

Figure 1: timing-pattern

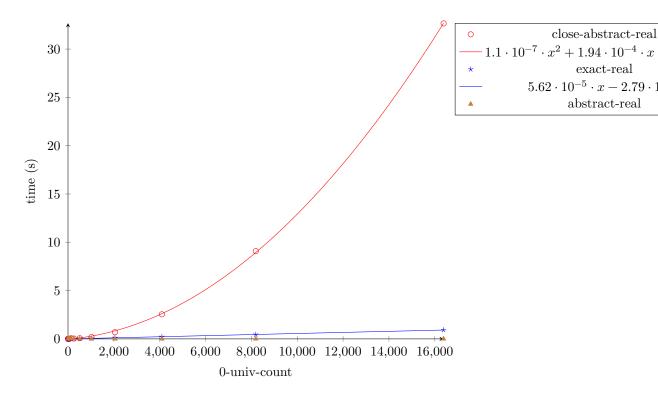
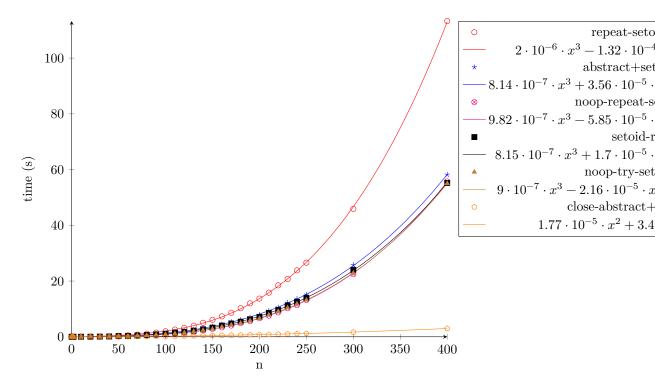
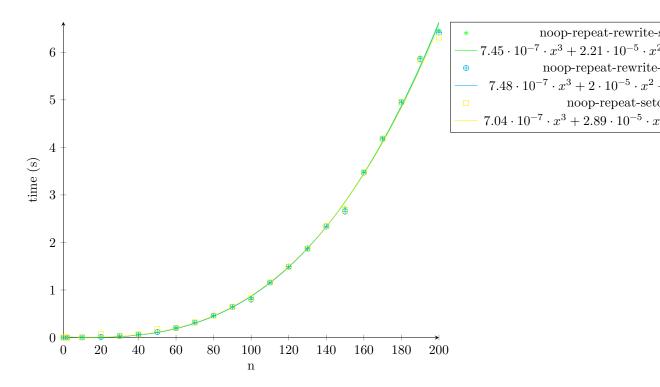


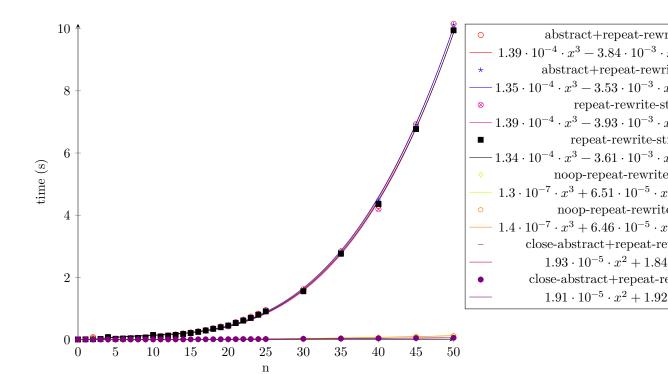
Figure 2: timing-n-polymorphic-universes param-1-n 0



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



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



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

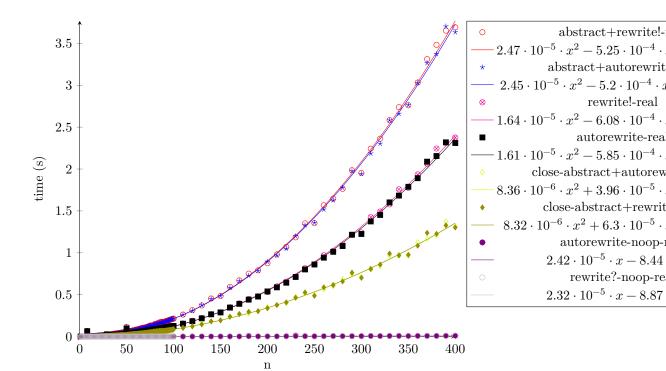


Figure 6: timing-rewrite-repeated-app-autorewrite

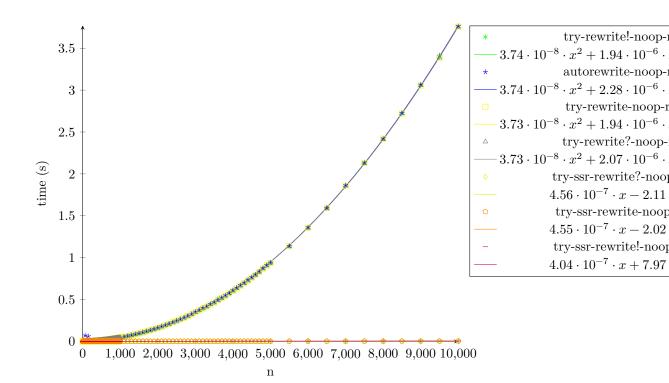


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

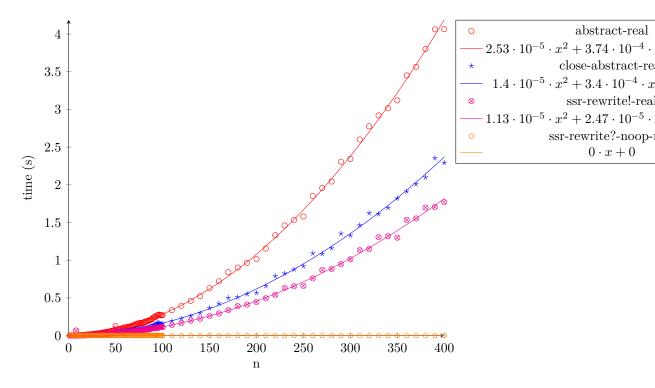
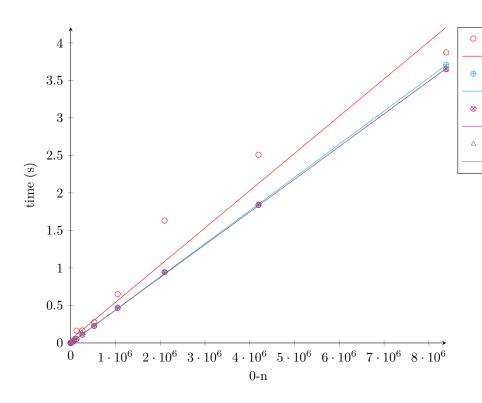


Figure 8: timing-rewrite-repeated-app-ssrrewrite



try-ssr-rewrite!-cold-noop-rea

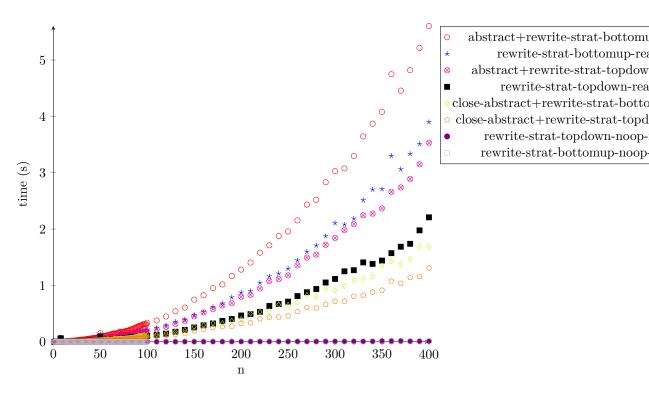
 $\begin{array}{l} 4.96\cdot 10^{-7}\cdot x + 4.51\cdot 10^{-2}\\ \text{try-ssr-rewrite-noop-real} \end{array}$

 $\begin{array}{l} 4.42\cdot 10^{-7}\cdot x - 1.03\cdot 10^{-3} \\ \text{try-ssr-rewrite?-noop-real} \end{array}$

 $\begin{array}{l} 4.36 \cdot 10^{-7} \cdot x + 9.78 \cdot 10^{-4} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$

 $4.35\cdot 10^{-7}\cdot x + 4.3\cdot 10^{-3}$

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

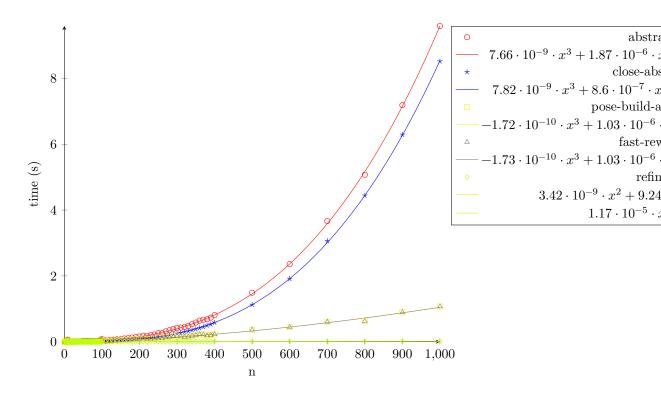


 $abstract + rewrite - strat - bottom \\ \\$ rewrite-strat-bottomup-rea

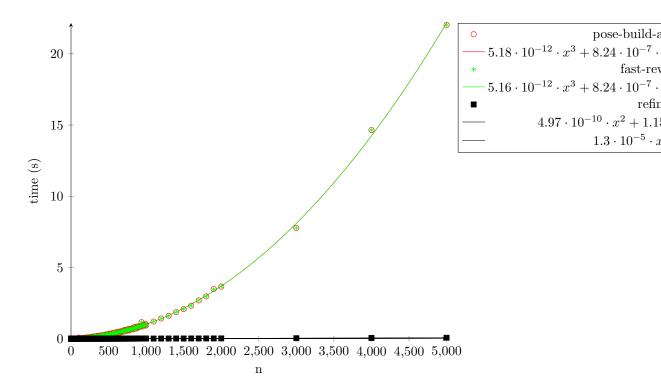
abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

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

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



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



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

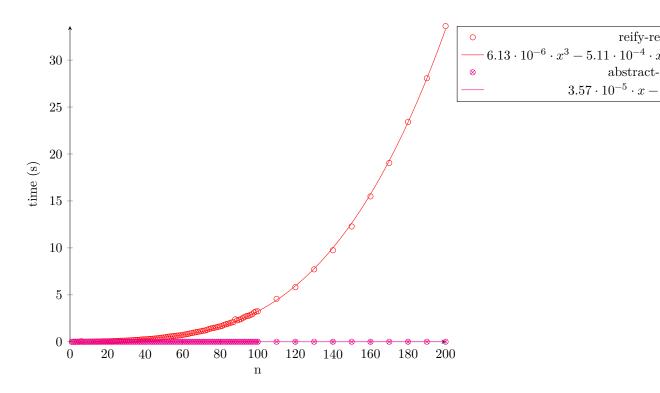


Figure 13: timing-typeclass-reification-let-in-HOAS

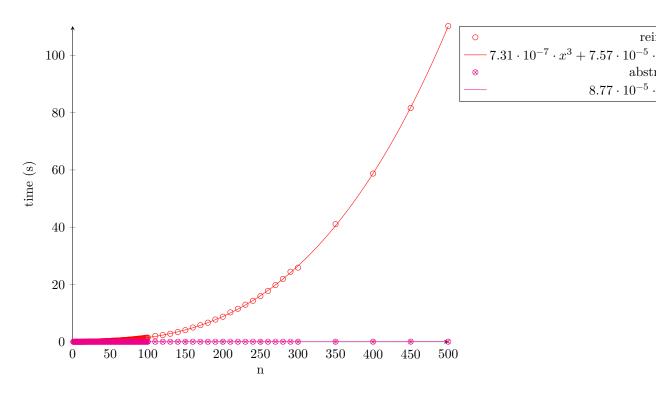
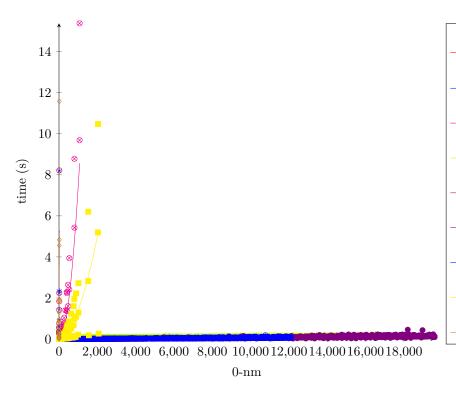


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot $2.5 \cdot 10^{-3} exp(0.5 \cdot (0.5))$

rewrite-strat(topdown-bot) $5.35 \cdot 10^{-3} exp(0.46 \cdot ($

 $7.53\cdot 10^{-6}\cdot x^2 - 1.69\cdot 10^{-4}\cdot x^2 - 1.69\cdot 1$

 $4.54\cdot 10^{-11}\cdot x^2 + 5.91\cdot 10^{-6}\cdot \\$

 $1.08 \cdot 10^{-10} \cdot x^2 + 3.57 \cdot 10^{-6} \cdot$

 $2.14\cdot 10^{-10}\cdot x^2 + 4.63\cdot 10^{-6}\cdot \\$

 $1.3 \cdot 10^{-10} \cdot x^2 + 5.12 \cdot 10^{-6} \cdot x^2$

 $1.08 \cdot 10^{-6} \cdot x^2 + 3.44 \cdot 10^{-4} \cdot x^2 + 3.44 \cdot 10^{-4}$

 $-6.74 \cdot 10^{-3} \cdot x^3 + 0.22 \cdot x^2 -$

cps+cbn-real

 $_{\rm cps+cbv\text{-}real}$

cps+lazy-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

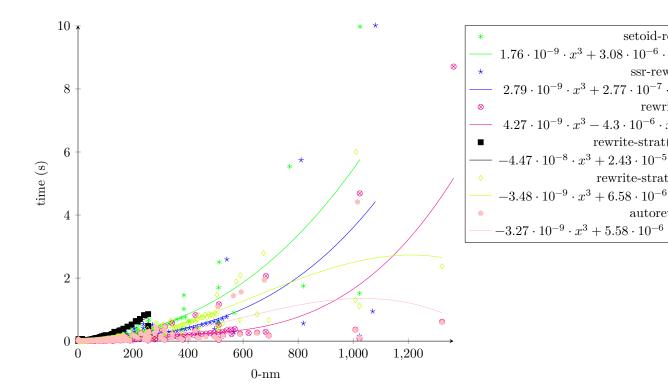
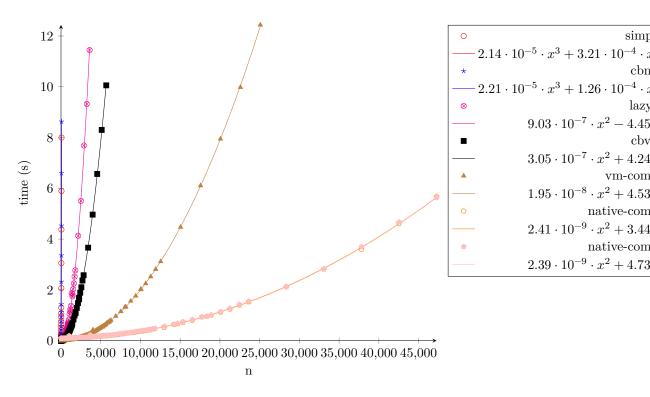


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $9.03 \cdot 10^{-7} \cdot x^2 - 4.45$

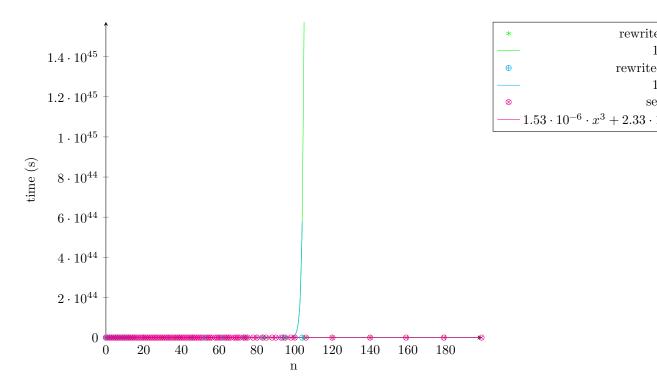
 $3.05 \cdot 10^{-7} \cdot x^2 + 4.24$

 $1.95 \cdot 10^{-8} \cdot x^2 + 4.53$

 $2.41 \cdot 10^{-9} \cdot x^2 + 3.44$

 $2.39 \cdot 10^{-9} \cdot x^2 + 4.73$

Figure 17: timing-sieve-of-eratosthenes



rewrite

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