2 + 5.45 \cdot 10^{-6} \cdot x^2$

 $1.11 \cdot 10^{-6} \cdot x^2 + 3.89 \cdot 10^{-4} \cdot x^2$

 $-8.41 \cdot 10^{-3} \cdot x^3 + 0.27 \cdot x^2 -$

 $6.28 \cdot 10^{-3} \exp{(0.47 \cdot ($ rewrite-strat(topdown-bot

 $7.35 \cdot 10^{-3} \exp{(0.46 \cdot ($

cps+native-compute

cps+cbn-real

cps+cbv-real

cps+lazy-real

cps+simpl-real

setoid-rewrite-re

cps+vm-compute-

Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

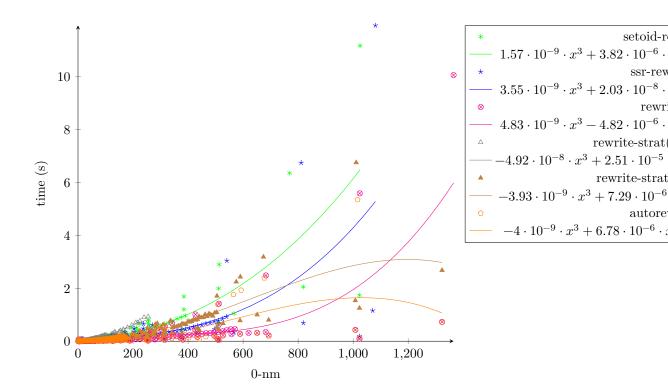
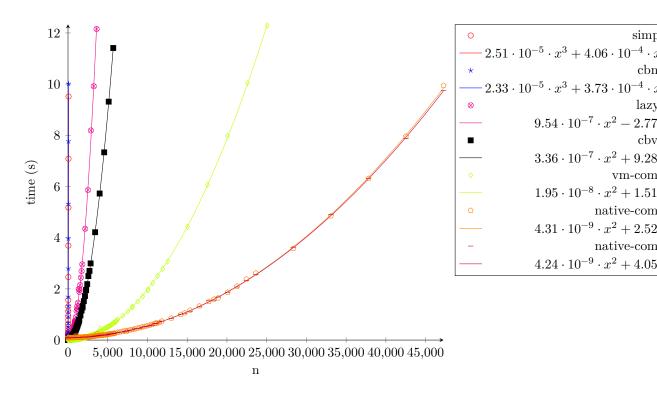


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $9.54 \cdot 10^{-7} \cdot x^2 - 2.77$

 $3.36 \cdot 10^{-7} \cdot x^2 + 9.28$

 $1.95 \cdot 10^{-8} \cdot x^2 + 1.51$

 $4.31 \cdot 10^{-9} \cdot x^2 + 2.52$

 $4.24 \cdot 10^{-9} \cdot x^2 + 4.05$

Figure 17: timing-sieve-of-eratosthenes

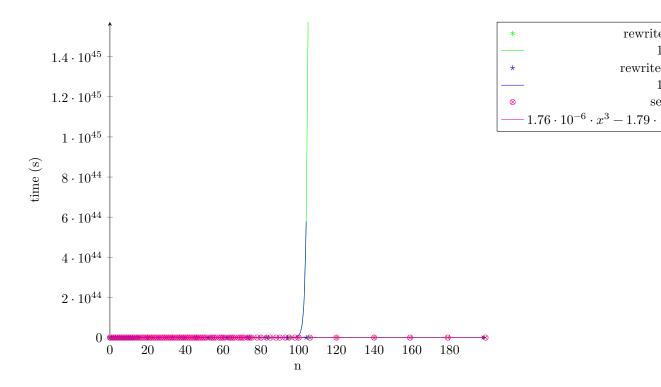


Figure 18: timing-rewrite-under-lets-plus-0 $\,$