

Figure 1: timing-pattern

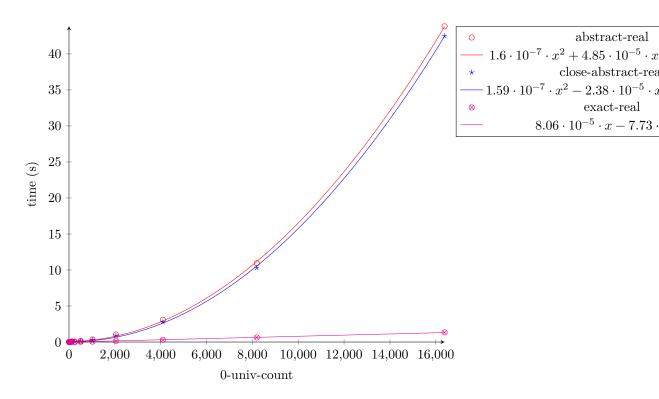
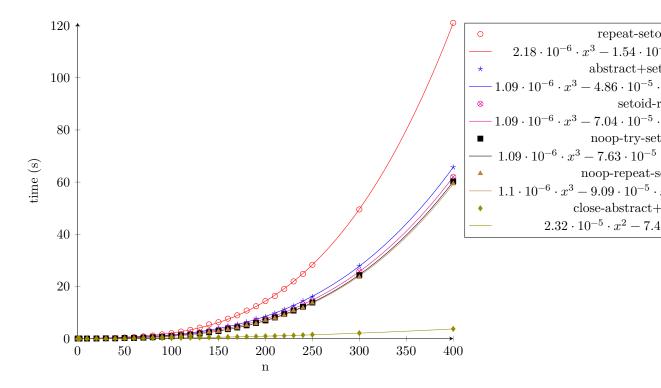


Figure 2: timing-n-polymorphic-universes param-1-n $\,0\,$



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

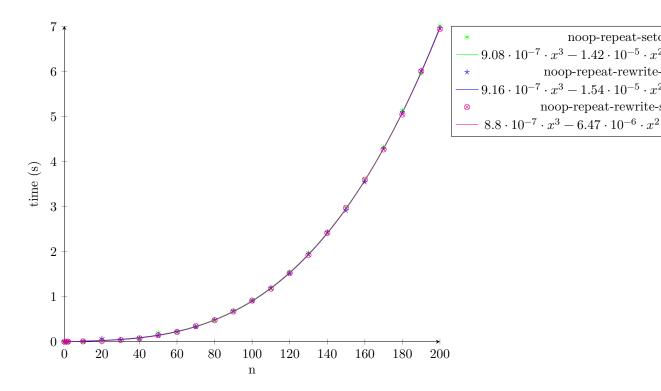
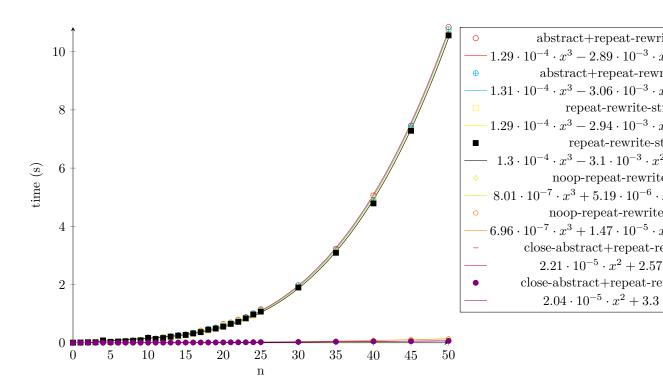
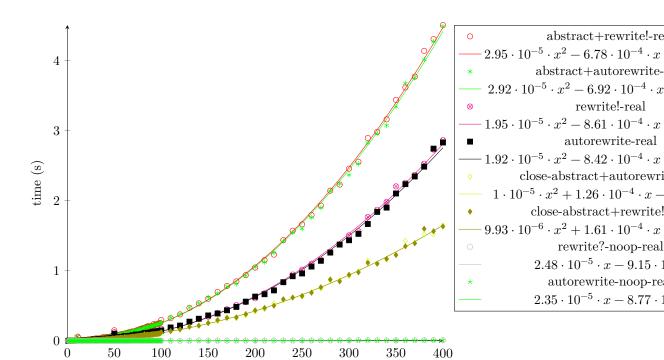


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

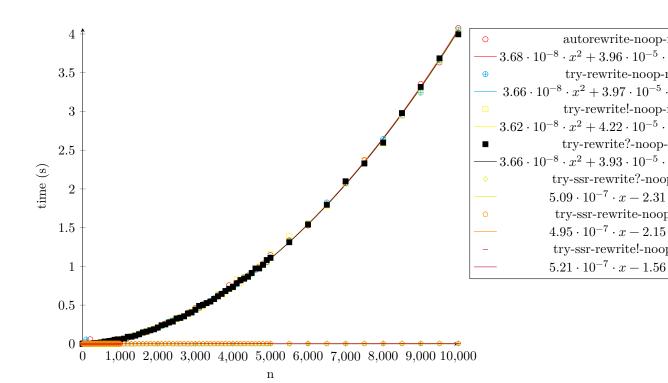


 $Figure\ 5:\ timing-rewrite-strat-under-binders$

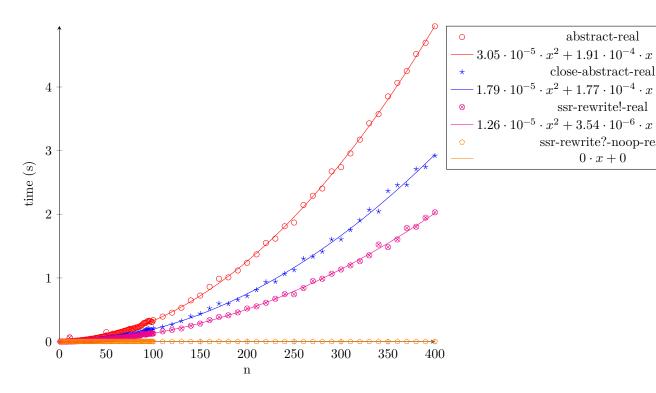


 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$

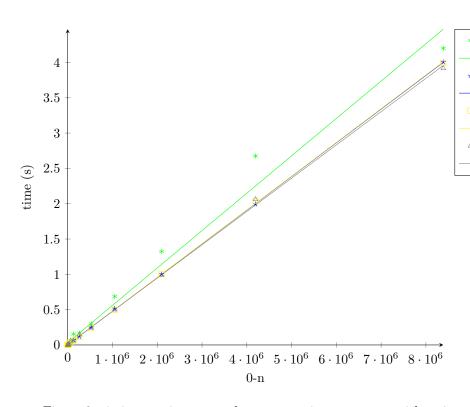
n



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



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



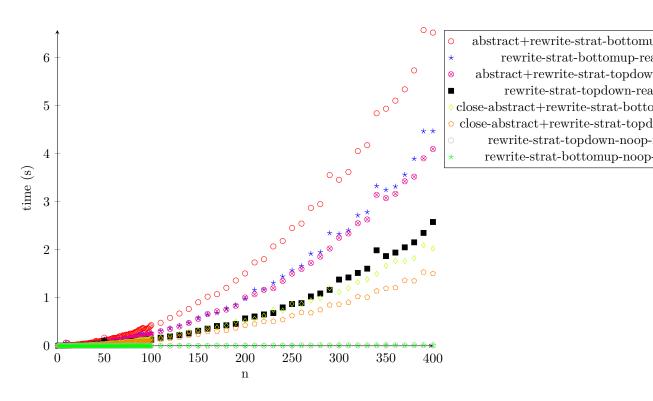
try-ssr-rewrite!-cold-noop-rea $5.29\cdot 10^{-7}\cdot x + 3.11\cdot 10^{-2}$

try-ssr-rewrite-noop-real $4.77\cdot 10^{-7}\cdot x - 1.52\cdot 10^{-4}$

try-ssr-rewrite?-noop-real $4.78\cdot 10^{-7}\cdot x - 1.51\cdot 10^{-4}$

try-ssr-rewrite!-noop-real $4.71\cdot 10^{-7}\cdot x + 4.42\cdot 10^{-3}$

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



 $abstract + rewrite - strat - bottom \\ \\$

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

rewrite-strat-topdown-noop-

rewrite-strat-bottomup-noop-

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

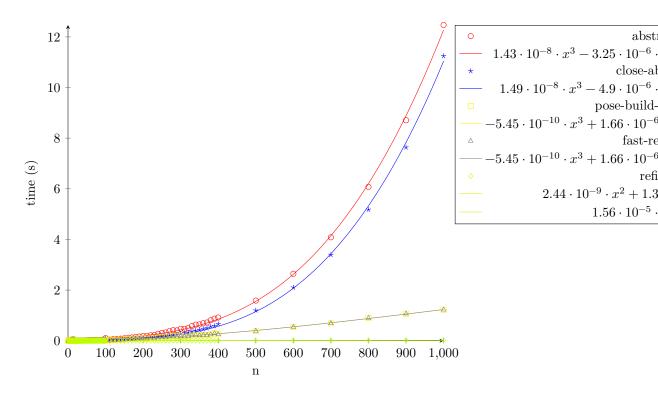


Figure 11: timing-rewrite-repeated-app-fast-rewrite

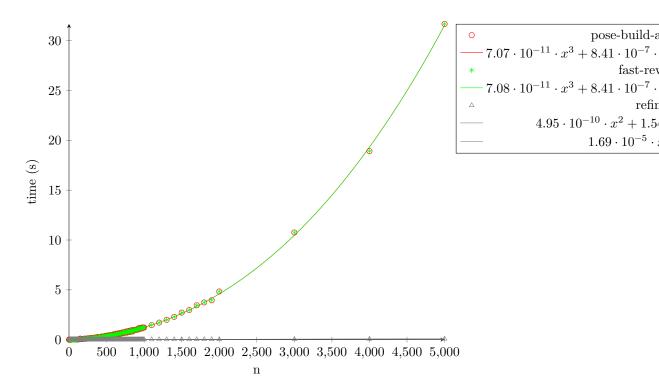


Figure 12: timing-rewrite-repeated-app-fast-rewrite-no-abstract

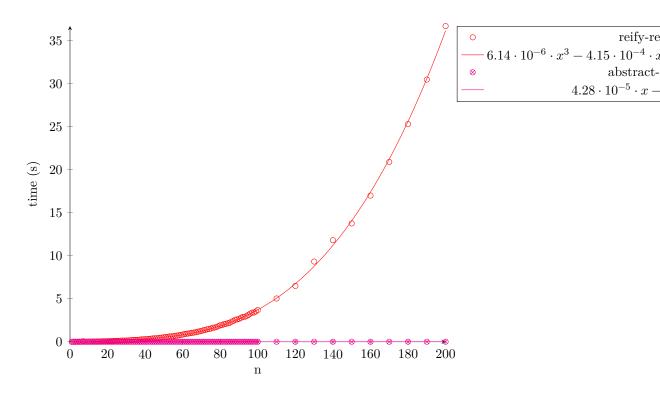


Figure 13: timing-typeclass-reification-let-in-HOAS

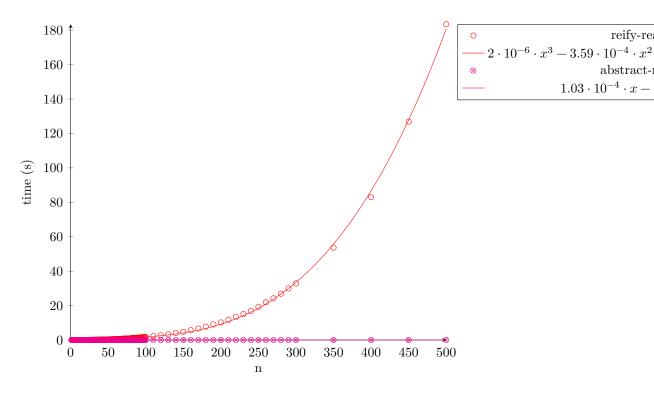
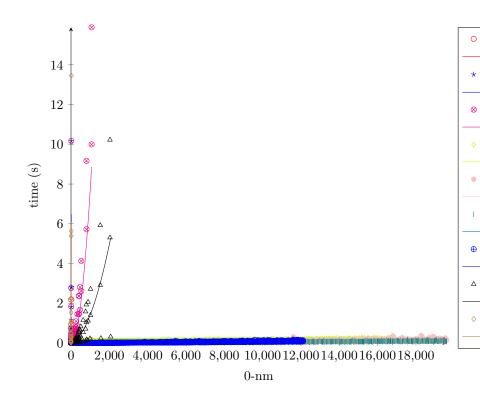


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot $6.65 \cdot 10^{-3} exp(0.46 \cdot ($

rewrite-strat (topdown-bot 6.84 \cdot 10⁻³ exp (0.46 \cdot (

 $7.67 \cdot 10^{-6} \cdot x^2 - 2.42 \cdot 10^{-5} \cdot x^2 + 2.42 \cdot 10^{-5} \cdot x^2$

 $7.43 \cdot 10^{-11} \cdot x^2 + 6.48 \cdot 10^{-6} \cdot$

 $2.46 \cdot 10^{-10} \cdot x^2 + 4.86 \cdot 10^{-6} \cdot$

 $1.19 \cdot 10^{-10} \cdot x^2 + 3.73 \cdot 10^{-6} \cdot$

 $1.69 \cdot 10^{-10} \cdot x^2 + 6.89 \cdot 10^{-6} \cdot \\$

 $1.06 \cdot 10^{-6} \cdot x^2 + 3.67 \cdot 10^{-4} \cdot x^2$

 $-7.85 \cdot 10^{-3} \cdot x^3 + 0.25 \cdot x^2 -$

cps+cbn-real

cps+lazy-real

 $\operatorname{cps+cbv-real}$

cps+simpl-real

setoid-rewrite-re

cps+vm-compute-

cps+native-compute

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

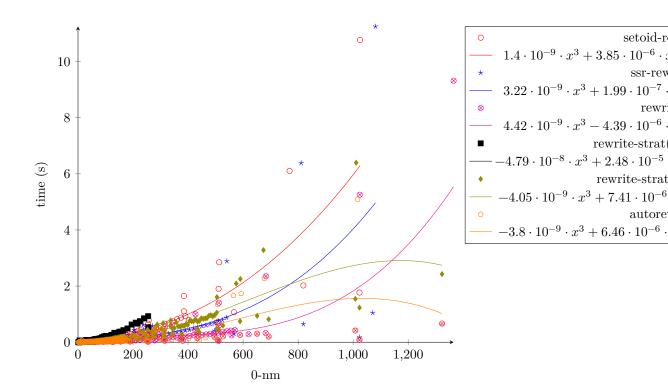
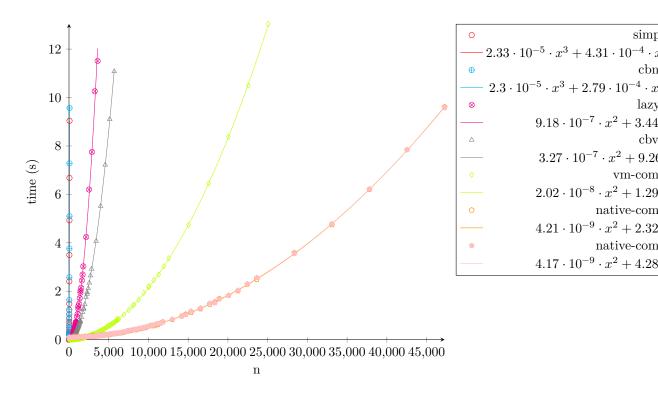


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $9.18 \cdot 10^{-7} \cdot x^2 + 3.44$

 $3.27 \cdot 10^{-7} \cdot x^2 + 9.26$

 $2.02 \cdot 10^{-8} \cdot x^2 + 1.29$

 $4.21 \cdot 10^{-9} \cdot x^2 + 2.32$

 $4.17 \cdot 10^{-9} \cdot x^2 + 4.28$

Figure 17: timing-sieve-of-eratosthenes

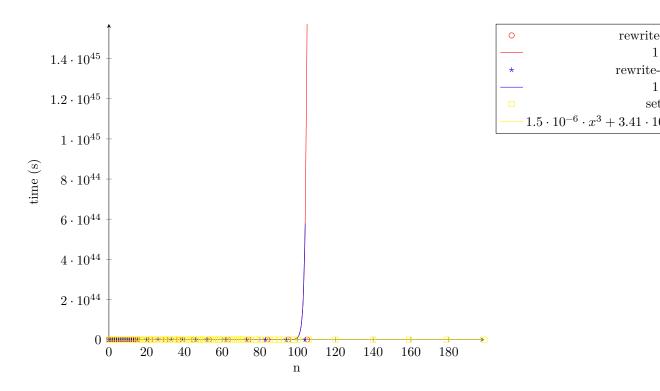


Figure 18: timing-rewrite-under-lets-plus-0 $\,$

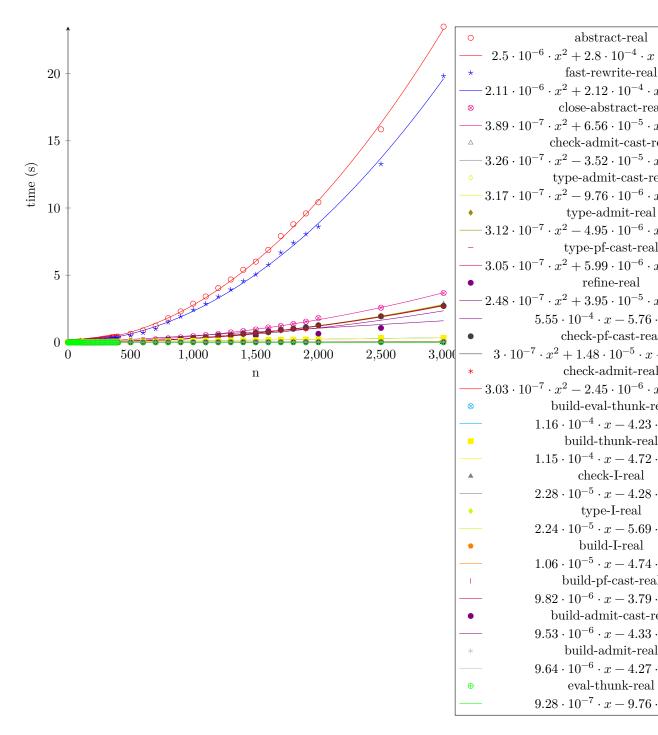


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2